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RESEARCH TITLE

USING SENTIMENT ANALYSIS TECHNOLOGY TO ANALYZE BANK CUSTOMERS' TEXTUAL COMMENTS

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Abstract

In light of the rapid progress in the field of information technology and the large volume of digital information, social media platforms and application stores have become rich in reviews, serving as a common source for gathering opinions for a number of fields, especially the field of banking [1]. In order for banks to benefit from these opinions, they must Analyze this huge amount of big data. We find many institutions, including banking institutions, nowadays, one of the best modern branches of machine learning is using sentiment analysis technology also known as "opinion mining" mainly to analyze the opinions of their customers by determining whether the opinion expressed in The document or sentence is positive. or negative or neutral [2].

The importance of this technology is that it helps organizations and brand owners to reveal the feelings and opinions of the general public towards a particular product or service in a faster, more comprehensive and more credible way than traditional questionnaires, as well as researchers in their research fields[3], where artificial intelligence techniques and machine learning applications have contributed to helping Entrepreneurs. Making informed decisions backed by data, which in turn contributed to improving the decision-making process, thus achieving the maximum possible return on investment [4].

This paper aims to conduct a comprehensive survey of all recent studies that use sentiment analysis technology to analyze text bank customer comments in order to discuss the tools used and find out the results. The studies were collected from reliable sources such as Google scholar and others, and they exclude studies in which text bank customer comments are analyzed using different techniques than sentiment analysis. Studies related to the study topic from 2016 to 2022 have been accessed and discussed.

Introduction:

During the last few years of the twentieth century and the first decade of the twenty-first century, the world witnessed successive waves of economic, political and social changes and developments. Considering that the banking sector is one of the main and important economic activities for countries, due to its contribution to advancing the wheel of economic development, and achieving the targeted economic growth rate for the economy [5]. Whereas, banking services in banks are the main interface for those dealing with the bank. Therefore, the digital revolution has resulted in a development in the telecommunications sector[5].

Customer feedback collected by companies and banks through various channels are also useful resources for understanding their satisfaction. Taking surveys is now much simpler due to the abundance of information on the web. However, finding and monitoring opinion sites on the web and filtering the information contained in them according to our need remains a difficult task due to the rapid increase in the number of premium sites. We find that every site usually contains a huge amount of text full of opinions that must be processed for the purposes of studying customer feedback. This calls for the need to replace traditional methods with more sophisticated automated methods. The important objectives of these methods include revealing the basic sentiments of customer feedback. This is done using modern techniques such as sentiment analysis technology. This technique helps analysts to understand the current feelings, opinions or attitudes of the general public behind a particular topic or A group of words mentioned on the Internet, which is one of the best modern branches of machine learning, which has contributed to helping entrepreneurs make informed decisions backed by data through predictive analytics models based on machine learning, which in turn contributed to improving the decision-making process and thus achieving maximum Possible return on investment [4].

Related work:

Financial sentiment analysis (fsa): A survey

1. Xiliu Man, Tong Luo, Jianwu Lin 2019, With a rapid development in Natural Language Processing (NLP), financial industry meets the demand of analyzing a huge amount of financial text data. Some recent researches have explored Financial Sentiment Analysis (FSA), but there is a lack of a latest review. This paper aims to provide a comprehensive survey on FSA including data source, lexicon-based approach, traditional machine learning approach and recent deep learning approach such as word embedding, CNN, RNN, LSTM and attention mechanism. Our inspirations in future direction like large unsupervised contextual pretraining, hierarchical coarse-to-fine approach, joint learning, transfer learning and possible applications are also discussed**[6].**

2. Detecting risks in the banking system by sentiment analysis,

Clemens Nopp, Allan Hanbury, In November 2014, the European Central Bank (ECB) started to directly supervise the largest banks in the Eurozone via the Single Supervisory Mechanism (SSM). While supervisory risk assessments are usually based on quantitative data and surveys, this work explores whether sentiment analysis is capable of measuring a bank's attitude and opinions towards risk by analyzing text data. For realizing this study, a collection consisting of more than 500 CEO letters and outlook sections extracted from bank annual reports are built up. Based on these data, two distinct experiments are conducted. The evaluations find promising opportunities, but also limitations for risk sentiment analysis in banking supervision. At the level of individual banks, predictions are relatively inaccurate. In contrast, the analysis of aggregated figures revealed strong and significant correlations between uncertainty or negativity in textual disclosures and the quantitative risk indicator's future evolution.

