

# **Net Promoter Score Scale Transformed into a Logit Model, a Full-service Restaurant Approach.**

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## **Abstract**

The objective of this research was to analyze the relationship between the Net Promoter Score (NPS), broadly used in industry, with dichotomous word-of-mouth (WOM) metric to gain more insight into customer satisfaction. The NPS is an indicator, which its author claims to be the ultimate question that industry practitioners should be increasing. The NPS system works with a single question: How likely are you to recommend our company to friends and family? This methodology classifies the status of interviewed clients into three groups using an eleven-point Likert scale: the ones answering from 0 to 6 are treated like detractors, the ones answering 7 and 8 are treated like passives and the ones answering 9 and 10 are treated like promoters. The methodology of this research was quantitative and exploratory. The data collection was through a probabilistic approach with a self-administered survey presented by waiters on a tablet in a full-service restaurant. The chosen statistical method was a logit regression towards suggesting a scale transformation; the reason to do so is to face one of the most criticized characteristics of the NPS system, which is the lack of justification while clustering. The results show evidence that the relationship between metrics is statistically significant. The originality of the article resides in the contribution of a complementary metric on the NPS system. Instead of making three big groups, the logit approach comes up with a probability of word-of-mouth intention for each of the responses to achieve more insight for each type of client in the original classification.

## **Keywords**

NPS, Customer satisfaction, logit, restaurants, WOM.

## **1. Introduction**

The Net Promoter Score (NPS) is a broadly used indicator in industry related to customer satisfaction (CS). Even though it is one of the most used and popular indexes, it is also one of the most controversial and criticized by researchers and academics. Reichheld, its author, published an article in 2003 in the Harvard Business Review proposing this one-question-eleven-Likert-scale-point as a solution for the industry and claiming that this metric is the one that most business should be growing, paying attention to reach CS and thus loyalty.

Customer satisfaction has been an important subject of study in social science since it has been related as an outcome of reaching customer's expectations (Zeithaml et al., 1996), usually through business performance and having beneficial behavioral outcomes, such as repurchase, loyalty, word-of-mouth intention, and so on (Chen, 2012; Garbarino & Johnson, 1999; Lee et al., 2020).

Parsa et al. (2005) acknowledge CS as a very important factor for success in the 800+ billion-dollar restaurant industry (National Restaurant Association, 2020), which has been struggling since the beginning of the COVID-19 pandemic, a situation that makes it especially important to gain insight into new customer's behavior knowledge so it can be applied in industry, thus helping companies to thrive during the lockdown.

## 1.1 Objectives

The purpose of this research is to assess the relationship between NPS and WOM intention, so a complementary outcome will provide probability on WOM depending on the NPS score. This approach tries to bring to the table a solution for one of the most criticized issues in the use of NPS, which is the clustering criteria, giving a probability for each of the 11 values of the scale instead of just having three big groups as an outcome: the promoters, the passives, and the detractors.

## 2. Literature Review

### The Net Promoter Score.

The NPS has been an important metric that has been used in most industries to assess service. This adoption relies on its easy operation, as just one question promises to classify types of customers into three big groups: A) The promoters: are the ones scoring 9-10, the kind of customers that are so heavily pleased and very likely to repurchase and recommend the business to others. B) The passives: the ones scoring 7-8, and finally, C) The detractors: scoring from 0-6, the kind of clients that are not satisfied (Reichheld, 2003). The NPS scale is presented in the figure 1.



Figure 1. Net Promoter Score scale

Taking 4,000 customers from 14 industries, its author determined that the survey questions with the strongest statistical correlation with repeat purchases or referrals in most industries were the following: “How likely is it that you would recommend [company X] to a friend or colleague? (Kristensen & Eskildsen, 2014). The NPS is then calculated as the percentage of promoters minus the percentage of detractors, aiming for a number that could lead from 100 to -100.

