

Regression Analysis of Beijing Hotels Customer Satisfaction Based upon Data from TripAdvisor

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Abstract

Big data is being used by many organizations to make decisions about the efficiency and effectiveness of their operation. One of the data sets that are used most frequently is TripAdvisor. This article explores the advantages and disadvantages of using such a data set. The case study chosen was the hotel services in Beijing, China. A new approach is being proposed in which baseline information is used on a regional basis to establish the uniqueness of a region. Many times the data does not give the proper perspective because it incorporates the larger perspective and does not provide for regional differences. The other dimension developed in the article is a statistical approach that tries to define a better understanding instead of using a descriptive method.

Keywords: Big data, TripAdvisor, Beijing, Statistical analysis

Introduction

The core of most evaluation systems are based upon guest input and trying to identify the primary factors that influence client's decision processes. Many hotel operations have their own assessment system, which are used heavily to make changes to operations or to justify the quality of their services. These evaluations are often spurious because they have an element of self-reporting. Many guests are prompted on what type of response to provide and sometimes even given rewards for providing evaluations.

There are obviously many studies that have been completed in trying to define the influences and how to make the best management decisions. (Bertan et al., 2015; Lee et al., 2014) Big data, such as TripAdvisor, may provide a window to help understand this paradox or dilemma. The reason this type of data may help is that it is unsolicited and critical. There are obvious problems with this type of data regarding not being representative of the general population that frequent a hotel, but may be skewed toward people who had a very good experience or a very bad experience. It is essential to understand the limitations of this type of data and place it in perspective. The other shortcoming of this type of data is that most of it is not statistically analyzed to provide in-depth understanding. This type of data must not be seen as an end in itself, but only one source that gives understanding. It is also reflective of data that has a Geo position. TripAdvisor has data that is divided into the smallest segment based upon location. It must be recognized that there are different influences in diverse geographic locations. This type of data has strengths and weaknesses, but provides a different perspective because of the amount and specific nature of the data.

Hotel information from TripAdvisor gives the best data in regard to reflective influences in terms of decisions from a diversity of respondents. (Lee, 2012) With a greater number of respondents, there tends to be a centroid factor that operates and helps to explore the extremes of opinions. The primary element is not only the data, but the type of analysis that will yield effective results. Many studies only look at one particular aspect and

perform a detailed analysis. This type of approach often leads to spurious relationships. (Mark, 2013) It must also be noted that a multivariate analysis allows for the inclusion of a large number of variables that can be manipulated in terms of a predictive framework. (Bertan et al., 2015) Given the variance in the data by geographic location and audience type, the data will vary significantly. Baselines have to be established in order to gain a proper perspective toward common themes and influences.

Social Media/TripAdvisor

The first question that really must be answered is about the quality of the data found on big data sources such as TripAdvisor. The data obviously has limitations. (Kim et al., 2016; Lawrence, and Perrigot, 2015) One of the first concerns is about the representativeness of the data regarding client's responses. Is there a difference between those individuals that respond and those that do not respond? It is often assumed that the clients responding represent the population. This assumption is often overlooked. It is difficult to have a comparison between respondents and non-respondents. Comparisons need to be made so that some indicator can be developed to answer this question and responses adjusted accordingly. Another question is the data pure or has it been contaminated with input from marketing professionals trying to boost ratings? (Thanh, 2015) The data has to be screened and these types of suspicious responses deleted from the data source. These ratings from TripAdvisor have been shown to have a significant influence upon decision-makers who reviewed the data. It is essential to have some type of filter or screening of the data before analysis. Many big data sources are proprietary and the companies have a companion data set that allows for comparisons with TripAdvisor. This will give some type of indication about the reliability and validity of the data. (Wilson, 2012) Comparisons can also be made by establishing baselines and analyses that have been completed on a time period format. This will also help to provide trends and allow the organizations to determine when significant changes have occurred in the client's decision-making. Another concern is that individuals do not express their true feelings. (O'Neil, 2009) Those that tend to respond are inclined to be at one extreme or the other and they have a propensity for wanting to make comments. There is also a concern about respondents not having criteria on which to base their assessments. Most of the scales are an arbitrary form that has no real meaning except to the individual responding. Much of the criticisms about TripAdvisor are the same problems that are identified with any measurement system. It is recognized that TripAdvisor is not a highly diagnostic assessment instrument. It is commercially designed and only to give the reader a general assessment. Another recent concern is that TripAdvisor has been developed into a commercial website. Previously, it was thought of as a location where objective information could be obtained without the bias of potential sponsorship. (Fuller, 2013) With the site selling product, there are individuals who are very suspicious now of the ratings.

