

Using Text Mining to Identify Key Dimensions of Service Quality for the Indian Public Sector Banks' Mobile Banking Apps

Nirav B. Halvadia (✉ niravhalvadia@gmail.com)

Ganpat University

Shekha Halvadia

Kadi Sarva Vishwavidyalaya

Rajen Purohit

Ganpat University

Research Article

Keywords: Service Quality Dimensions, Mobile Banking, Text Mining, Customer online reviews (CSRs), N-gram Analysis, Word Cloud.

Posted Date: April 13th, 2022

DOI: <https://doi.org/10.21203/rs.3.rs-1536236/v1>

License:   This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Abstract

The purpose of this study is to identify service quality dimensions that are very important for satisfied mobile banking app users of the Indian public sector banks using customer online reviews (CORs) analysis. A total of 5294 reviews of satisfied mobile banking app users (positive reviews) of leading Indian public sector banks (State Bank of India, Punjab National Bank, and Bank of Baroda) were collected from Google Play Store for text mining and the collected reviews were written from January 2018 to January 2022. Text indexing was performed after finding the string length and word count of all reviews. After text indexing, N-gram Analysis and word cloud analysis were performed using NLP models of Python software. Three important service quality dimensions for satisfied mobile banking app users (users with positive reviews) of the Indian public sector banks were identified. These dimensions were security, ease of use, and convenience. Mobile banking app users of Indian Public Sector banks are happy and satisfied because they perceive that the app is secure, convenient, and easy to use. The Indian public sector banks should position their mobile banking apps as secure and easy mobile banking apps for money transfers. The findings of this research are very useful to managers of Indian public sector banks in improving customer loyalty, getting new customers, and promoting their mobile banking apps in effective ways. This paper is a pioneer study in identifying important service quality dimensions for satisfied users of any mobile banking app in India using a text mining approach.

1. Introduction

Mobile banking is a way of connecting a customer to a bank via a mobile device, such as a smartphone or tablet, to conduct online financial transactions. In the early 2000s, mobile banking was introduced in India. It is defined as “a channel whereby the customer interacts with a bank via a mobile device, such as a mobile phone or personal digital assistant” [9].

The growth of mobile banking usage in India is exceptional because India has 1,186.84 million wireless subscribers, India has 86.78% wireless teledensity, India is a country with 137.26% urban wireless teledensity and 60.05% rural wireless teledensity, India has more than 749 million internet users in the year 2021 and this number was projected to grow to over 1.5 billion users in the year 2040, and Indian online market is the second-largest in the world after Chinese market [45].

Banks increasingly offer mobile banking services [14, 24]. Due to the rapid growth of the mobile phone industry over a short time period, mobile banking has become a key component of banking success. Indian banks are offering a large variety of financial and non-financial services which are delivered through mobile technologies. Mobile banking reduces clients' physical distance from their bank and helps them achieve financial inclusion. The importance of mobile banking for Indian banks lies in the fact that it reduces the number of customers who visit a bank branch for non-cash transactions and thus reduces their costs. Banks can increase the number of customers and market share by providing excellent mobile banking services [41]. Mobile banking is also very useful to banks in making their operations efficient and effective. Mobile banking also gives the opportunity of earning huge revenue by offering non-financial

services. Broadly, banks can reduce costs and increase profit by offering mobile banking services to customers. More than 1186 million wireless subscribers, present an exceptional opportunity to take benefit of the mobile platform for financial inclusion in India [49]. By utilizing the potential of mobile technology, banks can deliver services to unbanked and under-banked parts of Indian society also. Mobile banking can lead India to financial inclusion.

Most Indian banks are providing mobile banking services through their mobile app. The mobile wallets from non-bank companies, such as Google Pay, Paytm, PhonePe, and Amazon Pay also give cutthroat competition to mobile banking platforms of banks. So, any mobile banking app of any Indian public sector bank is facing tough competition from mobile banking apps of private sector banks and non-bank companies. In public and private sector banks, Yono Lite SBI- the mobile banking app of the Indian leading public sector bank had the highest market share of mobile banking transactions among all banks in the year 2019 and it was 16.73% [1]. But Paytm was the market leader with a 19.23% market share of mobile payment transactions in India in the year 2019 [1].

Over 70% of the market was controlled by public banks until a few years ago, however, the RBI's latest data shows, their market share in loans dropped to 59.8% in 2020 from 74.28 percent in 2015, while private banks' share rose to 36.04 percent from 21.26 percent. [40]. There is fierce competition between public and private sector banks in India. Indian public sector banks which are providing mobile banking services using Mobile apps must understand the importance of service quality because service quality provided by mobile banking apps gives a competitive edge to the banks in this competitive era.

For getting a sustainable competitive advantage, Indian public sector banks should deliver high service quality through mobile banking apps. The high service quality of mobile banking apps creates an impact on the loyalty of customers, repeat financial transactions, positive word of mouth, and overall profit of the bank [44]. The success of mobile banking apps is closely tied to how customers perceive and evaluate them. So it is very important to identify important service quality dimensions for mobile banking apps of Indian public sector banks.

To support the decision-making process and improve service quality in an organization, it is very important to use linguistic analysis for extracting important dimensions of satisfaction from customer online reviews (CORs). Advanced techniques of linguistic analysis are very useful in getting the valuable meaning of users' online comments or posting on social media websites, app stores, etc. [2, 3]. With getting new users, it is also important for Indian public sector banks to build long-term relationships with users of their mobile banking apps because many options are available to users from many private banks and non-banking companies. Happy or satisfied customers who post about their experiences on social media websites, app stores, e-commerce websites, etc. encourage other purchasers and it helps to increase sales of products or services [8, 22]. State Bank of India, Punjab National Bank, and Bank of Baroda were the leading public sector banks in India, and these three banks had a market share of more than 30 percent in the Indian banking sector and 71 percent in the public banking sector so online reviews

of these three banks' mobile banking apps are collected [40]. To keep this in mind, the following research question is framed:

Research Question 1: What are the key dimensions of service quality for satisfied users of the Indian public sector banks' mobile banking apps?

The answer to the above question helps Indian public sector banks in getting more customers, creating an effective advertisement campaign, and framing competitive marketing strategies. The following objective was framed based on the above research questions:

Objective 1: Apply text mining approach to identify key dimensions of service quality for satisfied users of the Indian public sector banks' mobile banking apps.

2. Literature Review

2.1 Service Quality:

Academic research has become increasingly focused on service quality over the last few decades. Gummesson [21] was among the first to propose the concept of service quality was strongly associated with trust and perception. Gronroos [20] then gave the notion of "total service quality" and this concept considers the difference between expected service quality and perceived service quality for measuring total service quality.

