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Sentiment Analysis of Public Perception of Fuel Subsidy Removal in Nigeria Using X Data

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ABSTRACT
The removal of fuel subsidy has been one of the most contentious economic policy measures in Nigeria due to socio-economic implications. After the policy announcement in May 2023, citizens widely shared their views on the social media platforms, leading to a very rich stream of public opinion that was captured while it was unfolding. The purpose of this study was to assess the perception of the public on the removal of fuel subsidy in Nigeria using sentiment analysis technique on data collected from the X application. Tweets were scraped with Snscrape from public sources from 29th May 2023 to 25th March 2025. The dataset was pre-processed using NLP techniques to classify tweets into positive, negative, and neutral sentiments, and then noise, duplicate, and irrelevant tweets were removed from the data. Latent Dirichlet Allocation (LDA) was also applied to cluster the most prevalent topics of discussion and an interactive Power BI dashboard were utilized to analyze sentiment trends and visualize the results. These findings indicated a negative sentiment regarding public opinion, as their discussions mainly focused on increasing transportation costs, economic hardship, decreased purchasing power and inflation. Additionally, sentiment trends showed significant shifts after key announcements by the government, suggesting that official communication had a significant impact on public responses. The results show the applicability of sentiment analysis and topic modelling to gain timely, data-driven understanding of citizens' perception of economic reforms. This approach provides much evidence that can help in policy decision-making processes based on the analysis of large-scale social media data.

Keywords - Fuel subsidy removal, Sentiment analysis, Public perception, Social media analytics, Policy evaluation

1. INTRODUCTION

The policy of fuel subsidy has always been part of economic management in Nigeria especially as a means of regulating fuel prices and the cost of living among people. Over time, various governments have tried to either reform or eliminate the subsidy system because it has become an increasing fiscal burden, and has continued to be inefficient and problematic in terms of governance (Aniemeke 2024). Such endeavors have been mostly faced by stiff opposition by the people, as fuel price adjustments directly influence transportation prices, food prices and the general welfare of the household.

The full elimination of fuel subsidy was announced by the President Bola Ahmed Tinubu during his inaugural speech on 29th May 2023, and this move was a major change in the national economic policy. Although the reform was introduced as a plan to enhance fiscal sustainability and to refocus social funds into development, it created a national level of

public discussion and emotion throughout the nation. The people resorted to the social media to speak out, share their opinions, issues and expectations about the policy and its short run impacts on their lives.

The social media has emerged as a significant venue of public interaction, a place where opinion is expressed in real-time and unsolicited, and in a way that is inconspicuous in more traditional survey-based methods (Muhammad et al. 2022). Specifically, the X application allows spreading the response to policy announcements fast and offers a valuable source of textual data to comprehend the feelings of the population. With the development of Natural Language Processing, it is now possible to handle these large amounts of unstructured text in a systematic way and derive valuable insights out of the public conversation.

Although the use of social media analytics has become increasingly relevant in policy evaluation, there are still limited empirical research studies analyzing the perception of the public on fuel subsidy removal in Nigeria (ICIST 2024). The available literature has, to a large extent, been interested in overall fuel price fluctuations or has been based on conventional opinion evaluation approaches which do not enable the real-time responses. This gap is filled in this study where sentiment analysis is employed to the tweets about removal of the fuel subsidies in Nigeria. The analysis of the tendency patterns and the prevailing themes of discussions over a period of time enables the study to prove empirical evidence of what people think of the policy and how the data-driven methods could be helpful in informing the policy review and decision making.

The withdrawal of subsidy has been one of the most controversial economic policy decisions in Nigeria because the withdrawal affects transportation expenses, food prices and cost of living in Nigeria (Aniemeke, 2024). The policy has been and will continue to have strong public reactions, protest and nationwide debates, even though often justified by the government as a fiscal saving and to achieve economic efficiency. It is important to measure the social acceptance and effectiveness of the policy, and having a good understanding of the perception of the public of the removal of fuel subsidy is crucial. Public opinion polls and interviews are expensive, small in size and delayed. These constraints render it challenging to record real-time response from the public, particularly when policies are announced and implemented. Social media platforms such as X (formerly Twitter), offer a wealth of unprompted, live, opinion from a wide cross-section of society (Muhammad et al, 2022).

