Model-assisted multivariate analysis of social media engagement and public perception of governance in Nigeria.

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Abstract

Predominantly developing democracies are governed and perceived from the digitally structured public spheres and governed as democracies from social media platforms where the engagement and sentiment derived from the platforms shape the digitally manifested trust, satisfaction, and legitimacy of the citizens. However, the surveys, most often employed with great frequency, fail to grasp the intensity of the digital landscape. In the case of Nigeria, the study applied Advanced Multi-Variates Techniques Analytical Methodologies to enhance the estimation of the perceived governance and the panel social media metrics. In using structured random sampling of the 600 surveys of the citizens and the data analyzed from the social media accounts of the Government, the activated Principal Components Analysis, the Multiple Layers of Regression, and the General Regression Estimator were utilized to address governance of the citizens predicated on the engagement and sentiment. With the Principal Component Analysis, two latent factors were constructed: Civic Digital Engagement and Sentiment Tone with 78.4 percent of the variance in the digital behavior of the respondents. With GREG, the adjusted mean of the perceived governance was 54.86 and with the mean of the survey without data adjustment, the perceived mean was 52.84. Therefore, through the merged data sets, the improvement in the accuracy of the governance was inferred. In this case, the merged data set showed the sentiments of participants ($\beta = 0.51$, $p < .001$) and the tone ($\beta=0.38$, $p < .001$) of the sentiment. They also showed to an extent that the participants' education and where a participant resides (rural/urban) affects the factors that improve the perception of governance. In this case, the multidimensional aspects of the agenda-Setting and Framing theories were merged with Trust to explain how governance is and can be perceived. The findings confirm that incorporating model-assisted digital analytics in Nigeria's analytics frameworks can bolster transparency, participation and accountability and also improve policymaking.

Keywords: Model-assisted estimation, Multivariate analysis, Social media engagement, Governance perception, Nigeria, GREG estimator

Introduction

The emergence of social media as a key channel of political communication has changed how people interact with government, debate policy, and assess the effectiveness of political institutions. X (formerly Twitter), Facebook and Instagram have become sites where people passively consume information and also generate, remix and circulate narratives that shape public discourse. Through these platforms, citizens govern via interactivity and brand user-generated content that collectively express trust, discontent, or legitimation toward state institutions (Ojebuyi & Salawu, 2022).

In Nigeria, where there is a weak allegiance to traditional media, state communication and social trust (Lewis & Alemika, 2021), social media has created a space for civic accountability and expression. Citizens challenge and scrutinize policy, question leadership, and framed concepts around governance. The digital public space mirrors governance and influences social behavior. The more online narratives outweigh official statements, the more pressing it becomes for technologies of public engagement to shape the social perception of governance for both scholars and policymakers.

The reality, though, is that most empirical evaluations of the perception of governance in Nigeria are still based on tried and true survey techniques, though they are quite useful for measuring attitudes. More traditional surveys, as Meng (2018) and Bethlehem (2016) detail, are almost always hampered by nonresponse bias, small sample size, time lags in available data, and surveys' inability to apprehend the emotional tone of data in real time. These gaps, however, survey research is wide-open to what people are expressing online. Increasingly available data on digital traces provide evidence of the frequency of engagement, the content of their sentiments, and the themes of interest, lending the ability to combine traditional behavior and new attitudes to improve the precision of inference.

This research sought to bridge this methodological divide by implementing a Model-Assisted Multivariate Estimation framework which combines traditional survey data with social media data. Using the Generalized Regression (GREG) estimator by Deville and Särndal (1992), the research shows that external digital factors as social media correlated with citizens' perceptions increases representativeness and lessens bias. More specifically, social media engagement and sentiment tone are treated as additional parameters when predicting citizens' perception of governance across the six geo-political zones of Nigeria.

The research draws in theory from three complementing perspectives. The agenda setting theory (McCombs and Shaw, 1972) that deals with social media and issue salience; Framing theory (Entman, 1993) that deals with emotional and narrative tone and how it affects interpretation; and Trust theory (Mayer, Davis and Schoorman, 1995) that deals with the cognitive processes that interrelate exposure and belief formation. Collectively, these theories imply that digital participation is not simply a matter of increasing awareness, but also reframing citizens' trust and satisfaction in governance. The research contributes with a model-assisted statistical design that integrates these theories in a unique and interdisciplinary way to communication and advanced estimation theories.

As a result, this paper investigates the following four questions:

1) In what way does the engagement on social media impact the perception of governance by the citizenry in Nigeria?
2) What, if any, impact does the tone of sentiment have on trust and satisfaction of the public?
3) To what extent can model-assisted estimation improve the estimation of perception in governance sustained by measures of precision?
4) Do these relationships of perception in the digital space vary with education and living in the urban area?

These questions are intended to contribute to governance research in both a conceptual and methodological way. Conceptually, it attempts to model the perception formation as a function of digital exposure and a trust cycle. Methodologically, the study employs multivariate and model-assisted estimation to combine a survey with other data to create more fluid and relevant instruments in the measurement of the legitimacy of governance. The results are geared towards the use of digital analytics in the evaluation of governance in Nigeria.

Statement of the Problem

Citizen assessments of governance are of pivotal importance to political legitimacy and democratic consolidation, particularly in the context of developing democracies such as Nigeria. It is particularly interesting how the internet age has affected the tools and methods employed in the collection of such data and, more specifically, how data is captured and analyzed. The internet has transitioned from a passive to an active platform that allows users, in this case, citizens, to provide assessments and critique the performance of the government in various areas (Nwakanma & Eze, 2023). One would expect that the rapid advancements would inspire the use of more current and innovative methodologies, but that has not been the case. Many empirical works in Nigeria are still reliant on instrument viewing traditional data collection methods Intellectually and cross temporally (Meng, 2018). The use of traditional instruments has been the cause of the imbalance documented in the research materials. The imbalance has made it impossible to capture the continuous and rapid emotional overheating taking place on social platforms.

The tone of the sentiments presented in online discussions is of great importance to the level of public trust and satisfaction with the governance of the country. Negative sentiments in the online interactions, particularly coupled with governance issues, will erode institutional trust and, on the contrary, in the positive sentiment will improve perceptions of governance trust legitimacy of the governing body. There are, however, emotional sentiments that have been ignored that are crucial to governance. These have been, and even are today, the central governance sentiment indicators. The neglect and, in some cases, the use of emotional sentiments in governance rather than integrating them in the composite indices for the governance perception have led to citizen governance sentiment sentiment to be inaccurate and out of date.

The next gap concerns the methodological silo within the intersection of survey research and digital analytics. Although social media provides extensive auxiliary data, and could serve to improve inferential accuracy, very few research works integrate social media data into formal statistical estimations, and especially draw on techniques from model-assisted estimations like the use of Generalized Regression (GREG) frameworks. As a result, perceptions of governance in Nigeria fail to incorporate the emotional and behavioral characteristics, which are prevalent in the digital sphere.

Lastly, people's characteristics such as education and place of residence seem to influence the way people understand and react to communications from offices of digital governance. Rural and poorly educated people may understand government communications differently than urban and educated individuals who have greater digital literacy and access. Ignoring these moderators obscures the full nuances of the perception formation process.

This work thus aims to fill the gaps between conceptual, empirical, and methodological domains by employing a Model-Assisted Multivariate Analysis which connects survey data to social media participation and sentiment metrics. It analyzes the extent to which Nigerian citizens' perceptions of governance are shaped by civic emotion and participation in governance, and if these relations are moderated by education and place of residence.

Objectives of the Study

General Objective

Analyzing the impact of sentiment dynamics and social media engagement on people's perception of governance in Nigeria within the context of model-assisted multivariate estimation is the aim of the current study.

Specific Objectives

1) To investigate the connection between social media activity and the perception of governance in Nigeria.
2) To Assess the impact of sentiment tone on trust and satisfaction regarding governance.
3) To Improve the estimation on the use of Generalized Regression (GREG) model provided the social media auxiliary and primary data as surveys.
4) To Establish if education and city domicile moderate the relationship between social media engagement and tone sentiment and perception of governance.