Hotels

Most of the information regarding hotels and satisfaction is very clear. Those with the higher star rating are those that receive the better satisfaction ratings. High ratings are obviously due to amenities and basic services. (Gadekar and Gadekar, 2016) The more the amenities and services, the better the ratings. There is not a high direct correlation among these dimensions. What is being suggested is that if a hotel follows this general rule it may or may not result in higher ratings. (Gadekar and Gadekar, 2016) Ratings are directly related to understanding the individual audiences that are to be served and providing the necessary amenities and services to achieve success. This type of approach goes beyond the facility and is directly related to the personnel services. (Coughlan, 2014) These individuals, if they go beyond the ordinary to provide extraordinary service, the ratings are extremely high. It is the marriage of amenities and types of service with the personnel to deliver a well-organized program that is extraordinary, that will make the difference in achieving success. (Allan, 2016) Size does not seem to make a difference, but it is the individualization of the hotel's program that does make a difference. It must be remembered that in a foreign country that the amenities and types of service that make a quality experience are quite different. (Ara, 2013) Many times individuals expect the same services as home, but do not find that type of experience. Those providing the service must be culturally sensitive and provide the necessary environment that the guest would expect from their home community.

Purpose

As a case study, Beijing hotels, Bed and Breakfast, and Inns were examined in terms of traveler satisfaction and important influences that affect manager's decision-making. Satisfaction Ratings were recorded as: five as excellent, four as very good, three as average, two as poor, and one as terrible. Satisfaction was the response or dependent variable. The primary predictor or independent variables were: Average Rating (A calculated variables based upon the average of each predictor variables. This is a contrived variable to reflect the variance in scores.), Type of Traveler, How Reservation Made, Positive Attitude, Type Facility (Number of Stars), Home Community of Client, Immigration Status, Location of the Facility, Quality of Sleep, Comfort, Value of Quality and Price, Cleanliness, and Number in the Party. Dummy variables were created where qualitative data was

provided. There were originally 24 variables and they were reduced to 14 (Dependent and Independent). Variables such as phone number, address, etc. were deleted because they could not be incorporated into the statistical modeling. Missing data was deleted or omitted from the study.

Methodology

A Generalized Linear Model (GLM) was initially used to analyze the data. This analysis did not provide suitable results because of the categorical nature of some of the response variables. Average Ratings were used. This did not provide the necessary detailed information as it relates to the impacts upon Satisfaction Ratings. These results were not reported because the data did not provide appropriate details. A Linear Regression was used because this model is more straightforward and allows for more depth of interpretation given the data set. A Classification and Regression Tree (CART) were applied to the data. CART represents non-parametric modeling which is in contrast to the parametric modeling of the Linear Regression. The goal of these contrasting analyses was to identify significant variables and their impact upon the prediction related to satisfaction.

Linear Regression Modeling

The first step in the analysis was the establishment of the strength of the relationships among the variables. Pearson's Correlation Test showed strong relations among Satisfaction Rating and Average Rating, Satisfaction Rating and Service, Satisfaction Rating and Comfortability, Comfortability and Service, Comfortability and Average Rating, Service and Average Rating. There is a high degree of multicollinearity among the variables.

A forward regression, a backward regression, and a stepwise regression were performed in order to identify the best model for predictive satisfaction. Of the models, the backward elimination provided the best model with the highest Coefficient of Determination (R^2) at 88.94%. (Table 1) This was a five variable model:

Total Rating = $-0.0753 - 0.0567 * \text{Reward} + 0.0610 * \text{Comfortable} + 0.1383 * \text{Service} + 0.0433 * \text{Price to Quality Ratio} + 0.7833 * \text{Average Rating}$.

The model using 14 variables had a similar Coefficient of Determination. The Linear Regression Model met all four assumptions of normality, constant variance, linearity, and independence.

