

Modeling and Sentiment Analysis of Online Reviews in Hospitality Industry

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Abstract - With the great extent of use of smartphones and the internet, the online hotel booking service providers have excessively increased thus producing more user-generated content in the form of reviews and comments about the customer experience. These reviews of visited customer's aids hotel management personnel not only to forecast the future demand but also to implement effective strategies for better service.

It is becoming a tuff job in this scenario for the hotel management to get exact information from the wide range of reviews.

In this analysis, it is to identify the classification of the sentiment from the customer reviews. The classification can be done with text mining approach with the source of information. Two dictionaries are developed for the usage of data classification around 431 reviews taken from Tripadvisor.com and Booking.com. Finally Latent Dirichent Allocation (LDA) modeling algorithm is applied to identify related topics and it was used to sort out the issues in consumer sentiment analysis.

Study findings revealed that majority of the reviews were with positive sentiments and the topics found best with hospitality domain and sentiment term were such as "food", "hospitality", "room", "people", "friendly", "Relax", "feelings", and "holiday" as hospitality terms and "Strong Positive" and "Ordinary Positive" as sentiment terms.

Index Terms - EWOM, Sentimental Analysis, Qualitative Study, Hospitality.

I. INTRODUCTION

The growth of the Indian economy is majorly driven by service sector business especially by travel and hospitality business. Indian Gross Domestic Product has gone up by 24 percent in 2021 by this travel and tourism and hospitality sector. As per the IBEF report, this industry itself brings 91 billion US\$ both directly and indirectly to the Indian market. In the year 2021, the tourism industry produced 9 percent of the country's GDP and it was the third foreign exchange source and stood at seventh position in the list of top contributors of nations GDP.

According to WTTC, India is in 10th position in travel and tourism which contributed 6.8% of the total economy, Rs.1,368,100crores. In 2020, the tourism sector provided 39 million jobs of overall job opportunity in India. The tourism industry in India is estimated to achieve US\$125 billion by the year 2027. The hotel industry including food and accommodation was earned US\$ 32 billion in financial year 2020 and is predicted to reach US\$ 52 billion by financial year 2027, steered to get huge demand in the future. Foreign direct investments made on tourism and hospitality industry has gained US\$ 16.48 financial year 2022.

Travellers in the recent days are not taking help from the travelling agency in the search of accommodations. Due to increasing of the internet usage many travel agency changed the way of approach in reaching the customer. Recent trend is attracting the customer through the website and mobile

applications. It is very easy to customer to find what they want in the terms of accommodations and other related. Many market players came into the field to provide the quality service to the customers and getting their feedback in the forms of reviews they can share. This reviews which is giving boost up for their business. These reviews are kept open for all to read and this can be positive, negative or neutral by this customer getting clarity on the hotels whether we have to accommodate or not.

In addition, for the next five years, the estimated future inventory in 11 major markets (across categories - solely branded) is expected to be roughly 49,400 rooms (FY18 to FY23). As a result, we expect the largest markets in the industry to maintain average room rates (ARRs) and grow at a rate of 3.5-4.5 percent per year as demand grows as a result of improved economic activity and lower unit additions. In addition, we predict occupancy to rise to around 68-70 percent by the end of FY23, up from 66.6 percent in FY18. As a result, over the next five years, the hotel industry is predicted to witness a 10-12 percent growth in room income.

Indian Online Travel Market

As of June 2018, India's total internet subscribers numbered over 512 million. The internet penetration rate is around 35%, which is lower than industrialised countries such as the United States and the United Kingdom, but it is expanding at a far quicker rate. In 2009, India's e-commerce market was worth

roughly \$2.5 billion; by 2017, it had grown to \$38.5 billion. Approximately 75% of this is due to travel. In addition, India has 1,147 million wireless customers at the end of June 2018, according to the telecom regulator TRAI. With the growing popularity of smartphones in India, which provide simple access to the internet and a variety of applications, they are quickly becoming a key source of travel bookings, including hotel reservations.

