# Social Media Influence on Banking using NLP Technics

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Research Proposal

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# **Abstract**

This study explores the influence of social media on the banking sector by applying Natural Language Processing (NLP) techniques to investigate customer sentiment, brand perception, and consumer engagement. By gathering data from various social media platforms, the research uses sentiment analysis, topic modelling, and text classification to uncover key patterns in how customers interact with banking brands online. The findings demonstrate a significant correlation between positive social media interactions and increased brand loyalty, highlighting the crucial role of effective social media strategies in modern banking. This research contributes to the field by offering actionable insights for bank marketers and presenting a novel application of NLP techniques in analyzing social media’s impact on brand equity in the financial services industry

By employing advanced NLP techniques, this research delves into how social media comments and interactions reflect customer perceptions of banking brands. The study particularly focuses on sentiment analysis to gauge the emotional tone of customer feedback and topic modelling to identify prevalent themes in online discussions. These methods provide a deeper understanding of how social media influences consumer behaviour and brand perception in the banking industry.

Moreover, the study identifies the significant role of social media marketing in determining brand equity, with findings suggesting that effective engagement strategies can enhance customer loyalty and perceived brand value. The insights gathered from this research offer practical implications for bank marketers, emphasizing the need for strategic social media management to strengthen customer relationships and maintain a competitive edge in the financial services sector

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# **List Of Abbreviations:**

SET: Social Exchange Theory

SMMA: Social Media Marketing Activities

BEQ:Brand Equity

BE: Brand Experience

PU: Perceived Uniqueness

# 1. **Background**

Motvation

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Relevance of research

Purpose of the study

Social media has become a pervasive part of daily life, influencing how individuals and organizations interact, share information, and form opinions. For the banking sector, this presents both opportunities and challenges in terms of brand management, customer engagement, and service delivery.

Despite the widespread use of social media, there is still a need for a deeper understanding of how it influences consumer behavior, particularly in the banking sector where trust and reputation are paramount. Banks are increasingly shifting toward digital channels to reach customers, and social media is a critical part of this transformation. Understanding how social media influences customer perceptions and behaviors is essential for banks to stay competitive.

By applying NLP techniques, banks can make data-driven decisions based on real-time insights from social media, enhancing their marketing efforts, customer service, and overall business strategy The study seeks to provide actionable insights that can help banks leverage social media more effectively, improving their brand equity, customer engagement, and overall market positioning

This research not only contributes to the academic field of social media analytics and NLP but also offers practical value to the banking industry, making it a timely and impactful study.

Obtaining relevant and comprehensive social media data (tweets, posts, reviews) can be challenging, especially if access is restricted by privacy policies or platform limitations.

Social media data is often vast and noisy, containing irrelevant information, spam, or biased opinions, making it difficult to extract meaningful insights.

Handling user-generated content comes with ethical and legal considerations, particularly concerning user privacy and data protection. Integrating social media sentiment data with quantitative banking metrics (e.g., financial performance, customer satisfaction scores) can be challenging due to differences in data formats and timeframes. The social media landscape is constantly evolving, with new platforms emerging and user behaviours changing. This makes it challenging to conduct research that remains relevant over time.

Different social media platforms have unique user dynamics and content formats, requiring tailored analysis approaches, which can complicate the research.

Translating the research findings into practical, actionable strategies for the banking industry can be difficult, especially when considering the variability in how different banks might implement these strategies.

The primary purpose of this study is to analyze how social media influences customer perceptions, brand equity, and overall consumer behavior within the banking sector.

It aims to explore the dynamics of bank-consumer relationships as they play out on social media platforms, providing insights into how customers engage with and respond to banking brands online.The study aims to identify key trends and patterns in how customers talk about and interact with banking services on social media, including the identification of common themes, sentiments, and consumer concerns.It seeks to measure how these interactions influence brand perception, customer satisfaction, and loyalty, providing banks with actionable insights to enhance their social media strategies. Ultimately, the purpose of this study is to provide insights that can help banks improve their customer engagement strategies on social media, thereby enhancing customer experiences, fostering brand loyalty, and strengthening their competitive position in the market.

# 2. Problem Statement OR Related Research OR Related Work

We have seen, these studies are for specific countries one thing is lacking which is comparative research analyses the influence of social media on banking across different regions, especially in emerging markets versus developed economies.

Although customer loyalty and engagement have been studied, there's room for deeper exploration of the psychological factors and antecedents that drive social media participation and loyalty in banking, especially in relation to Social Exchange Theory.

Further research is needed to understand how banks can strategically integrate social media into their overall business models to achieve long-term success, rather than just focusing on marketing and brand management.