The concept of service quality has been defined by many researchers in the past. According to Parasuraman et al., service quality refers to "the difference between customer expectations of what a firm should provide (i.e. expectations) and the perceived service performance" [35, 36].

Asubonteng et al. [7] defined service quality as "the difference between customers' expectations for service performed before the service encounter and their perception of the service received". Gefen [18] defined service quality as "the subjective comparison that customers make between the quality of service that they wish to receive and what they get". As per Parasuraman et al. [34], service quality is an abstract of three features that are very unique to services: the inseparability of production and consumption, heterogeneity, and intangibility.

Parasuraman et al. [36] proposed a very popular definition of service quality and according to them, service quality means "conformance to customer specifications" – that is, Customers' perception of service quality is very important, not management's. Service quality is recognized as a driver of corporate marketing and financial performance [12]. Service quality is capable of delivering strategic benefits, such as operational efficiency, improved customer loyalty, improved customer retention rates, etc. [56].

Service quality is observed as a key determinant of financial performance and corporate marketing [54]. The financial performance of banks is impacted by the Service quality of mobile banking applications.

2.2 Online Service Quality:

In online service, the customer interacts with the service provider via technology. In the last decades, many research scholars studied online service quality and define it in different ways. Zeithaml et al. [56] defined online services as “web services delivered through the internet”. Ghosh et al. [19] conceptualized an online service as an interactive information service. Rowley (2006) defined online service as “deeds, efforts, or performances whose delivery is mediated by information technology” [40].

Delivering services at a higher level of service quality create a positive influence on customer satisfaction [36, 15]. The quality of service is a very important factor affecting the success or failure of e-commerce [51]. The quality of service in e-commerce can also enhance customer retention and loyalty [35, 55].

2.3 Mobile Banking Service Quality:

The term mobile banking typically refers mostly to the use of mobile devices, such as a mobile phone, tablet, etc., to manage financial accounts [26]. M-banking is an essential tool for developing relationships between financial institutions and their customers [38, 44]. Service Quality of mobile banking applications represents the overall evaluation made by users of mobile banking applications regarding the service quality attribute of the mobile banking application [5]. There is no research conducted in the area of mobile banking application service quality in India. So literature review is conducted in the area of mobile banking/finance service quality.

Earlier researchers have used different approaches to determine important dimensions of service quality for mobile banking. Prior research has explored the factors that determine the quality of mobile services. Using text mining techniques, Leem and Eum [28] used sentiment analysis to measure the service quality of mobile banking apps in Korea, concluding that mobile bank managers should pay more attention to the service quality dimensions of enjoyment and practicality. Zhou et al. [57] researched to study various factors affecting the service quality of mobile banking and concluded that financial institutions and decision-makers with concern to mobile banking should consider the importance of security, assurance, system quality, and interface design. Mostafa [32] conducted an extensive literature review and identified four important mobile banking service quality dimensions: enjoyment, ease of use, security/privacy, and usefulness. Shankar et al. [42] explored important dimensions for mobile banking service quality using qualitative research methods (netnography, focusgroup, in-depth interviews, and critical incident techniques) and the results of the study demonstrated that content, efficiency, interactivity, customer support, and security are key dimensions for measuring service quality of mobile banking. Trialih et al. [50] examined the relationship between mobile banking service quality and customer satisfaction in Indonesia and concluded that easiness to operate, efficiency, convenience, assurance and security, and reliability and responsiveness are important service quality dimensions for measuring mobile banking service quality. Research conducted by Shareef et al. [43] on the adoption of mobile banking services found that perceived security, trust, perceived ease of use, and perceived functional benefits are important factors in the adoption of mobile banking services. Kumar [27] identified six dimensions for measuring online banking service quality and these dimensions were: assurance, mobile application design,

customization, functionality, service recovery, and fulfillment. Jun and Palacios [24] applied the critical incident technique and identified 17 service quality dimensions for mobile banking: m-banking application quality (convenience, ease of use, content, speed, accuracy, security, diverse mobile application service features, and aesthetics), and m-banking customer service quality (continuous improvement, competence, reliability, courtesy, responsiveness, credibility, understanding the customer, access and communication). In addition, the research revealed that five dimensions, such as ease of use, diverse mobile application service features, accuracy, and continuous improvement are measured as the most important sources of customer satisfaction/dissatisfaction for mobile banking users. Bhatiasavi [10] researched mobile banking adoption in Thailand and applied the unified theory of acceptance and usage of technology and this study concluded that performance expectancy, effort expectancy, and perceived convenience impact people's intentions to use mobile banking. Arvidsson [6] studied consumer attitudes toward mobile payment services and found that the important factors for consumers who use a mobile payment service are ease of use. In addition, Arvidsson [6] concluded that low perceived security risks and high trust have a strong positive relationship with the adoption of mobile payment services. Chemingui and Lallouna [13] identified four important factors affecting the adoption of mobile financial services, such as system quality, compatibility, trialability, and perceived enjoyment. Amiri Aghdaie and Faghani [4] used the SERVQUAL model to measure the relationship between mobile banking user satisfaction and mobile banking services; and concluded that responsiveness, empathy, reliability, and tangibility have a significant correlation with the satisfaction of mobile banking users. Lu et al. [30] proposed three mobile service quality dimensions: outcome quality, environmental quality, and interaction quality. Chen [14] conducted research work on measuring the effects of information quality, system quality, and information presentation quality on customer satisfaction for mobile banking, and concluded that information quality and system quality create a significant impact on mobile banking customer satisfaction. Tan and Chou [47] proposed seven determinants of mobile service quality: personalization, perceived ease of use, variety, content, perceived usefulness, feedback, experimentation, and personalization. Lim [29] identified five determinants of mobile service quality: network quality, customer services, billing systems, pricing plans, mobile data services, and customer services.

During the last two decades, service quality has emerged as the most explored area in the field of services marketing. Offering superior quality services is necessary for ensuring business success in today's dynamic and competitive environment. There is no effort has been made to identify important service quality dimensions for a mobile banking app using text analytics in India. Table 1 shows the summary of important research work in the area of mobile banking/finance service quality.

Table 1: Summary of Important Research Work in the Area of Mobile Banking/Finance Service Quality

2.4 Machine Learning and online reviews:

Mobile applications are an important part of our lives today. Mobile applications are special-purpose software that is developed to perform precise tasks. Any mobile application has unique features to perform precise tasks. Mobile phones have Mobile OS; "Mobile OS" means mobile phone operating system. Mobile OS operates PDA, smartphones, and other mobile devices. Mobile phone uses various

types of operating system like Android, Windows Phone OS, IOS, Blackberry OS; Firefox OS, etc...Any mobile applications can be downloaded from app stores like Google Play, Amazon App, Apple Store. All app stores offer the opportunity to users to make comments on the app and rate the app.