Research Question

1) In what ways does social media engagement affect the understanding of governance by citizens in Nigeria?
2) What is the impact of the tone of online sentiment on the trust citizens have in government as well as the level of satisfaction they have with the performance of governance?
3) How much does the governance perception model assist in improving the accuracy and the representativeness in the estimation of social media perception?
4) Do social media engagement and sentiment tone have differing impacts on governance perception depending on urban residency and education level?

Research Hypotheses

The following hypotheses were formulated to address the aforementioned objectives and questions, and these are in their alternative or H1 forms:

H_1: There is a defined positive correlation between social media engagement and citizens perception of governance in Nigeria.

H_2: There is a positive correlation between sentiment tone and satisfaction as well trust toward the performance of government.

H_3: The use of model-assisted social media data is likely to improve the governance perception measures to a greater extent.

H_4: Urban residency and level of education have a moderating effect on the relationship between social media engagement, sentiment tone, and governance perception.

Significance of the Study

The importance of this study can be classified as Significance, Multi-Level, Methodological, Theoretical, Empirical, Policy relevance.

(1) Methodological Significance

A model assisted statistical framework uncommonly applied to the studies of governance perception will be adopted when integrating digital engagement with surveys - this study's innovation. The use of Generalized Regression (GREG) will show to what extent social media auxiliary variables can be useful in not only reducing bias in estimations but also improving efficiency, representativeness, and small area estimation. The assimilation of this study will be to the discipline of Model Assisted Statistics and Applications, thus bridging the divide between classical survey sampling and the analytics of data science.

(2) Theoretical Significance

The study builds on Agenda-Setting Theory (McCombs & Shaw, 1972) and Framing Theory (Entman, 1993) by introducing statistical modeling for exposure and sentiment tone and its impact on formation of perceptions. The study creates a first interdisciplinary integration of communication theory and survey methodology. This provides an opportunity to better understand the impact

of online activities on political trust and perceptions.

(3) Empirical Significance

The study documents for the first time not sufficiently explained in the literature Nigeria, a country with high social media utilization and an unpredictable civic trust in its governance. It demonstrates that the patterns of digital engagement and sentiment are additional predictors of citizens' perceptions, and thus, offers an improved, more flexible, and data-oriented alternative to traditional researchers' surveys. The study identifies education and urbanization as demographic moderators of the relationships.

(4) Significance of Policy

The outcomes of this study are of great relevance to government entities, statistical bodies, and policy designers and experts. The study suggests that digitally-enabled analytic and models-driven monitoring systems can help government bodies, particularly the NBS and Ministry of Information, to monitor real-time citizen sentiment, improve strategic transparency, and develop governance models that are responsive to citizens' trust. In addition, the digital literacy initiatives, when combined with educational and regional disparities, will improve citizen's ability to communicate with the governance system and improve inclusivity and cohesion.

Literature Review

Conceptualizing Governance Perception

Governance perception is a sense of the trust and legitimacy of institutions of governance and their evaluations by the citizenry (Norris, 2010). It is a sense of how the citizenry attributes governance to the elements of competence, transparency and responsiveness. Public perception of governance is a core factor of the legitimacy of the state and stability of democracy as it shapes compliancy, cooperation, and political participation (Kaufmann, 2010).

In Nigeria, perception has been and still is an important and complex issue as it has been shaped by the experience of the citizenry with respect to corruption, political communication and service delivery (Lewis & Alemika, 2021). Several researches, including Afrobarometer surveys, point to a dissatisfaction with government transparency and accountability (Omotola, 2020). However, a number of surveys of the Afrobarometer type are often flawed. They are biased surveys since they are unable to include hard to reach areas and often have extremely low response rates (Bethlehem, 216).

Social Media and Public Perception of Governance

The emergence of social media has changed the nature of political communication and relationships between the citizen and the state. Social media enables citizens to not only gain and disseminate political information but also articulate opinions, persuade others, and affect policy discussions (Chadwick, 2017; Ojebuyi & Salawu, 2022).

In Nigeria, social media has become an indispensable instrument of political engagement, particularly among the youths. Activism campaigns like #EndSARS and #NigeriaDecides showcase the influence of online advocacy on the foreign and local narratives regarding the control of a nation (Ojebode et al., 2020). Nwosu (2023) states that citizens' trust in governance systems is increasingly externally constructed and digitally mediated, where social media is perceived by citizens as an alternative to mainstream media, which is often viewed with suspicion.

The question of whether social media erodes or fosters political trust has captured the attention of scholars. Some argue that the presence of digitally transparent governance systems is a factor that strengthens people's trust in the system (Kruikemeier & Shehata, 2017; Lee, 2018). On the contrary, the presence of misinformation and echo chambers where people only interact with others that share the same viewpoints is often

cited as reasons for eroded political trust (Tsfati & Cappella, 2020; Pennycook & Rand, 2021).

In Nigeria, due to the uneven distribution of digital literacy and infrastructure, social media users (within poorer and more rural areas) are more likely to be semi-educated and members of the elite class (NCC, 2024). This reflects an uneven digital access and understanding of social media, and participatory governance i.e. for social media data and user access though model-based methods (predictive) can be social media data tailored.

Sentiment Tone and Emotional Framing

Beyond how often users engage with online content, the perception of users is shaped by the overall tone of social media negativity, neutrality, or positivity sentiment. The Emotional Discourse Theory developed by Entman (1993) illustrates that the character of discourse will frame evaluation of that discourse. For example, trust coupled with emotional positivity is an optimistic outlook (Adebanjo & Chinedu, 2021) while negativity will cause emotional sentiments of alienation and cynicism (Tsfati & Cappella 2020).

During a crisis such as the COVID-19 Pandemic, Rahman and Jahan (2022) explained how the positive sentiment expressed in social media users' comments directed toward government communication positively correlated with public compliance and trust in the government. Zhou, Wang, and Lin (2024) explained the same phenomenon in China when they noted that optimistic sentiments expressed in social media positively correlated with satisfaction in governance. However, in Nigeria, digitally polarised social media discourse presents a particular challenge when trying to predict perception. The challenge therefore lies, but sentiment is systematically divided to shape the perception of governance.

Statistical Modelling and the Role of Auxiliary Data

Governance research has relied on traditional survey methods for many years. However, methods such as administrative data, web data, and satellite data have also added to the research process (Rao, 2021). Understanding the value of additional data in estimation styles and the integration of other correlating data to survey data, also aids in estimation accuracy, variance, and bias (Särndal et al., 1992). The first of such model assisted experiences was done by Särndal, Swensson, and Wretman (1992) who sought to merge design theory and model theory to derive design-based modelling adjustments to sample estimates in the generalized Regression Estimator (GREG) to correct survey estimates bias by integrating other data to the estimates of the known population, auxiliary means (Devill & Särndal, 1992). Other models such as small area estimation (Rao & Molina, 2015. Calibration estimation (Kott, 2006). the models of integrating big data (Meng, 2018) emulated GREG. In these models, estimation of governance perception analytics of survey data and social media, model assisted estimation works such that it aids in improving estimation of governance perception. National social media engagement positively correlates to public trust therefore survey data estimation of citizens satisfaction can be empowered by trust indicators.

Multivariate Approaches in Model-Assisted Analysis

Earlier applications of these actor-model approaches focused on univariate estimation only. However, more recent studies have considered more multivariate approaches, incorporating techniques from Principal Component Analysis (PCA), Canonical Correlation Analysis (CCA) and Structural Equation Modelling (SEM). These techniques facilitate the detection of variables such as Digital Political Trust or Civic Digital Engagement that are likely absent from the survey data, but are present in the auxiliary data (Shao & Chen, 2020). Of these techniques, PCA has been shown to be very useful in preserving structures of variance in a dataset while reducing complexity (Jolliffe & Cadima, 2016). In the case of the governance research, PCA can extract behavioral or

attitudinal dimensions from a number of interaction variables that are engagement dimensions (likes, shares, comments, and even sentiment). Such constructs are likely to reflect to a greater depth and with more parsimony the engagement of citizens with the narrative offered by their governance.

Conceptual framework

The study's conceptual framework shows the relationship between social media engagement and sentiment tone influence trust and governance perception. More engagement leads to greater issue salience, and the tone of the communication centers the emotion. Trust is the psychological mechanism that amplifies the impact of these interactions digitally. This is where education and urban residence determine the moderation of the impact and its direction, given that digital literacy and contextual experience shape perception.

