Factors Affecting Customer Satisfaction with The Telecommunication Industry in Saudi Arabia

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Abstract **– Telecommunications is a customer-oriented industry in which client satisfaction is crucial for an organization's survival. Social media plays a vital role in customer decisions, acting as both a search tool and a communication channel. On social media platforms, customers can air their grievances, and a company can use these complaints to improve its products and services. During the first quarter of 2022, sentiment analysis was conducted to evaluate customer satisfaction with telecom services in Saudi Arabia. With a machine-learning approach, more than 90K comments were recorded and categorized as positive, negative, or neutral. For the classification, we utilised a support vector machine (SVM) model with an average accuracy of 88%. After that, We utilised thematic analysis of social engagement opinions. We identified seven themes among the comments related to factors affecting efficiency and satisfaction with telecommunications services: product, package, price, promotion, place, people, and public relations. In conclusion, we recommend some solutions to improve efficiency and increase customer satisfaction in the telecom sector.**

Keywords **– telecom services; SVM; sentiment classification; sentiment analysis; machine learning.**

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1. Introduction

The telecom industry is experiencing rapid growth and fierce rivalry in developed and emerging countries, making the quality of service a crucial factor for assessment and evaluation. In today's competitive business world, no company can survive without satisfaction and loyalty. Similarly, no organization can enjoy significant sales without addressing the needs of its clients. Creating a solid and long-lasting relationship with clients is a two-way exchange. Improved service quality will help a telecommunications firm to better satisfy its current customers' needs, retain their business, and attract new clients to the brand [1].

Today's consumers are more informed than ever, due to online reviews, online groups, and ratings that contribute to the abundance of product knowledge available at any time via their mobile devices. Similarly, social media provides companies with insights into customer needs, behavior, feedback, which helps them understand the composition of their client base and position in market.

Social media generates a tremendous amount of unstructured data in the form of free text. Natural language processing and sentiment analysis allow for a better understanding of customer opinions and emotions, enabling firms to gain insight into their behavior and needs.

As far as we know, previous studies have not used the opinions of GoogleMaps or GooglePlay users to evaluate customer satisfaction with telecommunications services. This study aims to bridge this gap by achieving the following objectives:

1) Analyzing customer satisfaction with Saudi Arabia's telecommunications services for the first quarter of 2022
2) Identifying the factors that influence customer sentiments concerning telecom services.

The following is the structure of the paper. Section II provides the background for the research, followed by a review of the relevant literature in section III, and a description of the methodology

used in data collection and conducting the analysis in section IV. The following section presents and discusses the findings. In conclusion, consideration is offered to the managerial implications of the findings and possible future directions for research.

Background

This section defines customer satisfaction and its relevance in the business. It then goes on to explain sentiment analysis and how it can be used to measure customer satisfaction.

1.1. Customer Satisfaction

Customer satisfaction is a marketing metric that determines whether a product or service meets or exceeds anticipated results. Customer satisfaction is defined as "The percentage of customers whose experience with a business, its products, or its services exceeds specified customer goals and objectives" [2].

Numerous studies have demonstrated the benefits of providing high levels of customer satisfaction. This is because higher levels of customer satisfaction are always associated with higher levels of loyalty, which have a direct effect on revenue. In a study by Farris et al. (2010), 200 senior marketing managers were surveyed, and 71% of them reported that customer satisfaction was an important tool for monitoring and managing their business [3]. Fornell et al. (2006) found that higher customer satisfaction leads to a higher return on investment. Additionally, satisfied customers will spread positive word of mouth when a new product or service is launched and they will ignore other attractive prices [4]. Thus, customer satisfaction is considered a key performance indicator in business and it is often included in a Balanced Scorecard. In a competitive market, customer satisfaction has become an increasingly significant element of business strategy [5].

1.2. Sentiment Analysis

Businesses used to measure customer satisfaction by observing customer behaviour, conducting focus groups, and administering multi-dimension questionnaires. Since the evolution of Web.2, customers have been expressing their opinions and sharing their feedback about products and services on social media.

