



Dental Service Strategy of Hospitals in Indonesia Based on Big Data Analysis of Social Media Users X

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Abstract

This study analyzes public perception of hospital dental polyclinic services in Indonesia through big data sentiment analysis of 3,075 tweets from the X platform (January–November 2024), using keywords like “dental hospitals” and “dental poly hospitals.” Employing a descriptive design, data was crawled via Google Colab, followed by preprocessing steps: duplicate removal, non-essential character cleanup, normalization, tokenization, stopword elimination, and stemming. The Naïve Bayes Classifier algorithm classified sentiments, revealing 61.54% negative sentiment (1,571 tweets) and 38.46% positive sentiment (982 tweets), with 73% model accuracy, 0.73 negative precision, and 0.90 negative recall. Negative sentiments highlighted issues, such as long waiting times, inadequate facilities, and BPJS-related administrative delays, while positive sentiments praised professional staff and comprehensive facilities. Field data from tweet analysis showed frequent complaints about procedural discomfort (e.g., “pain,” “pluck”) and appreciation for competent doctors. SWOT analysis, triangulated with multi-stakeholder assessments (hospital administrators, directors, dentists), yielded an IFAS score of 7.04 and an EFAS score of 6.84, indicating strong internal capabilities but operational inefficiencies. Strategic recommendations include optimizing workflows, standardizing services, and leveraging public awareness to enhance specialized dental care, addressing public dissatisfaction for sustainable service improvement.

Introduction

Dental and oral health problems have become a complex global problem with a significant impact on the quality of life of people in various parts of the world (Nbaia *et al.*, 2018). According to Singh & Purohit (2017), suboptimal dental and oral health conditions not only cause sensations of pain and physical discomfort but also have a multidimensional impact that interferes with the fundamental functions of individuals in daily life. Takeuchi *et al.* (2026) asserts that dental and oral health disorders often

result in barriers in verbal communication skills, food mastication processes, and social interactions, which cumulatively contribute to decreased levels of self-confidence and holistic degradation of quality of life. The global dimension of dental and oral health problems is reflected in the World Health Organization's 2022 Dental and Oral Health Status report, which reveals that approximately 3.5 billion individuals worldwide, or nearly half of the global population, experience various forms of dental and oral health disorders. The dental health profile published by WHO (2023) shows

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Indonesia's position, which ranks second in the Southeast Asian region in terms of spending allocation for dental health care, after Singapore, and a total expenditure of US\$ 1,160 per individual, indicating the magnitude of the economic burden that must be borne by the community to obtain adequate dental health services.

The complexity of dental and oral health problems in Indonesia is manifested through various indicators that show conditions requiring serious attention. The prevalence of dental caries that has reached a critical level, limited accessibility to quality dental care services, and low levels of public literacy regarding the importance of maintaining dental and oral health are the main challenges faced. Empirical data from the Ministry of Health of the Republic of Indonesia through Basic Health Research 2018 (2023) shows that the prevalence of dental caries has reached an alarming figure of 88.80%, while the results of interviews in the 2023 B. K. P. Health Indonesian Health Survey (SKI) indicate that around 56.9% of the population aged 3 years and older experience various forms of dental and oral health disorders (Kemenkes, 2023). Although the results of the 2023 SKI show a decrease in the Dental and Oral Health Index (DMFT-T) for all age groups compared to the 2018 Riskesdas, dental and oral health issues in Indonesia still require more intensive and comprehensive attention (Widi *et al.*, 2021). The age group of 3-4 years, 5 years, and those over 35 years old are still classified as high and very high on the DMF-T index, indicating that, despite positive progress, the challenges in maintaining dental and oral health are still very significant. This condition implies the need for a more intensive strategy in terms of education and increasing the accessibility of quality dental health services.