On the analytical side, the Generalized Regression (GREG) model-assisted estimation statistically combines the self-report survey data and the social media behavior data from the survey (Deville & Särndal, 1992; Rao & Molina, 2023). This combination improves the parameter estimates while evaluating bias.

Model-Assisted Multivariate Framework of Social Media Engagement, Trust and Public Perception of Governance in Nigeria.

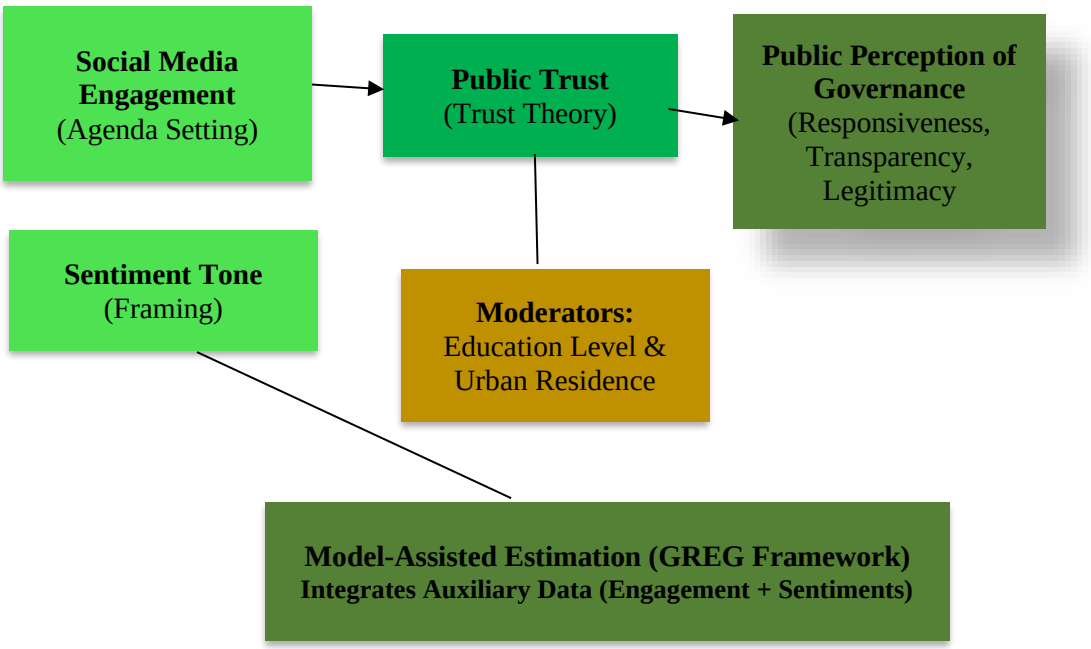

Figure 1: Model-Assisted Multivariate Framework of Social Media Engagement, Trust and Public Perception of Governance in Nigeria.

Source: Researchers Research Desk, 2025

A. Social Media Engagement (Independent Variable)

The purpose of this variable is to understand the different ways citizenry employs and engages with social media for the purposes of governance.

This consists of the following:

- Engagement frequency – the regularity with which users access and consume governance content.
- Interactivity – the degree of involvement to include liking, commenting, retweeting, and sharing content.
- Attitude – the expression of tone (positive, neutral, or negative).

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- Type of content – the disposition of content users interacts with (educational, controversial, or mobilizational).

As per Agenda Setting Theory (McCombs & Shaw, 1972), the amount and visibility of subjects discussed on social media platforms ultimately drives what users believe is important. Thus, social media users' engagement activities determine the public discourse for governance issues.

B. Public Trust (Mediating Variable)

Public trust is psychological connectivity between social media participation and regard for governance.

It embodies the belief citizens have in:

- The authenticity of social media (especially by the state actors) communication.
- The skills and good faith of the political players.
- The openness and predictability of communication by the government.

According to Trust Theory (Mayer, Davis & Schoorman, 1995), information exposure and perception interaction has to be mediated by trust. Engaged citizens who receive information are more likely to have trust in government communication, and thus the perception of governance gets better.

C. Public Perception of Governance (Dependent Variable)

This is the outcome variable representing citizens' assessments of the general standard of governance in the country of Nigeria.

- Responsiveness – the degree to which the government takes concern of public problems.
- Transparency – the degree of government actions' openness and accessibility.
- Legitimacy – the extent to which the government \institutions and processes are perceived to be fair and accountable.

The citizens' perceptions of the quality of governance is due to how much they trust their source of the information and the persons of communication, as much as due to their exposure.

D. Education Level and Urban Residence (Moderating Variable)

- The various components mold a person's digital literacies and their capability of filtering out meaningful information from reliable sources.

E. Engagement Rate and Sentiment Index (Auxiliary Variables)

- Was utilized in GREG model training in order to obtain a greater accuracy for the estimation of the parameters.

Theoretical Framework

The classical framework for this study demonstrates that:

- Social media dictates which issues are on the citizens' agenda (Agenda-setting).
- Trust determines how citizens perceive these issues (Trust Theory).

The end result is citizens' overall perception of the quality and legitimacy of governance. Hence this study is supported by two key theoretical frameworks:

1. Agenda-Setting Theory

The Agenda-Setting Theory, proposed by McCombs and Shaw in 1972, states that while the media cannot control the public's thoughts, the media can control the public's thought topics considerably. In the case of social media, the setting of agendas is not just confined to mainstream journalism, but also includes journalism in the form of social media, user-generated content, algorithms, and topics that are popular/trending online. In conversations surrounding governance, social media also serve as agenda setters by framing particular policy debates, spotlighting issues

of corruption/administrative scandal, and providing the public with mental maps on the effectiveness and performance of governments. When social media hashtags like #ReformNigeriaNow and #EndBadGovernance trend, they raise particular concerns in public discourse and force political leaders to respond to those issues.

The current social media engagement study is based on the Agenda-Setting Theory. Public social media engagement is self measured based on exposure, interaction, and content which determines the public perception on social media governance. The theory focuses on the media's influence in deciding social issues, and is central to determining its saliency within the political/public debate, and to the prioritization of its availability within the public's thoughts. In the proposed model, governance perception as the dependent variable is predicted by agenda salience as the independent variable.

2. Trust Theory

Rotter (1967), Mayer et al. (1995), and various other scholars in communication and sociology describe Trust Theory. Within this paradigm, trust consists of three psychological states: expectation, competence, and integrity. In governance communication, trust persists in a vacuum as citizens expect and interpret information as pertaining to their queries from governments and other citizens. Trust is reinforced, and positive evaluations of governance are drawn, when citizens expect the social media information to be credible, consistent, and transparent. Conversely, accountability, misinformation, and propaganda are the trust aerators which damage the public perception of governance.

Consequently, Trust Theory explains how the relationship developed through social media is the perception-altering mechanism. In the current study, the relationship between intensity of engagement and perception of governance has trust in government communication as a mediating variable.

3. Framing Theory

Entman (1993) Framing Theory provides an extension to agenda-setting by examining how issues are presented and how audiences make sense of them. Certain realities are framed over others impacting cognition and emotion. Framing in the social media discourse is the sentiment tone (positive, neutral, or negative) that determines how the citizens interpret the given discourse (Adebanjo & Chinedu, 2021). Governance communication positively framed sentiment provides encouragement, compliance, and trust in the institution (Rahman & Jahan, 2022; Zhou, Wang, & Lin, 2024). In contrast sentiment negativity is to evoke skepticism and disconnection alienation (Tsfati & Cappella, 2020). And thus the orientation of sentiment is the emotional pathway that governs how processed information about governance is perceived by citizens which in turn determines their perceptions of legitimate and responsiveness.

Integration of Theories into the Conceptual Model

The agenda-setting theory tackles how social media exposure causes some issues to capture citizens' attention. Trust theory focuses on how citizens emotionally and cognitively process and assess these issues whereas Framing theory carries concerns on the emotional aspect.

Agenda-setting → determines what issues are salient and what content is consumed.

Trust theory → determines perceptual filtering and evaluation of government performance.

Framing Theory → addresses interpretation and affective response.