Users of mobile banking applications are producing huge amounts of text data in the form of reviews or comments on online platforms like Google Play Store, Appgrooves, etc. This data is very useful to study customer dynamics more rigorously. Online reviews allow organizations for performing consumer behavior analyses[3].

Customer online reviews are very helpful because it allows consumers to get information about products and services through other people's opinions. Nowadays, positive reviews are very important, since the interactions and postings of online customers are viewed by many potential buyers of products and services every day. Online customer reviews are the second most reliable source for product or service information after the recommendation of friends and family. Analyzing online customer reviews is also critical for companies to gain knowledge about customers' perceptions of their products and services. The outcome of customers review analysis is very useful to companies or organizations because it helps companies in improving the design of product/service, measuring product or service quality, framing positioning strategy, etc. [51]. Optimistic reviews state customer satisfaction, while, negative reviews state customer dissatisfaction [52].

Analytics related to mobile apps is vital for understanding and analyzing the behavior of mobile app users. Today, most organizations use mobile apps for selling their products and services. Users can purchase products or services with a few swipes on mobile devices. Users' experiences are also logged in the app. These experiences and opinions are very important for any organization for getting a competitive advantage.

ML (Machine Learning) is considered an area within AI (Artificial Intelligence). Machine learning includes various types of computerized methods of data mining usually in big and complex data to support classification, prediction, and decision-making procedures [23]. Machine learning techniques are effectively used in determining customers' satisfaction dimensions from the large quantity of text data. Machine learning techniques are that it identifies the preferences of the customers automatically from big datasets of online ratings and reviews of customers but it is not possible using a survey-based approach using statistical approaches [2] and for that machine learning is very useful in online reviews analysis.

2.5 Text Mining Approach:

Text is defined as "the unstructured data which consists of strings which are called words". In the broad view, data mining is referred to the process of receiving hidden knowledge from any type of data. Text mining is a special type of data mining, which is useful to get implicit knowledge from text data. Text association, clustering, and classification are the tasks of text mining and they are very important in extracting implicit knowledge from the textual data. Text mining is very useful in extracting and analyzing

text data for business insight and mostly it is used to understand the sentiments of users or customers [25].

Business insight can be extracted from textual elements, such as comments, reviews, tweets, and blog posts, using text mining. In most cases, it is used to identify emerging themes or topics or gauge user sentiments [25].

3. Methodology

State Bank of India, Punjab National Bank, and Bank of Baroda are the leading public sector banks of India, and these three banks have a market share of more than 30 percent in the Indian banking sector and 71 percent in the public banking sector so 5294 online reviews of satisfied mobile banking app users (positive reviews) of the leading three Indian public sector banks were collected from Google Play Store in the December month of the year 2021 [40]. These three banks cover a large portion of market share in Indian public banking sector so findings of this study would be generalized for the all Indian public sector banks. Figure 1 shows that the string length of most of the reviews was between 1 and 300. Figure 2 shows that more than 4000 reviews had a word count between 0 and 20.

Figure 1: **String Length of the Online Reviews**

Figure 2: **Word count of the Online Reviews**

Text indexing was performed after finding the string length and word count of all reviews. The computer program cannot process text because it is unstructured raw data. It is very difficult to apply numerical operations to texts and encoded texts into numerical values. Because of these reasons segmentation of texts is required and we know the segmentation of text or texts in the list of words as text indexing. Text indexing is very important because the output of text indexing (list of words) is input for text representation. Text indexing has three steps: Tokenization, Stemming, and Stop word removal.

The process of segmenting texts or a text in tokens by punctuation marks or white space is known as tokenization. Also in subsequent processes of tokenization words with special characters or numbers are removed and tokens are converted into lower case. For example, the words which include some special character like, "19%" are removed in the tokenization process. Figure 3 shows the example of tokenization.

Figure 3: **Tokenizing Text**

Sometimes text mining requires removing high-frequency words including determiners (e.g. the, a) pronouns (e.g. He, She, I, us), prepositions (e.g. in, on, for, of), and others. As per Mihalcea & Strapparava [31] and Pennebaker & King [37], stopwords are useful in getting significant insight into the behaviors and personalities of people. It is also important to remove stopwords and give more emphasis on content words such as nouns and verbs. For getting more insight into this research, reviews are analyzed with stop words and without stop words.

Lemmatization is very useful to get a valid word form; word form means the base of a word. Lemmatization reduces the inflectional forms of the word to its root form. For instance, lemmatization will transform lions into lion, girls into girl. It is an approach based on a dictionary. For getting more insight into this research, reviews are analyzed with Lemmatization and without Lemmatization.

After text indexing, N-gram Analysis and word cloud analysis were performed using NLP models of Python software.

4. Analysis

NLP models in Python software were used for text analysis.

4.1 N-gram Analysis with stop words removal and lemmatization:

Documents contain continuous sequences of words, symbols, or tokens called n-grams. The 1-gram consists of a single word and it is known as a unigram. The sequence of two words is known as 2-gram or bigram. The sequence of three words is known as 3-gram or trigram. N-gram analysis is a very important technique of text analytics.

Unigram, bigram, and trigram text analysis were performed with stop word removal and lemmatization using Python. In identifying important service quality dimensions for mobile banking apps’ of Indian public sector banks, the following unigrams, bigrams, and trigrams were found: friendly, transaction, quick, operate, simple, transfer, transfer money, money transfer, user friendly, quick transfer, visit the branch, check balance, useful transaction, Transfer money anywhere, withdraw money without and quick money transfer. In all reviews, the unigrams transaction, transfer, friendly, secure, simple, transaction, quick, operate, simple, quick, and operate occurred 532, 362, 334, 265, 181, 157, 151 times (Table 2, Fig. 4), respectively. In all reviews, the bigrams transfer money, money transfer, user friendly, quick transfer, visit the branch and check balance were occurred 88,72,47,39,27 and 24 times (Table 3, Fig. 5), respectively. In all reviews, the trigrams without visit branch, withdraw money without, transfer money anywhere and quick money transfer was appeared 6, 6, 5, and 5 times (Table 4, Fig. 6), respectively.