Consequently, the volume of online reviews is continually increasing, making them difficult to evaluate.

Text mining is the process of discovering and extracting non-trivial knowledge-valuable insights from unstructured texts [6]. Text mining and sentiment analysis are used to analyse this kind of text. Geetha, Singha, and Sinha [7] defined sentiment analysis as the process of auto-judging the polarity (positive, negative, or neutral) of a text. Sentiment analysis, also known as opinion mining, is a technique of classifying people's opinions using a textual format.

According to Maynard and Funk [8], There are two types of subtractive techniques: lexicon-based and machine-learning. The hybrid approach combines these two techniques. In lexicon-based approaches, emotions are classified in the text through algorithms by matching either predefined sentimental words or negative and positive expressions contained in an emotional dictionary. Machine learning is a technique that uses artificial intelligence (AI) that learns from syntax or language features, including emotional vocabulary.

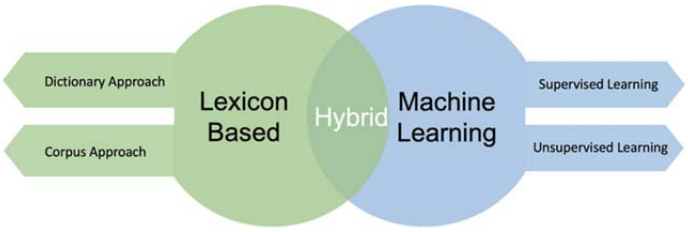

Figure 1. Sentiment Analysis Techniques

2. Literature review

This section explores customer satisfaction with telecom service providers, and the tools and methods used to measure customer satisfaction, including the applications of Arabic sentiment analysis.

2.1. Telcom service quality and customer satisfaction

Several studies have been conducted to define the key factors that affect customer satisfaction. The research conducted by Kalita, B [9] on the Indian telecom industry measured the functional aspect of service quality through SERVQUAL, which details five dimensions of service quality: tangibles, reliability, responsiveness, assurance, and empathy. The survey was conducted in the city of Guwahati within a time frame of one month.

A questionnaire was distributed and 220 respondents from all the major cellular operators in the city completed the questionnaire.

According to the findings, network quality is the most important factor, followed by responsiveness. All the factors were found to be significant, and, in turn, they retained their place in the equation that delineates customer satisfaction.

Rahmoun's [10] study followed semi-structured interview method that surveyed 100 customers leaving Tunisie Telecom. The researcher found that

71% of customers stated that reception plays a significant role in a service's overall evaluation. 69% of the respondents reported that service speed was important to them, followed by the reliability of information. Reliable information tends to foster trust between customers and providers. Lastly, 60% stated that the rapid processing of complaints was a priority.

The study by Dey et al. [11] adopted a quantitative approach and involved collecting data via a self-administered survey targeting adults in the United Kingdom. Telecom company Three commissioned and supervised the survey, and it was launched in the last week of 2016, yielding 861 complete responses. Questions were developed based on prior literature, constructs and indicators (network quality elements [speed, reliability of network coverage, call and text quality]; perceived value, customer service, service quality, customer satisfaction, and brand image). Speed emerged as the most significant component of service quality and had the greatest impact on the brand image of all the network quality elements.

2.2. Sentiment analysis and customer satisfaction

Lee et al.) [12] investigated whether ratings reflected consumer reviews. In total, 28,841 reviews were analysed; the study applied the sentiment analysis technique to identify customer satisfaction from the reviews, and a lexicon-based approach to establish whether the rating systems reflected genuine experiences and the satisfaction levels of customers. The study found that the rating did not accurately express consumer experience. They recommended developing systems that could recognise when its evaluations needed to be improved.

Imtiaz and Ben Islam [13] examined 1,000 customer reviews from five e-commerce websites with 45 smartphone models. The reviews were evaluated by using Python programming language, and the Vader algorithm was employed to measure comments.