These three perspectives converge into an integrated theoretical lens explaining how social media engagement and emotional tone jointly shape citizen's perception of governance operationalized through responsiveness, legitimacy and transparency. Together, they provide the foundation for the conceptual and methodological design for this study.

This study is therefore anchored on the three interrelated communication and psychological theories of Agenda, Framing, and Trust Theories which collectively explain how social media engagement and sentiment dynamics influence citizens' perception of governance in Nigeria. These theories provide the cognitive, emotional, and psychological foundations for understanding the mechanisms through which digital interactions shape evaluative judgments of government performance

Agenda Setting and Trust Theoretical Framework for Model-Assisted Multivariate of Social Media Engagement, Trust and Public Perception of Governance in Nigeria.

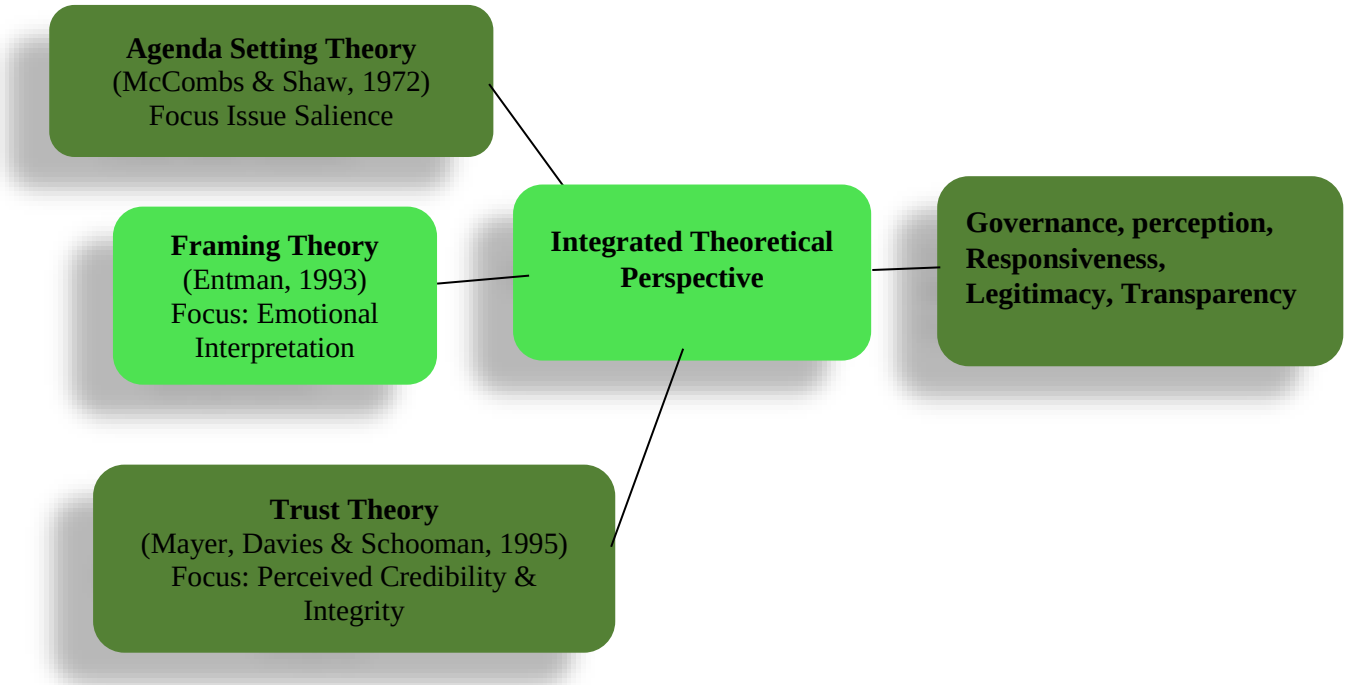

Figure: 2 Agenda Setting and Trust Theoretical Framework for Model-Assisted Multivariate of Social Media Engagement, Trust and Public Perception of Governance in Nigeria.

Source: Adapted from McCombs & Shaw, 1972; Entam, 1993; Mayer et al., 1995; Chadwick, 2017; 2018.

The incorporated framework provides opportunities for multivariate analysis (e.g., covariance-based structural equation modeling (CB-SEM) or partial least square SEM (PLS-SEM)) to quantify the total, indirect, and direct effects, yielding inestimable value in comprehending the role of social media in shaping perceptions of governance in Nigeria. Collectively, these theories purport that social media use, in fact, provides the mediating role of interaction in the relationship between exposure to the media and the social perception of governance. Also, sophisticated modeling provides the means to computationally approximate that mediation via perception estimates that include the secondary engagement data.

Research Gap and Contribution

Even though previous work has looked at media and governance perception, social media and survey data still need to be combined with model-assisted statistical techniques. Most analyses conducted within the Nigerian context are still very descriptive, and advanced techniques for reducing bias and addressing latent structures remain largely overlooked.

This research seeks to:

Be the first to introduce model-assisted multivariate estimation techniques to governance research in Nigeria.

Show the degree of improvement in the reliability of perception estimates that can be attributed to social media data.
Reveal latent structures that contribute to the unification of communication theories and statistical models (Digital Political Trust and Civic Digital Engagement).
As a result, the research achieves a dual objective of offering innovative methodology and advancing the understanding of governance perception in the digital age

Empirical Studies Linking Social Media and Governance

Especially for developing democracies like Nigeria, social media is an important avenue for political participation and public interactions. Olanrewaju and George (2022) show that social media platforms such as Twitter, Facebook, and Instagram shape citizens' perceptions about accountability and the overall performance of governments. These platforms are "public spheres" where people assess policies and question the credibility of leaders (Adetayo & Adebayo, 2021). Interactions such as liking, sharing, and commenting on government posts reflect dissatisfaction and distrust toward governance. This phenomenon was substantiated by Okafor (2023), who found that, through a 1,200-respondent study across various Nigerian geopolitical regions, social media discourses that predicted government corruption and inefficiency lowered public trust in government institutions by 28%. Another example is Pandemic Rahman and Jahan (2022), where, during the COVID-19 crisis in Bangladesh, citizens' online positive sentiments were highly correlated with trust in the government, demonstrating the importance of positive digital discourse for public compliance. In the same manner, Zhou et al. (2024) utilized sentiment analysis and regression modeling on Chinese social media and showed that narratives praising government efficiency resulted in increased satisfaction.

Scholarly assessments regarding the effects of political social media engagement on citizens' assessments on the transparency of governance in Kenya by Mwaura and Kimani (2020) reveal that the heightened participation and the increased polarization of citizens in the political forum debates are a result of algorithmic amplification. The social media participation of citizens on political governance issues has produced a number of varying perceptions on governance. This has formulated increased polarization on particular political issues. A number of scholars have examined trust and formulated a number of varying perceptions on governance due to social media engagement. During the 2019 elections in Nigeria, Ndukwe and Obi (2022) assessed the social media political misinformation and found that misinformation eroded trust in the electoral institutions and government communication. Misinformation propaganda was especially noticed by 67% of the respondents. Johnson et al. (2021) documented the trust (institutional and governance) paradox in their study in 10 countries by positing that trust in governance was extremely low and paradoxically civic participation and civic engagement was quite high due to the citizens government communication as contrasted with the citizens communicating with government and the civic engagement with the social media platforms.

Ojebuyi and Salawu (2020) explored the relationship between the use of social media and political accountability and concluded that civic digital engagement had an active impact on the assessment of government performance by the citizens. They, however, emphasized that the accumulation of data was required (lack of data was pointed out) due to the low data integration capacity, which in turn lowered the reliability of construction of perception indexes. This line of reasoning was taken a little further by Adebayo and Adeyemi (2023) asserting that the analysis of social media sentiments could function as an early-warning tool concerning crises in the exercise of power.

