

Insight from Nigerian Banking Customers Discussions: A Study of Contextual Semantic Search and Twitter Sentiment Analysis

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Abstract—Abstract—Globally, the bank is a significant financial institution that engages customers in millions daily. This financial institution helps its customers in saving their money, with withdrawals, and money transfer electronically. Despite the inevitability of these financial institutions, they are still struggling to improve their customer’s satisfaction index scores. The intervention of the Central Bank and Federal Competition and Consumer Protection Commission are yielding positive results whenever the local bank failed, but the response time to the customer grievances is quite challenging. The literature reviewed for this study indicates the cruciality of the sentiment analysis technique. This study utilized Twitter Crawler API called the Twitter Scraper for data collection and Textblob, Vader and SentiStrength for the data analyses. The result shows the sentiments in the International Authorization Banking group as against the National Authorization group and a slight difference between the polarities of their customer’s tweets. This study gives new insights internationally and nationally to banking managers and proposes future research directions.

I. INTRODUCTION

Globally, the bank is a significant financial institution that engages customers in millions daily. This financial institution helps its customers in saving their money, with withdrawals, and money transfer electronically. Despite the inevitability of these financial institutions, they are still struggling to improve their customer’s satisfaction index scores. There are hanging issues of arbitrary charges, unauthorised withdrawals, lack of update on the status of customers complaints, unresolved complaints, empty Automated Teller Machine (ATM) that cannot dispense cash, ATM card getting stuck on the ATM, insecurity [1] and other unethical practices. The intervention of the Central Bank and Federal Competition and Consumer Protection Commission are yielding positive results whenever the local bank fails, but the response time to the customer grievances is quite challenging. For instance, it is mandatory for the banks to attend to customers’ queries not later than 14 days and after the expiration of 14 days customers can report the concerned bank to the Federal Competition and Consumer Protection Commission or report directly to the Consumer Protection Department of the Central Bank of Nigeria (CBN). According to [2], the Consumer Protection Department of CBN, in its effort to attend to 13,715 complaints of different banking customers, was able to recover 18.5 million dollars for the affected customer’s and use the money recovered to settle the concerned customers. The choice of Nigeria as a

case country for this study is due to the author’s familiarity with this big emerging market where banks are one of the progressive financial sectors. Also, with the author’s previous studies on mobile money [3], mobile banking [4], customer’s loyalty [5], cross-cultural analysis of tablet etailing [6], mobile commerce [7], and sentiment analysis of social commerce in Nigerian context [8]. Through these studies, we discovered the challenges of the banking industry in Nigeria, such as service delivery failure, distrust, and poverty that contributes to banking exclusion of the rural Nigerians. Besides, there are also opportunities for banking expansion because of the most significant percentage of unbanked and underbanked Nigerians. Due to the complaints of dissatisfied bank customers, this study embarked on Sentiment Analysis of International Authorization Banks in Nigeria (IAN) based on eight banks and National Authorization Banks in Nigeria (NAN) with ten banks. In total, this study examined 18 standard banks in Nigeria. Earlier studies in Nigeria have examined sentiment in different ways. For example, [9] investigated social media data in the banking industry with the aid of data mining while [8] dug into the sentiment analysis of social commerce with hybrid data technique. Similarly, [10] used machine learning to review movies through sentiment analysis, [11] used Neural Networks for sentiment-aware deep recommender system and [12] utilised support vector machine to examine Nigerian Banks Financial Tweets through sentiment analysis.

Ojo, Ibeh, Kieghe [13]; Oyebode Orji [14] probed into Nigeria Presidential Election with sentiment analysis technique. All these studies indicate the cruciality of the sentiment data analysis technique. This study answers the following research questions: 1) What are the differences in the banking customer’s sentiment of the international authorization group as against the national authorization group? The results show differences in how the banking customers tweet while the positive tweets of the international authorisation banks are higher than national authorisation banks for both TextBlob and Vader analysis. This study also shows the managerial implication of the study and proposes future research.