In an effort to meet the needs of the community in maintaining dental and oral health in Indonesia (Prasetio *et al.*, 2024), the government together with support from the private sector, has made efforts to provide dental poly services in various strategic locations (Fatmasari *et al.*, 2017). Hariyani *et al.* (2023) explained that the provision of dental poly aims to increase the accessibility of dental care

for the community, with the hope that people can more easily get the necessary examinations and treatments, ranging from the prevention of dental diseases to more complex and specialized treatments. Dental poly services in Indonesia are an integral component of the national health system, aiming to provide comprehensive care and treatment related to dental and oral health. Dewanto *et al.* (2020) explain that the scope of this service covers a wide spectrum of treatments, such as preventive dental check-ups, prevention of dental diseases, cavity treatment, tooth extraction, as well as more specialized orthodontic and prosthodontic services (B. Santoso *et al.*, 2017; Xiao *et al.*, 2025). The existence of dental polyclinics also serves as a strategic educational facility for the community to understand the importance of maintaining dental and oral health through systematic health counseling programs and campaigns (Widiyanti *et al.*, 2023).

Leander *et al.* (2025) emphasize that collaborative efforts between the government and the private sector in providing dental poly services are fundamental to improving awareness and quality of dental health care in Indonesia, with the main goal of reducing the prevalence of dental health problems, which is still high among the community. Dental poly service facilities are available in various health institutions, from health centers and dental clinics to hospitals with varying levels of complexity. Chen *et al.* (2024) revealed that general hospitals and specialty hospitals typically have dental polyclinics equipped with modern equipment and trained medical personnel, but the quality of services can vary significantly depending on geographical location and available facilities (Santhosh *et al.*, 2025; Yu, 2026; Zhou *et al.*, 2020). Some of the fundamental challenges faced in dental poly services in Indonesia include low public awareness of the importance of preventive dental care and regular dentist visits. Teoh *et al.* (2026) identify that the availability of adequate dentists and health workers, especially in rural and remote areas, is a significant structural problem, while the cost of care is often a barrier for some communities, despite government programs aimed at providing more affordable dental health services (Soegyanto *et al.*, 2022;

Teoh *et al.*, 2026).

Digital transformation and increasing people's technological literacy have fundamentally changed the paradigm of health service evaluation. Attar & Shukla (2025) explains that the maturing character of society, coupled with the increasing technological literacy, allows individuals to critically assess the dental poly services received (Shivananda & Doddawad, 2025; Widi *et al.*, 2021; Widiyanti *et al.*, 2023). Wider access to information through the internet and social media allows the public to have a more comprehensive understanding of good health service standards, comparing the quality of services, available facilities, and the experiences of other patients. C. M. A. Santoso *et al.* (2020) emphasized that the ability of the public to use technology in assessing dental poly services also contributes significantly to improving the quality of the service itself, where the feedback provided by patients through online platforms can be valuable input for service providers to make continuous improvements. Dynamic interactions between an increasingly critical community and responsive dental healthcare providers can create a better dental care ecosystem, not only improve patient satisfaction but also potentially reduce the prevalence of dental health problems in the long run.

X's social media, formerly known as Twitter, has become a strategic platform for the public to provide feedback on dental poly services in hospitals. This platform allows users to share their experiences directly and quickly, both positive and negative, regarding the services they receive. The characteristics of using limited characters in each tweet require users to express their opinions clearly and concisely, so that the information shared can be easily accessed and understood by other users. The strategic problem faced is that although hospitals have realized the potential of social media X as a platform to interact with dental patients, healthcare institutions often experience limitations in processing and analyzing comments made by the public. This condition results in the potential for valuable feedback not being utilized optimally for service improvement. This inability can be caused by a lack of understanding of data analysis,

limitations of human and technological resources, or uncertainty in choosing the right and effective analysis method.