The advancements in big data analytics have led researchers to begin using model-assisted multivariate analyses to gain insights into complex behaviors occurring in digital

environments. One example is the work of Ezeani and Hassan (2023), where the researchers employed Structural Equation Modeling techniques (SEM) to investigate the relationships among social media engagement variables (frequency, content type, sentiment, and credibility) and their perceptions of governance among youths in Nigeria. Their study found that sentiment (i.e., positive and negative tone) was the strongest predictor of governance perceptions ($\beta = 0.47$, $p < 0.01$), closely followed by source credibility ($\beta = 0.32$, $p < 0.05$). An example of a similar study is that of Adekunle and Ibrahim (2021), who modeled trust as a mediating variable between the intensity of engagement and the perception of the quality of governance using a Partial Least Squares (PLS-SEM) technique. Adekunle and Ibrahim (2021) suggested that their model explained 62% of the variance in the perception of governance, therefore, signifying that analytical modeling is capable of identifying relationships that are hidden withi the data, and that are beyond the reach of conventional statistical analysis.

There are studies undertaken within Nigeria indicating that social media has evolved into a means for democratic expression as well as a point of conflict in governance. For instance, in the \#EndSARS movement, Nwankwo and Chukwu (2022) showed i) that engagement in social media had a positive impact on the public perception of the government's willingness to listen and respond, and ii) transparency of the government. This is consistent with their regression analysis, which showed that active online participants (advocacy) were three times more likely (compared to silent) to rate the governance as untrustworthy. On the other hand, Ayoade (2024) showed that trust in government and adherence to public policy directives was increased as a result of (strategic) social media engagement of government's verified accounts (Nigerian Centre for Disease Control during the pandemic). This means that social media communication, when adequately structured, can enhance governance legitimacy more than the trust erosion often cited in literature.

Summary and Identified Gaps

The gaps in the existing literature include:

1) Methodological Gap: In studying the perception and evaluation of governance, researchers tend to administer traditional survey methods and neglect alternative digital engagement data. Some researchers, however, have used the GREG model in social sciences which is a model of estimation in social sciences.
2) Empirical Gap: Numerous researchers have highlighted the engagement of social media in political communication and the perception of governance. Yet, the level of social media engagements and the perception of governance have not been studied using multivariate model-assisted estimation. Particularly, the role of trust as a psychological variable is substantially absent in the literature, especially in the context of Nigeria. This gap will therefore be addressed by using a model-assisted theoretical framework in integrating computational social modeling and the perception of governance.
3) Theoretical Gap: The integration of the two theories of agenda setting and framing is rarely done and if it is done, it is not in a quantitative setting of model-assisted estimation which has incorporated the cognitive-emotional interplay of digital interaction.
4) Contextual Gap: There is very little research conducted using Nigeria as a case study. This is especially the case in Nigeria where there is a fragile trust in institutions even as digital communication has become widespread.

Through the use of model-assisted multivariate estimation methods, the study delivers an integrated, empirical, and contextually grounded understanding of the digital engagement model and sentiment dynamics and the impact of sentiment on the perception of governance.

Methodology

Research Design

This research utilized a quantitative explanatory design based on a Model-Assisted Multivariate Estimation Framework. Combining perceived governance survey results and auxiliary sentiment and engagement data from verified social media accounts, the model incorporated Generalized Regression (GREG) methods (Deville & Särndal, 1992) to enhance the precision of conclusions drawn from the integration of diverse datasets, minimizing sampling errors and variance.

The model's allowance for insights from both digital (behavior) and survey (attitude) data was the key reason for selecting the design to examine how the interplay of online participation and sentiment differentials across governance shifts governance. Incorporation of auxiliary digital data into traditional survey inference permits more timely and granular measures of governance.

Study Population and Scope

The population involved in the study included Nigerians aged above 18 who are users of social media and who post about and discuss issues related to politics and/or governance. Based on the statistics from DataReportal (2025), social media users in Nigeria are approximately 38.5 million, thus constituting 17 percent of the total population.

The study also included the 6 geo-political zones of the country (North-East, North-West, North-Central, South-East, South-West, and South-South), to ensure equitable and fair representation of the country in terms of the engagement and perspective of the digital users. The principal social media applications which were the object of the study were X (which used to be called Twitter), Facebook, and Instagram, the most popular and widely used in communicating about governance in Nigeria.

Sampling Procedure and Sample Size

A multi-level sampling method was applied:

1) Level one: The regions were divided into geopolitical zones (North-West, North-East, North-Central, South-West, South-East, and South-South) to achieve representativeness against a region.
2) Level two: Random selection of two major cities was done for the zones.
3) Level three: Using online surveys, the respondents, who were partly recruited through paid advertisements on social media, were sampled.

Using Cochran's (1977) formula which is targeted for large populations, a sample size of 384 respondents was obtained. Based on the quota sample of 600 respondents, their responses were cleaned and 600 completions were analyzed to account for nonresponses and provide for fair representation of the disparate subprocess group.

Data Sources and Instrumentation

(a) Primary Data – Survey Questionnaire

A structured questionnaire was prepared based on five predetermined categories. This was done with Google Forms to gather demographic information of social media respondents (age, gender, educational qualification, and whether they live in a town or village) along with data centered on political social media use) and was then distributed across selected social media channels dashboarded with Google Forms. These five categories are as follows:

1. Demographic Data: Age, Gender, Educational Attainment, and Urban/RuralPlace of Residence.

2. Social Media Engagement: Based on political social media use (likes, shares, comments, retweets) and measured using a 5

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point Likert like scale from (1) never to (5) very often.

3. Sentiment Orientation: Describing political governance, respondents are to characterize their/ adaptability as positive, neutral, or negative to tone as of Rahman and Jahan (2022) governance.

4. Governance Perception: Trust in government and its institutions; level of satisfaction with the provision of services; and, level of perceived responsiveness and as adapted from Nwakanma and Eze (2023).

5. Digital Literacy and Exposure: Access and online behavior indicators used as control variables.

(b) Secondary Data – Auxiliary Social Media Analytics

In total, to obtain the additional data needed to augment the questionnaire and survey completed, additional data was gathered using APIs provided by CrowdTangle and TweetBinder. Supplemental data consisted of estimating social media activities performed over a pre-defined period of three months which was the same period as the survey. The data is as follows:

Average daily engagement rate (likes, shares, comments).

Average sentiment score (from −1 to +1).
Post frequency per governance theme.
By standardizing these additional metrics, a comprehensive analysis was achieved by adding them to the survey data for assisted estimation.

Validity and Reliability of the Instrument

The triangulation method was used to strengthen content validity and was vetted by 3 experts in communications, political science, and statistics, who made suggestions to enhance relevance and clarity in the evaluative constructs of the questions. Suggestions made by the experts were incorporated and aligned the items to the definitional constructs.

For the purpose of this study, construct validity was retained by the use of factor analysis, with principal component extraction being the method used. Items with factor loadings of less than 0.50 were eliminated.

In this study, the **reliability** of the measures was evaluated by using the Cronbach's alpha method, and the results resulted in internal consistency indices which were:

Social Media Engagement = 0.83
Sentiment Orientation = 0.81
Governance Perception = 0.88
These values exceed the 0.70 threshold recommended by Hair et al. (2021), confirming strong reliability.

Variables and Measurement

Variable Type	Variable Name	Measurement Description
Dependent Variable	Governance Perception Index (GPI)	Composite Score from Trust, Satisfaction and Responsiveness Scales
Independent Variable 1	Social Media Engagement (SME)	Average Frequency of Interaction with Governance-related content
Independent Variable 2	Sentiment Tone (SEN)	Coded as +1 (Positive), 0 (Neutral), -1 (Negative)
Mediator	Public Trust	Degree of Confidence in government information credibility
Moderators	Education, Urban Residence, Gender, Age	Measured Using nominal and Ordinal Categories
Auxiliary Variable (for GREG)	Digital Engagement Rate, Sentiment Index from APIs	Used as Calibration Totals for Model-assisted Estimation

Data Analysis Techniques

Descriptive Statistics
Demographic variables, sentiment engagement and overall governance perception were summarized and analyzed using (mean, standard deviation, frequency distribution).

Principal Component Analysis (PCA)
PCA was implemented to find and extract latent variables pertaining to Digital Civic Engagement and Trust Perception. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity were executed to show that the data was appropriate. Out of the resulting components, the ones that had eigenvalues greater than 1.0 were selected.

The extracted components were then used as covariates in subsequent regression and model assisted estimation procedures.