II. LITERATURE REVIEW

In Nigeria, the commercial banks are categorized on a regional, national or international basis [15]. Each category

has a specific set of requirements for minimum capital-base, adequacy ratios and operational coverage – among others. According to the latest banking laws and regulations in Nigeria [16], a bank with regional banking authorization must maintain a minimum capital-base of 10 billion naira and can only operate within a minimum of six and a maximum of twelve contiguous States of the country, lying within not more than two geo-political zones, as well as within the Federal Capital Territory (FCT). A national authorization bank must maintain a minimum paid-up share capital of 25 billion naira and is entitled to carry out its banking business operations within every State of the country. Lastly, an international authorization bank must fulfil a minimum capital-base of 50 billion naira and is entitled to operate anywhere in Nigeria, as well as to establish and maintain offshore banking operations anywhere overseas - subject to the approval of CBN - and in line with regulation of the host country.

The Nigerian commercial banking sector is on the verge of disruption¹. This disruption is largely influenced by technological advancements - and partly by government policies. The disruption - from a technological standpoint - has so far manifested as mobile banking, agent banking, cryptocurrency and social banking. This has led to reduction in the number of adults who were excluded from the country's financial services from about 53.0% in 2018 to about 46.3% in 2010 [17] – to mention only a few. Further contributor to the disruption is the Nigerian government's institutionalisation of financial protection programmes such as the establishment of a dedicated Consumer Protection Department and a high-level Consumer Protection Framework [18]. This initiative requires banks to extend their service points (including help desks) to handle all forms of consumer complaints within a stipulated time of two weeks - failure to adhere shall attract severe penalties [2], [18]. In addition, the Central Bank of Nigeria is also striving to increase financial inclusion within the country. The objective is to decrease the number of the people who do not have access to financial services in the country. The implementation of the National Financial Inclusion Strategy has opened opportunities to new entrants in the nation's commercial banking sector - thus, making it more competitive than ever [19].

To remain competitive and relevant, the banks are stepping up their game to fulfil the needs of their customers and gain new ground. To this end, many banks have launched several strategic initiatives designed to facilitate new levels of customer-driven products and services that would help them to: disseminate information more effectively, increase sales, manage customer relationships better, carry out more cost-effective advertising, and build better brands [20]. To achieve these goals, one of the overwhelming recommendations in the literature on customer relationship is for banks to join social media platforms. The most famous platforms include Facebook, Twitter, Instagram, Pinterest and LinkedIn. Among the five leading social media platforms, Twitter is the second most popular social network in Nigeria with 24.38% users following Facebook with 49.8% [21]. This study adopts Twitter because the linear move of its users in Nigeria is interesting. Twitter is a unique social network with outstanding capabilities with resource sharing features

that brings both consumers and brand together to interact for the purpose of relationship and engagement in a free online social network platform.

Many publications have been made on titles related to social media. Over the years, scholars have alluded to the fact that social media have become the primary medium where banks connect, engage, inform and understand their customers, as well as the place where customers research and compare banks' product offerings [22]. According to a report, there are about 3 billion people currently using social media as the main form of communication on a daily basis - with an average annual growth rate of 21% [23].

On Twitter, for example, there are millions of messages (or tweets) that are shared everyday by people. Almost every tweet represents an opinion or how a person feels about a topic or an entity e.g. product and service. Studies have shown that ideas and opinions are contagious [24]. The opinions of one person may affect the opinions of others. Bing [25] asserts that our behaviours are sometimes formed based on our opinions. For example, potential customers may decide to buy or not buy a product based on the sentiments (opinions) they may have formed about the product through their interactions on Twitter. This is why the different opinions expressed on Twitter are a goldmine of insights [9].

Opinion mining is the process or technique of studying people's opinions towards entities such as products, organisation or any topics. It is also referred to as 'sentiment analysis'. The outcome of a sentiment analysis is usually reported as a polarity score: positive, negative or neutral [26]. Sentiment analysis - to a large extent - is an automated process and each process (technique) is based on certain algorithms. The different algorithms or approaches used can be broadly grouped into two categories.

The first is the supervised approach, and it involves the training of data for sentiment classifiers. The second is lexicon-based approach, which uses pre-built lexicons of words. Lexicon-based approach achieves satisfactory results when applied to well-known domains. Comparing the two approaches, the lexicon-based methods are more popular partly because they cover a wider range of domains and they require no training of datasets [27]. That said, lexicon-based approach to sentiment analysis has the following shortcomings: One, the amount of words in the library is finite, this can be a problem when extracting sentiment from very dynamic environments such as Twitter where as a result of tweet's 280-character (previously 140) restriction, people tend to make use of abbreviations, irregular expressions, poor grammar and misspellings [28], [29]. Two, sentiment lexicons assign fixed polarity scores to words, irrespective of the context in which they are used. In view of these drawbacks, gaining insights from Twitter sentiment analysis presents a challenge. To tackle this challenge, contextual semantics search was proposed.