Table 2: Unigram Analysis with Stop Words Removal and Lemmatization

Figure 4: Unigram Analysis with Stop Words Removal and Lemmatization

Table 3: Bigram Analysis with Stop Words Removal and Lemmatization

Figure 5: Bigram Analysis with Stop Words Removal and Lemmatization

Table 4: Trigram Analysis with Stop Words Removal and Lemmatization

Figure 6: Trigram Analysis with Stop Words Removal and Lemmatization

4.2 N-gram Analysis without stop words removal and lemmatization:

Bi-gram and tri-gram text analyses were performed without stop word removal and lemmatization using Python. In identifying important service quality dimensions for mobile banking apps of Indian public sector banks, the following bigram and trigram were found: easy to use, user friendly, easy to use, and easy to operate. In all reviews, Bigrams easy to and user friendly occurred 800 times and 371 times, respectively (Table 5, Fig. 7). In all reviews, trigrams easy to use and easy to operate were mentioned 417 times and 114 times, respectively (Table 6, Fig. 8).

Table 5: **Bigram Analysis without Stop Words Removal and Lemmatization**

Figure 7: **Bigram Analysis without Stop Words Removal and Lemmatization**

Table 6: **Trigram Analysis without Stop Words Removal and Lemmatization**

Figure 8: **Trigram Analysis without Stop Words Removal and Lemmatization**

4.3 Word Cloud Analysis:

Word clouds are clusters of words that are displayed in different sizes. The larger and bolder the word, the more frequently it appears in the text and the more important it is. Word cloud is very important in SEO (search engine optimization), finding patterns in text data, simplifying technical data, quickening business actions, sentiment analysis, and understanding client issues.

As part of this research, a word cloud was used to identify important words related to the service quality dimensions for mobile banking apps of the Indian public sector banks (Fig. 9).

Figure 9: **Word Cloud Analysis**

The following words and groups of words were identified as important to the service quality of the Indian public sector banks' mobile banking applications via a word cloud analysis:

transaction, money transfer, secure, security, friendly, convenient, safe, comfortable, quick, simple, user friendly, and instant payment.

After analyzing the output of N-gram analysis and word cloud analysis, three important service quality dimensions were identified: security, ease of use, and convenience. Unigram, bigram, and trigram like, comfortable, convenient, instant payment, visit the branch, money transfer, withdraw money without, without visit branch are related to convenience dimension of service quality.

5. Discussion

Three important service quality dimensions for satisfied users (users with positive reviews) of Indian public sector banks' mobile banking applications were identified. These dimensions were security, ease of use, and convenience. Mobile banking apps users of the Indian public sector banks are happy and satisfied because they perceive that the apps are secure, convenient, and easy to use.

First important service quality dimension for satisfied users of the Indian public sector banks' mobile banking applications is security. Security is the most important service quality dimension for any mobile banking application because most of the users of mobile banking applications consider this dimension before adopting any mobile banking app. Usage of mobile banking applications is perceived as riskier because of theft or loss of the device and remote connectivity [48]. The Security dimension directly impacts users' financial loss and social loss.

Another important service quality dimension for satisfied users of the Indian public sector banks' mobile banking applications is the ease of use. A mobile banking application's ease of use refers to how easy it is for customers to operate and comprehend. With screen size and technical constraints, it is very difficult to develop an app that is easy to use. Generally, users prefer mobile banking applications which are user-friendly or easy to use. Apps with easy navigation, easy login, efficient interfaces, and easy operation are popular among users [24]. Mobile banking apps should provide an efficient user interface because users want to use multiple applications simultaneously and they also want to switch between apps easily to perform financial transactions [16].

The third important dimension of service quality for satisfied users of the Indian public sector banks' mobile banking applications is convenience. Satisfied users of Indian public sector banks' mobile banking applications perceive that the app is very convenient and banking is possible from anywhere, anytime because of the app. They also perceive that this app helps them in avoiding waiting in lines at bank branches.

Users prefer Indian public sector banks' mobile banking applications it is simple, convenient, and easy to use app for money and financial transactions. Based on analyses, the following positioning for Indian public sector banks' mobile banking applications is proposed: **"Secure and easy mobile banking app for money transfer"**.

6. Practical Implications

This research provides insight into important service quality dimensions for satisfied users of the Indian public sector banks' mobile banking applications and this insight is very useful to managers of the Indian public sector banks in improving customer loyalty and getting new customers. The findings of this research are very useful to the Indian public sector banks to promote their mobile banking apps. This study also identifies factors that are important for satisfied customers of the Indian public sector banks' mobile banking applications and these findings may be useful to the Indian public sector banks in developing their positioning strategy.

Security is a very important service quality dimension for satisfied users of the Indian public sector banks' mobile banking applications because it is one of the main determinants of users' e-trust. Management of the public sector banks must ensure that state-of-the-art protocols and encryption mechanisms are implemented to guarantee the safety and security for users of the Indian public sector banks' mobile banking applications in the m-banking medium. Security features must be communicated to accelerate the adoption of the app and increase its usage frequency.

For satisfied users of the Indian public sector banks' mobile banking applications, ease of use is another important aspect of service quality. To increase customer loyalty and attract new customers, Indian public sector banks should continually improve app features like navigation, easy login, and user interface. There should be a marketing campaign developed to promote the Indian public sector banks' mobile banking applications for elderly people and inform them of their ease of use.

According to our results, continuous improvement in security, ease of use, and convenience service quality dimensions are needed because these service quality dimensions are essential for sustaining a high level of satisfaction for users of the Indian public sector banks' mobile banking applications.

7. Limitations And Future Research

Despite these implications, this study has some limitations. This study only includes positive reviews of the Indian public sector banks' mobile banking applications. In this research, online reviews were collected from Google Play Store only but online reviews for the same app were available on various websites also. The results of future research will be more meaningful by combining text mining and quantitative research. Text mining has not been used in India to measure the service quality of any mobile banking app so some research work is expected in this area.

Declarations

Author Contribution:

Dr. Shekha Halvadia wrote Introduction and Literature Review.

Dr. Nirav Halvadia wrote Methodology and Analysis.

Dr. Rajen Purohit wrote Practical Implications and Future Research.

All authors reviewed the manuscript.

Publishing Option:

Traditional Publishing Model

Funding Declaration:

The authors did not receive support from any organization for the submitted work. There are **no** financial or non-financial interests that are directly or indirectly related to the work submitted for publication.