The potential of social media X as a digital public space to provide feedback on health services, including dental polyclinics, allows for the implementation of more in-depth sentiment analysis of people's experiences. Cambria *et al.* (2017) define sentiment analysis as a systematic process used to identify and classify opinions or emotions in a text, with the aim of understanding individual attitudes, opinions, and emotions toward a particular entity, product, or topic. Sentiment analysis involves natural language processing (NLP) techniques to process text data, thereby enabling the system to recognize the emotional nuances contained in sentences with high accuracy (Bhardwaj *et al.*, 2023; Ma & Ho, 2025). The Naive Bayes Classifier (NBC) algorithm is one of the effective methods for sentiment analysis in text classification. Tan *et al.* (2009) explain that NBC is a probability-based algorithm that utilizes Bayes' theorem to determine the class of a document based on its existing features, able to classify text into positive, negative, or neutral categories with high efficiency. Jurafsky & Martin (2024) explain that NBC is very popular in natural language processing because of its ability to handle big data quickly and effectively, although the independence assumptions it uses are often unrealistic in real-world contexts. The implementation of sentiment analysis on dental poly services in hospitals using the NBC method can provide valuable insights into public perception of the quality of these services. C. M. A. Santoso *et al.* (2020) explained that the results of the processing, which are then processed into sentiment reviews, can be used by hospitals to improve service quality and increase overall patient satisfaction. Sentiment analysis not only serves as a retrospective evaluation tool but also as a strategic basis for more evidence-based decision-making to improve the quality of sustainable health services.

Method

This study embraces a big data approach with a descriptive design to evaluate public perception of dental poly services in hospitals

through data analysis from the social media platform X (Twitter). Based on Cambria *et al.* (2017), this methodology authorized the collection and analysis of numerical and graphical data to comprehensively describe existing phenomena. The implementation of sentiment analysis techniques in this study aims to identify emotions and opinions contained in texts, particularly tweets related to dental poly services, to determine positive or negative sentiments of the community. Balaji *et al.* (2020) explained that the research design used the Naïve Bayes Classifier (NBC) method as an effective probabilistic classification algorithm for text processing, with a working mechanism based on the probability calculation of each sentiment class based on the words that appear in the tweet. Cambria *et al.* (2017) in “A Practical Guide to Sentiment Analysis” emphasizes the importance of a multidisciplinary approach in sentiment analysis that integrates linguistic, psychological, and sociological aspects, as well as taking into account the cultural and social context of the analyzed data. They explain that data quality is crucial in sentiment analysis, where proper data collection and a good cleaning process can improve the accuracy of the analysis, as well as the importance of representative data to obtain valid results. Yoshikawa (2022), in his work on Naïve Bayesian adaptations to domain adaptation, shows that machine learning models often have difficulties when applied to data from different domains, so an approach that allows the model to leverage information from the source domain when analyzing data in the target domain is needed.

The data collection process was carried out through crawling X social media data using Google Colab with specific keywords, namely “dental hospitals,” “dental poly hospitals,” “hospital dental clinics,” and “hospital dental polyclinics” during the period from January 1, 2024, to November 20, 2024. The data preprocessing stages include the removal of duplicate data, the cleansing of data from special characters and links, the normalization of words, tokenization, stop word removal, and stemming to prepare the data to be ready for further analysis. Wordcloud visualizations are created before and after the pre-process

to provide an overview of the words that frequently appear in the dataset. Data labeling is done by assigning sentiment labels (positive or negative) to the processed dataset, followed by the TF-IDF stage to highlight the keywords in each tweet. The dataset is then divided into training data and test data, where the training data is used to train the Naïve Bayes Classifier model while the test data is used to evaluate the model’s performance. K-Fold cross-validation is applied to ensure good model generalization, so the results of the analysis are more reliable. The evaluation of the policy of dental poly services was carried out by analyzing the words that appeared the most in the results of the sentiment analysis, to be lowered to a SWOT analysis with EFAS-IFAS weighting. Explained that SWOT weighting is carried out by relevant stakeholders, consisting of hospital administration experts, hospital directors, and dentists, to provide Significant Level (TS) scoring and SWOT analysis ratings. Edison & Kartika (2024) emphasized that the SWOT results will be a SWOT chart that can describe the evaluation of the existing dental poly service policies in hospitals, to provide recommendations to improve service quality based on community feedback.