All the 15 citations explain

**Related Work:**

Social media has become integral to modern society, serving not only as a platform for staying updated on current events and trends but also as a powerful tool for promoting businesses, organizations, and causes. For companies, it has evolved into a crucial marketing instrument, enabling them to connect with customers, lift sales through targeted advertising and promotions, track emerging consumer trends, offer customer service, and gather user data—sometimes without users' full awareness. View of The Role of Instagram Social Media as a Marketing Communication Strategy in the Era of Digital Transformation of the Banking Industry (n.d.)

In India, social media usage has surged, with a growing number of users accessing banking services through these platforms. This trend is propelled by increased mobile connectivity and the widespread adoption of mobile wallets and payment apps. However, private start-ups, such as PayTM and Mobikwik, pose a competitive threat to traditional banks by offering streamlined payment solutions and capturing significant market share. (Small Finance Bank (2023))

In Bangladesh, Social media marketing activities (SMMAs) influence brand equity (BEQ) in the banking sector, particularly through the mediating role of brand experience (BE) and the moderating role of perceived uniqueness (PU). (Hafez (2022)) Perceived uniqueness amplifies the impact of SMMAs on brand experience, providing valuable insights for bank marketers to harness social media effectively.

In the Kenyan banking sector,(Owino et al. (2016)) social media has positively impacted brand equity by significantly enhancing brand awareness, perceived quality, and customer loyalty, underscoring its essential role in modern brand management.

Banks in Kenya and similar markets should strategically integrate social media into their overall marketing and customer engagement strategies to build and sustain brand equity effectively.

Social media is a contemporary phenomenon that, while seemingly new, is deeply rooted in human communication and interaction. As it has evolved, social media platforms have become essential tools for engagement and content dissemination. Studies examines the role and perception of social media within Romanian banks, providing insights based on a survey of banking managers, directors, and social media representatives.

Social media like Facebook and Instagram play a noteworthy role in enhancing the financial performance of banks in Indonesia.(Sadalia et al., n.d.)

Banks should strategically leverage social media to improve customer relationships and financial performance.

Social media encompasses websites and applications that allow users to create, share information, and engage in social networking. Various types of social media platforms include social networking sites, microblogging services, and wikis, each serving different purposes and uses.(Hui Chin, 2017)

The study suggests further research could explore other social media metrics and their impact on financial performance across different sectors or in different geographical contexts.

I have seen study aims to explore the factors that precede social media participation in the context of U.S. retail banking customers, using Social Exchange Theory (SET). (Kirakosyan, n.d.; Toplu et al., 2014; Dănăiaţă et al., 2015; Matei et al., 2015; Cupp, 2016; Rahman Khan et al., 2017; Chappa, 2018; Ajina, 2019; Kuchciak and Wiktorowicz, 2021; Naeem and Ozuem, 2021; Wibowo et al., 2021; Yasin et al., 2024)Specifically, it seeks to understand the antecedents of the cost-benefit analysis that individuals conduct before engaging with social media and how these factors influence attitudinal loyalty. (Althuwaini, 2022)Research has confirmd that social media participation is influenced by specific pre-existing traits and has significant implications for customer loyalty in the retail banking sector. Understanding these antecedents can help banks tailor their social media strategies to foster greater customer loyalty.

In UK , This study examines the relationship between banks and consumers as reflected on social media platforms. It emphasizes the social aspect that enables customers to interact with brands, while also allowing brands to gain a deeper understanding of how consumers engage with their advertisements and overall brand presence. As Tsai and Men (2013) observed, academic research has struggled to keep up with the rapid evolution of social networking sites (Mogaji et al., 2016)Previous studies have primarily relied on surveys, interviews, and focus groups. However, prior to this research, the potential of analyzing customer comments on social media to gain insights into their perceptions and attitudes toward advertisements and brands had not been fully explored. This study aimed to address that gap.

So far there have always been some or the other research on specific counties, there's a lack of comparative research that analyzes the impact of social media on banking across different regions, especially in emerging markets versus developed economies.

Although customer loyalty and engagement have been studied, there's room for deeper exploration of the psychological factors and antecedents that drive social media participation and loyalty in banking, especially in relation to Social Exchange Theory. Further research is needed to understand how banks can strategically integrate social media into their overall business models to achieve long-term success, rather than just focusing on marketing and brand management.