A contextual semantics search is a data-searching technique that attempts to understand the user's intent and context - e.g. (location, culture) - by transforming data into an intuitive and responsive database, thereby improving search accuracy [30]. With this technique, it is now easier to extract

answers, and delivers more personalized results to queries. The key value of contextual semantic search is that it enables users to search for knowledge and relationships that are not present in the initial lexicon of words for a given domain [31]. Take for example, if users, working in a Nigerian banking domain, were to search for any terms: Naija, for example, maybe synonymous to Nigeria and ‘ego’ to money. The contextual semantics search also allows disambiguation of terms: Lagos, as a term, may refer to a river in Portugal, but to Nigerians it is the city of Lagos.

The adoption of social media platforms by Nigerian banks happened at a relatively slower pace compared to their counterparts outside Africa. Today, almost every bank in the country seems to have recognised and embraced social media as a strategic tool [32], [33] to the extent that they are ranked among the top banks using social media globally [34]. As of the third quarter (Q3) 2019, the following banks were considered to the most active on Twitter based on the number of followers: GTBank (1.520 million), Zenith Bank Plc (1.07million), Access Bank Plc (405,647), United Bank of Africa Plc (397,429), Stanbic IBTC Bank (240,555) [34]. These statistics give an indication that the international authorization banks (such as GTBank, Zenith and Access Bank) have had the most interactions on social media platforms as compared to the national and regional authorization banks.

The review of literature has shown how opinionated postings - such as the one on Twitter - have helped organisations, governments and even the masses to achieve some outstanding results. Scholars have therefore stressed that the necessity for businesses - especially, those in consumer-oriented service - to collect and study customers’ opinions on the Web [1], [9]. In their case-study, [9] found that Zenith Bank has the highest negative sentiment polarity on Twitter when compared to their rivals: Access Bank, First Bank, GTBank. This report is an illustration of insights that can be generated from Twitter.

III. METHODOLOGY

To carry out this research, the major commercial banks in the Federal Republic of Nigeria are grouped into two categories, namely, the commercial banks with International Authorization in Nigeria and the banks with National Authorization in Nigeria. The banks in their different groups are shown in Table I and Table II.

TABLE I. INTERNATIONAL BANK NAMES IN NIGERIA

International Authorization Banks in Nigeria	
1	Access Bank Plc
2	Fidelity Bank Plc
3	First City Monument Bank Limited
4	First Bank of Nigeria Limited
5	Guaranty Trust Bank Plc
6	Union Bank of Nigeria Plc
7	United Bank for Africa Plc
8	Zenith Bank Plc

TABLE II. NATIONAL BANK NAMES IN NIGERIA

National Authorization Banks in Nigeria	
1	Citibank Nigeria Limited
2	Ecobank Nigeria Plc
3	Heritage Banking Company Limited
4	Keystone Bank Limited
5	Polaris Bank Limited..
6	Stanbic IBTC Bank Plc
7	Standard Chartered
8	Sterling Bank Plc
9	Titan Trust Bank Limited
10	Unity Bank Plc
11	Wema Bank Plc