Results and Discussion

The implementation of sentiment analysis using the Naïve Bayes Classifier algorithm on public perception of dental services in Indonesian hospitals resulted in comprehensive findings that describe the actual condition of dental health services. The data extraction process was carried out through a crawling method on the Twitter (X) platform using specific keywords, including “dental hospital”, “dental poly hospital”, “hospital dentistry”, and “hospital dental poly” in the period from January 1 to November 20, 2024. This approach resulted in the accumulation of 3,075 tweets, which then became the basis for the analysis of public sentiment on the quality of dental health services in hospital institutions. The pre-processing stage of the data shows a significant transformation in the quality of the research dataset. Duplicate data elimination successfully identifies and removes identical entries based on full-text columns, ensuring

each tweet is counted only once in the analysis. The data cleansing process includes the removal of non-essential characters such as emoticons and Unicode symbols that do not make an informative contribution to textual analysis. Case folding transformation converts the entire text to lowercase to ensure consistency in word pattern recognition.

Wordcloud visualization before preprocessing revealed the dominance of the word “teeth” with a frequency of 2,772 occurrences, followed by “RS” 1,234 times, and “doctor” reaching 699 mentions. This frequency distribution explains the primary focus of the public discussion, which is concentrated on the fundamental aspects of dental health services in hospitals. The word normalization stage converts non-standard spelling variations into standard forms, such as the transformation of “because” to “because”, which improves the accuracy of the analysis by reducing semantic fragmentation. The tokenization process breaks down text into individual word units, facilitating granular analysis of textual components. The elimination of stop words removes functional words such as “in”, “and”, “to” that do not contribute to substantive meaning, focusing the

analysis on informative words.

The implementation of stemming converts words to their basic forms, such as “reference” to “reference”, creating consistency in identifying the same concept even though it is in different morphological forms. The deletion of blank-value (NaN) data reduces the dataset from 3,051 to 2,553 entries, eliminates 498 entries with incomplete information, and ensures data integrity for further analysis. Post-preprocessing wordcloud analysis showed significant changes in word frequency distribution. The word “dent” increased to 3,375 occurrences, “rs” 2,675 times, “doctor” 982 times, and “pluck” 838 times, demonstrating the effectiveness of the preprocessing process in consolidating semantically equivalent word variants. The auto-labeling stage classifies sentiment based on the linguistic characteristics of the tweet, resulting in a distribution of 1,571 entries (61.54%) with negative sentiment and 982 entries (38.46%) with positive sentiment. This disparity indicates the prevalence of critical perceptions of polydental services in Indonesian hospitals, reflecting areas that require attention to improve service quality.



FIGURE 1. Wordcloud After Preprocessing

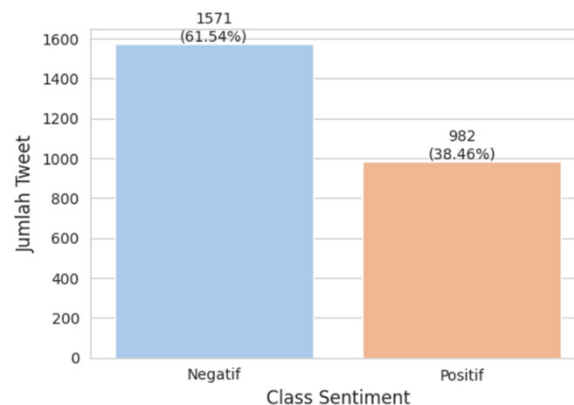


FIGURE 2. Results of Sentiment Analysis at the Data Labeling Stage

Negative sentiment wordcloud analysis revealed the dominance of words such as “rs”, “dent”, “wisdom”, “pluck”, and “pain”, explaining the context of complaints that focus on aspects of procedural discomfort and suboptimal clinical experience. In contrast, the positive sentiment wordcloud displays similar words but in the context of appreciation for the competence of the “doctor” and the effectiveness of handling the problem of “teeth”. The implementation of Term Frequency-Inverse Document Frequency (TF-IDF) resulted in a spectrum of IDF values ranging from 5 to 7.5, identifying words with varying document-specific importance. Words with an IDF score close to 7.5 represent a unique complaint or experience that is rarely discussed but of high significance, while an IDF value close to 5 indicates a common issue that is often of public concern.

