A SERVQUAL based E-Commerce platform for Indian customers

[1] Dr. Satish R. Billewar, [2] Prof. Sunil Ghane, [3] Dr Gaurav Londhe, [4] Prof. Sunil Saxena

[1] Vivekanand Institute of Management Studies & Research, Mumbai, India
[2] Sardar Patel Institute of Technology, Mumbai, India
[3] Mukesh Patel School of Tech. Mgmt & Engg, NMIMS, Mumbai, India
[4] St. Francis Institute of Management and Research, Mumbai, India.

Abstract: The customer reviews and ratings are now part of the purchasing process on E-Commerce platforms. It helps online businesses from knowing the goods but also influences companies to rectify the lacunas in buying process and to give better services to the customers. Nevertheless, poor reviews are a great deal to enhance the quality of the goods and services. That means a lot for the improvement of the products is needed. Most of the time bad reviews and ratings are outcomes of the problems faced by the customer after the delivery of the products. The customer expects a repair facility after the warranty period of the products. Often customers expect the repair facility like a service engineer to be close to their home. The key issue is that there is no shared forum to provide all of the product services. Online businesses must consider the effect of the psychology of the customers on their company. The paper recommends SERVQUAL for improvements in Indian E-Commerce like pre-purchase product comparisons, repair facility to every product after warrantee, and a helpdesk with a real-time conversation facility to resolve the issues in services for any brands in the existing E-Commerce structure based on customer's reviews and ratings only.

Keywords: Customer psychology, E-Commerce, customer reviews, online ratings, SERVQUAL.

1. Introduction

Sardar's third law of futures studies states that the study of the futures for cultures is always suspicious. A single culture is always doubtful to implement everywhere in the world and a single culture cannot survive in the future also (Sardar, 2010). Every geographical region has its

unique culture, thus different markets. E-Commerce companies need to understand the existing market model and need to mold E-Commerce models into it (Ferguson, 2006).

As Indian culture is different from other cultures, the Indian customers are also different from other customers of the world. Indian customer segment is different and thus, need to target differently (Jadhav, 2020). India is now the second biggest market in the world. India has the largest young population in the world. Therefore, every online company expects Indian youth to accept the E-Commerce concept easily. Online reviews and ratings not just help to provide information about the choices of the customers but also can be used as recommenders (Gupta,2014). Even bad customer reviews are an asset to online companies. That means a lot for the improvement of the products is needed. Most of the time bad reviews and ratings are outcomes of the problems faced by the customer after the delivery of the products.

A lot of research has been done on E-Commerce customer satisfaction. The researchers have worked on Technology Acceptance Model (TAM) to understand the possible reasons to accept the technology by users and Transaction Cost Analysis (TCA) to understand investment-oriented approach for successful business implementation (Alalwan, 2018)(Gefen, 2003). TAM has successfully proved that customer trust is very important to get success in new E-Commerce scenario and customer's online reviews play a crucial role to implement it (Gefen, 2003). The studies also found the importance of Service Quality (SERVQUAL) as the final determinant of customer satisfaction (Asubonteng, 1996) (Buttle, 1996) (Parasuraman, 1985).

Then it is time to question why e-commerce firms are struggling even after two decades to survive in India (Billewar,2012). The success of each company depends on the customer's services.

2. Existing Systems

If the customer wants to purchase a product, two platforms exist to check the ratings and reviews of the products.

2.1 Platform 1: Online Reviews and Ratings

There is the first platform where the customer visits an E-Commerce Company like Amazon and checks the details like:

2.1.1 Product Ratings

Online ratings are equally important. Online ratings help to categorize products from highest to lowest level of satisfaction. The lowest ratings reflect risks and frauds associated with the product quality or the services of the vendor (Filieri R., 2015) (Clemons, 2006). Every E-Commerce company has its product search algorithm. Amazon has an algorithm named A9,

which also keeps track of the best deal of buying the product for a single customer. The algorithm pulls the relevant information based on the keywords used by the customer and finds "most suitable" options for the customer. Then the customer checks the ratings of the product.

2.1.2 Feature Descriptions

The user goes on checking the details of the products for features. The features are nothing but the detailed product subparts & their specifications.