References

1. Adhikari, A. : SBI Yono is the 'startup' you didn't see coming! It's worth billions now.
<https://www.businesstoday.in/magazine/finance/story/yono-sbis-start-up-299520-2021-06-24>
(2021). 16 January 2022.
2. Ahani, A., Nilashi, M., Yadegaridehkordi, E., Sanzogni, L., Tarik, A. R., Knox, K., Ibrahim, O.: Revealing customers' satisfaction and preferences through online review analysis: The case of Canary Islands hotels. *Journal of Retailing and Consumer Services*. 51, 331-343 (2009).
3. Ahani, A., Nilashi, M.: Coronavirus outbreak and its impacts on global economy: the role of social network sites. *Journal of Soft Computing and Decision Support Systems*. 7, 19-22 (2020).
4. Amiri Aghdaie, S. F., Faghani, F.: Mobile banking service quality and customer satisfaction (application of SERVQUAL model). *International Journal of Management and Business Research*, 2, 351-361 (2012).
5. Arcand, M., PromTep, S., Brun, I., Rajaobelina, L.: Mobile banking service quality and customer relationships. *International Journal of Bank Marketing*. 35, 1068-1089 (2017).
6. Arvidsson, N.: Consumer attitudes on mobile payment services – results from a proof of concept test. *International Journal of Bank Marketing*. 32, 150-170 (2014).
7. Asubonteng, Patrick, Karl J. McCleary, John E. Swan: SERVQUAL revisited: a critical review of service quality. *Journal of Services marketing*. (1996).
8. Balaji, M. S., Khong, K. W., Chong, A. Y. L.: Determinants of negative word-of-mouth communication using social networking sites. *Information & Management*. 53, 528-540 (2016).
9. Barnes, S. J., Corbitt, B.: Mobile banking: concept and potential. *International journal of mobile communications*. 3, 273-288 (2003).
10. Bhatiasavi, V.: An extended UTAUT model to explain the adoption of mobile banking. *Information Development*. 32, 799-814 (2016).
11. Bose, S.: Digital Transaction Payment Banks Clock Big Volumes.
<https://www.financialexpress.com/industry/digital-transaction-payment-banks-clock-big-volumes/1576349/> (2019). Accessed 14 January 2022.
12. Buttle, F. (1996). SERVQUAL: review, critique, research agenda. *European Journal of marketing*.
13. Chemingui, H., Lallouna, H. B.: Resistance, motivations, trust and intention to use mobile financial services. *International Journal of Bank Marketing*. 31, 574-592 (2013).
14. Chen, C.: Perceived risk, usage frequency of mobile banking services. *Managing Service Quality: An International Journal*, (2013).
15. Cronin, J., Taylor, S. A.: Measuring service quality: a reexamination and extension. *Journal of marketing*. 56, 55-68 (1992).

16. De Leon, M. V., Atienza, R. P., Susilo, D.: Influence of self-service technology (SST) service quality dimensions as a second-order factor on perceived value and customer satisfaction in a mobile banking application. *Cogent Business & Management*, 7, 1794241 (2020).
17. Del Giudice, M., Campanella, F., Dezi, L.: The bank of things: An empirical investigation on the profitability of the financial services of the future. *Business Process Management Journal* (2016).
18. Gefen, D.: Reflections on the dimensions of trust and trustworthiness among online consumers. *ACM SIGMIS Database: the DATABASE for Advances in Information Systems*. 33, 38-53 (2002).
19. Ghosh, M.: Measuring electronic service quality in India using ES-QUAL. *International Journal of Quality & Reliability Management* (2018).
20. Grönroos, C. : An applied service marketing theory. *European journal of marketing* (1982).
21. Gummesson, E.: The marketing of professional services—An organizational dilemma. *European Journal of Marketing* (1979).
22. Iduozee, E.: The credibility of online consumer reviews. Case Lumene (Master's thesis) (2015).
23. Jourdan, Z., Rainer, R. K., Marshall, T. E.: Business intelligence: An analysis of the literature. *Information systems management*. 25, 121-131 (2008).
24. Jun, M., Palacios, S.: Examining the key dimensions of mobile banking service quality: an exploratory study. *International Journal of Bank Marketing* (2016).
25. Khan, R., Urolagin, S.: Airline sentiment visualization, consumer loyalty measurement and prediction using twitter data. *International Journal of Advanced Computer Science and Applications*. 9, 380-388 (2018).
26. Kim, G., Shin, B., Lee, H. G.: Understanding dynamics between initial trust and usage intentions of mobile banking. *Information Systems Journal*. 19, 283-311 (2009).
27. Kumar, G., & Shenbagaraman, V. M.: A study on customer's perception of online banking and e-service quality among Chennai customers. *International Journal of Business Excellence*. 11, 72-94 (2017).
28. Leem, B. H., Eum, S. W.: Using text mining to measure mobile banking service quality. *Industrial Management & Data Systems* (2021).
29. Lim, H., Widdows, R., Park, J.: M-loyalty: winning strategies for mobile carriers. *Journal of consumer Marketing* (2006).
30. Lu, Y., Zhang, L., Wang, B.: A multidimensional and hierarchical model of mobile service quality. *Electronic Commerce Research and Applications*. 8, 228-240 (2009).
31. Mihalcea, R., Strapparava, C.: The lie detector: Explorations in the automatic recognition of deceptive language. In *Proceedings of the ACL-IJCNLP 2009 conference short papers*. 309-312 (2009).
32. Mostafa, R. B.: Mobile banking service quality: a new avenue for customer value co-creation. *International Journal of Bank Marketing* (2020).
33. Nilashi, M., Ibrahim, O., Yadegaridehkordi, E., Samad, S., Akbari, E., Alizadeh, A.: Travelers decision making using online review in social network sites: A case on TripAdvisor. *Journal of computational*