Although there has been a lot of debates on the subject of removal of fuel subsidy in Nigeria, empirical studies that can be used to systematically present the public sentiments on the issue, based on the use of social media data is still limited (Nwachukwu et al., 2024). Some studies have been done in Nigeria and these studies have been largely on the general price movements in the fuel market or other changes in the energy sector, and studies focusing on fuel subsidy removal by sentiment analysis techniques are limited. In addition, the majority of these studies make use of simple analytical approaches which may not be sufficient to fully represent the complexity, context and emotionalism of public debates in social media.

This represents a gap in the existing literature, and a data driven approach is needed to assess public sentiments on the removal of fuel subsidy in Nigeria. This study aims to give empirical evidence of the sentiment of the policies towards fuel subsidy removal by analyzing the tweets on the X application that were related to the policies. The results will help in the understanding of citizens' responses to the removal of fuel subsidies and guide policy makers in making socially and responsibly oriented economic choices.

Therefore this study aims to (i). To gather categorize and examine the general public opinion on the removal of fuel subsidy from Twitter. (ii). To explore the direction of the sentiment change over time in response to major government announcements regarding the removal of fuel subsidy. (iii). To detect key concepts from a collection of texts with topic modeling (LDA) and (iv). To use an interactive Power BI dashboard to display results.

This study combines sentiment analysis, topic modeling, and interactive visualization to give a holistic picture of the public perception on the removal of fuel subsidy in Nigeria, which wasn't the sole focus of the previous studies. The results are important for the development of

data-driven policy assessment approaches, and show social media analytics can be a valuable tool to evidence-based decision making.

Literature Review

The issue of the removal of fuel subsidy has been the subject of great research and academic scrutiny due to its economic and social implications for the developing economies and especially Nigeria. Public response to subsidy reforms has been the subject of recent study, both with traditional surveys and economic analysis and, more recently, social media analysis. With the help of advancements in NLP, researchers can now process vast amounts of user-generated content in real-time, gaining insights into public opinions and perceptions on policies. The relevant empirical literature on fuel subsidy removal, sentiment analysis and topic modeling is reviewed, with a focus on the methodological approaches used and the gap addressed in this study.

Related Works

Studies on Fuel Subsidy Removal and Public Perception

On one hand, several studies (Aniemeke, 2024; Ifeduba et al., 2024; Ezegwu et al., 2024) have been conducted and reported on the socio-economic consequences of the removal of fuel subsidy, and the dominant issues that public opinion is built on has been identified as increase in transportation costs and cost of living from online discussion, but there is no study that combined sentiment analysis with topic modeling to arrive at the dominant issues affecting the public opinion.

Studies on Sentiment analysis using Social media.

Sentiment analysis is a powerful technique to gauge public opinion on socio-economic and political issues through harnessing sentimentality and opinions expressed on social media. The NaijaSenti corpus was developed by Muhammad et al. (2022), showing that Nigerian Twitter data can be used effectively for multilingual sentiment analysis and that NLP can be useful in capturing public opinion on social media. Likewise, Nwachukwu et al. (2024) used sentiment analysis to explore sentiments expressed by the public on X (Twitter) after the removal of fuel subsidy by the Nigerian government, where they found that the sentiments expressed were negative. Similarly, Umar et al. (2025) used the opinion lexicon algorithm with an enhancement to classify opinions of Nigerians on the removal of fuel subsidy, and also observed that the negative opinions were higher than the positive opinions. In total, these research works illustrate the potential of social media as a source of actual “live” public opinion. But they largely concentrated on sentiment classification, and offered little information about the content of public responses to the themes. In this study, it goes further by combining sentiment analysis with topic modeling to gain more insight into public perceptions.

Studies on Topic modeling (LDA) and text analytics.