2.1.3 Customer Reviews

Most of the online customers are very conscious. They relate online reviews with word-of-mouth and influence the final decision of the customer to buy or not to buy a product (Filieri R., 2015). The customer checks the number of reviewers and reads the comments given to the products. The good reviews lead to purchase and the bad reviews help him to understand the problems associated with the product. A9 algorithm arranges the positive reviews and good sellers in ascending order.

2.1.4 Customer Comments

The comment section provides the platform to provide feedback and suggestions from the customers. The comment section helps companies to know the customer expectations in the products and especially the loopholes in services (Parasuraman, 1985).

2.2 Platform 2: Product Comparison Websites

There is another platform to compare the products which are sometimes called price comparison websites. These websites simply show the common features like price, technical specifications, reviews, and the rest of the criteria side by side. The customer compares products based on the details which can be incomplete and there is no authenticity of their opinions which can be influenced by some unethical activities (Cosma, 2016) (Singh, 2017). However, these websites give just a table of features of the products, which cannot be called as comparison unless, and until the users get it is relevant for their expectation in the product.

3. Existing System Problems

1 There is a need for an algorithm-based platform that should use customer reviews and ratings transparently to provide the comparisons of the products and should not be influenced by self-proclaimed experts.
2 The biggest problem is there is no platform to guide the best product purchase based on customer's expectations of the product.

3   There is no system to evaluate the negative feedbacks of customers to satisfy their expectations & to help E-Commerce websites to overcome the problems (Billewar,2020).

4   Where can I search if I am not a customer of a company, but I have to modify some features or overcome the problems of the system? Eg: Laptop is running slow… a need to increase RAM…but there are so many companies.

5   There is no platform like consultancies.

6   The customer should have technical knowledge of the product to compare the features based on cost-effectiveness (Besterfield, 2019).

4. Motivations

There is a need to make improvements to the existing E-Commerce platform. The SERVQUAL model helps to understand the expectations of Indian customer's perspective (Parasuraman, 1988).

1.   The Existing System: Online Reviews and Online Rating need to use provide services

To explore the link between the rating system and customer demographics and their perception of e-commerce retailers.

2.   Gap 1: Product Comparisons

To consider the effect of e-commerce appraisal activities and customer satisfaction without the intervention of experts.

3.   Gap 2: Customer Care platform to all brands (Not Yet Available)

To define the reach and effect of the customer service platform on customer loyalty.

4.   Gap 3: Repair Services (Not Yet Available)

To consider the degree to which online retailers offer repair services and propose novel proposals to address the major challenges

5.   Proposed System Architecture

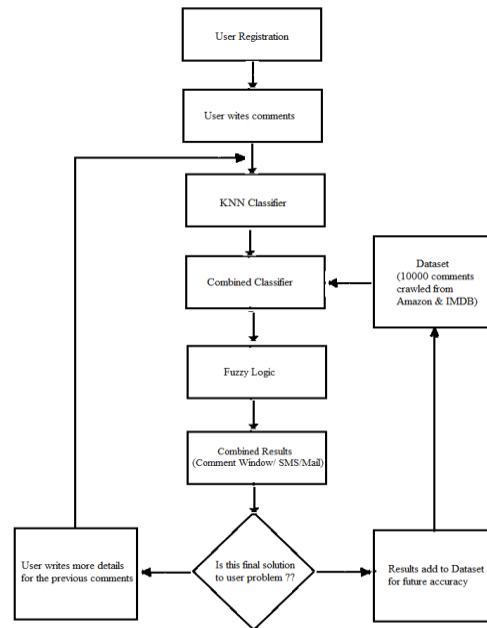The paper proposes the following architecture with the step-by-step approach shown in the diagram.