### Criticism to NPS

As NPS has been adopted massively in industry, it has also been on the spot of academia. Researchers have shown evidence of the metric’s weak spots. For example, Keiningham et al. (2007) found in their research that at its macro-level analysis, they did not find any real indication that attitudinal metrics significantly correlate with revenue, contrary to what NPS’s author stated, relating NPS to grow in revenue. Keiningham et al. (2008) followed up their research on NPS, affirming that a single item measure on customer satisfaction is not enough to have accurate outcomes since all these variables tend to be multidimensional. Supporting this same idea, Pollack and Alexandrov (2013) stated that a combination of metrics is best for predicting actual loyalty behaviors. Zaki et al. (2016) also critic that a lack of insight exists in those clients who churned. Kristensen and Eskildsen (2011) concluded that the way the NPS grouped detractors, passives and promoters was not supported by their analysis and found it very sensitive to change.

### Word-of-Mouth Intention

Jalilvand et al. (2017) define Word-of-Mouth (WOM) as casual communication among people who have consumed or experimented with products or services and generated a post-purchase evaluation and shared it with people interested in experiencing those goods or services as well. WOM is an attitude and behavior that is related to customer satisfaction (Storback et al., 1994) and has been broadly studied in different industries because of its link to business success.

For the sake of this research, the approach was to use a single dichotomic question. Interval scale, such as NPS measured intensity; dichotomic questions obtain 0,1 outcomes, yes, I will recommend or no, I will not recommend.

Word-of-mouth is rarely measured as a single item variable. Since this is an exploratory approach supported by previous theory, the following research hypothesis is stated:

H1: There is a statistically significant relationship between NPS and the dichotomic WOM approach.

### 3. Methods

The approach in this research is exploratory and quantitative. The chosen statistical method to analyze data is through a Pearson correlation; later, a logit regression was performed to assess the proposed relationship and find its statistical significance.

### 4. Data Collection

Data were collected in February 2021; the collection was made in the city of Monterrey in four different branches of the same brand of a full-service restaurant. Randomly, at the end of consumption, an employee of the restaurant offered a self-administered electronic survey using a tablet. The following formula was used to find an adequate sample size.

$$n = \frac{Z^2(P)(Q)(N)}{S^2(N - 1) + Z^2(P)(Q)}$$

Where:

n = Sample size

Z = Confidence interval 95% = 1.96

P = Probability that the event occurs = 50%

Q = Probability that the event does not occur (1-P) = 50%

N = Population size = 3,664,659 inhabitants in Monterrey Metropolitan area

$$n = \frac{(1.96)^2(.5)(.5)(3664659)}{.05^2(3664659 - 1) + (1.96)^2(.5)(.5)}$$

$$n = 384 \text{ cases.}$$

After analyzing the data, any cases that seemed to have a patron were removed from sampling to avoid response bias, resulting in 458 valid cases collected in a cross-sectional approach.

## 5. Results and Discussion

### 5.1 Numerical Results

First, while having the data was to perform a Pearson correlation on SPSS software version 22. The result showed a moderated correlation between NPS and WOM of 0.483, statistically significant (P < 0.000), as observed in Table 1.

Table 1. Pearson Correlation:

|     | 1       | 2       |
|-----|---------|---------|
| WOM | 1       | 0.483** |
| NPS | 0.483** | 1       |

\*\* P<0.000

Descriptive statistics were also performed. So, for WOM, the mean value was 0.97, with a standard deviation of 0.172. On the other hand, the mean obtained for NPS was 8.94, with a standard deviation of 1.373, as seen in Table 2.

Table 2. Descriptive statistics:

|     | Mean | SD    | N   |
|-----|------|-------|-----|
| WOM | 0.97 | 0.172 | 458 |
| NPS | 8.94 | 1.373 | 458 |

The logit regression results were performed in Python software (Anaconda, PKG version), pseudo r-square for the model is 0.4989, statistically significance ( $P < 0.000$ ) and coefficients are also reported in Table 3.