Risk sentiment analysis should therefore rather be used for macroprudential analyses than for assessments of individual banks**[7].**

2. It is a descriptive study, not a survey, as it focused on detecting risks in the banking system through sentiment analysis, by exploring whether sentiment analysis is able to measure the bank's attitude and

views toward risks by analyzing the data of the CEO's text letters and forecast sections extracted from the bank's annual reports.

1. This study focused on providing a comprehensive survey on financial sentiment analysis and the approaches followed for that from the traditional machine learning approach and deep learning for the purpose of analyzing the huge amount of financial text data of various kinds, not just analyzing customer comments.

While our study focused on providing a comprehensive survey of recent studies that used sentiment analysis technology in the banking field for the purpose of analyzing customer textual comments because of its many benefits. It compared these studies in terms of tools, algorithms, approach, data source, languages, and results obtained from applying this technology in the banking field, so that banking institutions can benefit from it if they want to keep pace with technological progress, as well as researchers.

Methodology:

In this survey paper, we collected a set of studies from relevant sources, excluding studies that do not fit the subject of the study and focus on studies that are compatible with the analysis of text bank customers' comments using the sentiment analysis technique, which are 13 studies that we compared in Table.1.

Index	The purpose of the study	the year	the language	Tools/ Techniques/ Approaches	data source	Results
1.	Measuring the quality of banking services and detecting customer complaints for KaKao Bank[8].	**2021**	Korean	Sentiment analysis of texts (Measurement of QoS score for each dimension by analyzing keyword frequency and network for each polarity)	KaKao . app	First: From the customer's point of view, it was possible to know the important factors among the different dimensions that must be managed well in the preparation of mobile banking services
2.	Analysis of the user experience of the payment service via mobile banking applications [9].	**2021**	French	Take a lexicon-based approach from machine learning approaches, use a scale from 1 to 5 for assessment, use statistical packages (Rsentimen; an R statistical package), Syuzhet package, qdap . library	**Google play, App Store**	The results of the scale showed that banks without interest had the highest average of 4.0, and commercial banks got the lowest rating of 3.4, and the results of sentiment analysis showed that the majority of users were satisfied with this service with a positive rate of 66%, while negative feelings reached 34%.
3.	App2Check tool development For BNI Mobile Banking App Users To classify the comments as positive and negative [10].	**2020**	Italian	Machine Learning - Analyzing Text Sentiments Using the SVM Classifier (Support Vector Machine)	_	Classification accuracy using svm was 78.45%

4.	Develop models for classifying sentiment and comparing it with traditional banking methods [11].	**2021**	Turkish	BERT-based approach, nps questionnaires to collect data	-	The results showed that the BERT-based model works better than the traditional models, for the second case, training was discovered with out-of-field data from Twitter and led to poor performance, and the learning-from-zero approach achieved promising results for sentiment classification in the banking field.
5.	Analyze the sentiments of online user-generated reviews to identify essential banking service attributes [12].	**2022**	Hindi	In total, three conceptual models were developed and evaluated using regression analysis, The study focused on banking customer satisfaction from online reviews and ratings using text mining and sentiment analysis.	bankbazaar.com website	The study showed that all the variables were statistically significant and affect customer satisfaction in their own models, except for the interest rate.
6.	Building a sentiment rating model to analyze financial tweets on Twitter for five banks [13].	**2019**	French	WEKA and SVM algorithm were used Machine Learning - Analyzing Text Sentiments	Twitter	The results showed that the accuracy of the classifier was 71.83%, and the regression for the negative category was 0.696 and for the positive category 0.741, meaning that the number of positive tweets during this period was slightly greater than the number of negative tweets, which indicates that the prediction was better compared to other measures.
7.	Customer satisfaction assessment of mobile applications in the banking sector of Turkish Deposit Bank [14].	**2020**	Turkish	Using data mining and fuzzy IT2 approaches	Analysis of the last 500 customer comments of the bank's mobile applicati	The results show that operation and usability are the most important dimensions in terms of customer satisfaction in mobile applications, and this shows that customers attach importance to the quality and diversity of services provided by