Figure 1: Proposed Block Diagram

5.1 Crawl the contents

Some E-Commerce companies allow to crawling the contents from their platforms. The researchers always need data to do their research activities. Amazon helps the researchers to crawl 10000 customer reviews at a time.

i)   Crawl the customer reviews from the E-Commerce platform
ii) The users need to register with basic required details to understand his problem area
iii) Then customer will be allowed to write the comments which will be further matched with crawled data

5.2 KNN Classifier

The k nearest neighbor algorithm (KNN) is as a type of machine learning algorithm which is sometimes also called lazy learning where there is only partial computation until function input is evaluated. It is used in statistical techniques like regression and classification. Therefore, normalizing or standardizing training data can improve accuracy. It answers the questions that have values. This makes clustering relatively easy for data mining. Here we can classify the comments of single products for features

Eg. In case of Laptop, the classifications can be done based on problems in

1.   RAM – the system is running slow; Movies are not playing.

2.   Hard Disk
3.   OS
4.   Processor

5.3 Naïve Bayes Algorithm

Naive Bayes classifiers are statistical algorithms that process, analyze, and categorize data. Bayes classifiers was a popular text categorization tool among text analyzers in the 1960s. Email filtering systems are used to receive and distinguish spam.

Naïve Bayes Classification is a fast and simple process. Classification with Naive Bayes is a type of statistical model that does not require independence between variables when applying Bayes' theorem. These methods can achieve higher accuracy levels when combined with density estimation techniques. Naïve Bayes Algorithm is used for sentiment analysis.

Sentiment analysis is the technique to understand the sentiments of the customers by statements or opinions given in reviews and ranking. Sentiment analysis helps E-Commerce companies and vendors to understand the gaps in an existing system (Zhu., 2008).

$$\hat{P}_{(t_i|c_j)} = \frac{1 + number\ of\ times\ t_i\ appears\ in\ a\ document\ from\ class\ c_j}{d + number\ of\ words\ in\ all\ documents\ from\ class\ c_j}$$

$$\hat{P}_{(t_i|c_j)} = \frac{\sum tf(t_i.d \in c_j) + \propto}{\sum N_{d \in c_j} + \propto.M}$$

It identifies specific words, phrases, and pieces of statements on a particular topic and ratifies positive, negative or neutral emotions about a product or services".

5.4 Modified Max Entropy Classifier

The Maximum Entropy approach is commonly used for text classification, by using the weights for both feature selection and feature importance, both to select features and to emphasize the importance of each feature. Maximum Entropy classifiers are often able to define more realistic boundaries. We use Maximum Entropy modeling so that all features will be equally weighted and give lesser importance to the features. (Deshmukh, 2018). There are two methods namely the Chi-Square test and the Gini Index which are frequently used. DIA and CMFS are also used in some of the situations (Nurdiansyah, 2018).

Chi-Square Test

The formula for Chi-Square Test is defined as:

$$\mathrm{CHI}(t_k.c_i) = \frac{N(a_{ki}d_{ki} - b_{ki}c_{ki})^2}{(a_{ki}+b_{ki})(a_{ki}+c_{ki})+(b_{ki}+d_{ki})(c_{ki}+d_{ki})}$$

Which is one of the most common tools to measure equality" and used for classification (Jain,2016).

Gini Index

The formula for Gini Index is also used for classification:

$$\mathrm{Gini}(S) = 1 - \sum_{i=1}^{n}\left(P\left(Si/_S\right)\right)^2$$

5.5 Combined Classifier and Algorithm

The Naive Bayes and maximum entropy classifiers are well-known techniques for text analysis. Both methods work based on calculating wordcounts. In recent research works, the combinations of classifiers exhibited better accuracy when compared to the single classifiers (Jain, 2016).
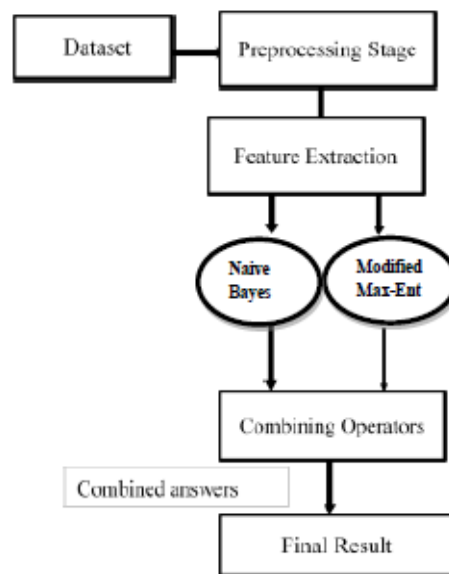

Figure 2: Modified Max Entropy and Naive Baye Combined Classifier

1. **Preprocessing the Dataset**

The proposed process reads the datasets and uses them for preprocessing of text data for further classifications.