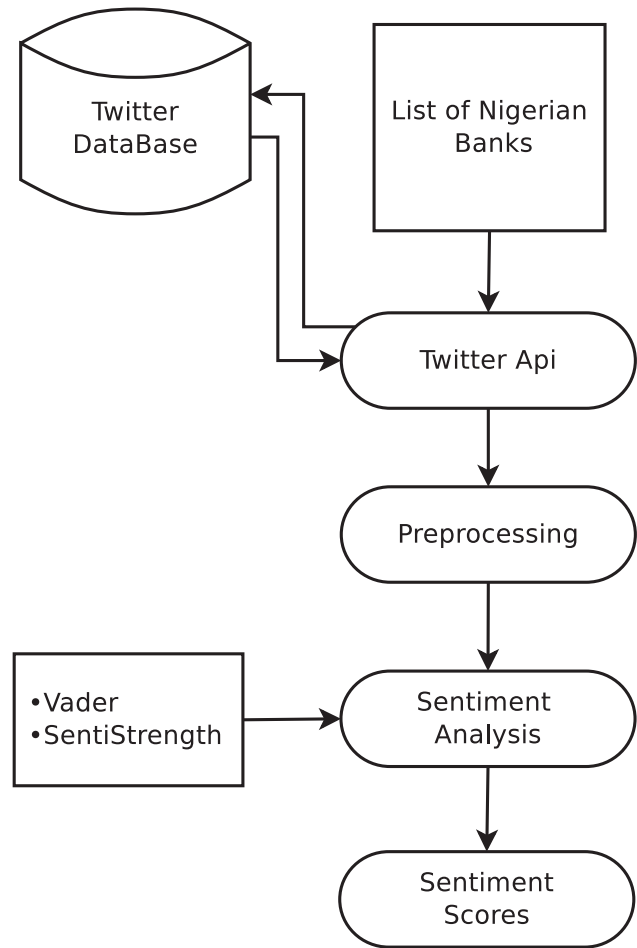


Fig. 1. Methodological Framework

A. Data Collection

The data collection is the first stage of the methodology. Hence, we collect tweets from the major banks listed in the above categories using the available Twitter Crawler API called the Twitter Scraper. This is a Python Library API that crawls through twitter within a declared duration and return the following information:

- Name
- Description and location
- Number of favorites, replies and retweets
- List of tweets, retweets, and replies

As aforementioned, a list of the input data for retrieving the required tweets are as follows:

- List of Twitter user handles, whereby this is where we provided the user handles of all the banks focused in our study. Hence, tweets generated via the bank twitter handles are tweets sent directly to the banks from their customers.
- Max Tweets, whereby we can specify the maximum number of tweets we can scrape from Twitter. However, in this study, we did not specify the maximum number of tweets as the idea is to retrieve as many tweets as we can get.
- Timeframe, whereby we can specify the duration of which the public have tweeted the banks in our lists.

B. Data Preprocessing

Following the data collection stage, preprocessing of our data is the next stage. It is important to mention that this stage consists of converting and organizing the data crawled into a simple table format, and thereby reducing the noise in the data. Using standardized procedure for the tweets preprocessing we go through the following steps in clearing out all the noise in the twitter data extracted.

- 1) Remove urls and hyperlinks .
- 2) Remove punctuation, numbers and abbreviations.
- 3) Negation replacement. "hasn't" becomes "has not".
- 4) Remove mentions (bank usernames).

C. Data Analysis

This stage consists of the exploration and the analysis of the texts. Thus, this process can be called text mining. one of the ways of which we analyze the text is using sentiment analysis. Sentiment analysis also known as opinion mining is the process of identifying and grouping the emotional opinion expressed in texts. It is worth mentioning that the identification of the texts uses tools from natural language processing, computational linguistics. etc., to identify the sentiments of texts. In this study, we have used the following three sentiment analysis tools:

- **Text blob** - This tool is an API library for processing textual data. Specifically, used for natural language processing tasks.
- **Vader** - This tool is more advanced compared to Text blob. Hereby, the Vader tool can also return how positive or how negative a sentence is.
- **SentiStrength** - This sentiment analysis tool is more accurate than other tools. Also, SentiStrength uses a lexical approach to process a text.

The processed tweets are classified following the lexicons of both the sentiment analysis tools. On this note, both the Vader and SentiStrength sentiment analysis tools are capable of returning both polarity and subjective values of in two forms. Basically, these two tools were used so that we can obtain both the similarities and the de-similarities of their outcomes. Following the derivation of results processed by the three sentiment analysis tools it is noticed that the textblob is less