While the influence of social media on banking is evident across various global markets, there remains a need for a comprehensive understanding of its broader implications. The existing literature highlights diverse impacts, ranging from enhanced brand equity to shifts in customer loyalty and engagement. However, as social media continues to evolve, so too must our understanding of its role within the financial sector. This thesis aims to address this evolving landscape by examining the intricate relationships between social media strategies and banking performance. By synthesizing insights from multiple geographic contexts and exploring emerging trends, this study seeks to provide a nuanced perspective on how banks can strategically leverage social media to maintain competitive advantage and foster long-term customer loyalty

# 3. **Research Questions (If any)**

1. How do social media interactions with banks differ across regions, and what cultural factors contribute to these differences?
2. What are the key factors that influence customer loyalty in the banking sector as observed through social media interactions?
3. How do social media interactions with banks differ across regions, and what cultural factors contribute to these differences?

# **4. Aim and Objectives**

* 1. **Aim**:

This thesis aims to comprehensively investigate the stimulus of social media on the banking sector across various global regions, with a particular focus on understanding the strategic integration of social media metrics into banking operations. By employing Natural Language Processing (NLP) techniques, the study seeks to analyse and compare the effect of social media on customer behaviour, brand equity, and financial performance in different geographic contexts. Additionally, the research will explore the antecedents of customer loyalty in the framework of social media interactions, providing actionable insights for banks to enhance their social media strategies and maintain competitive advantage

The research objectives are formulated based on the aim of this study which are as follows:

* **Research**:
  + Will need to Analyse and compare social media's impact on banking in different regions.
  + Identify and evaluate various social media metrics affecting financial performance.
  + Need to Gather data from social media stages (e.g., Twitter, Facebook, LinkedIn) related to banking. This can include customer comments, brand interactions, advertisements, and more.
* **Data Preparation:**
  + With the help of technics data cleaning of the collected social media data will be done.
  + Sentiments analysis would be done to understand customers emotions and expressions.
  + Comparison of the influence of social media on banking in different regions, identifying patterns and disparities will be done. Models to analyse which social media interactions are most predictive of customer loyalty, informed by Social Exchange Theory will be done.
* **Validation**:
  + Cross validation would be performed using different datasets and methods to ensure robustness. Compilation of insights will be done from analysis into a comprehensive report, highlighting the differences across regions, key metrics, and strategic recommendations.

In this research will gain a comprehensive understanding of how social media influences banking operations, customer engagement, and financial performance across different regions. This includes a comparison of trends in emerging markets versus developed economies.

# **Significance of the Study**

Outcome of the study

Whom and how it will be helpful

Unlike many studies that focus on a single country or region, thesis undertakes a comparative analysis of social media's influence on banking across multiple regions, including both emerging markets and developed economies. This approach allows for a broader understanding of global trends and regional differences, offering insights that are often overlooked in existing literature.

Research aims to identify and analyze social media metrics that have not been extensively studied in the context of banking. By doing so, I contribute new insights that could shape how banks measure and respond to their social media presence.

While many studies examine social media's impact on brand equity or customer engagement, this thesis goes a step further by exploring how banks can strategically integrate social media into their overall operations to achieve long-term success. This practical focus on strategy and implementation is particularly valuable in a rapidly evolving digital landscape.

The thesis will address the psychological factors driving customer loyalty in the context of social media, informed by theories like Social Exchange Theory. This focus on the antecedents of loyalty and how they can be influenced by social media participation will add a unique dimension to the study.

The intersection of social media and banking is highly relevant in today's digital age, where customers increasingly interact with financial institutions online. The growing importance of digital engagement makes this a timely and impactful research topic.

Since I have a background in banking, marketing, or technology, this topic likely aligns with my professional interests. My passion for understanding how digital platforms is transforming traditional industries might have driven to explore this area.

# 6. **Scope of the Study**

**Inclusion**:

Would clearly state my research question, objectives, and significance.

Provide a brief overview of the current state of research on social media's influence on banking. To discuss existing studies on social media and banking, highlighting gaps in knowledge. To include relevant theories (e.g., Social Exchange Theory) that inform this research. To provide a detailed context of social media's role in banking globally, using the information I've already compiled. To discuss the specific challenges and opportunities social media presents to banks in different regions. To explain the NLP techniques and data sources use. Justify choice of regions and social media metrics for comparison. Present the results of NLP analysis, including sentiment analysis, topic modelling, and other relevant techniques. To compare social media's impact on banking across different regions. To analyse the antecedents of customer loyalty as informed by social media participation. Interpret the findings in relation to research questions.

To discuss the implications for banks and how they can strategically integrate social media into their operations. To highlight the significance of findings for both academics and practitioners. To summarize the key findings and their contributions to the field.