Table 3: Logit regression results and coefficients.  
 Logistic regression results:

|                         |           |                         |         |
|-------------------------|-----------|-------------------------|---------|
| <b>Dep. Variable</b>    | WOM       | <b>No. Observations</b> | 458     |
| <b>Model</b>            | Logit     | <b>DF residuals</b>     | 456     |
| <b>Method</b>           | MLE       | <b>DF model</b>         | 1       |
| <b>Pseudo R-Square</b>  | 0.4989    | <b>Log-likelihood</b>   | -31.376 |
| <b>Converged:</b>       | True      | <b>LL-Null</b>          | -62.613 |
| <b>Covariance type:</b> | Nonrobust | <b>LLR p-value</b>      | 0.000** |

|              | <b>Coef</b> | <b>Std error</b> | <b>Z</b> | <b>P&gt;z</b> | <b>[0.025</b> | <b>0.975]</b> |
|--------------|-------------|------------------|----------|---------------|---------------|---------------|
| <b>Const</b> | -6.0367     | 1.42             | -4.252   | 0             | -8.819        | -3.254        |
| <b>NPS</b>   | 1.2754      | 0.22             | 5.801    | 0             | 0.844         | 1.706         |

\*\*  $P < 0.000$

Once the coefficients for the logit regressions were obtained, these were substituted in the logistic function formula, so the odds ratio and probability of WOM intention were calculated for each of the NPS values. The results can be observed in Table 4.

Logistic function:

$$f(x) = \frac{e^{\beta_0 + \beta_1(x)}}{e^{\beta_0 + \beta_1(x)} + 1}$$

Where:

$$\beta_0 = -6.0367$$

$$\beta_1 = 1.2754$$

$$e = 2.7182$$

$$x = \text{NPS value}$$

Table 4: Probability of WOM intention according to NPS values (scale transformation).

| <b>Client status</b> | <b>NPS Value</b> | <b>Odd ratio</b> | <b>Probability of WOM intention</b> | <b>Change from previous value</b> |
|----------------------|------------------|------------------|-------------------------------------|-----------------------------------|
| Detractor            | 0                | 2.20485E-05      | 0.22%                               | 0.00%                             |
| Detractor            | 1                | 7.86132E-05      | 0.78%                               | 0.56%                             |

|           |    |             |        |        |
|-----------|----|-------------|--------|--------|
| Detractor | 2  | 0.000277492 | 2.70%  | 1.92%  |
| Detractor | 3  | 0.000982976 | 8.95%  | 6.25%  |
| Detractor | 4  | 0.003487996 | 25.86% | 16.91% |
| Detractor | 5  | 0.012371365 | 55.30% | 29.44% |
| Detractor | 6  | 0.043908356 | 81.45% | 26.15% |
| Neutral   | 7  | 0.155837479 | 93.97% | 12.52% |
| Neutral   | 8  | 0.551797753 | 98.22% | 4.25%  |
| Promoter  | 9  | 1.950784314 | 99.49% | 1.27%  |
| Promoter  | 10 | 7.132857143 | 99.86% | 0.37%  |

## 5.2 Graphical Results

The data of the dichotomic variable WOM intention (on the Y axis) and the NPS score (on the X axis) plots an s-curve that graphically represents the logit function that allows the scale transformation in this research, as seen in Figure 2 and Figure 3.

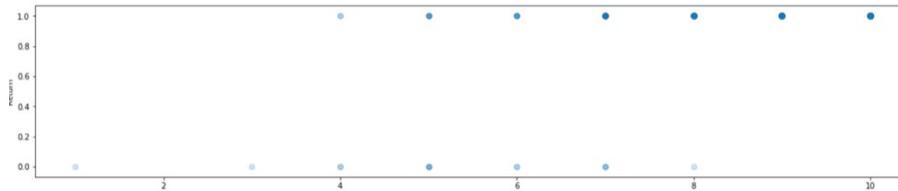


Figure 2. Plot of WOM intention (Y) and NPS (X).