- science. 28, 168-179 (2018).
34. Parasuraman, A., Zeithaml, V. A., Berry, L. L.: A conceptual model of service quality and its implications for future research. *Journal of marketing*. 49, 41-50 (1985).
 35. Parasuraman, A., Zeithaml, V. A., Malhotra, A.: ES-QUAL: A multiple-item scale for assessing electronic service quality. *Journal of service research*. 7, 213-233 (2005).
 36. Parasuraman, A., Zeithaml, V. A., Berry, L.: SERVQUAL: A multiple-item scale for measuring consumer perceptions of service quality. 64, 12-40 (1988).
 37. Pennebaker, J. W., King, L. A.: Linguistic styles: language use as an individual difference. *Journal of personality and social psychology*. 77, 1296 (1999).
 38. Riquelme, H.E., Rios, R.E.: The moderating effect of gender in the adoption of mobile banking", *International Journal of Bank Marketing*. 28, 328-341 (2010).
 39. Rowley, J.: An analysis of the e-service literature: towards a research agenda. *Internet research* (2006).
 40. Saha, M.: In just 5 years, private banks have narrowed public sector's huge lead in loans & deposits. <https://theprint.in/economy/in-just-5-years-private-banks-have-narrowed-public-sectors-huge-lead-in-loans-deposits/550570/> (2020). Accessed on 15 January 2022.
 41. Shaikh, A. A., Karjaluoto, H.: Mobile banking adoption: A literature review. *Telematics and Informatics*. 32, 129–142 (2015).
 42. Shankar, A., Datta, B., Jebarajakirthy, C., Mukherjee, S.: Exploring mobile banking service quality: A qualitative approach. *Services Marketing Quarterly*. 41, 182-204 (2020).
 43. Shareef, M. A., Baabdullah, A., Dutta, S., Kumar, V., Dwivedi, Y. K.: Consumer adoption of mobile banking services: An empirical examination of factors according to adoption stages. *Journal of Retailing and Consumer Services*. 43, 54-67 (2018).
 44. Shih, K.-H., Hung, H.-F. , Lin, B.: Assessing user experiences and usage intentions of m-banking service. *International Journal of Mobile Communications*. 8, 257-277 (2010).
 45. Statista: Number of Internet Users in India. <https://www.statista.com/statistics/255146/number-of-internet-users-in-india/> (2022). Accessed on 15 January 2022.
 46. Statista: Leading public sector banks in India as of May 2021, based on market capitalization. <https://www.statista.com/statistics/944665/india-leading-public-sector-banks-based-on-market-capitalization/> (2021). Accessed on 16 January 2022.
 47. Tan, F. B., Chou, J. P.: The relationship between mobile service quality, perceived technology compatibility, and users' perceived playfulness in the context of mobile information and entertainment services. *Intl. Journal of Human–Computer Interaction*. 24, 649-671 (2008).
 48. Trabelsi-Zoghalmi, A., Berraies, S., & Ben Yahia, K. (2020). Service quality in a mobile-banking-applications context: do users' age and gender matter?. *Total Quality Management & Business Excellence*. 31, 1639-1668 (2020).

49. TRAI: Highlights of Telecom Subscription Data as on 31st August , 2021. TRAI, India (2021). Accessed on 14 January 2022.
50. Trialih, R., Astuti, E. S., Azizah, D. F., Mursityo, Y. T., Saputro, M. D., Aprilian, Y. A., Rizki, A. S.: How mobile banking service quality influence customer satisfaction of generation x and y?. In 2018 International Conference on Information and Communication Technology Convergence (ICTC). 827-832 (2018)
51. Wang, T., Yeh, R. K. J., Chen, C., Tsydypov, Z.: What drives electronic word-of-mouth on social networking sites? Perspectives of social capital and self-determination. *Telematics and Informatics*. 33, 1034-1047 (2018).
52. Xu, X.: Does traveler satisfaction differ in various travel group compositions? Evidence from online reviews. *International Journal of Contemporary Hospitality Management* (2018).
53. Yang, Z.: Measuring e-service quality and its linkage to customer loyalty. New Mexico State University (2001).
54. Yasin, M., Correia, E., Lisboa, J.: The profitability of customer-targeted quality improvement efforts: an empirical examination. *The TQM magazine* (2014).
55. Zeithaml, V. A., Berry, L. L., Parasuraman, A.: The behavioral consequences of service quality. *Journal of marketing*. 60, 31-46 (1996).
56. Zeithaml, V. A.: Service quality, profitability, and the economic worth of customers: what we know and what we need to learn. *Journal of the academy of marketing science*. 28, 67-85 (2000).
57. Zhou, Q., Lim, F. J., Yu, H., Xu, G., Ren, X., Liu, D., Xu, H.: A study on factors affecting service quality and loyalty intention in mobile banking. *Journal of Retailing and Consumer Services*. 60, 102424 (2021).

Tables

Table 1: Summary of Important Research Work in the Area of Mobile Banking/Finance Service Quality

Author Detail	Mobile banking service quality dimensions
Leem and Eum [28]	Enjoyment and Practicality
Zhou et al. [57]	Security, Assurance, System Quality, and Interface Design
Mostafa [32]	Enjoyment, Ease of Use, Security/Privacy, and Usefulness
Shankar et al. [42]	Content, Efficiency, Interactivity, Customer Support, and Security
Trialih et al. [50]	Easiness to Operate, Efficiency, Convenience, Assurance and Security, and Reliability and Responsiveness
Shareef et al. [43]	Assurance, Mobile Application Design, Customization, Functionality, Service Recovery, and Fulfilment.
Jun and Palacios [24]	M-Banking Application Quality (Security, Convenience, Ease of Use, Content, Accuracy, Speed, Diverse Mobile Application Service Features and Aesthetics), and M-Banking Customer Service Quality (Courtesy, Reliability, Understanding the Customers, Responsiveness, Credibility, Continuous Improvement, Competence, , Access and Communication)
Bhatiasevi [10]	Performance Expectancy, Effort Expectancy, and Perceived Convenience
Arvidsson [6]	Security
Lu et al. [30]	Outcome Quality, Environmental Quality, and Interaction Quality

Table 2: Unigram Analysis with Stop Words Removal and Lemmatization

Word	Frequency
transection	532
banking	519
useful	467
transfer	362
application	344
account	338
friendly	334
service	316
secure	265
excellent	260
money	248
experience	225
thanks	218
option	192
great	187
simple	181
feature	177
mobile	173
helpful	169
really	160
quick	157
operate	151

Table 3: Bigram Analysis with Stop Words Removal and Lemmatization

Bigram	Frequency
transfer money	88
money transfer	72
mobile banking	68
user friendly	47
quick transfer	39
internet banking	37
online transection	30
visit branch	27
online banking	29
banking service	27
account holder	25
banking transection	24
check balance	24

Table 4: Trigram Analysis with Stop Words Removal and Lemmatization

Trigram	Frequency
transfer money account	7
without visit branch	6
withdraw money without	6
transfer money anywhere	5
useful online transaction	5
mobile banking application	5
balance transfer money	5
useful transfer money	5
quick money transfer	5

Table 5: Bigram Analysis without Stop Words Removal and Lemmatization

Bi Gram	Frequency
easy to	800
this app	692
to use	628
very good	491
good app	406
user friendly	371
it is	368
is very	342
app is	340
very useful	321

Table 6: Trigram Analysis without Stop Words Removal and Lemmatization

Tri Gram	Frequency
easy to use	417
and easy to	198
very easy to	167
this app is	166
very good app	166
it is very	114
easy to operate	113
to use and	106
app is very	91
very nice app	77