India's online market is got more mature in recent days, many segments has been made in mobile application for giving better service for the customers. Especially in the online travel booking application more options and features are added to give better experience in choosing the best hotel based on their requirement. By this many online travel agencies started giving attractive deals to attract more customers. Key market players are Makemytrip (20%), Goibibo (15%), Oyo Rooms(15%), Booking.com(10%), Clear trip(10%), Trivago(10%), Yatra(10%), Others(10%). These market players are having their decent market share in the Indian online travel market. Indian consumers are spending their 4% of their income on travel. This gives a new way for increasing the opportunity for the travel and tourisms with this hotel accommodation is also getting new business.

Online travel booking application came up with new kind of the strategy to attract the more customers. Here there are providing actual consumer reviews which was given by the existing consumers. They are having more ties up with the banking services in giving discounts and offers on debit and credit card. Exclusively EMI option for the consumers it they required. In addition to this providing tour packages and travel services. These are all the other attractive advantages why people are selecting online travel booking application as their top priority.

II. REVIEW OF LITERATURE

Customer rating and eWOM

Consumer reviews, for example, have become one of the most important forms of electronic word of mouth (eWOM) in today's industry. It has had a huge impact on customer interaction and company advertising. Consumer evaluations, for example, have been increasingly common as social media has grown in popularity, consumers accessing easily in giving information in the form of reviews and it is becoming deciding factor for the new consumer. Maximum time has been spending on hotel for the product discussion. Consumer taking more than two hours for searching reviews to book weekend excursions.

Consumer reviews are written by the existing persons who having the experience of the particular product or service. It is giving a wide range of space to share their experience. It was considered as important aspect of eWOM. In Tripadvisor.com there was one interesting consumer review which collected

from the hotels in Seoul, capital city of South Korea. The consumer review includes star rating as well as text review which includes different titles and brief explanation of the experience and viewpoint. The rating of the consumer which gives the nominal impression about the hotel. In the other hand the textual reviews will give a brief note on hotel stay.

Generally a consumer or hotel management seeks information from the existing customer. They confined with only rating not on the reviews. If the decision taken on the reviews then it will be more beneficial. On the other side reviews can be positive, negative or neutral.

Online Reviews and Sentiment Analysis of Tourism

The literature now shows that online reviews have a considerable impact on electronic word of mouth (eWOM) communication. Consumers' increasing reliance on internet reviews of services and products had resulted in an avalanche of user-generated content that no budding customer can possibly wade through. Sentiment analysis software that can reduce enormous quantities of written comments into a few easily consumable statistics, can be a useful tool for aggregating and summarizing a wide range of viewpoints. The tourist and hospitality industry is a boundless instance of a business where the triumph of services and products is becoming increasingly reliant on enormous volumes of user-generated content shared on social media sites. Users can evaluate hotels and their facilities on algebraic scales as well as submit their comments or attitudes in text on sites like Tripadvisor.com, Booking.com, and HolidayCheck.com. Text comments are an effective type of eWoM that are just as essential as numerical ratings.

The fact that hundreds of marketable and open-source apparatuses had been established to resolve demonstrates the promise of sentiment analysis for harnessing the power of eWoM. Teams of researchers from the University of Pittsburg, Cornell University, and the University of Utah developed Opinion Finder. Based on context, this system employs a vocabulary to identify sentiment expressions. Researchers at Stanford University created the Recursive Neural Tensor Network (RNTN) tool, which operates by labelling phrases in parse trees of judgments using a facts set called Sentiment Treebank and serves as a sentiment analysis annotator in the Stanford Core NLP. Core NLP is a set of natural language processing (NLP) tools for the English language (Manning et al., 2014). Sent UAH is a tool that leverages CoreNLP's tokenizer, sentence splitter, and part-of-speech (POS) tagger to do unsupervised lexicon-induced sentiment analysis. SentiWordNet and a naive Bayesian approach to data mining are used in conjunction with the tool. The goal of creating this tool was not to increase efficiency, but to compare the results of a simple algorithm (naive Bayes, which is well known for being efficient in specific cases) with the results of more

complex algorithms and assess their consistency in predicting algebraic rankings with a huge volume of data. We are not aware of any researches that have compared these software tools to a huge experimental fact or to an additional. This type of research is critical for testing sentiment analysis techniques in the field and guiding future improvements.