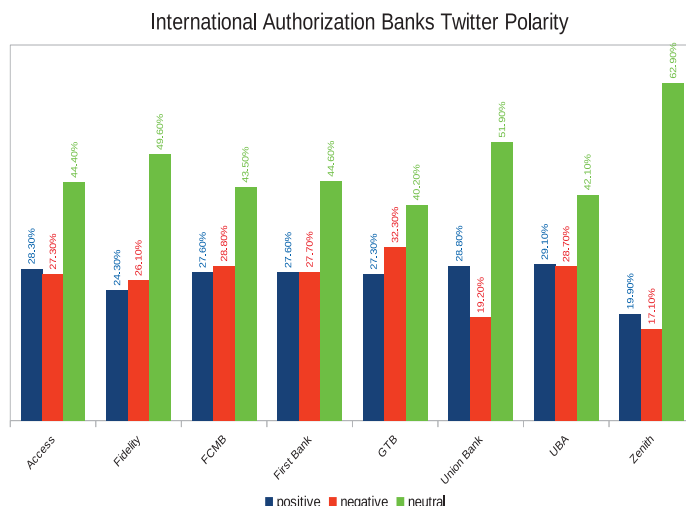


Fig. 2. The polarity of International Authorization Banks

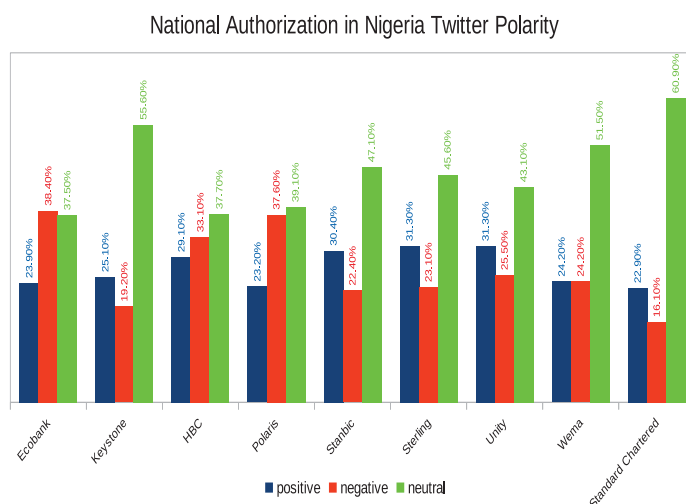


Fig. 3. The polarity of National Authorization Banks

accurate than the other tools. As a matter of fact, according to the study in [?], it was mentioned that the accuracy of the textblob sentiment analysis tool is 69.12%. In the case of the vader sentiment analysis tool, it was proven in [35] that vader has a better accuracy compared to the textblob analysis. For this reason, this study focuses on the results obtained from the sentistrength analysis. It is known for a fact that the Sentistrength is more accurate than the other tools. According to [36], it was stated that the SentiStrength provides an acceptable analysis outcome for developing intellectual and academic purposes.

TABLE III. RESULTS FROM TWEETS

Bank Groups	Banks	Tweets	Pos	Neg	Neut
IAN	Access	14978	4245 28.3%	4096 27.3%	6637 44.4%
	Fidelity	4649	1130 24.3%	1210 26.1%	2309 49.6%
	FCMB	5381	1487 27.6%	1550 28.8%	2344 43.5%
	First Bank	34443	9527 27.6%	9540 27.7%	15376 44.6%
	GTB	9229	2526 27.3%	2990 32.3%	3713 40.2%
	Union Bank	4428	1276 28.8%	852 19.2%	2300 51.9%
	UBA	2947	858 29.1%	848 28.7%	1241 42.1%
	Zenith	13144	2626 19.9%	2244 17.1%	8274 62.9%
	NAN	Ecobank	346	83 23.9%	133 38.4%
Keystone		1880	472 25.1%	361 19.2%	1047 55.6%
HBC		172	50 29.1%	57 33.1%	65 37.7%
Polaris		7095	1648 23.2%	2669 37.6%	2778 39.1%
Stanbic		2955	900 30.4%	662 22.4%	1393 47.1%
Sterling		1089	341 31.3%	251 23.1%	497 45.6%
Unity		548	172 31.3%	140 25.5%	236 43.1%
Wema		1238	300 24.2%	300 24.2%	638 51.5%
Standard Chartered		527	121 22.9%	85 16.1%	321 60.9%