Since there are large amounts of unstructured textual data, getting important information from them is crucial, and topic modeling and NLP have become indispensable technologies. Latent Dirichlet Allocation (LDA) (Blei et al. 2003) is a probabilistic topic modeling algorithm that models the underlying thematic structure by clustering words that tend to co-occur in a corpus. Since its emergence, LDA has been applied in diverse fields such as social media analytics, finance, healthcare, public policy analysis and more. Although newer transformer-based methods have surfaced in recent years, LDA is still one of the most used methods because of its interpretability, computational efficiency and ability to explore large text datasets to generate topics. Although these are strides made, few studies have attempted to combine topic modelling with sentiment analysis to simultaneously identify the polarity of public sentiment and the topics underlying this sentiment, for fuel subsidy removal in Nigeria. To overcome these methodological limitations, this study combines the LDA topic modeling with sentiment analysis to detect patterns and offer a more holistic understanding of the public sentiment toward X.

Research Gaps

These studies that have been reviewed have contributed to the understanding of fuel subsidy removal, public opinion, sentiment analysis and topic modelling. But there are a few things that aren't included. First, while there are studies on the economic effects of fuel subsidy removal and significant public discourse on fuel subsidy and its removal, little attention has been paid to the analysis of public opinion in real-time through social media data. Second, the existing sentiment analysis studies have mainly concerned with categorizing an opinion as positive, negative or neutral, rather than exploring the themes that are contained within an opinion. Third, while LDA has been used in text mining and topic modeling there has been limited application of LDA to public discourse on fuel subsidy removal in Nigeria. In addition, only a few studies have put together sentiment analysis, topic modeling and interactive visualization. This study aims to fill these gaps by leveraging sentiment analysis, Latent Dirichlet Allocation (LDA), and Power BI visualization to comprehensively assess the sentiments of the Nigerian public towards the removal of fuel subsidy from Nigeria's economy using data from X.

2. MATERIALS AND METHODS

2.1 Research Design

This research study adopted a quantitative and exploratory research design approach to evaluate the public perception the people on fuel subsidy removal in Nigeria using social media data. The quantitative approach was suitable as textual opinions obtained from X (previously Twitter) were converted into measurable sentiment categories for statistical analysis. The exploratory study allowed for an investigation of new attitudes and reactions towards economic policy changes from 29th May 2023 until 25th March 2025.

2.2. Data Collection.

Tweets were scraped from X (formerly Twitter) with the open source library Snscrape. The data were collected from tweets created on keywords and hashtags that were related to fuel subsidy removal in Nigeria from 29th May 2023 to 25th March 2025. The tweets were only in English and publicly available, and directly relevant to the study. To enhance data quality, duplicate tweets, ads, irrelevant posts, retweets without any comments, and tweets from protected accounts were removed.

2.3 Data Preprocessing

2.3.1 Data Cleaning

The collected tweets were filtered off noise and unwanted items such as URLs, punctuation, emojis, special characters, and duplicates.

2.3.2 Text Normalization

All text was converted to lowercase also to eliminate irrelevant data, stop words were eliminated while Tokenization and lemmatization were used to normalize words.

2.3.3 Handling Informal Expressions

Nigerian slang and other common informal expressions were made standard in order to enhance the accuracy of sentiment classification.

2.4 Sentiment Analysis and Topic Modelling.

2.4.1 Text Representation

The text data were pre-processed and turned into numerical data with proper text Vectorization techniques which can be analyzed with machine learning techniques.

2.4.2 Sentiment Classification

Natural Language Processing were employed because they offer a speedy way to automatically categorize massive amounts of unstructured textual data into meaningful sentiment categories.

2.4.3 Topic Modeling

Sentiment classification is a task of determining the emotional polarity of tweets but it does not shed light on the problems underlying the sentiments. Hence, topic modeling was then conducted to extract the most prominent topics users were talking about. This process helped

to gain a better understanding of the key issues, not just if they were positive, negative, or neutral, but deepened the understanding of the issues of public opinions.