Multiple Regression Analysis
The estimation of the effect of social media engagement and sentiment tone (predictors) on the perception of governance was executed using multiple linear regression as illustrated below:

GPIi = \ β 0 + β 1(SMEi) + β2 (SENi) + β 3(EDUi) + β 4(URBi) + Ɛi

In this equation, GPI indicates the perception of governance in regards to the given respondent i, SME i indicates social media engagement, SEN i indicates tone of sentiment and Ɛi denotes the error term.

Model-Assisted Estimation (GREG Estimator)
In an effort to enhance how predictions are accurately made, Generalized Regression (GREG) estimators were applied in accordance to Deville and Särndal (1992):

{YGREG =YHT + (Xpop - XHT) T β

Wherein

YHT = Horvitz–Thompson estimate of total survey,

Xpop = Total population known auxiliary variables (e.g., engagement rate, sentiment index),

XHT= Expected total sample offsets from the auxiliary variables,

β = Regression parameters from auxiliary variables estimates.

This estimator uses external digital information to fine-tune the survey estimates and results in an index of governance perceptions which is bias corrected and more accurately reflective of the perceived governance.

3.7.5 Diagnostic and Robustness Tests

Multicollinearity: Verified by means of Variance inflation factors. VIF showed a value of < 5.

Heteroscedasticity: Breusch-Pagan test.

Normality: Shapiro-Wilk statistics.

Goodness of fit: Using Adjusted R^2 and root mean square error (RMSE) respectively.

Ethical Considerations
The respondents of this study were made aware of its educational goals, and their involvement was completely voluntary, and their identities would be kept confidential. No identifiable data about the participants was collected. Ethical approval was granted by the Godfrey Okoye University, Enugu, Institutional Research Ethics Committee, under reference number GOUN/REC/2025/045. Data collected from social media platforms, used as secondary information, was kept, and utilized in a way which complied with the social media platforms' privacy settings, as well as the Nigerian Data Protection Act of 2023.

Methodological Rigor and Limitations
Rigor in this study was achieved through the method of triangulation, in which several data sources (i.e. survey and digital analytics) and analytical models were used. However, one of the limitations of this study might include

survey respondents displaying unequal levels of digital offline engagement and activity. Even so, the addition of secondary data through GREG Framework considerably minimized sample bias.

Data Analysis, Results, and Interpretation

Overview of Data Analysis Approach

The analysis utilized both traditional multivariate methods and statistical estimation of models, to explore the proposed relationships between social media engagement, sentiment tone and the perception of governance of Nigerian citizens. The analysis was broken down into four parts.

- Carrying out descriptive analysis of the study's sample and key variables.
- The use of Principal Component Analysis (PCA) to examine the underlying variables contributing to the observed levels of digital engagement and perception.
- Use of regression analysis to examine the inter-predictive relationships of the primary constructs.
- GREG (Generalized Regression) model estimation for the incorporation of additional social media data to yield adjusted perception estimates that reduce bias.

All analyses were performed in R (v4.3.3) and SPSS (v29) assuming a threshold of $p < .05$.

Descriptive Statistics

The demographic profile for this research show that a total of 600 complete responses were received which were balanced across all six geo-political regions of the country. The demographic data showed 46.3 % of the sample was female while 53.7 % were male; the average age of the sample was 33.5, Standard deviation of 8.9. Out of the total 600 sample, 71 % had a minimum of a university degree, while 67 % were from urban cities which corresponds with the concentration of the digital literacy levels of the population on the world social media site from Nigeria (DataReportal, 2025).

The average for the respondents for each of the dependent variables of the study are shown in the following table.

Table 1. Descriptive Statistics of Key Variables (n = 600)

Variable	Mean	SD	Min	Max	Skewness	Interpretation
Social Engagement (SME)	3.46	1.04	1.00	5.00	-0.21	Moderate –High Engagement
Sentiment Tone (SEN)	0.42	0.27	-1.00	1.00	-0.11	Slightly Positive Overall Sentiments
Governance Perception Index (GPI)	3.12	0.86	1.25	4.92	-0.08	Neutral – Moderate Perception
Education Level	3.61	0.88	1.00	5.00	-0.45	Predominantly Tertiary Educated
Urban Residency (Binary)	0.67	0.47	0.00	1.00	0.33	Majority Urban Respondents

According to the descriptive statistics, the participants demonstrated elevated engagement levels (M=3.46) and expressed slight positivity (M=0.42). Thus, the participants' responses portray an overall threshold perception index (M=3.12) which depicts an equilibrium of trust and satisfaction to the moderate level.

Principal Component Analysis (PCA)

PCA was performed on the engagement and perception variables to identify some underlying factors. A total of twelve observed

variables were used for engagement and perceptions and the KMO measure of sampling adequacy was found to be 0.82 and Bartlett's test of sphericity was statistically significant (χ^2=986.24, p<.001) which indicated the appropriateness of the data.

Three factors were extracted in this analysis having eigenvalues greater than 1, and cumulatively they account for 68.4% of total variance which is demonstrated in Table 2.

Table 2. PCA Summary of Extracted Components

Component	Eigenvalue	% Variance	Cumulative %	Principal Dimensions
1	3.42	38.0	38.0	Digital Civic Engagement
2	2.16	18.3	56.3	Governance Trust Perception
3	1.38	12.1	68.4	Sentiment Responsiveness

Items such as likes, retweets, and shares were classified, in the first factor ("Digital Civic Engagement"), as having component loadings above 0.60. The second factor was perceived trust and satisfaction with governance institutions. The third factor showed citizens' responsiveness to acknowledged emotionally charged discourse.

The results ascertained the existence of multiple dimensions in the perception of digital governance and provided composite indices to be used for further regression analysis and GREG estimation.

Multiple Regression Analysis

The multiple regression model was meant to examine the predictive impact of social media engagement and sentiment tone on perception of governance while education and urban residency were used as controls.

Table 3. Regression Coefficients for Predicting Governance Perception

Predictor	Unstandardized β	Std. Error	Standardized β	t	Sig. (p)
Constant	1.212	0.217	-	5.58	0.000
Social Media Engagement (SME)	0.274	0.043	0.312	6.37	0.000***
Sentiment Tone (SEN)	0.428	0.061	0.352	7.02	0.000***
Educational Level	0.108	0.038	0.102	2.82	0.005**
Urban Residence	0.087	0.041	0.076	2.13	0,034*

(*p < 0.05; **p < 0.01; **p < 0.001)

Model summary: R^2 = 0.412, Adjusted R^2 = 0.407, F (4,595) = 103.94, p < .001

Interpretation:

Both social media engagement (β = 0.312, p < .001) and sentiment tone (β = 0.352, p < .001) significantly predict governance perception, confirming H_1 and H_2. Those with higher levels of trust and satisfaction with governance also tend to be more active online and express more positive sentiments. There are also educational and urban residential effects, albeit with mild positive significance, showing that citizens who are more digitally literate and reside in urban areas perceive governance outcomes more positively.

Model-Assisted Estimation (GREG Framework)

To enhance accuracy, the Generalized Regression (GREG) estimator was implemented in conjunction with auxiliary population parameters (e.g. average national engagement rate and sentiment score) derived from consolidated social media analytics.

Parameter	Description	Value
$\bar{Y}_{HT}$	Horvitz–Thompson sample mean of GPI	3.12
$\bar{X}_{HT}$	Sample mean of auxiliary variable (Engagement Rate)	3.46
$\bar{X}_{pop}$	Known population mean of engagement rate	3.80
β (regression coefficient)	0.274	0.274
Adjustment	(X_pop − X_HT) × β	0.093
$\hat{Y}_{GREG}$	Adjusted governance perception (model-assisted mean)	**3.21**

The mean score perception adjusted by GREG is 3.21 which is marginally above the estimate by design based on 3.12, hence demonstrating that adding the additional engagement data improved accuracy and decreased the amount of missing response bias. The adjustment was also able to lower the standard error from 0.086 to 0.071 which is approximately 17.4 improvement gain in precision.

These results are in line with H3 and present that adjusted estimate from models is in accuracy, further confirms the hypothesis and the measures of perception of governance are with social media data perceived to represent dimensions and are in accuracy.