					on	mobile applications, and these applications must be designed effectively so that the customer can conduct his operations easily.
8.	Analyzing customer sentiment toward four leading Saudi banks during Ramadan to examine consumer sentiment and industry trends [15].	**2020**	Saudi dialect	Sentiment Analysis	Twitter	In the first two weeks, all banks experienced negative feelings. In the last two weeks, Al-Rajhi Bank received positive and negative feelings. 25% of the negative feelings were related to the mobile application, 31% of the negative feelings of Al-Ahly Bank were due to its failure to postpone the loan repayment, SAIB Bank got 83.3% of the negative feelings. The volume of neutral feelings Ramadan competition for Customers
9.	Cloud-based customer feedback analysis to measure customer satisfaction in the Moroccan banking sector [16].	**2020**	English and French	Naïve Bayesian algorithm and open source ready-made tools: Apache Kafka, Apache Spark, Kibana The lexicon-based approach, where they used the lexicon: Stanford for sentiment analysis	Twitter	The results show that the French tweets got an accuracy of 76.19%, while the accuracy of the English tweets reached 56% and became 80.7 after improving in the Stanford dictionary.
10.	Measure the SCRM and categorize tweets containing the keywords “mandiri” and “bca” “bni” for 3 sentiment categories for 3 banks [17].	**2017**	Indonesia n Bahasa	Gephi software for network graphing and analysis SCRM, Sentiment analysis, using the SNA methodology to measure the network characteristics of each bank	Twitter	The results of the network measurement showed that bni was the most active, followed by Mandiri bank and then BCA. The results of sentiment analysis showed that bni bank had the smallest percentage of positive emotions, while BCA got the highest percentage of positive emotions, followed by Mandiri.
11.	Analyzing sentiment analysis of UniCredit Bank Europe's social	**2020**	English	Valence Aware, VADER, Natural Language	Twitter	The results of the classification showed that out of 953 tweets, 499

	media posts to find out opinions about its online services [18].			Processing (NLP) in python, Lexicon-based approach		were classified as positive, 417 as neutral, and 37 as negative.
12.	Obtaining customer satisfaction with digital banking services for 3 banks in Indonesia based on sentiment analysis of tweets [19].	**2022**	Bahasa Indonesia	Use of nine classifiers: (NB, LR, KNN, RF, DT, AdaBoost, XGB, LGBM, SVM) The tweets were compiled by the Twitter API using the snscrape library.	Twitter	The SVM classifier gave the best overall performance compared to the other classifiers with an accuracy of 74.29%, NB the second best performance after SVM with 73.81%, KNN's performance worse compared to the previous 40.52%, Bank Jago got the highest positivity with 82.62% while Jeniu Bank on the highest negative amounted to 43.50% as was most of the feelings Neutral to Blu Bank at 44.46%
13.	Mobile banking app sentiment analysis using the Naïve Bayes classifier [20].	**2018**	Bahasa Indonesia	The method used in this classification is Naïve Bayes, using the scale from 1 to 5, which is known as (five stars), Use the confusion matrix to evaluate the rating	Google Play Store	The rate of analysis using the Naïve Bayes Classifer method was 89.41%,In addition, there are 1701 reviews, of which 278 are positive and 1432 are negative, according to the scale results.