Research Gap / Problem Statement

Taking the other view from the traditional meaning of sentiment analysis which is likely to say as a text mining or opinion mining, the present research is been intended to extract the sentiment based on emotional experiences gained toward electronic word of mouth shared by early visited travelers of select destination and tests its impact on star rating of the hotels. Thus it has been observed as a gap left in the previous research on eWOM by sentiment influence on star hotel rating system by the customers. Adding to this, using emotional sentiment in online reviews about the hotel experiences, how electronic word of mouth publicity can used for identifying the best topics related to hospitality domain referring to south Indian hotel industry was not much explored still and considered as a researchable topic.

III. RESEARCH OBJECTIVE

With the intention of studying sentiment analysis of electronic word of mouth shared by tourists in Tripadvisor about star (5*, 4*, 3*) hotel service quality, satisfaction, stay experience, lodging and boarding facilities etc. it is been set specific objectives in the present research. Such objectives are

1. To study the sentiment detection of reviews shared by the customers visited different star hotels.
2. To find the sentiment classification of overall reviews shared by the tourists for different star hotels.
3. To understand the meaningful information from the unstructured text shared as review of different star hotels (topic modeling)
4. To examine the relationship between magnitude of sentiment of different star hotels' reviews.

Data Collection

Reviews shared by tourists in Tripadvisor were the major source of the information for the present study. All these reviews were collected in text format only thus collected text reviews are used for analysis further. Data was collected manually and arranged in Excel format for analysis.

Text Preparation

It is not possible to prepare the text that can be used for analysis of sentiment detection and classification if it is in excel format so we have used text mining and analysis software R' with a built-in software package called 'tm'. Using this software, text data was prepared as non-textual

content, cleaning with special characters like punctuations, eliminating stop words, converting the text into lower case format etc.

Sentiment Detection

At this stage, each sentence of the review and opinion is examined for subjectivity. Sentences with subjective expressions are preserved and that which express objective expressions are redundant. Sentiment analysis is done at different levels using common computational techniques like Unigrams, lemmas, negation and so on.

Sentiment Classification

Under this stage, sentiments detected in step three were classified in three categories such as Positive opinions, Negative opinions, and Neutral opinions based on some key words in hotel industry. For this purpose, we used two dictionaries such as dictionary for hospitality domain and dictionary for sentiment classification availed by Calheiros, A. C. D. S. (2015).

Presentation of Output

After the classification of sentiments extracted from the opinion of tourists, we put all those sentiment scores and magnitudes in a tabular format. Also we prepared a separate contingency table for each type of star hotels. The text results are displayed on graphs like pie chart, bar chart and line graphs.

Sampling & Selection Criteria

Sample of 431 reviews were the reviews posted in the websites during June, 2020 to December, 2020. These reviews were further used for sentiment analysis and topic modeling in the experimental analysis. According to Pekar & Ou (2008) sentiment and text analytics can be done if the sample is more than 268 thus the present research is consisting more than 268 reviews i.e. 431 valid reviews to justify the sample size for text analysis. Only online reviews were included in the present study though there would be a possibility of collecting data through mails and data supplement sources are available.