Reflect on the limitations of study and suggest areas for future research. Provide actionable strategies for banks to optimize their use of social media. Suggest how banks can use findings to enhance customer loyalty and financial performance.

**Exclusion**:

Would try to avoid repeating basic information on social media's role in general business marketing if it doesn't directly contribute to the banking focus. Would Focus on the results of analysis rather than getting too technical about the algorithms used in NLP, unless it's critical for audience to understand. Would try to avoid including case studies or examples from countries or sectors that don’t align with my research focus. For example, if certain regions or sectors are not relevant to banking or social media analysis, leave them out. If certain social media platforms (e.g., niche platforms) are not part of my research, there’s no need to include details about them unless they serve a comparative purpose.

# 7**. Research Methodology**

7.1 Dataset

The datasets offer a comprehensive view of the relationship between social media influence and banking. The Tweets and Reviews datasets provide direct insights into public sentiment and customer feedback, which can be analyzed using NLP techniques. The "191(1).xlsx" dataset, presumably containing banking-related metrics, can be used to validate or correlate the findings from the social media and review data, helping to paint a complete picture of how online perceptions and customer feedback impact banking performance.

7.2 **Dataset** **Preprocessing**

* **Tokenization**: Splitting text into individual words or phrases (tokens).
* **Stopword Removal**: Removing common words that don't carry significant meaning.
* **Stemming and Lemmatization**: Reducing words to their base or root forms.
* **Text Normalization**: Converting all text to lowercase and removing special characters.
* **VADER** (Valence Aware Dictionary and sentiment Reasoner): A rule-based model for general sentiment analysis.
* **TextBlob**: Another simple tool for sentiment analysis.

7.3 Feature Extraction

* **TF-IDF (Term Frequency-Inverse Document Frequency)**: A statistical measure used to evaluate the importance of a word in a document relative to a collection of documents.
* **Bag of Words (BoW)**: A simple method for extracting features by counting the frequency of words.
* **n-Grams**: Extracting sequences of n words as features.

**7.4 Modelling Techniques**

**BERT (Bidirectional Encoder Representations from Transformers)**: A more advanced deep learning model for nuanced sentiment analysis. BERT is one of the most effective models for understanding the context and sentiment of text. It excels at tasks like sentiment analysis because it can capture the nuances of language, including sarcasm and context, which are often present in social media data. BERT's ability to understand the bidirectional context of words in a sentence makes it particularly powerful for sentiment classification tasks.

**Aspect-Based Sentiment Analysis (ABSA) using BERT**

If interested in not just overall sentiment but also sentiment towards specific aspects (e.g., customer service, online banking features), ABSA models are ideal. BERT can be fine-tuned for aspect-based sentiment tasks, allowing you to analyse sentiments tied to specific features or services mentioned in the text. BERT-based models are state-of-the-art in capturing contextual nuances, which is critical for analyzing the often ambiguous and varied language used on social media.

**7.5 Evaluation Metrics**

* **Sentiment Analysis:**
* **Accuracy:** Measures the percentage of correctly classified sentiments (positive, negative, neutral) out of the total predictions. It gives a general sense of the model's performance but can be misleading if the dataset is imbalanced.
* **Precision:** The ratio of true positive predictions to the total predicted positives. It’s particularly important when the cost of false positives is high (e.g., incorrectly identifying a neutral statement as negative).
* **Recall (Sensitivity):** The ratio of true positive predictions to all actual positives. It’s important when missing a positive instance (e.g., failing to identify a negative sentiment) is costly.
* **Topic Modelling:**
* **Perplexity:** Measures how well the model predicts a sample. Lower perplexity indicates a better model. However, perplexity alone might not always correlate with human interpretability.
* **Coherence Score:** Measures the semantic similarity between high-scoring words in topics. Higher coherence indicates that the topics are more meaningful and interpretable
* **Text Classification:**
* **Accuracy:** As in sentiment analysis, accuracy gives a broad view of model performance but can be misleading with imbalanced data.
* **Precision, Recall, F1 Score:** Important metrics to consider, especially in cases where misclassification has different costs. These metrics help in understanding the model’s performance on specific classes.
* **ROC-AUC (Receiver Operating Characteristic - Area Under Curve):** Measures the ability of the model to distinguish between classes. A higher AUC indicates better performance across all classification thresholds.
* **Named Entity Recognition (NER):**
* **Precision, Recall, F1 Score:** These metrics are key for evaluating NER models. Precision measures how many of the entities identified by the model are correct, recall measures how many of the actual entities were identified, and the F1 score balances the two.
* **Entity-Level F1 Score:** This metric is often preferred for NER, as it evaluates the model's performance at the entity level rather than at the token level, which is more aligned with the task’s goals.
* **Aspect-Based Sentiment Analysis (ABSA):**
* **Aspect-Level Precision, Recall, F1 Score:** Similar to general sentiment analysis but focused on the accuracy of the sentiment assigned to specific aspects (e.g., customer service, mobile banking experience).
* **Aspect Coverage:** Measures the model's ability to correctly identify all relevant aspects discussed in the text.
* **Regression Models (for Correlation and Impact Analysis):**
* **R-squared (Coefficient of Determination):** Indicates how well the independent variables explain the variability of the dependent variable. A higher R-squared value means a better fit of the model.
* **Mean Squared Error (MSE) / Root Mean Squared Error (RMSE):** Measures the average squared difference between the observed and predicted values. RMSE is often preferred for its interpretability.
* **General Model Evaluation:**
* **Cross-Validation Scores:** To ensure that your models generalize well, consider using cross-validation, where the dataset is split into multiple folds, and the model is trained and evaluated across these folds. This helps in reducing overfitting.
* **Training Time and Inference Speed:** Evaluate how long it takes to train the model and how quickly it can make predictions, especially if the model will be used in real-time applications.
* **Data Quality Metrics:**
* **Data Imbalance Ratios:** If your dataset is imbalanced, ensure you measure the imbalance and consider metrics like G-Mean or Balanced Accuracy, which are designed for such cases.
* **Data Augmentation Impact:** If you use data augmentation techniques, measure their impact on model performance to ensure they contribute positively.