Figures

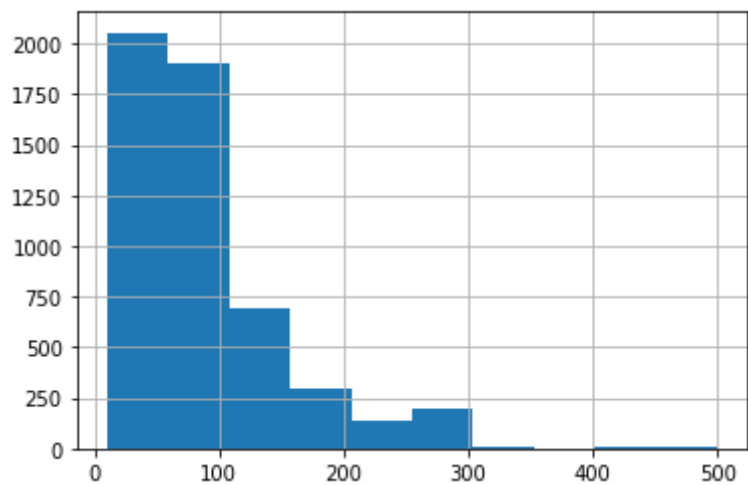


Figure 1

String Length of the Online Reviews

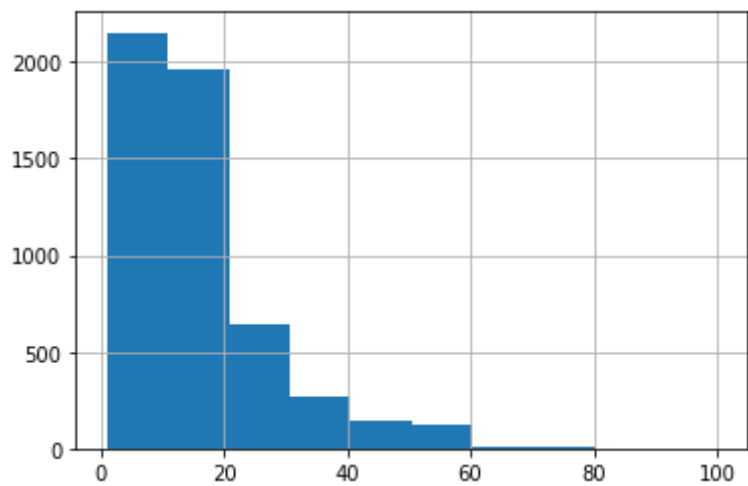


Figure 2

Word count of the Online Reviews

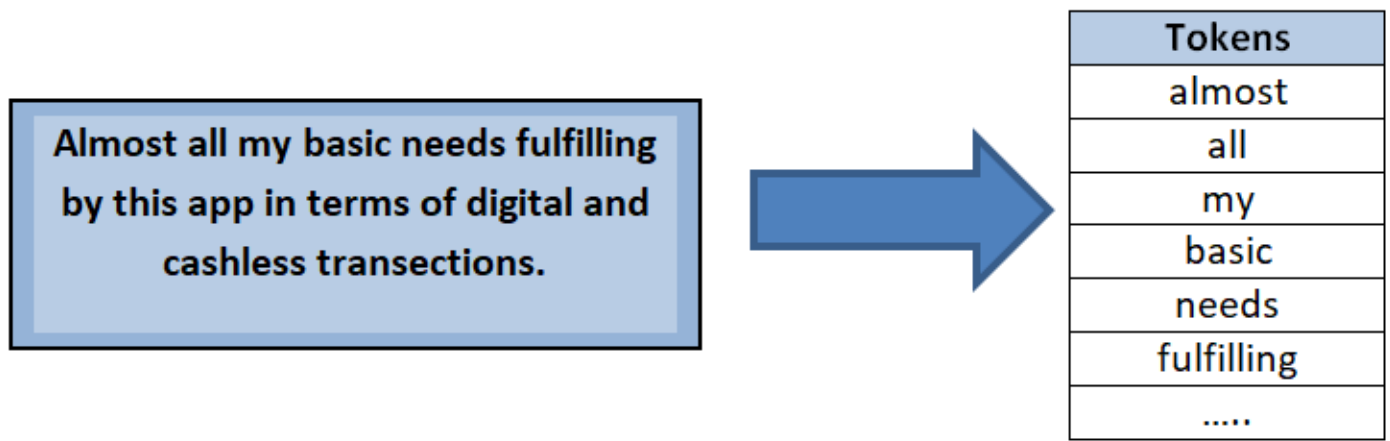


Figure 3

Tokenizing Text

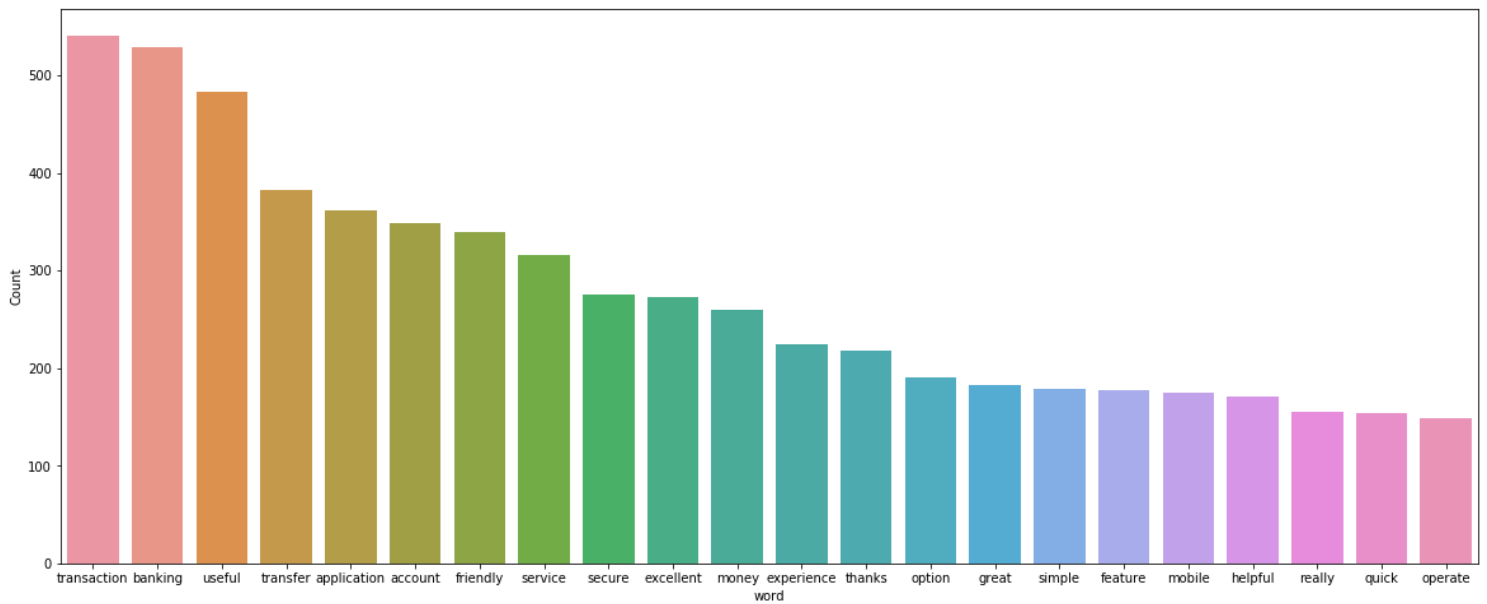


Figure 4

Unigram Analysis with Stop Words Removal and Lemmatization

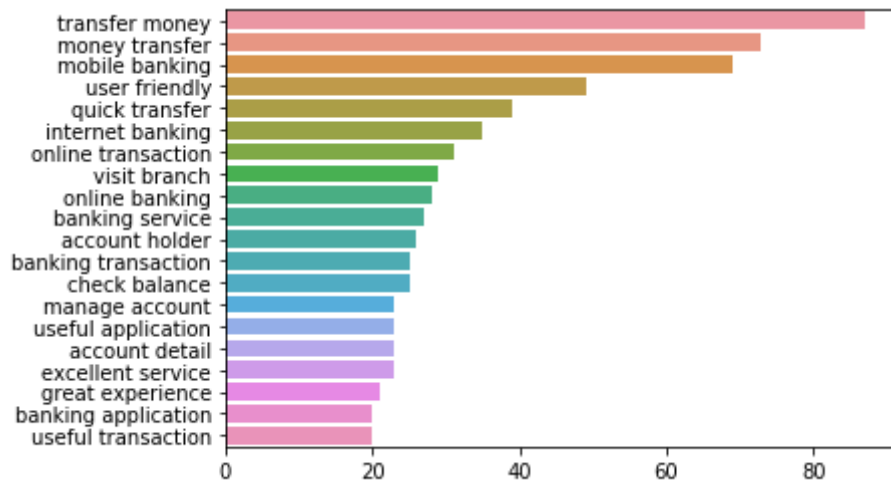


Figure 5