Latent Dirichlet Allocation (LDA) was adopted because it is used to determine the prevailing themes in the extracted tweets data set, and to offer more insight into social discourse. LDA assumes that each document is a mixture of multiple latent topics and that each topic is characterized by a probability distribution over words. The probability formula of observing a word is expressed as: P(w)== $\sum_{k=1}^{k} P(w|z=k)P(z=k)$.

Where P(w|z=k) represents the probability of a word occurring within topic , and P(z=k) represents the probability of selecting topic k. After training the model, the highest probability of common themes within each topic were examined and the review showed there were a number of common themes, such as:

- Increased fuel prices and transportation costs.
- Rising cost and price of goods and services.
- Economic hardship and poor purchasing power.
- Government policy making and trust of citizens.
- Demands palliative actions and economic aid.

2.5 Statistical Analysis.

Data was summarized using descriptive statistics and analyzed using temporal analysis to understand the distribution of sentiment in the dataset and the changes in sentiment after key government announcements. The sentiment analysis results were presented in a visual format using Microsoft Power BI which is also an interactive dashboard that shows distributions of sentiment, time series.

2.6 Methodological flow

The analytical workflow consisted of six sequential stages:

Data collection using Snscrape

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Data preprocessing

↓

Text vectorization

↓

Sentiment classification

↓

Topic modeling using LDA

↓

Interactive visualization using Power BI

2.7 Software Tools

This analysis was carried out using Python programming language. The python library Snscrape was used for tweet extraction because it enables the retrieval of publicly available tweets without requiring access to the official X API. Natural Language Processing (NLP) libraries were adopted for text preprocessing and sentiment classification due to their effectiveness in handling large volumes of unstructured textual data. Latent Dirichlet Allocation (LDA) was used for topic modeling because it effectively identifies hidden thematic structures within large volumes of texts. Microsoft Power BI was used to visualize sentiment distributions, temporal trends, and identified themes through an interactive dashboard, providing an intuitive platform for interpreting the findings.

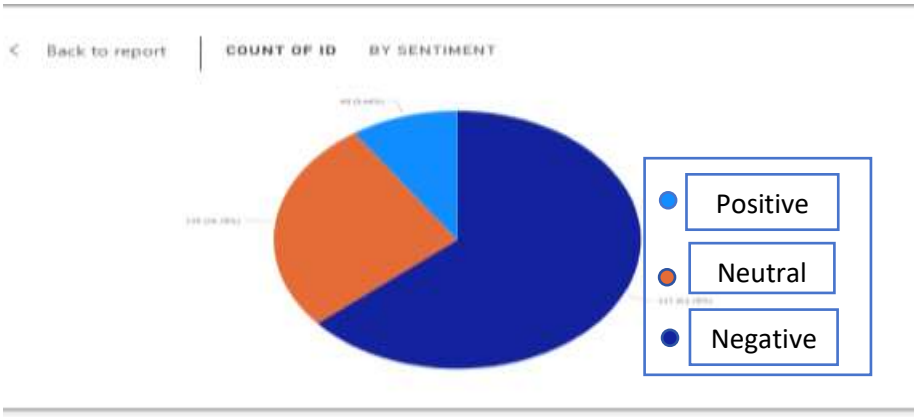
2.8 Ethical Considerations

The research was based on publicly available information only. No personal identifiers were gathered and/or released and all data were utilized solely on an academic basis in accordance with the ethical standards of research.