Vader is a lexicon- and rule-based emotion analysis tool. Designed by C. J. Hutto [13], the Vader Lexicon contains around 7,075 English words, some slang words, and some emoticons with polarity scores.

Imtiaz and Ben Islam's study defined 21 attributes determining customer satisfaction and buying decisions over smartphones.

2.3. Arabic sentiment analysis

Nahar et al. [14] uitlised Arabic sentiment analysis – (Jordan slang).

This study evaluated Jordanian feedback about three telecommunication service providers: Zain, Orange, and Umniah. The data were gathered from Facebook, as it is the most influential site among Jordanian citizens. The researchers implemented a lexicon-based approach to identify the comments' polarity. The study found that 60% of the social comments were positive while 40% were negative. The general lexicon accuracy was 98%.

Almuqren, Alrayes, and Cristea [15] applied Arabic sentiment analysis – (Saudi slang). The researchers predicted customer churn in the telecommunication sector by examining selected service providers (Zain, Mobily, and STC). They gathered the data from Twitter as it was the most influential site among the citizens. The researchers developed a model to predict customer satisfaction on the AraCust corpus. The model was based on two models: bidi-sectional gated recurrent units (Bi-GRU) and the Word2Vec model. The model achieved 95.16% accuracy. According to the study's findings, the most critical factors influencing churn are the price of internet packages (data) and the price of calls (voice).

3. Research methodology

This section provides an overview of the Arabic sentiment analysis utilised in this study. It consists of five phases: data collection, data pre-processing, data annotation, the machine-learning model, and sentiment analysis.

Figure 2 illustrates the steps involved in the implementation of the sentiment analytics methodology; the following sections explain each step in more detail.

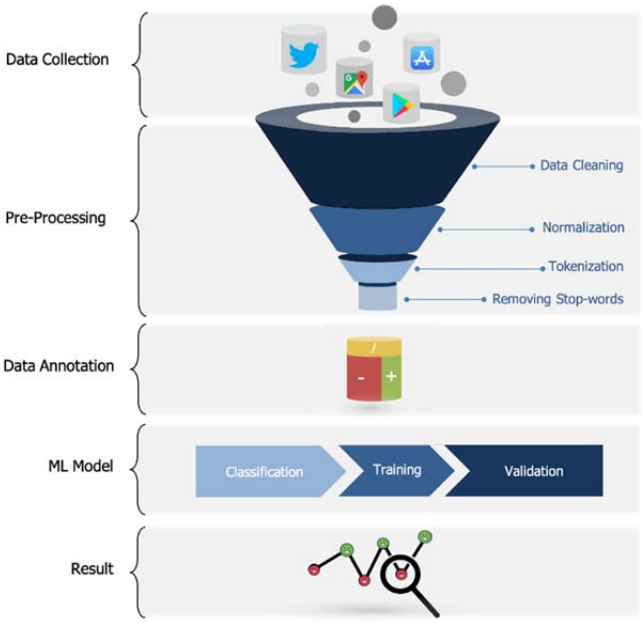

Figure 2. Arabic sentiment analysis methodology

3.1. Data collection

From January 1st to March 31st, 2022, over 120,000 Arabic reviews were collected on eight telecom providers. The data were extracted from different sources including Twitter, Google Maps, and Google Play. Twitter was used to obtain a general overview of the services provided, as it is the most widely used social media platform used by citizens. As Google Maps reviews are commonly used by citizens, and most of the telecom branches are registered with them, we analysed them to explore the in-store services offered by retail channels. In order to assess digital channels and self-service, we gathered user reviews from Google Play. The tweets were collected through the mentions of official company accounts. These include @stc, @stccare_ksa, @Mobily, @Mobily1100, @ZainKSA, @ZainHelpSA, @Virginmobileksa, @LebaraKSA, @salam, @Salam_Mobile_SA, @Salam_Support, @redbullmobileSA, and @GOTelecom_KSA.