Sentiment Analysis and Text Mining

We used text mining which is also called as opinion mining technique to study the unstructured form of data (431 reviews) collected from two different sources like Tripadvisor and booking.com to extract meaningful insights. Text mining technique has been the popular technique to analysis and interprets the interesting findings from free form texts like reviews, opinions, media posts, opinion surveys etc. Along with text mining techniques, study had also incorporated sentiment analysis to find the sentiment polarity of the opinions. As the present study focus was mainly on two

different attributes like hospitality and sentiment analysis, it is required to construct two major dictionary related to the concepts and key words associated with hospitality and sentiment analysis. Therefore, two different dictionaries were applied, one from hospitality domain and another form sentiment analysis domain which contains the terms compiled by one or more words i.e. n-grams. Along with sentiment-based sentiment lexicons, the study also used the manual approach in finding the dictionary consisting key words from various hospitality and sentiment analysis literature. The base for this dictionary development was from the work published by Ingram (2003). Further, Lau et al (2005) approach was followed to enrich the important missed attributes of hotel in the hospitality dictionary. At last, using 431 reviews, we identified additional terms and included them in the dictionary. We used Hu et al (2012) approach to construct sentiment analysis dictionary and this dictionary terms were already represented in Calheiros, A. C. D. S. (2015)'s work. Subsequently, the dictionary was improved with terms representing sentiment intensifiers, following diverse polarity, including "strong positive"; "ordinary positive"; "ordinary negative"; and "strong negative" categories.

Text Mining Tools

To apply the text mining review analysis, we select to use the open sourced software called R statistical tool which provides. In R studio, we referred and used a package called "tm" for text mining procedure since it is specially developed for text mining analysis through default functions (Meyer et al 2008). The great advantage of this package is to convert unstructured

text into structured, to reduce dimensionality of data while maintaining relevant information, and to analyze both qualitative and quantitative data. Within the comments or opinions in the reviews, the topics hidden can be found using a library package called "topicmodels" in R software.

Latent Dirichlet Allocation (LDA), is a three stage level of Bayesian modeling analysis that groups collected data from the source and topics are created. Words are identified from the topics finally it is characterized (Blei, 2012). Such models are used for analysis for the finding beta distribution value, which identifies sentiment between topic and term. If beta values are negative then term is not having any relationship with sentiment. If beta value closer to zero then there is relationship is existed between the related topic. With the help of LDA algorithm that is implemented in 'topicmodels' package, the term document matrix (TDM) and desired number of topics are created for text mining. However, LDA algorithm has been developed to compute only these two parameters.

IV. ANALYSIS & RESULTS

In this part of the research, we first performed the corpus-based approach to find sentiment polarity of each review along with its average sentiment score. Usually, a sentiment scores close to 0 is considered negative and that of close to 1 is considered as positive. The following table shows average sentiment and sentiment polarity of each review.

Sentiment Scores and Polarity of sample reviews (only 15 samples were shown in out of 434 sample reviews)

Sl.No	Review	Average Sentiment	Sentiment Polarity
1	"Amazing place to stay. Superb spa. Great restaurants. Very nice buffet breakfast. Gym pretty good. Pool closed due CV 19. Lounge very nice. Highly recommend speaking toconcierge Habeeb for anything you need"	0.543085715	Strong Positive
2	"Very passable. Too much hype for little to offer in service. Why the hotel needs to createclass system for check in beats me. Only positive experience is the cafe and few dishes we ordered for lunch snack. There are better options in Chennai than this hotel"	-0.023437485	Ordinary Negative
3	"Stay and food good..... Services excellent.staffs are all very kind food spread is nice I'm grateful for all the front office staffs. Thanks to jia satish Lekha and ammonarica cute girl.Also the bell desk who works very hard"	0.535085972	Strong Positive
4	"House keeping Very good service from house keeping doirong stay your property Spesialstaff anitha &siva And restaurant best good staff manager srinath sathish good swimming pool very nice thank you all"	0.910399981	Strong Positive
5	"Lovely ambience and good food. Good service. Excellent job by vasanth. Quality of food is very good. Sanitized rooms and lovely treatment of guests .Over all its good. I wouldsuggest this for reception"	0.466954243	Ordinary Positive
6	"Excellent rooms ,and facilities was very good was good south Indian breakfast with lots ofvariety was amazing staff was very helpful keep rocking reidency teams very good location in Chennai"	1.431891232	Strong Positive
7	"Service was good.I loved the ambience food tasted fantastic.especially the vasanth andteam excellent service.rely tool great care for my family and ensured that we feel really special.we enjoyed the hospitality very much"	0.798486406	Strong Positive