Bigram Analysis with Stop Words Removal and Lemmatization

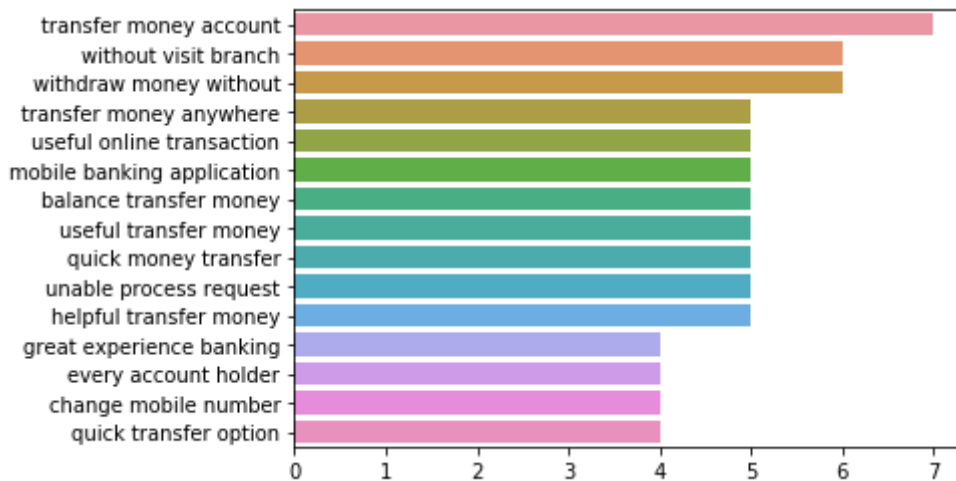


Figure 6

Trigram Analysis with Stop Words Removal and Lemmatization

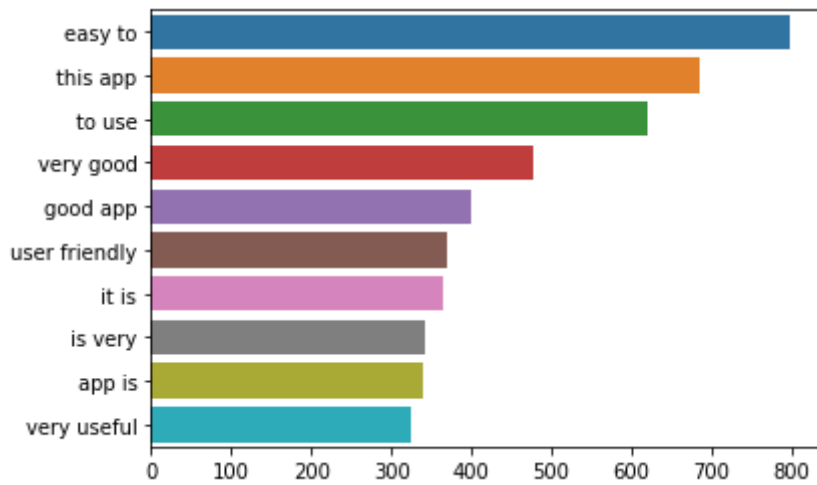


Figure 7

Bigram Analysis without Stop Words Removal and Lemmatization

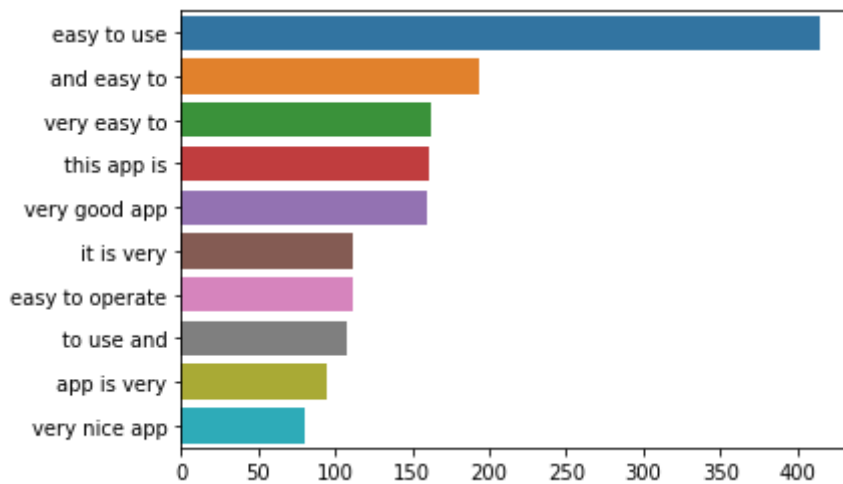


Figure 8

Trigram Analysis without Stop Words Removal and Lemmatization

Figure 9

Word Cloud Analysis