In Google Maps reviews, the telecom branches were selected randomly due to the extremely large number of telecom branches in Saudi Arabia, (e.g., Mobile has 215 branches). The reviews were gathered randomly by selecting five branches for each company from different geographic locations (the central, eastern, western, southern, and northern regions).

3.2. Data pre-processing

During the pre-processing phase, four stages are carried out sequentially: text cleaning, normalization, tokenization, and removing stop words. The following are the steps taken during the text cleaning phase:

- Removing irrelevant tweets, e.g., advertisements, companies mentioning themselves in a tweet, or sister companies mentioning them.
- Removing data outside the timeframe of the study [Jan to March, 2022].
- Eliminating duplicate tweets resulting from web scraping.
- Removing non-alpha characters, including numbers, symbols, punctuation, and emojis.
- Eliminating double characters in a word by replacing them with single characters. For example, (ج م ي ي ي ي ي ل) was changed to (ج م ي ل), which means that “Niiiiiice” was changed to “Nice”, by removing repeated characters.
- Normalising some characters, including replacing
    - ["آ","أ","إ"] --> with [ا]
    - ["ي" ,"ى"] --> with [ي]
    - ["ة"] --> with [ه]
    - ["گ"] --> with [ك]
- Eliminating Arabic diacritics, for example:
    - ◌َ | # Fatha
    - ◌ً | # Tanwin Fath
    - ◌ُ | # Damma
    - ◌ٌ | # Tanwin Damm
    - ◌ِ | # Kasra
    - ◌ٍ | # Tanwin Kasr
    - ◌ْ | # Sukun
- Removing stop words listed in the (NLTK) library
  The text was then split into tokens or words using NLTK tokenization1.
- Finally, tokenization was employed to break down the sentence into the smallest unit using NLTK tokenization1. After the pre-processing, 98K comments were left.

				Total
stc	4296	170	28947	33413
Mobily	3462	85	18780	22327
zain	469	131	27322	27922
Virgin	190	8	596	794
LEBARA	72	25	9473	9570
salam	44	31	3470	3545
Red Bull MOBILE	11	-	258	269
gosa	4	4	511	519
Grand Total	8548	454	89357	98359

Figure 3. The data after the pre-processing

3.3. Annotation-based data

A few Arabic-labelled data sets related to telecom are available, and the only one we found [15] was classified into positive and negative. Therefore, we reviewed it and added an additional classification (neutral). The annotated dataset contained 19.5K comments. Following that, we assigned polarity scores to each tweet: 1, 0, or -1 based on whether a comment was positive, neutral, or negative respectively. The feature extraction step was then performed on our dataset.

3.4. ML traning and validation

TF-IDF was used for feature extraction. It is an information retrieval technique which weighs the frequency of a term (TF) and its reverse document frequency (IDF).

The training set and the test set were converted via the TF-IDF vectoriser.

To avoid overfitting, we applied cross-validation using Sklearn. The following flowchart illustrates a typical cross-validation workflow in model training. Grid search can be used to determine the best parameters.

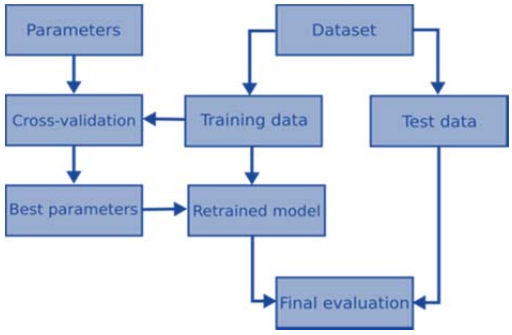

Figure 4. Flowchart of cross-validation in the training model

Using the train_test_split helper function, the data were randomly split into training and test sets. The training set was sampled and 30% was held back for testing (evaluating) the classifier.

For validation, we used a 10-fold cross-validation, where the training set is divided into ten smaller sets. Following is the process for each of the k "folds":

a) Training the model with k−1 of the folds as training data.

b) The remaining data are used to validate the model (i.e., it is used as a test set to measure accuracy).