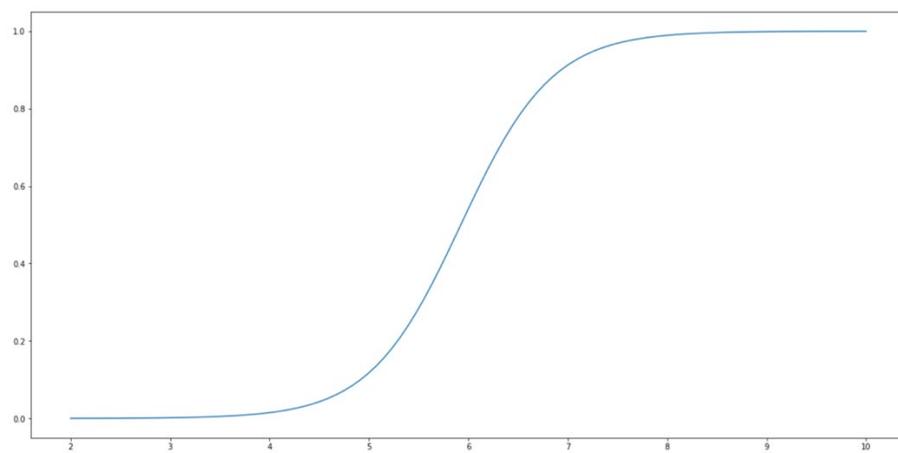


Figure 3. Logit regression function plot of the model.

## 6. Conclusion

The main research question in this paper aims to know how the NPS clusters clients could be better, so in this fashion, the data shows that the probability of detractors to recommend varies a lot. The value of 0 in the NPS means a 0.22% probability that the client would be willing to recommend, while the value of 6 on the NPS represents above 81.45% of the probability. If NPS is claimed to be a predictor metric of some other outcomes, such as loyalty and growth (Reichheld, 2003), a serious concern is derived from this investigation regarding the arguments and reasons about NPS treating the same way responders from 0 to 6, which in all probability implies going from 0 to up to 80%, making predictability, in this case, of willingness to recommend very inaccurate.

It is also important to analyze the behavior of the cumulative frequencies of the probabilities, as well as the change of the previous values (or deltas) all along the NPS scale. The greatest substantial change goes from the punctuation 4 to 5, which change probability to recommend in 29.44%, having a cumulative probability of 55.30%. Following the same exercise, moving a client from 5 to 6 aims to have a delta of 26.15%, having a cumulative probability of willingness to recommend from 55.30% to 81.45%, which is also a very clear sign that the post-purchase efforts with clients clustered as detractors should be differentiated according to the score.

The managerial implications of this research are to provide NPS users with a complementary metric to enhance the decision-making derived from this metric. One of the most common arguments coming from managers using NPS about not asking many questions in customer satisfaction surveys has to do with delivering a good user experience and not overwhelming clients. This companion metric does not require extra information from the clients, while companies could gain extra insight for their post-purchase strategies.

There are some limitations and future research lines that are acknowledged. The first is that this research was only carried out in one brand of restaurant, even though the sampling was done in different branches. This implies a limitation to properly making inferences about the whole full-service restaurant industry, so future investigations could repeat the research with a broad sampling in a confirmatory approach. The second limitation is that this research was done in the restaurant industry, and NPS is broadly used in pretty much all industries, so it may be important to also assess some other industries in a confirmatory approach with this approach. The third limitation is that both, NPS and the willingness to recommend (WOM) are self-reported. It may be interesting to use different sources of information, like having real return data (from loyalty programs or credit cards) and the previous scores from NPS. This research approach would be really powerful because instead of working with recommend or return intention, the new data would be about behavior, which is more accurate than intention.

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## **Biographies**

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