Fig. 4. Word Cloud for IAN banks

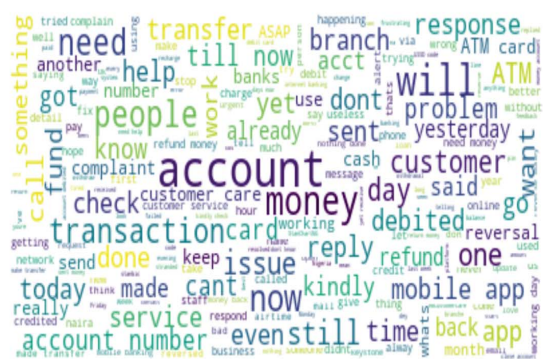


Fig. 5. Word Cloud for NAN banks

IV. RESULTS

In this study, 105049 number of tweets that were tweeted between the period of 2017 and 2020 are collected for both IAN and NAN banks in Nigeria. Overall, 32.47% of positive sentiments are recorded for the textblob sentiment analysis tool, with 48.62% positive sentiment for the vader sentiment analysis tool and 26.43% positive sentiment for the Sentistrength sentiment analysis tool. In contrast, 23.54% negative sentiments for the textblob tool, with 16.26% negative sentiments for the vader sentiment analysis tool and 26.64% sentistrength sentiment analysis tool. Table 1. describes the different categories of each bank in Nigeria and the results obtained from the Sentistrength sentiment analysis tool. Further, the word cloud generated from NAN and IAN groups shows that accounts issues like account numbers, account debited, transactions, ATM card, money refund, mobile app, network problem, transfer, reply to query predominant in NAN and IAN banking groups.

The IAN banks have the greatest number of tweets (89199 tweets) in this analysis. Herewith, it is worth mentioning that the First Bank of Nigeria has more twitter engagement (34443 tweets) than the rest of the banks in the IAN category with 27.67% positive sentiment while the remaining percentage

consist of both the neutral and negative sentiment. On the other hand, the bank with the least engagement on twitter is the United bank for Africa (2947 tweets), with 29.11% positive sentiments. It is important to note that banks with more twitter engagement do not guarantee the gratifications of their customers. Zenith bank has the second largest twitter engagement yet the result on the analysis show that only 19.97% of their customers were pleased with their services.

In the case of the banks under the category of NAN, the result shows that the twitter engagements between customers and the banks are less compared to the banks in IAN. Further, it was shown that Polaris bank has the most engagement having 7095 tweets with only 23.23% positive sentiments. Similarly, the result also shows that Ecobank of Nigeria Plc (346 tweets) has only 23.99% of customers expressing positive sentiments.

Overall, in NAN, Stanbic Bank had the highest positive tweets with 30.40%, Ecobank had the highest negative tweets with 38.40% while Chartered Bank had the highest neutral tweets with 60.90%. On the part of IAN group, United Bank of Africa (UBA) had the highest positive tweets with 29.10%. Guaranty Trust Bank (GTB) had the highest negative tweets with 32.30% while Zenith Bank had the highest neutral tweets with 62.90%. Comparatively, NAN group had the lowest number of tweets but a higher percentage of positive tweets than the IAN group. In the case of the negative tweets, the NAN group had the highest negative percentage while the IAN group had the highest neutral tweets (Figures 1 and 2 for details).

V. CONCLUSION

The results of this study give the opportunity to compare Nigerian banks based on two groups of international and national authorization. There are existing studies on Nigerian banks that utilize sentiment analysis techniques, but there is no earlier study that focused on banking comparative study based on International and National Authorization Banks with sentiment tools and online social media data in Nigeria. This study novelty will enlighten the Nigerian community on the categorization of banking systems in Nigeria and giving insights to the casual customer's tweets regarding the service offering of the Nigerian banks. The study findings show the service sentiment of the Nigerian banking customers, which centers on account transaction issues, ATM card disservice, money refund based on service discrepancies, technology issues on the mobile app, network failure, money transfer, and negligence in prompt banking response to their customer's queries. Concerning these customers' sentiment in IAN and NAN groups, the banking managers should revise their electronic customer relationship (eCRM) strategy and urgently attend to all these sentiments in order to increase their customer's trust and satisfaction level. The banking managers should reposition their social media strategy as they recruit social media administrators that can promote them on social media and set apart a budget for social media adverts.

This study is not without a limitation that can expand this research scope and paved the way for future researchers to contribute to the research domain of sentiment or online opinion. This study excludes some banks from these studies because they did not meet up with the required tweets for sentiment analysis. Since social media is growing rapidly in a developing country such as Nigeria, future researchers should endeavor to include the excluded banks in their study and draw more insights that will benefit the banking community and all the banking stakeholders. Also, the neutral polarity dominates the sentiment analysis, and this is a trend in some of the extant studies. For instance, in this study, the IAN group had the highest rank in neutral response from its customers. Some assume that neutral comments are not weighty, but this study argues that neutral comments are more dangerous to the banking sectors than negative because it is difficult to get any insight from a silence opinion. It is challenging to know if these customers are saturated with sentiments and bottled up with negative emotions. Future researchers should look into these limitations.

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