8	"Great hotel for the value, stayed a total of 10days.. the hotel was under renovation thoughso it was abit annoying having to use the staff lifts at the back to go in and out... all in all I had a good stay"	0.144426309	Ordinary Positive
9	"Worst experience. Booked through some other website. The hotel front office guy was behaving like an illiterate person. He was so hard to me when I requested him to extend mystay. This property is one of the worst property I have visited so far. Rude staff behaviour"	-0.141455519	Ordinary Negative
10	"Everything was smooth. Had a pleasant stay. Excellent location. Friendly staff. Checkinand checkout was really quick. Very close to the egmore railway station. Breakfast was great, and they allowed to heat food for my 2-year son"	0.471212599	Positive
11	"Awesome facilities of Stay Room Breakfast Service Cleanliness Hygiene Courteous Staff. I hope they will keep continuing the same way. Small Towels are required to be added in thebathroom. Otherwise they are doing good job"	0.350911898	Ordinary Positive
12	"Hotel is good I will also share my friend location wise is good break fast also good , next visit I will stay same hotel ,transport very convenient, treebo all hotel is very good overallall is good thanks"	1.742258063	Strong Positive
13	"Clean toilet, Clean and comfortable room, Comfy bed, Lovely food, In fact it was betterthan renowned restaurants.Reachable to egmore railway Station and other parts of city. Good service. Keep it up"	0.478803036	Ordinary Positive
14	"Laundry is not good for the hotel.. I gave my Tshirt for washing and at that time colour was cream.. when i got (after wash) there was some other colour as they washed with any other dark colour cloth.. and now nobody is listening and no resolution provided by the staff"	-0.13815698	Ordinary Negative
15	"Lovely ambience and good food. Good service. Excellent job by vasanth. Quality of food is very good. Sanitized rooms and lovely treatment of guests .Over all its good. I wouldsuggest this for reception"	0.466954243	Ordinary Positive

From the above table, we can observe the average sentiment of each review and its polarity i.e. Negative or Positive. Result shows that there are major reviews with positive emotion since their average sentiment scores are positive. However, some of these average positive scores are strong positive (Average score should be above 0.5) and some of them are ordinary positive (Average score should be less than 0.5). Negative emotions seems to be very less in number and even all these negative emotions are ordinary negative (Average score should be less than -0.5) but very few of them are strong negative (Average score should be above -0.5)

Average Sentiment of Total Reviews (431)

Sl. No	Sentiment	Average of sentiment	Standard Deviation
1	Negative	-0.142737364	0.10
2	Positive	0.420388991	0.30
Grand Total		0.299440375	0.051

Result of Text Analysis using "tm" and "topicmodels" packages

The results were achieved using dictionaries available manually and lexicon based. This result has been obtained by these dictionaries where unorganized text information was transformed into organized so as to get a meaningful insights for managerial decisions. Results were initiated with qualitative approach and further extended with quantitative approaches using computer programming

techniques availed by R software. We run the program using 'wordcloud' package in R software to create a word cloud of most frequent or repeated terms i.e. more than 25 times in a document. Thus obtained word cloud of 431 reviews based term document matrix was shown in figure 1.