# 8. Requirements Resources

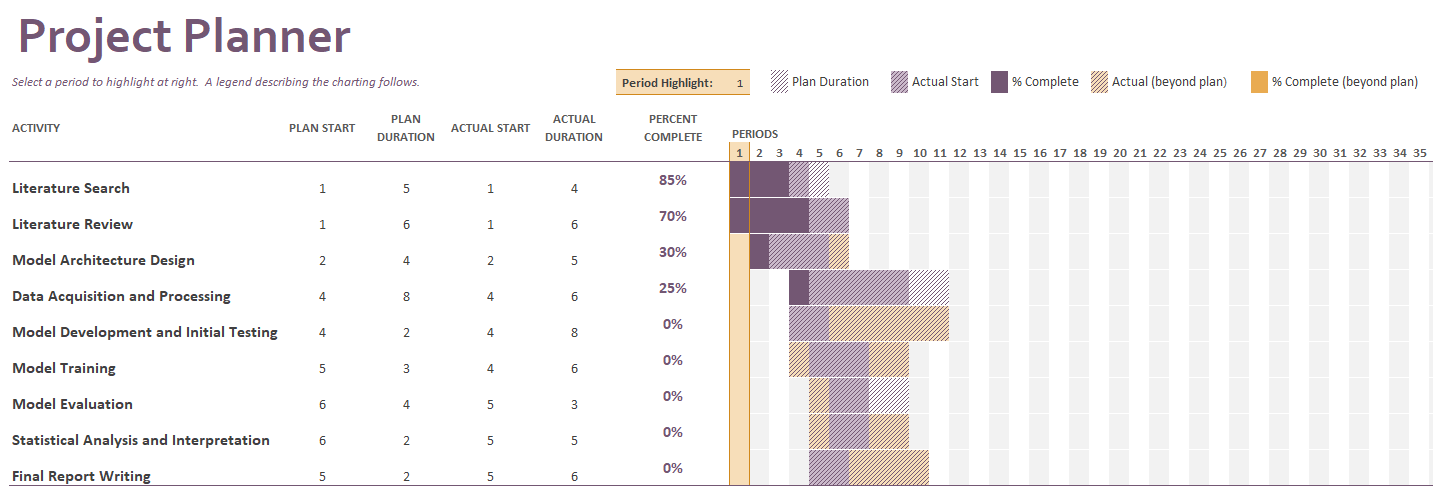
8.1 Software

* For this project I will need intermediate performance computing resources including servers equipped with high GPU 0for deep learning tasks.
* Python with NumPy, pandas, seaborn, Matplotlib, Scikit Learn, Stats models, TensorFlow and Pytorch libraries will be utilized, requiring relevant software licenses.
* The research will use openly available social media datasets, necessitating moderate storage and secure data handling capabilities.

* 1. **Hardware**
* Windows 11, AMD Ryzen 5 5500U with Radeon Graphics, 16 Gb RAM

# **9. Research Plan**

Below is the progress plan:



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