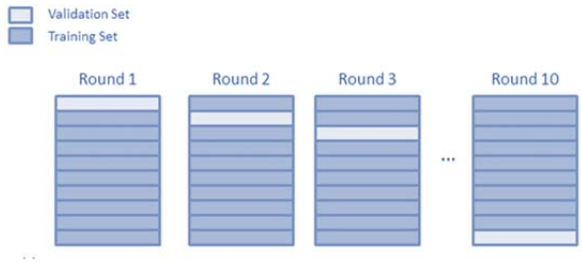

Figure 5. Cross-validation10-fold

4. Performance evaluation

Several studies have demonstrated that SVM performs well with Arabic text. Thus, we applied SVM, and our project showed that it was highly efficient at classifying multidimensional feature datasets. We observed good results for all accuracy and precision scores, and for the F1 score.

```
**** Classification Report ****
              precision    recall  f1-score   support

    Negative       0.84      0.94      0.89      2548
    Positive       0.93      0.87      0.89      1862
     Neutral       0.91      0.79      0.85      1413

    accuracy                           0.88      5823
   macro avg       0.89      0.86      0.88      5823
weighted avg       0.88      0.88      0.88      5823
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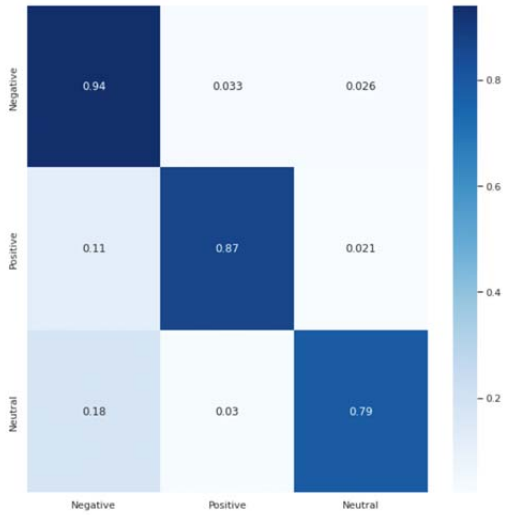

Figure 6. Classification report

5. Thematic analysis of the results

We identified positive, negative and neutral comments, and classified them into seven main categories: product, package, price, promotion, place, people, and public relations.

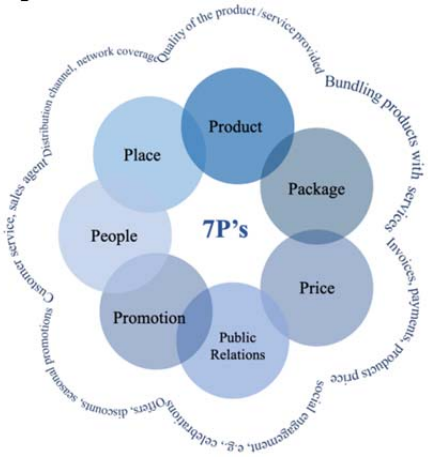

Figure. 7. Themes and sub-themes

1) Product (quality of the service or product provided)
2) Package (bundling products and services)
3) Price (product and service prices, payments, invoicing)
4) Promotions (advertisements, discounts, seasonal promotions)
5) Place (the distribution channel: application, store, service delivery, and network coverage)
6) People (Customer service
7) Public relations (social engagement, e.g., celebrations, events, games, etc.)

The comments listed in subsections were originally written in Arabic and have been translated into English for this paper.

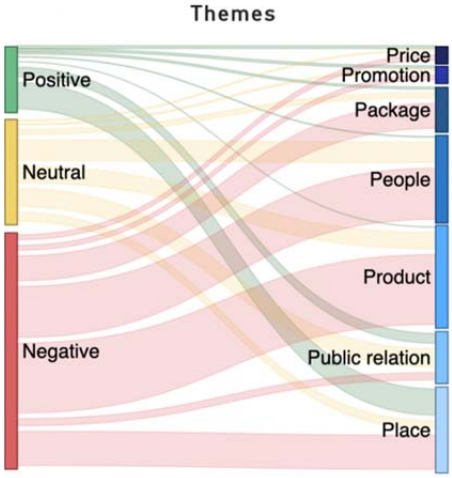

Figure 8. The relationship between the themes and the sentiments

a) Products

Approximately 33% of the negative feedback, due the quality of the service provided. Customers complained that they had low bandwidth or a lack of connection. Some examples of these complaints are as follows:

"The internet has been down for three days! and the LOS light is red.

"My phone line isn't working in Egypt."

"Hey, group calls aren't working."

b) People

Several problems related to customer service were reported, with 24% of the negative comments focusing on poor customer service. Many customers claimed that customer service representatives were inadequate in their responses or were unable to resolve issues - some of the tweets are shown below:

"It's been 24 hours, and no one has contacted me!!!"

"Poor customer service. Do not recommend."

c) Place

About 17% of the negative comments showed that customers had negative opinions of the telecom branches, network coverage, and delivery of products. Some examples of customers' complaints are as follows:

"The store is closed before 9 o'clock!"

"It was overcrowded inside the branch with no distance between people."

"Nine days have passed, and the phone still has not been delivered."

"There's no network coverage; we need a tower!"

d) Packages

About 13% of the negative comments were related to package. Customers ask for proper packages or for more services to be included. Here are some examples of these tweets:

"They said thee was unlimited social media, but TikTok wasn't there!

"It's exploitative of your company to reduce the internet bandwidth of the package without telling customers."

e) Public relations