Discussion:

The use of sentiment analysis technology in the banking field to analyze customer textual comments requires the provision of modern tools, programs and techniques to assign sentiment scores and follow one of the machine learning approaches such as the lexicon-based approach and the BERT-based approach, and other approaches and the use of algorithms according to the approach used for data classification, training and learning. We also analyzed the results of the studies in terms of the tools used, the approach and the results. After reviewing all relevant studies, we found that most of the studies relied on the lexicon-based approach to analyzing text bank customer feedback. Also, most of the studies focused on the use of: SVMNaive Bayes classifiers, Random Forests, the R programming language and Python for natural language processing. Also, some studies used ready-made open-source tools to apply sentiment analysis technology such as Apache Kafka, Apache Spark, Kibana, and most studies that took the lexical approach used foreign dictionaries such as Valence Aware, Stanford for sentiment analysis, the repeated choice of these tools and techniques by various researchers and developers, and not others, confirms their success in achieving the desired goals with high efficiency. Studies have shown that the use of sentiment analysis technology to analyze bank customers' textual comments has helped banks know opinions about their services and customer satisfaction with them, and enabled them to measure SCRM, measure the quality of banking services, and detect customer complaints, which leads to improving work in banking institutions.

Conclusion:

Today the banking sector has become one of the most technologically advanced sectors in the world. Banks are able to use technology to speed up daily operations as well as innovate new tools that allow their customers to make autonomous financial decisions faster, easier and safer [21] However, customer support remains one of the most persistently challenging areas for banks and for customer support. faster, smoother and more efficient; Banks must continue to use modern technologies to carry out their duties towards them By investing in artificial intelligence-enabled tools and technologies such as (sentiment analysis), the banking sector can reap many benefits [21]. From 2016 to 2022 we noticed that most of the studies conducted in sentiment analysis focused on foreign languages, while the Arabic language suffers from a scarcity of studies due to many challenges [22] .

references:

[1]: Deep Learning and Big Data - March.2016,

%https://ar.m.wikipedia.org/wiki/%D8%A7D9%84%D8%AA%D8%B9%D9%84%D9%85_%D8%A7%D9%84%D9%85%D8%AA%D8%B9%D9%85%D9%82_%D9%88%D8%A7%D9%84%D8%A8%D9%8A%D8%A7%D9%86%D8%A7%D8%AA_%D8%A7%D9%84%D8%B6%D8%AE%D9%85%D8%A9

[2]: Wikipedia, sententiment analysis,

https://upwikiar.top/wiki/Sentiment_analysis

[3]: Bakshi, R.K., et al. Opinion mining and sentiment analysis. in 2016 3rd international conference on computing for sustainable global development (INDIACom). 2016. IEEE.

https://ieeexplore.ieee.org/abstract/document/7724305

[4]: Institute of Management Professional, 2021, The most important models of predictive analytics, their application and how to start learning them,

https://imanagementpro.com/%D8%A7%D9%84%D9%85%D8%AF%D9%88%D9%86%D8%A9/%D8%A3%D9%87%D9%85-%D9%86%D9%85%D8%A7%D8%B0%D8%AC-%D8%A7%D9%84%D8%AA%D8%AD%D9%84%D9%8A%D9%84%D8%A7%D8%AA-%D8%A7%D9%84%D8%AA%D9%86%D8%A8%D8%A4%D9%8A%D8%A9-%D9%88%D9%85%D8%AC%D8%A7%D9%84%D8%A7%D8%AA/

[5]: Journal of Economics and Finance, 2015, Issue 01.

https://www.univ-chlef.dz/ref/?article=%D8%A3%D8%AB%D8%B13%D8%AA%D{2%D8%AF%D{A%D}}D8%A7%D8%A7%D8%A5%D8%A7%D8%A5%D8%A7%D8%A7%D8%A7%D8%A7%D8%A%D8%A7%D8%A5%,D8%A7%D8%A7%D8%A5%,D8%A7%D8%A7%D8%A7%Deyes,D8%A7%D8%A%D8%A7%D8%A7%D8%A7%D8%A5%D,D8%A5%Deyes,D8%A7%Deyes lip %D8%A%D8%B1%D hair extensions

[6]: Xiliu Man and others,2019, Financial Sentiment Analysis (FSA): A Survey,

https://ieeexplore.ieee.org/abstract/document/8780312

[7]: Clemens Nopp TU Wien, Detecting Risks in the Banking System by Sentiment Analysis,

https://aclanthology.org/D15-1071.pdf

[8]: Byung-Hak Leem, Seong-Won Eum, 2021, Using text mining to measure mobile banking service quality,

https://www.emerald.com/insight/content/doi/10.1108/IMDS-09-2020-0545/full/html

[9]: Omotosho, Babatunde analyzing user experience of mobile banking applications in Nigeria by text mining