Word cloud



We understand the big sized term is the most repeated term related to hospitality domain and such terms are "Hotel", "Good", "Room", "Service", "Staff", "food", "breakfast", "time"

Topics represent hospitality domain for sentiment analysis

Topics	Number of Comments pertopic	Hospitality Term	β	Sentiment Term	B
1	79	Food	0.001	Strong Positive	1.56
2	64	Hospitality	0.030	Strong Positive	1.45
3	61	Room	0.024	Strong Positive	1.11
4	58	People	0.007	Strong Positive	1.89
5	53	Relax	0.023	Ordinary Positive	1.01
6	46	Friendly	1.012	Strong Positive	1.31
7	39	Feelings	0.008	Ordinary Positive	1.67
8	31	Holiday	0.021	Ordinary Positive	1.09

First column shows the number of topics discovered through LDA function for hospitality domain. Second column represents number of comments per each topic in the whole document while third column shows the topics identified representing hotel domain. Fourth and sixth columns show the beta (β) values of each topic which tells the strength of the relation to the given topic and sentiment (usually beta value closer to zero indicates a stronger relation). Fifth column present the sentiment terms categorized in the study i.e. “strong positive”, “Ordinary Positive”, “Strong Negative”, “Ordinary Negative”.

V. DISCUSSIONS AND RECOMMENDATIONS

The primary theme, being the most referenced service with respect to hospitality terms, is best relate to "food" which gets a total of 79 observations, with a significant lesser β esteem (0.001) implying that the connection between the topic and the hospitality term is strong. Moreover, the sentiment term (Strong Positive) related to the topic also presents a strong connection from the theme but has a little variation in β value (1.56) which is higher than 0.001 but not a significant difference. Notwithstanding the given β value, having shared with Strong Positive sentiment, all those 79 reviews in the sample of 431 were concerned with the hospitality topic related to food. This finding supports research finding which tells that different types of food verities provided by the hotel is one of the most representative topic in hospitality domain (Calheiros, A. C. D. S., 2015).

This finding recommends that food is one of the top priorities expected from the customers who wish to stay in star hotels. Those who are highly satisfied with food service provided by the hotel should share a strong positive emotion in social media. This is in support to the suggestion given by Namkung & Jang, (2007)

The second topic was best find with the hospitality term related to “Hospitality” which has go the beta β value of

0.030. Based on this finding we recommend that the hotel management should consider the best strategies that that can bring for their customers is about hospitality services like maintenance, guest receivable, checking –in and out, villas, child travel beds etc. Third “Room” and this term is also strongly associated with the hospitality topic as the beta β value is 0.024. With reference to this finding, we recommend the management of the hotel, practitioners of hotel management that hotel rooms should be offered with all the amenities required by the customers so as to attract their positive sentiment which further can be used as a testimonial for future customers.

Fourth topic has been found with “People” as the beast term related to hospitality domain as this term’s beta β value was very close to 0 (beta value is 0.007) and 58 comments in the total of 431 reviews were bout this topic. This finding from the study has made a source for recommending management of hotels to maintain the best staff whose job is as hotel personnel, waiter, housekeepers, staff, trainee, administrators etc. Since hotel personnel play a indicative role in all customer-hotel service related issues (Calheiros, A. C. D. S., 2015). Topic five was emphasized on the hospitality term called “Relax” which was commented in 53 reviews out of 431 reviews collected and analyzed. The relation between topic five and term “relax” was found strong as the beta β value is 0.023. It is recommended that hotel management has to uphold with the key service terms like facility of spa or massage, center for yoga, place designed for having a feel of good and peace etc.

VI. FUTURE RESEARCH SCOPE AND LIMITATIONS OF THE STUDY

The purpose of the present research is to identify the sentiments or emotions involved in customer reviews which are shared in micro blog websites that provide hotel booking and travel and tourism services. However, study was conducted using the text mining or opinion approach with

the aid of open source software like R studio and text2data. Though study is concerned with text analysis and opinion survey analysis, it has got its own limitation by its way which is considered to be a scope for future study. First limitation of the study is that reviews collected for analysis were from only one location i.e. Chennai. Second limitation of the study is that we have collected the reviews given about three major hotel categories like 5 star, 4 star, and 3 star even though reviews about middle range hotel, budget hotel and other categories might contribute to find different topic related to hospitality domain thus future research can take this scope as a future research.

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