The dataset allocation allocated 2,042 entries (79.98%) for training data and 511 entries (20.02%) for testing, ensuring the optimal proportion between model learning and performance evaluation. The evaluation of the Naïve Bayes Classifier algorithm on the testing data resulted in an accuracy of 73% with a precision of 0.73 for the negative category and 0.72 for the positive category. The recall value showed 0.90 for negative sentiment and 0.44 for positive sentiment, indicating the superior capability of the model in identifying negative versus positive sentiment. Validation via K-Fold cross-validation with 10 folds yielded an average accuracy of 0.69, with the highest accuracy of 0.76 on the 30th fold and the lowest of 0.61 on the 5th fold. This variation in accuracy demonstrates the model’s stability in classifying sentiment despite performance fluctuations in a given subset of data, explaining the inherent complexity in the analysis of social media textual sentiment regarding dental health services in Indonesian hospitals.

The implementation of the data crawling methodology through the Google Colab platform using the Python script in this study represents the use of contemporary technology for massive-scale data acquisition and analysis. The selection of strategic keywords that include “dental hospitals,” “dental poly hospitals,” “hospital dentists,” and “hospital dental polys” ensures the relevance of the data collected

according to the focus of the study. The determination of the data collection timeframe from January 1, 2024, to November 20, 2024, allows this study to capture the dynamics of public sentiment in a substantial temporal span, providing a comprehensive representation of high-value public opinion trends. In the context of “Big Data Analysis and Deep Learning Applications” presented by Tiara et.al. (2024), this research embodies how big data analysis can be operationalized to understand and explore public opinions on public services. Zhang *et al.* (2026) emphasized the significance of big data processing techniques and deep learning applications in processing large-scale data to uncover valuable insights. The data crawling methodology applied in this study is a concrete manifestation of how the big data approach can be implemented in the health domain for service optimization based on user feedback.

The convergence of this research approach with the concepts described by Cambria *et al.* (2017) demonstrates significant alignment. Cambria underscores the importance of concept-based sentiment analysis that is not limited to textual analysis at the word level, but rather seeks to understand the semantic meaning behind the linguistic structure. Sentiment analysis of the accumulated tweet data enabled the researcher to identify the positive and negative sentiments articulated by the public towards polydental services. The utilization of visualization tools, such as WordCloud allows this study to visualize the frequency of word occurrences, contributing to the identification of service aspects that require improvement and that have met the expected standards. The performance evaluation of the Naive Bayes Classifier (NBC) algorithm implemented in this study demonstrated significant results, with a dominance of negative sentiment of 61.54% and a proportion of positive sentiment of 38.46%. These findings correlate with the views of Liu *et al.* (2024), which emphasize the urgency of not only classifying sentiment as a positive-negative dichotomy but also understanding the underlying emotions and opinions. Sentiment analysis at the conceptual level, as Cambria suggests, can provide deeper insights into the factors that cause people to perceive certain experiences as positive or negative.

NBC's algorithm application managed to classify the majority of the data with an accuracy of 73%. However, there is a misclassification, especially in the identification of positive sentiment. As explained (Jurafsky & Martin, 2010), sentiment analysis is a complex component of natural language processing. Misclassification often occurs due to challenges in understanding the linguistic nuances, contexts, and emotional expressions hidden in the text. Cambria's recommended conceptual-level approach can be a solution to improve classification accuracy, especially in capturing more subtle positive sentiments. The work "Adapting Naive Bayes to Domain Adaptation for Sentiment Analysis" by Tan *et al.* (2009) highlights the challenges that Naive Bayes algorithms face when applied to data from different domains. The data collected in this study came from the social media platform Twitter (X), which has distinctive language style and expression characteristics. Adapting NBC algorithms to address these domain-specific characteristics could be a crucial step for optimizing accuracy and sensitivity in sentiment analysis.