2. Feature Extraction

The next step will extract the relevant features to set the keywords for processing. The Global Feature Selection (GFS) method is used to find similarities in the contents (Agnihotri, 2017). The GFS method arranges the features in ascending order as per importance and top priority feature are extracted.

3. Individual Classification

In the individual classification step, both classifiers perform the process on an individual level.

4. Modified Max Entropy and Naive Baye Combined Classifier

Now Modified Max Entropy Classifier is then combined with a Naïve Bayes classifier by using three combination operators – Average (d), Max (d), and Harmonic Mean (d) to increase the performance and decrease the errors.

$$Average(d) = avg(NB(d).ME(d))$$

$$Max(d) = \max(NB(d).ME(d))$$

$$Harmonic(d) = \frac{(2.0 * NB(d) * ME(d))}{(NB(d) + ME(d))}$$

5. Final Results

The Classification Algorithm used for final results

INPUT: Classes prepared C, the documents for test d, and the data for training DR

OUTPUT: Maximize class C for document d

Step 1: Use Naïve Bayes Algorithm for the conditional probability and train to use class labels

Step 2: Calculate the succeeding class probability of the Naïve Bayes Algorithm for every class

Step 3: Use the weighting method Gini Index and Chi-square and train Modified Max Entropy Classifier

Step 4: Calculate Modified Max Entropy Classifier for every succeeding class

Step 5: Calculate the results for every class by combining it

Step 6: Find the maximum class and finalize it as a class of d

6. Fuzzy Logic

The term fuzzy refers to what is not clear or unclear. In the real world, there will be many times where you are unable to determine whether the belief is true or false. It is useful in the face of inaccuracies of any sort.

Fuzzy logic enables a combination of multiple values based on a variable. Fuzzy logic hopes to gain an array of very accurate solutions. Fuzzy logic is an engineering program for solving problems. A computer has to provide a meaningful output – TRUE or FALSE, which essentially means "Yes" or "No." A wide variety of systems from microcontrollers to large, networked, and powerful workstations can be managed (Jetter, 2014). We can use it to –

1. To provide the full solution based on the Interval system.
2. Servlet static pages will be accessed as a solution by the experts based on the problem in the comments.
3. The reply can be given by mail, SMS, or on the site itself.
4. The process will be repeated.
5. The process will be the same for non-customers also

6. Proposed Templates
6.1 User Registration
To improve an authenticity of the data, the users need to do the registration.
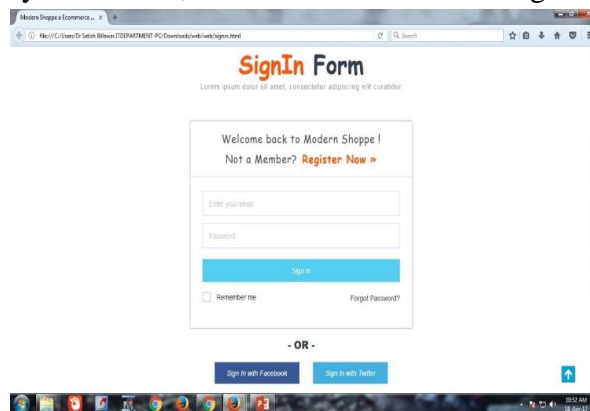

Figure 3: User Registration

6.2 Job Details
The job details will help to understand the user's work background that can directly relate to the mode of need & the level of understanding of the technology.
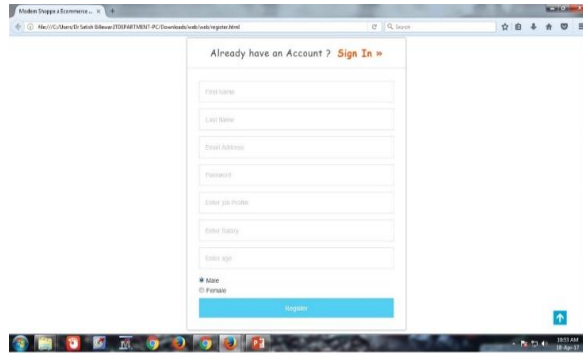
Figure 4: Job Details