Although social engagement activities received the highest positive score. About 5% of the negative feedback was related to social engagement. Some examples of the comments are as follows:

"Only three girls won, so we're not going to play a game based on gender."

"Jobs should be filled with dependable people, not those who are insincere and have disdain for the country and its residents! He should be deported."

f) Price

Approximately 4% of customers were dissatisfied with pricing, payments, and invoices. The data showed negative feedback on hidden fees—for instance:

"Where is my money? I transferred the amount 4 days ago, and it is not reflected [in my account]."

"After I paid the bill, I received a message saying that I had remaining payments to make!"

"I have subscribed the 300SR package, but my monthly bill is 318SR."

g) Promotions

Around 4% of the negative comments were related to promotions. Customers want fair offers accompanied by clear terms and conditions. Here are some examples of these Tweets:

"I got a a fiber upgrade offer. It's supposed to be free of charge from 80 to 100, but I was charged!"

"There's a reason why this offer is only for employees!"

6. Discussion and recommendations

This section discusses the findings and ways in which a telecom company can increase customer satisfaction. It is worth mentioning that we should not rely on social media feedback only to measure companies' success, as people tend to share and

interact with negative conversations more than positive ones. Several studies have demonstrated this. For example, Dwivedi et al. (2021) found that people were more likely to share and interact with negative reviews of products and services on social media than with positive reviews [16].

Social media is a valuable tool that can be used to measure performance, such as the open rate and click-through rate of an advertisement, as well as the quality of content shared by customers or potential customers on social media platforms (Hussein & Hassan, 2017) [17]. Therefore, setting a baseline based on real-time data obtained from social media sources and using that baseline to develop an ongoing strategy that aims to improve marketing efforts would be a valid approach to accurately measuring customer satisfaction levels.

Figure 9 shows that most of the interactions (likes and retweets) were with negative comments, totalling 87%.

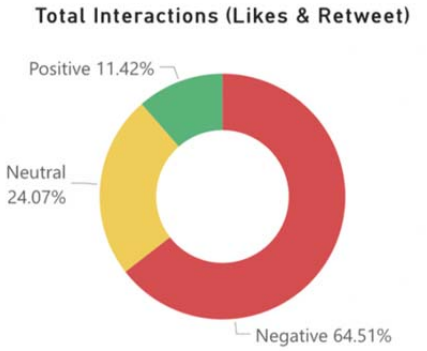

Figure 9. Customer interactions with negative comments

People tend to write longer text in negative comments. The diagram below shows the length of the texts.

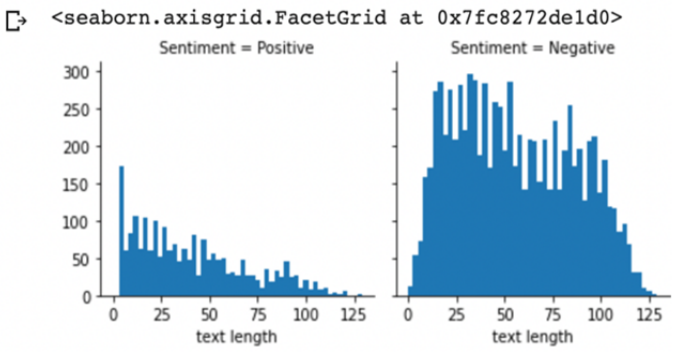

Figure 10. The length of negative comments

From analyzing the rating scale e.g., in Google Play it appears as a number of stars given by the commentator. It has been found that a high rating score does not always correlate with positive reviews. Of the negative reviews, 14% were rated five stars, while 2% of the positive reviews were rated one star.

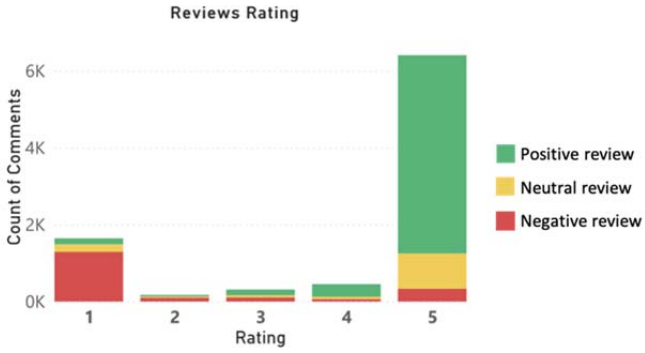

Figure 11. Ratings with textual review

Social media can be a major source of customer feedback that companies can leverage to gain valuable insights into their customers' needs and wants. Using social media effectively can help to build and maintain a sustainable relationship with customers, providing them with high value so they will be satisfied and loyal[18]. There are various ways in which telecommunication company can deliver high-quality customer service. High customer satisfaction reflects positive customer interactions and increases a company's profitability. Customer satisfaction has been defined as the result of things going as planned, enhancing customer needs and fulfilling their desires. It can also be viewed as the positive feeling or judgment that customers have toward a brand or product after purchase [19].