Interactions were examined with the matrix plot and no significant interactions had to be added to the model. There may be a potential problem with outliers and influential observations. When the potential outliers were examined: Golden Street Business Hotel (629 observations), Guest House (969 observations), Harbor Inn (1014 observations) Dongfang (1045 observations), and LaijinLifa Hotel (1047 observations), it was found that these outliers had no influence upon the model.

Interpretation

An examination of the coefficients gave a relative indication of the importance of the variables. The beta coefficients were standardized. All coefficient estimates were positive with the exception of reward.

While examining the Average Rating and holding the other variables constant, the Satisfaction Score increase by an average of 0.7883.

While examining the Price to Quality Ratio and holding the other variables constant, the Satisfaction Index increased by an average of 0.0433.

While examining the Service Component and holding the other variables constant, the Satisfaction Score improved by an average of 0.1383.

While examining the Comfort Complement and holding the other variables constant, the Satisfaction Index increased by an average of 0.0610.

While examining the Reward Component and holding the other variables constant, the Satisfaction Score decreased by an average of 0.0567

The importance of the positive correlated variables were: Average Rating, Service, Comfort, and Price to Quality Ratio. The negative correlated variable was the Rewards Program.

An unexpected result was a negative correlation of the Rewards Program. This is very difficult to explain as one would expect that individuals who have greater rewards would have a higher satisfaction level. This was not found to be true and represents an anomaly and suggests that rewards have a negative impact upon satisfaction. Those that receive more rewards may have higher standards and therefore expect more from their experience. When they do not receive these better treatments, there is some diminishing of satisfaction because the experience did not meet expectations.

Most studies involving attributes or amenities usually point to a cluster of elements that are directly related to satisfaction. This is also true in this study dealing with Service, Comfort, and Price to Quality Ratio. The interesting finding in the Beijing market is that Service is very important as compared to the other variables. For the international visitor, this is a must for the traveler to feel at home. This does not diminish the importance of the other elements.

Classification and Regression

When the Classification and Regression Tree Modeling was used to analyze the data, only the Average Rating was selected by the CART analysis for generating a classification tree. Since this is a contrived variable it would be of little use in the analysis and provide no additional insight. CART is a non-model, based upon clustering and prediction. It sometimes leads to a different type of insight and understanding other than the Linear Regression.

Conclusion

The results are straightforward in that increasing Average Rating, Service, Comfortability, and Price to Quality Ratio will increase satisfaction. One of the obvious links in application of this model is once satisfaction is increased profits and retention of clients can be increased. The obvious limitation of the model is that it only examines linear relationships and there could be some better curvilinear models. These curvilinear models may provide greater understanding because it allows for more complicated or complex analysis. It is obvious that the other limitation of the model is that it is specific to Beijing. This model does provide baseline, and recognizes the difference in geographic regions. With a high degree of multicollinearity, those hotels that seek top positions in the market have all of the attributes that clients seek.

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Table 1. Backward Elimination

Backward Elimination of Terms

α to remove = 0.1

Analysis of Variance

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	5	220.358	44.0716	1704.05	0.000
Reward	1	0.197	0.1970	7.62	0.006
Comfortable	1	0.406	0.4062	15.70	0.000
Service	1	1.473	1.4726	56.94	0.000
PricetoQualityRatio	1	0.203	0.2025	7.83	0.005
AverageRating	1	31.983	31.9831	1236.65	0.000
Error	1059	27.389	0.0259		
Lack-of-Fit	1054	27.389	0.0260		* *
Pure Error	5	0.000	0.0000		
Total	1064	247.746			

Model Summary

S R-sq R-sq(adj) R-sq(pred)
 0.160819 88.94% 88.89% 88.75%

Coefficients

Term	Coef	SECoef	T-Value	P-Value	VIF
Constant	-0.0753	0.0459	-1.64	0.101	
Reward	-0.0567	0.0206	-2.76	0.006	1.14
Comfortable	0.0610	0.0154	3.96	0.000	2.93
Service	0.1383	0.0183	7.55	0.000	3.65
PricetoQualityRatio	0.0433	0.0155	2.80	0.005	2.18
AverageRating	0.7833	0.0223	35.17	0.000	4.25

Regression Equation

TotalRating = -0.0753 - 0.0567 Reward + 0.0610 Comfortable + 0.1383 Service
 + 0.0433 PricetoQualityRatio + 0.7833 AverageRating