3. ANALYSIS AND RESULTS

3.1 Overall Distribution of Sentiments

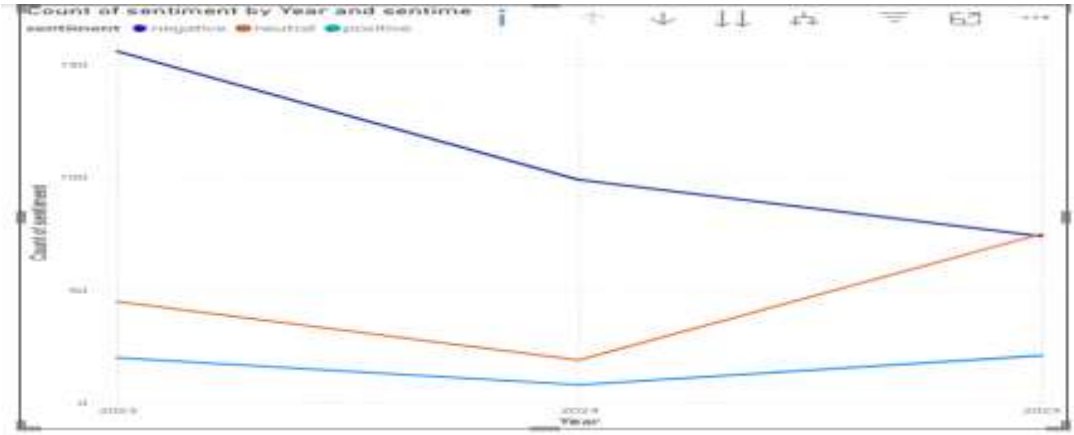
Fig.1: Overall Sentiment Distribution



The results above indicate that negative sentiment accounted for the highest proportion of tweets (61%), followed by neutral sentiment (22%), while positive sentiment represented the smallest proportion (17%). This shows that most X users expressed negative opinions regarding the fuel subsidy removal.

3.2 Sentiment Trend Over Time

Fig. 2 Sentiment Trend from May 2023 to March 2025



The figure above shows that negative sentiment was highest during 2023 and gradually declined over time. Neutral sentiment increased toward 2025, while positive sentiment remained consistently lower than the other sentiment categories throughout the study period.

3.3 Topic Modelling

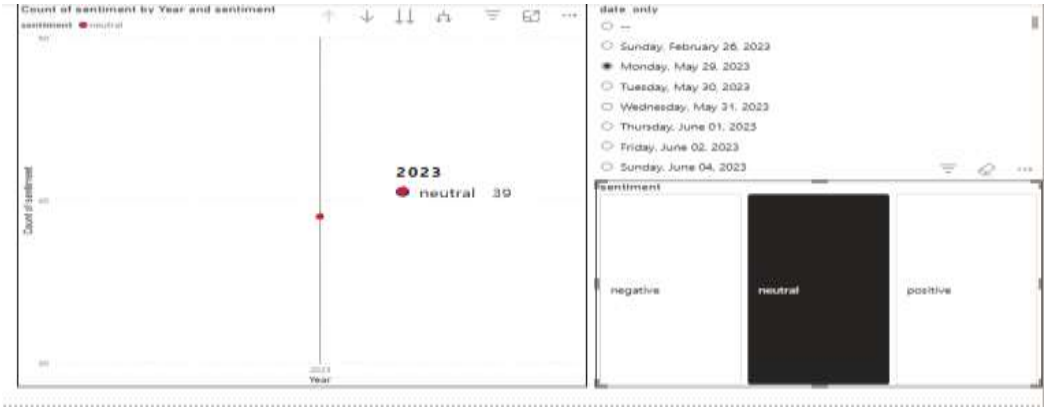
Fig. 3 Major Themes Identified Using LDA

Topic	Representative Keywords	Interpretation
Transportation Costs	Fuel, Transport, Price	Citizens highlight rising transport expenses due to subsidy removal
Inflation	Price, Economy	Discussions reflect concern over general cost of living increases
Economic Hardship	Suffering, Government, Subsidy	Negative sentiment is linked to economic struggles

The topic modelling results reveal three dominant discussion themes. Transportation costs, inflation, and economic hardship occurred most frequently in the dataset, indicating that these were the major issues discussed by the public.

3.4 Interactive Visualization of Sentiments

Fig.4. Interactive Dashboard



The dashboard provides interactive visualization of sentiment categories across different dates. Users can filter the data by sentiment type and time period, making it possible to examine changes in public opinion efficiently.