a) Customer engagment

Most telecommunication companies fail due to their inability to provide a smooth customer experience, which leads to service cancellation.

Furthermore, a survey relating to customer experience indicated that customers find discussing issues with telecommunication companies to be time-consuming, usually requiring repeated calls to resolve an issue [20].

When companies respond quickly to complaints, they can build a loyal customer base. It is important for brands to know where and when their customers spend most of their time on social media and to focus their efforts there [21].

Additionally, companies can use social media to inform their customers of planned maintenance times and to identify peak periods of customer engagement so they can staff accordingly. For example, in our study we found that Tuesday is the most popular day to communicate with companies via social media. Companies can use this information when developing schedules to ensure adequate coverage, thereby improving the customer experience.

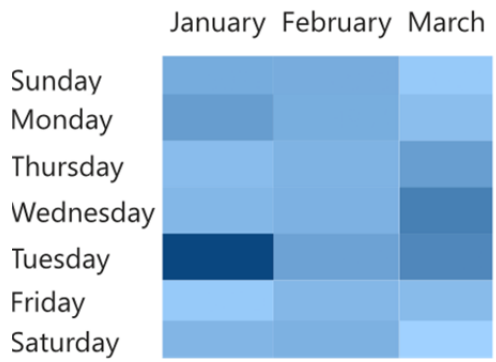

Figure 12. Heat map of number of comments shared per day

b) Internal marketing

Internal marketing refers to promoting an organization's objectives, brands, internal procedures, culture, products and services to employees within the organization. Nwoko et al. [22] conducted a study about the effectiveness of internal marketing on customer satisfaction in telecommunication companies in Anambra. The study found that employee empowerment, skill development and promotions have a positive impact on customer satisfaction.

c) Enable agents

Today, long-term steadfastness relies upon the nature of administration and the level of fulfillment. A customer-centric approach should not sidestep the significance of the job done by customer service agents. Agents should have access to information and practical assistance on various topics. A live agent handles repeat inquiries seamlessly and customer relationships are enhanced from a more personalized standpoint [23]. Although the use of artificial intelligence and automation has become an integral part of customer self-service, they are also essential tools for customer service agents. Many customers prefer to receive live assistance from a friendly, helpful and knowledgeable representative.

d) Embrace technology

According to a survey by Ernst & Young, one of the biggest risks facing the telecommunication industry is its inability to innovate and use new technology. A telecommunication company should strive to incorporate new technologies and innovative ways of meeting customer needs. [24] Technology and innovation can be demonstrated through thoughtful leadership, such as embracing smart and innovative technology like smart monitoring systems to help reduce customer downtime. Loyalty programs can also be used to influence customer preferences, leading to an increased level of consumer satisfaction.

e) Empowering self-service