6.3 Select Product Category & then Comment
Then user will select the category and the product to know the details.
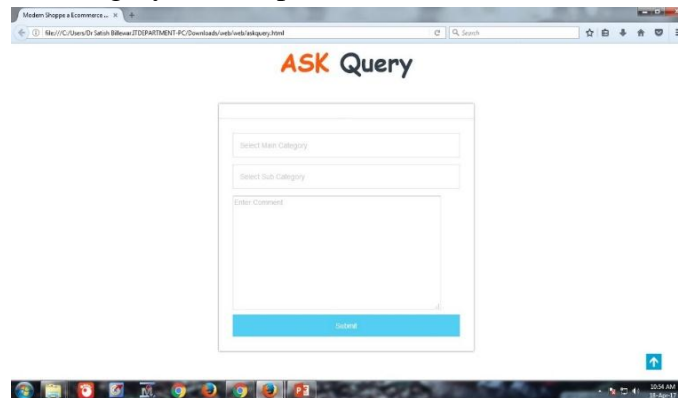

Figure 5: Product Category and Comments

6.4 Solutions with cost details
With the user's comment, the system will find the most suited solution through static pages available. In repetitive conversation with the system will lead to the exact problem & the system will also provide the links of the products to purchase of different brands with cost differences.
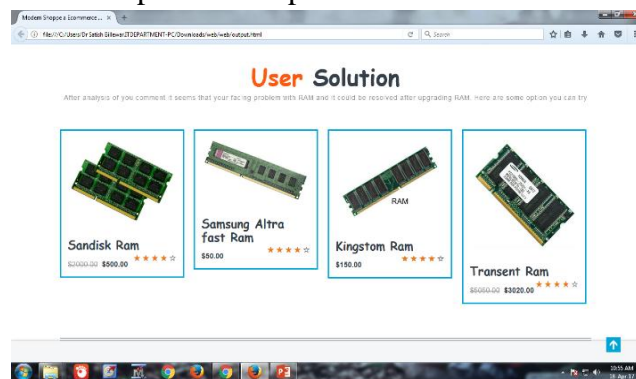

Figure 6: User Solution

7. Run Time Analysis

ME Classifier contains some shortcomings. The training time and the testing time are measured for the improvement in the machine learning techniques helps in dealing with time complexity in the learning of the algorithm. Different tests will be constructed for different factors to get expected results. Figure 2 presents is deviating from 20 to 500 which is represented by K. The classifiers are denoted as MEG, MEG and MEC.
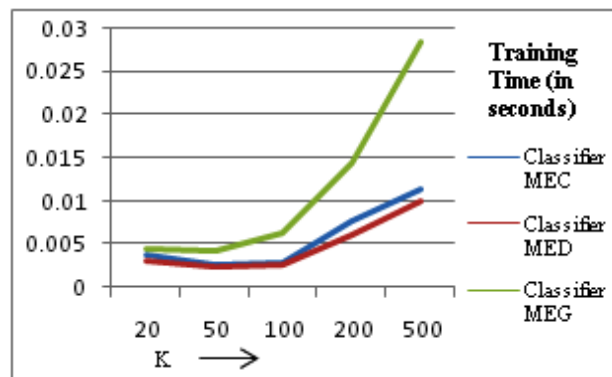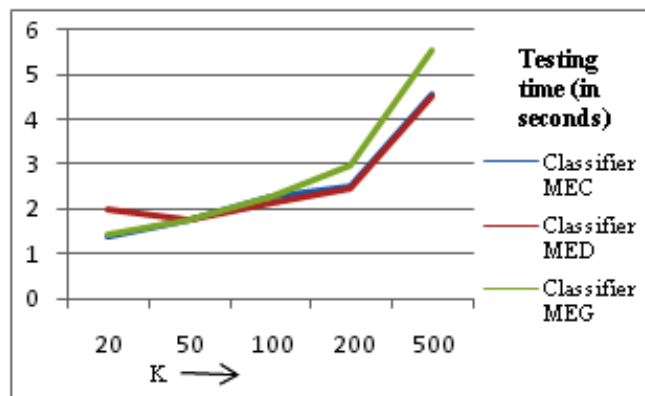