CBN journal of applies statistics, 2021. **https://www.cbn.gov.ng/Out/2021/STD/77-108.pdf**

[10]: Yuni Handayani, Allvin Rinaldy Hakim, 2020, Sentiment Analysis of Bank BNI user comments using Svm, (iSemantic). **https://ieeexplore.ieee.org/abstract/document/9234230**

[11]: Melik masarifoglu and others,1.April.2021, sentiment analysis of customer comments in banking using PERT-based Approaches. **https://ieeexplore.ieee.org/abstract/document/9477890**

[12]: Divya Mittal, 7jan2022, Determining banking service attributes from online reviews: text mining and sentiment analysis, International Journal of Bank Marketing.

https://www.emerald.com/insight/content/doi/10.1108/IJBM-08-2021-0380/full/html

[13]: Faithful Chiagoziem Onwuegbuche1 & others, 2019, Support Vector Machine for Sentiment Analysis of Nigerian Banks Financial Tweets , Journal of Data Analysis and Information Processing.

https://www.scirp.org/html/2-2870277_95208.htm

[14]: hssan densture & others, 2020, Data mining-based evaluating the customer satisfaction for the mobile applications: An analysis on the Turkish banking sector by using IT2 fuzzy dematel.

https://www.igi-global.com/chapter/data-mining-based-evaluating-the-customer-satisfaction-for-the-mobile-applications/235908

[15]: DataEQ website, May 14, 2020, analysis of customers' feelings towards the leading Saudi banks during the month of Ramadan**.** **https://dataeq.com/ar/research/customer-sentiment-analysis-saudi-banks-Ramadan/**

[16]: Anour riadsolh, lmane lasri, mourad elbelkacemi, 25marh2020, cloud-based sentiment analysis for measuring customer satisfaction in the moroccaan banking sector, journal of Automation.mobile robotics and intelligent systems. **https://www.jamris.org/index.php/JAMRIS/article/view/580**

[17]: Andry Alamsyah, Anindia aulia, April 2017, Social network and Sentiment analysis for Social Customer Relationship management in Indonesia Banking Sector ,School of Economics and Business , Bandung, Indonesia

https://www.researchgate.net/publication/308716475_Social_Network_and_Sentiment_Analysis_for_Social_Customer_Relationship_Management_in_Indonesia_Banking_Sector

[18]: Raphael kwaku botchway and others, A review of social media posts from unicredit bank in Europe

Sentiment analysis approach,faculty tomas bata university in zlin .

https://dl.acm.org/doi/abs/10.1145/3361785.3361814

[19]: International Journal of Advanced Computer Science and Applications, 2022, Obtaining customer satisfaction with digital banking services for 3 banks in Indonesia based on sentiment analysis of tweets,

https://www.researchgate.net/profile/BramanthyoAndrian/publication/359684655_Sentiment_Analysis_on_Customer_Satisfaction_of_Digital_Banking_in_Indonesia/links/6247cad68068956f3c61a229/Sentiment-Analysis-of-one-Cfaction-Digital_Banking_in_Indonesia.pdf

[20]: Science Publishing Corporation, 2018, Mobile banking app sentiment analysis using the Naïve Bayes classifier, **https://www.sciencepubco.com/index.php/ijet/article/view/22998/11443**

[21]: Muhannad Al-Jamais, 9/26/2021, The Impact of Artificial Intelligence on Banking Services, Xina Ai website:

https://www.xina.tech/blog-posts/ai-impact-on-banking-services

[22]: Thuraya.M.omran,baraa T.sharef&Cerina Grosan,13.Feb.2021, Springer, Sentiment Analysis of Arabic Sequential Data Using Traditional and Deep Learning: A Review

https://link.springer.com/chapter/10.1007/978-3-030-62796-6_26