Automated customer service with digital self-service is an approach that companies use to enhance customer experience on their digital channels. If a human-assisted channel, such as chat, social media or community forums, focuses on helping clients to continue using digital self-service, it brings added value. Companies can better meet customer demand if they adopt an integrated approach that emphasizes the development of channel skills [25]. Agents in the firm's contact center can, for example, better serve consumers who begin their interaction with the company through a digital channel as they can then view their browsing history on the company's website [26].

f) Utilizing a digital channel

Digital marketing uses digital technologies, such as mobile phones, which use the internet to market and advertise products and services [27]. Companies use the internet and digital platforms to promote and sell their products and services.

Different digital channels can be used to improve marketing with the use of mobile apps and websites.

When companies use websites to market their goods, they can see the number of visitors to their channel. They can also tell which products have been searched for most. This information can then be used to improve products and services and enhance customer experience [28].

g) Remain vigilant and proactiveness

An important step toward further improvement of the customer experience is to understand client expectations. Today's clients expect access anywhere and anytime. Due to the rapid advancements in technology, the need for consistent availability of information has grown. Consumers seek speedy solutions to their problems. Through the different sources of information, such as live flexible conversations, text visits, SMS, phone support, and so on. Thus, they tend to start with one specialized strategy and then proceed to the next to access superior information and obtain answers to their concerns [29].

Successful organizations identify the basic pointers pertinent to consumer loyalty and routinely track these measurements. Companies owe it to themselves to be proactive because it's an effective way to satisfy customers. Proactive client service enables organizations to monitor issues and alert customers to problems ahead of time instead of waiting for customer service to be contacted [30]. Additionally, offering detailed information about an issue's cause and resolution gives an organization more credibility than if it simply promises to resolve the problem. By adopting this approach, more misunderstandings can be avoided, and customers are more likely to be tolerant of unavoidable delays.

7. Conclusion

In this paper, we have analysed Saudi Arabia telecom customer comments posted on social media during the first quarter of 2022. Sentiment analysis was conducted to analyse the opinions expressed by customers on Twitter, Google Maps, and Google Play. A SVM classifier was applied to predict the sentiment polarity of customer opinions, and it proved to be 88% accurate. Additional investigation through thematic analysis identified several themes for factors that negatively impact the quality of telecommunications services. According to the findings, several recommendations were developed to assist telecom service providers with improving the quality of their services.

Looking ahead, we plan to increase the number of languages included in machine learning and extend our approach to analysing customer comments across industries. This will allow us to identify companies' strengths, and weaknesses and support them in enhancing the quality of their services.

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