4. DISCUSSION OF FINDINGS

The first objective of this study was to find out the opinions of the general public on the withdrawal of fuel subsidy in Nigeria from the data obtained from the X application. The results showed that most of the tweets voiced negative sentiment, and comparatively fewer tweets voiced positive or neutral sentiment. This suggests the removal of fuel subsidy was largely seen badly by the public in general, particularly due to the short term socio-economic implications. The high negative sentiment indicates that a lot of Nigerians linked the policy to transportation prices, food and service prices going up and loss of their purchasing power. The discovery aligns with Nwachukwu et al. (2024) who reported a dominance of negative sentiments in the public discussions on X after the announcement of the removal of fuel subsidy. Likewise, Umar et al. (2025) revealed that the public perception of the policy was largely negative, as there were widespread concerns about the inflation and economic difficulties.

The second objective of the study was to evaluate the changes in public opinion over time after the policy was put in place. The sentiment trend analysis revealed that negative reactions were the strongest right after significant government statements on the fuel subsidy removal. The negative sentiment gradually decreased over time, but it was always more negative than positive or neutral sentiment during the study period. This discovery will show that citizens' reactions to the government's policy announcements are strongly influenced by the same public opinion that circulates on social media, which will prove to be a handy and timely tool for tracking citizens' reactions in real time. The findings are concurrence with findings by Muhammad et al. (2022) which showed that Twitter can be a reliable source of real-time public opinion for sentiment analysis and policy-related research.

The third aim of the study was to determine the core problems that have led to public opinion against the decision to remove fuel subsidy using the topic modeling method. The study identified key themes using Latent Dirichlet Allocation (LDA), such as an increase in transportation costs, inflation, rising prices for goods and services, economic hardship, public trust and government policy, and calls for palliative measures. The above results show that the negative sentiments noted were more likely to be a response to the economic impacts of the policy than to the opposition of government reforms in general. The identified themes are

able to explain the motivations behind the public response better and show how the two techniques of sentiment analysis and topic modeling can be used together. Unlike previous studies like Nwachukwu et al. (2024) and Umar et al. (2025), the current research not only classifies sentiments but also identifies specific issues that cause the sentiments using LDA.

The research also showed that the sentiment analysis and interactive visualization of data were practical and useful. The Power BI dashboard allowed for visualization of sentiment distribution, trends in the data over time, and the main topic of conversations. The dashboard offered a more dynamic and user-friendly way of viewing shifts in public opinion over time and emerging issues that needed to be monitored. The results are important because they reveal the promise of interactive visualization as a helpful decision-support tool for policy makers who want to have evidence available in a timely fashion for evaluating and communicating their policies.

In general, the results of this research reveal that sentiment analysis is an effective method to analyze citizens' feelings about socio-economic policies based on social media data. This study also utilized NLP, LDA, and interactive visualization to present not only the polarity of public opinion, but also the issues behind the opinions. The findings thus offer a body of empirical evidence that would help inform policymakers with citizens' reaction to economic reforms and design the policy interventions to be more responsive and socially inclusive.

5. CONCLUSION

This paper has examined the perception of the removal of fuel subsidy in Nigeria using sentiment analysis techniques from data gathered using the X application (formerly Twitter). The study will draw the empirical evidence on the response of Nigerians to the policy and the popular opinion that has emerged following the key government announcements from the publicly available tweets in the data set spanning 29th May 2023 to 25th March 2025.

The findings show that attitudes of the public towards the elimination of fuel subsidy were generally negative during the study period. Negative response was mainly motivated by issues of increasing transportation prices, inflation and general economic distress. The negative attitude still won, although it is gradually changing to neutral and positive attitudes over time, people have yet to be satisfied with the economic effect of the policy.

The study also demonstrates the sensitivity of the government's perception in social media, which is very sensitive to government communication. Acute negative sentiment surge when a policy is announced show the significance of appropriate communication in time and disclosure in dealing with public perception during economic reforming. Furthermore, sentiment analysis tools combined with interactive Power BI dashboards proved to be helpful for better interpretation and usability of sentiment data when evaluating policies.

Altogether, the research adds to the body of literature in the data-driven policy assessment showing how social media sentiment analysis can be utilized to obtain real-time public response to economic reforms. The findings underscore the potential for using computational analysis in conjunction with interactive visualization software applications as a tool to support responsible decision making and more responsive governance in Nigeria.

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