Fig. 7: Training Time

Fig. 8: Testing Time

So, it can be stated that the runtime growth is not related to weighting features in the ME classifier and changes that have been made in the ME classifier are not creating a disadvantage to its complexity.

Sentiment Analysis

We recommend the implementation of this methodology based on user reviews. For analysis purposes, we are providing some customers' reviews.

For this analysis, 252 reviews related to a battery are considered. The positive reviews of the service are graded as a class. The first reply is negative and so labeled them as 'No'. As a pie chart image. Based on an assessment of user sentiments, there are approximately 69 percent negative reviews with 21 percent positive responses.
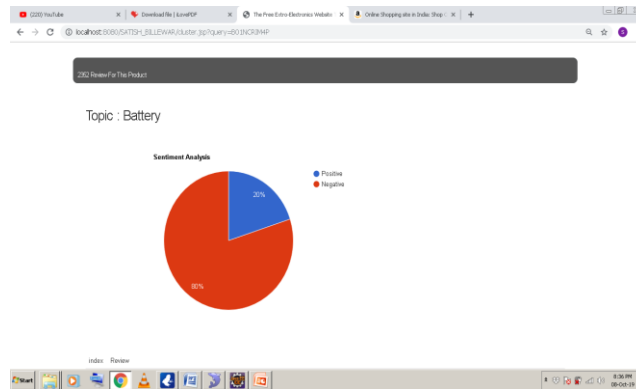

Figure 9: Sensitivity Analysis

The user will also be able to decide on purchasing and not purchasing the product due to user reviews.

Now if we apply the algorithm to a different product like RAM, it shows that the customer feedback is 100%. This product has a significant impact on all clients as users will be able to understand what the clients want.
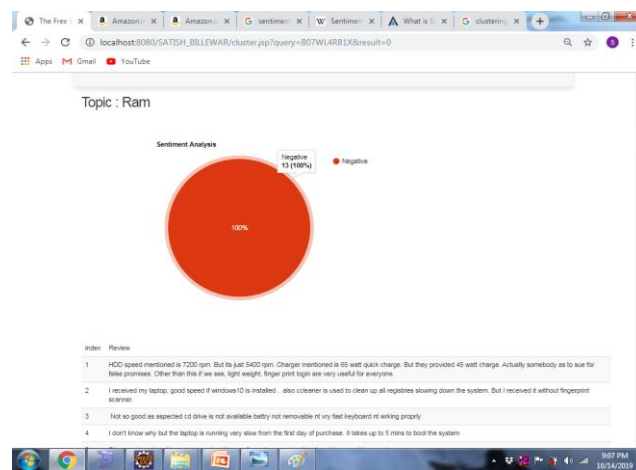

Figure 10: User Experience

8. Conclusion

Traditional markets have their advantages. They have been so successful and stable for centuries in the Indian market. The SERVQUAL proves that the online market must not be the competitor but should be the modification to the traditional market system (Parasuraman, 1985) (Kurucu, 2017). The E-Commerce business has a huge scope to take over offline businesses into an online

one. But need to differentiate the Indian customers from other types of customers all over the world. The Indian customers still have the psychology to confirm the quality of the product with the conventional offline way of personal assurance during the buying process. No device in the world is flawless. We can embrace it only then we attempt to change it (Trist, 1980). The researchers have proposed innovative classification methods to protect E-Commerce businesses from malicious harmful activities (Parasar, 2021). Change is an unavoidable environmental process. There are still openings for improvements (Pirages, 1994). The standard model does not guarantee the optimal framework for success in all world markets (Negrotti, 1984). The whole process can be used to compare the product features for any customer. A user's technical product knowledge should not be needed to fulfill his technical requirements.

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