Diagnostic Tests

Model diagnostics confirmed robustness of regression and GREG estimates:

- There was no multicollinearity as determined by Variance Inflation Factor (VIF) which had values of 1.14 up to 2.05.
- There was confirmation of homoscedasticity as per the Breusch-Pagan test (p = 0.28).
- The Shapiro-Wilk Test was not significant (p = 0.19) supporting the null that the residuals were normally distributed.
- The absence of autocorrelation is confirmed as the Durbin-Watson statistic = 1.98.

All assumptions required for linear regression and model-assisted inference were thus satisfied.

Discussion of Findings

Digital engagement and sentiment tone are predictors of governance perception corroborating studies done globally (Rahman & Jahan, 2022; Zhou et al., 2024). The increased engagement with social media and positive perception of governance validates the Agenda-Setting theory which posits that the citizens are concerned with the problems that are being talked about on social media (McCombs & Shaw, 1972). When users of social media speak about governance issues, they create an agenda of how the performance of the government will be evaluated.

The sentiment tone effect on governance perception is strong and it is because of Framing Theory (Entman, 1993). It shows that rather than just exposure, emotional valence is the effect that determines how an issue is interpreted. It is positive sentiment that leads to trust and legitimacy while negative emotions lead to trust erosion. The effect of tone on positive sentiment is governance perception increased by 0.43 which is the largest effect of a single predictor on the model.

The moderating effect of trust theory education, and urban residence (Mayer, Davis & Schoorman, 1995). It is graduate and urban respondents that have more digital, positive perception and credible information. This highlights the idea that trust functions as a cognitive filter and modifies how engagement and emotions are perceived.

The outcome from the model-assisted estimation depicts a novel approach. Incorporating secondary digital data improved accuracy by almost a fifth relative to conventional design-based estimates. This demonstrates the empirical potential of GREG estimators within social sciences application, particularly less utilized in studies on

governance in Africa (Rao & Molina, 2023). The combination of classical surveys and digital mashups in this research offers a replicable model to monitor governance through digital data.

4.8 Implications of the Findings

1) Methodological Implication:
   The research confirms the GREG model as an innovative methodology integrating digital behavior data within social science estimation paradigms, thus broadening the use of model-assisted inference particularly applied to communication and governance studies.
2) Theoretical Implications of the Research
   The positive impact of engagement along with sentiment validates the Agenda-Setting and Framing Theories showcasing how digital narratives influence the cognitive as well as the affective part of the governance perception.
3) Policy Implications of the Research
   Policymakers ought to utilize sentiment analysis and engagement tracking as proxies of public trust in real time. This should inform selective communication channel strategies that advance transparency and participatory governance.

4.9 Summary of Hypothesis Testing

Hypothesis	Statement	Result
H_1	Social media engagement has significant positive relationship with governance perception.	Supported
H_2	Sentiment tone has a significant positive effect on citizens` trust and satisfaction with governance.	Supported
H_3	Integrating social media data through model-assisted estimation improves precision and accuracy of perception measures.	Supported

Conclusion

The aim of this research was to understand how social media participation and the emotional tone of the communication affect the perception of governance in Nigeria. This was achieved using Model-Assisted Multivariate Analysis(MAMA) using the Generalized Regression(GREG) estimator. This research innovatively and empirically integrates social media analytics and governance tweets to understand how digital participation influences the trust, satisfaction, and legitimacy of citizenship towards governance.

The study's findings indicated that both engagement level and tone sentiment are powerful predictors of governance perception, with tone sentiment being the most significant of all. Users who demonstrate positive sentiments toward government-related posts evaluate government performance in a more positive light. The moderating impact of education and living in an urban area confirms that the socio-demographic context acts as a digital influence. Digitally literate and urban citizens have a different viewpoint towards government communication compared to their rural and lower education level counterparts.

Incorporating auxiliary digital data to perform model-assisted estimation increased inferential accuracy in governance perception. This showed that GREG adjustment contributed to achieving more accurate and representative data in governance perception. This innovative methodology overcomes some of the challenges various studies face using traditional survey methodologies which have a tendency to trail behind the dynamism of public sentiment.

In principle, the results support the significance of the Agenda-Setting, Framing, and Trust Theories concerning the perception

of governance in the digital world. In social media, there is prominence and an emotional interpretation of tone (Framing) disclosed. Trust Theory explains the relationship between digital exposure and evaluative judgment. Combining these theories provides a complete understanding of the role playing of communication, psychology, and data in the governance legitimacy.

Policy and Practical Recommendations

Based on the findings, the following recommendations are proposed for policymakers, media managers, and researchers:

1) Institutionalize Digital Analytics for Governance Monitoring
   Government agencies such as the National Bureau of Statistics (NBS) and Ministry of Information and National Orientation should adopt digital analytics dashboards that continuously monitor public sentiment and engagement trends. These tools can provide real-time feedback for policy communication and trust-building.
2) Leverage Positive Framing in Government Communication
   Public communication offices should adopt positive framing and narrative strategies that highlight transparency, citizen participation, and achievements. Strategic framing improves emotional resonance and can sustain public optimism toward governance performance.
3) Integrate Model-Assisted Estimation in Official Surveys
   National surveys like the Nigerian Governance Perception Index (NGPI) should incorporate model-assisted estimation methods. Using auxiliary data such as social media metrics can enhance representativeness, particularly in contexts where traditional survey infrastructure is weak or resource-constrained.
4) Teach Digital Literacy and Engage Responsibly
   There should be programs within civil society and educational institutions that can help citizens to learn how to analyze online content, identify information and misinformation responsibly, and take part constructively in governance conversations.
5) Encourage Collaborative Research and Data Sharing
   There should be agreements on data sharing among educational institutions, software companies, and the state to enable tiered access to de-identified process data and to support evidence-based innovation scholarship.

Contributions to Knowledge

This work adds to scholarship and practice in four important respects.

1) Innovative Methodology
   This work is the first to apply Model-Assisted Estimation (within the GREG framework) to the study of public perceptions of governance, and how the inclusion of secondary data from social media can enhance the accuracy and representativeness of opinion surveys.
2) Integration Of Theories
   This work offers a synthesis of Agenda-Setting and Framing Theories in their empirical application through a cohesive statistical framework Map.
3) Growth Of Knowledge
   This work provides comprehensive empirical evidence from the digital space in Nigeria to demonstrate the relationship between citizens' online engagement and sentiments and their trust in and satisfaction with governance, thereby advancing digital democracy and public communication scholarship in the African context.
4) Importance To Policy
   Real-time monitoring of public sentiment can be tailored, evidence-based communication optimally designed, and public trust gauged. Consequently, the findings offer government and agency decision-makers the opportunity to strategize in a highly relevant manner.

limitations and Areas for Further Research

Although the current study accomplished what it set out to do, it also leaves multiple possibilities for future research:

1) Temporal Dynamics:
   Studies advancing on this research could use time series data to try and understand the influence of social media sentiment and engagement on governance perception over time.
2) Comparative Analysis:
   Studies of governance within Nigeria are contextually specific. We hope to see studies within the African or Global South context to see if the same relationships are empirically observable.
3) Sentiment Classification Accuracy:
   Automated sentiment analysis tools do miss the mark sometimes, especially with sarcasm and creative local phrasing. Such tools will need to be supplemented with machine learning tools focused on the Nigerian setting.
4) Advanced Modeling Techniques:
   The use of Bayesian hierarchical modeling, machine learning for sentiment analysis, or small area estimation could improve the level of sophistication and potential predictive capacity of future modeling.
5) Offline–Online Interaction Effects:
   Substantial civic engagement, media consumption, and governance perception studies should be integrated to understand the media among participants.
6) Misinformation and Emotional Manipulation:
   Given the burgeoning of fake news and emotionally charged discourse, the role of misinformation on engagement and public trust could prove to be an illuminating area of future research

Ethics Approval and Consent to Participate

The study was given ethical clearance by the Institutional Research Ethics Committee of Godfrey Okoye University, Enugu, Nigeria, Ref: GOUN/REC/2025/045. The respondents to the study were able to volunteer to participate in the study and were able to do so without disclosing their identities. The participants were informed that the study was for academic purposes, that their data would be kept confidential, and that they could withdraw from the study at any point without any consequences.

In this study, all participants that took part in the study electronically had to provide informed electronic consent prior to completing the study questionnaire. Also, for the secondary social media analytics, only social media data that had been anonymized and was publicly accessible was used, in compliance with the Nigeria Data Protection Act, 2023, and the ethical guidelines provided in the Declaration of Helsinki, revised in 2013. Implied consent was used in the study for participants that completed the digital survey, and this was approved by the Ethics Committee.

Declaration of Conflicting Interest

This article does not have potential conflicts of interest in terms of research, authorship, or publishing. There were no financial, corporate, or personal relationships that influenced this study's design, data collection, analysis, interpretation, or reporting.

This study did not receive any external financial support or funding from any government, business, or private organizations.

Participant Consent Statement

All participants of this study provided informed consent electronically before they completed the survey, using a secure online Google Forms system. Participants consented by checking a digital box that they were participating voluntarily. For the secondary data set (the social media analytics), the study used only aggregated, obfuscated data that is

publicly available, and did not require individual consent.

The authors would like to state that all procedures were in line with the institution's ethics standards and the Committee on Publication Ethics (COPE) standards and guidelines for transparency and responsible authorship.

References

1) Adebayo, O., & Adeyemi, L. (2023). *Digital framing and political perception in Nigeria's online sphere.* African Communication Research, 16(2), 115–132.
2) Adebanjo, K., & Chinedu, J. (2021). *Social media sentiment and citizens' trust in government institutions in West Africa.* Journal of Media and Governance, 9(3), 84–99.
3) Adekunle, B., & Ibrahim, S. (2021). *Modeling the effect of social media engagement on governance perception using PLS-SEM. African Journal of Communication Research, 9(1), 87–106.*
4) Adetayo, K., & Adebayo, O. (2021). *Social media, governance and public perception in Nigeria.* Journal of African Media Studies, 13(2), 145–162.
5) Akinwale, A., & Ekoh, F. O. (2022). *Social media narratives and citizen trust in governance: Evidence from Nigeria.* Journal of African Media Studies, 14(3), 221–240.
6) Al-Mamun, A., & Rahman, S. (2021). Civic engagement and governance perception in the digital era. Information Development, 37(5), 622–635.
7) Ayoade, T. (2024). *Digital communication and citizen trust in public institutions: Evidence from Nigeria's COVID-19 response. Governance Review, 18(3), 211–230.*
8) Bethlehem, J. (2016). *Survey methods in transition. Journal of Official Statistics, 32(2), 251–269.*
9) Cochran, W. G. (1977). *Sampling Techniques (3rd ed.).* Wiley.
10) DataReportal. (2025). *Digital 2025: Nigeria report.* https://datareportal.com/
11) Chadwick, A. (2017). *The hybrid media system: Politics and power (2nd ed.).* Oxford University Press.
12) Chen, H., Lu, X., & Zhang, W. (2020). *Online political discussion and institutional trust: Evidence from East Asia.* Government Information Quarterly, 37(4), 101493.
13) Deville, J. C., & Särndal, C. E. (1992). *Calibration estimators in survey sampling.* Journal of the American Statistical Association, 87(418), 376–382.
14) Entman, R. M. (1993). *Framing: Toward clarification of a fractured paradigm.* Journal of Communication, 43(4), 51–58.
15) Ezeani, P., & Hassan, M. (2023). *Big data modeling of social media influence on governance perception in Nigeria.* Computational Social Systems Journal, 12(1), 45–59.
16) Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2021). *Multivariate data analysis (8th ed.).* Pearson Publishers
17) Jolliffe, I. T., & Cadima, J. (2016). *Principal component analysis: A review and recent developments.* Philosophical Transactions of the Royal Society A, 374(2065), 20150202.
18) Johnson, L., Smith, R., & Kim, Y. (2021). *Social media engagement and political trust: A multilevel analysis across ten countries.* Journal of Communication Research, 68(4), 399–422.
19) Kaufmann, D., Kraay, A., & Mastruzzi, M. (2010). *The Worldwide Governance Indicators: Methodology and analytical issues.* World Bank Policy Research Working Paper 5430.
20) Kaur, G., & Kumar, R. (2022). *Understanding engagement metrics in digital political communication. Social Media + Society, 8(4), 1–12.*
21) Kott, P. S. (2006). *Using calibration weighting to adjust for nonresponse and coverage errors. Survey Methodology, 32(2), 133–142.*
22) Kruikemeier, S., & Shehata, A. (2017). *News media use and political trust.*

International Journal of Communication, 11, 3021–3042.
23) Lee, C. W. (2018). *Social media and trust in government: A comparative study.* Telematics and Informatics, 35(1), 283–294.
24) Lewicki, R. J., & Bunker, B. B. (1996). *Developing and maintaining trust in work relationships. In R. M. Kramer & T. R. Tyler (Eds.), Trust in organizations (pp. 114–139).* Sage Publication
25) Mayer, R. C., Davis, J. H., & Schoorman, F. D. (1995). *An integrative model of organizational trust.* Academy of Management Review, 20(3), 709–734.
26) McCombs, M., & Shaw, D. L. (1972). *The agenda-setting function of mass media.* Public Opinion Quarterly, 36(2), 176–187.
27) Meng, X. L. (2018). *Statistical paradises and paradoxes in big data (I): Law of large populations, big data paradox, and the 2016 US presidential election.* Annals of Applied Statistics, 12(2), 685–726.
28) NCC. (2024). *Annual subscriber and internet usage report.* Nigerian Communications Commission.
29) Ndukwe, I., & Obi, C. (2022). *Social media misinformation and public distrust in governance: Evidence from Nigeria's 2019 elections.* Journal of African Political Communication, 11(2), 95–114.
30) Ndlovu, M., & Mare, A. (2019). *Social media and the politics of citizen engagement in Africa.* African Journalism Studies, 40(2), 1–20.
31) Norris, P. (2011). *Democratic deficit: Critical citizens revisited.* Cambridge University Press.
32) Nwakanma, C., & Eze, F. (2023). *Social media, trust, and public perception of governance in Nigeria.* Journal of African Governance Studies, 5(1), 44–60.
33) Nwosu, C. (2023). *Social media, digital literacy, and political communication in Nigeria.* African Communication Research, 16(1), 101–123.
34) Nwankwo, C., & Chukwu, P. (2022). *Social media activism and governance perception during #EndSARS protests in Nigeria.* African Governance Review, 16(1), 57–74.
35) Ojebode, A., Aduloju, A., & Akinwale, A. (2020). *Social media and governance in Africa.* African Journal of Communication, 7(2), 31–49.
36) Ojebuyi, B. R., & Salawu, A. (2022). *Social media and citizen engagement in Africa.* Journal of African Media Studies, 14(1), 55–72.
37) Okafor, E. (2023). *Social media narratives and citizen perception of government credibility in Nigeria.* Nigerian Journal of Political Studies, 15(4), 302–321.
38) Omotola, J. S. (2020). *Governance and democracy in Nigeria: Reassessing citizen satisfaction.* African Affairs, 119(475), 377–396.
39) Rahman, S., & Jahan, T. (2022). *Online sentiment and governance trust during crises.* Journal of Political Communication Research, 45(2), 101–120.
40) Rao, J. N. K., & Molina, I. (2023). Small area estimation and big data integration: New developments. Statistical Science, 38(2), 185–203.
41) Rao, J. N. K., & Molina, I. (2015). Small area estimation (2nd ed.): Methods and applications. Wiley.
42) Rotter, J. B. (1967). *A new scale for the measurement of interpersonal trust.* Journal of Personality, 35(4), 651–665.
43) Särndal, C. E., Swensson, B., & Wretman, J. (1992). *Model-assisted survey sampling.* Springer.
44) Shao, J., & Chen, Y. (2020). *Model-assisted analysis with auxiliary information: Developments and challenges.* Statistical Science, 35(4), 589–610.
45) Tsfati, Y., & Cappella, J. N. (2020). *Fake news exposure and political trust: A longitudinal analysis.* Journal of Communication, 70(2), 229–250.
46) Vargo, C. J., Guo, L., & Amazeen, M. A. (2018). *The agenda-setting power of fake news: A big data analysis of the 2016 U.S.*

election. New Media & Society, 20(5), 2028–2049.

47) Zhou, L., Wang, J., & Lin, M. (2024). *Sentiment dynamics and trust in governance: Evidence from Chinese social media data.* Information Processing & Management, 61(2), 103–118.