The implementation of the Naïve Bayes Classifier algorithm in analyzing the sentiment of X social media users regarding dental poly services showed significant findings related to public perception of the quality of dental health services in Indonesian hospital institutions. Based on the evaluation of the entire dataset, it was found that 61.54% of the total data entries showed a tendency to negative sentiment, while the remaining 38.46% indicated a positive perception of the services received. This proportional distribution reveals the dissatisfaction of the majority of service users, which indicates the urgent need to conduct an in-depth evaluation of various operational aspects of dental poly services, including infrastructure quality, medical personnel competence, procedural efficiency, and implementation of hospital management policies. The classification performance of the Naïve Bayes Classifier model shows asymmetrical characteristics in identifying the two sentiment categories. Through the confusion matrix analysis of the test data, the model managed to accurately reveal 287 negative sentiment

entries, but misclassified 32 data points that should have been categorized as positive. This phenomenon demonstrates that algorithms have high sensitivity in detecting expressions of dissatisfaction, but face challenges in identifying the nuances of satisfaction or appreciation expressed by users. The precision value for the negative category reached 0.73, demonstrating adequate predictive ability, while the precision for the positive category was at the level of 0.72, indicating relative consistency in the prediction accuracy of the two classes.

The recall analysis revealed a more pronounced disparity between the model's ability to capture both types of sentiment. The negative category recall reached 0.90, indicating that the model was able to identify almost all expressions of dissatisfaction present in the dataset. In contrast, the recall for the positive category reached only 0.44, indicating that more than half of the positive sentiment was not successfully detected by the algorithm. This inequality is also reflected in the F1-score, where the negative category gets a score of 0.79 while the positive category only reaches 0.55. The overall accuracy of the model was 0.73, indicating that three-quarters of the total data were correctly classified. Evaluation of training data showed superior performance compared to test results. The precision for negative sentiment increased to 0.89, while the precision for positive sentiment reached 0.96, indicating excellent discriminative ability in the learning phase. The negative sentiment recall reached 0.98, indicating an almost perfect detection of the expression of dissatisfaction, while the positive sentiment recall was at 0.82. The F1-score demonstrated a better balance with a value of 0.93 for the negative category and 0.88 for the positive category. The confusion matrix confirmed that out of 2,042 training data entries, the model managed to classify 1,226 negative sentiments and 646 positive sentiments with an overall accuracy of 0.92.

The methodological implications of these findings suggest that the Naïve Bayes Classifier algorithm has an inherent bias in detecting negative sentiments, likely due to the linguistic characteristics of complaint expressions that are more explicit than satisfaction expressions. Limitations in identifying positive sentiment

can result in the loss of valuable information about aspects of services that have met patient expectations, which should be the foundation for retention strategies and service development. Model optimization through fine-tuning hyperparameters, more sophisticated feature engineering, or the implementation of ensemble methods can improve the detection ability of positive sentiment, thereby providing a more comprehensive and balanced picture of public perception of the quality of dental poly services in Indonesia.

The results of sentiment analysis using the Naïve Bayes Classifier (NBC) on public data on Twitter (X) regarding hospital dental poly services in Indonesia indicated that 61.54% of the total entries had negative sentiment, while 38.46% had positive sentiment. The proportion that shows the dominance of negative sentiment gives an idea that there is a substantial volume of complaints related to services that are perceived as unsatisfactory by the public. In this context, an in-depth exploration of the factors that cause this dissatisfaction is essential, both from the perspective of services, facilities, and institutional policies. Introduced the SERVQUAL model, which can provide a relevant framework to understand these outcomes through five dimensions: tangibility, reliability, responsiveness, assurance, and empathy (Hariyani *et al.*, 2023). The precision and recall performance for the negative category showed that the model had adequate capabilities in detecting negative sentiment, with an accuracy of 0.73 and a recall of 0.90. However, for the positive category, a low recall of 0.44 indicates that a lot of positive sentiment is not detected. This suggests the need for further optimization in the model to improve the detection capabilities of positive sentiment, which correlates with the importance of measuring the empathy and assurance dimensions in SERVQUAL. Research by Teoh *et al.* (2026) text mining demonstrated that the use of more sophisticated natural language processing (NLP) techniques can facilitate the capture of more subtle nuances of sentiment, including positive sentiments. A more comprehensive implementation of text mining can contribute to the identification of context that is often missed in conventional

sentiment analysis (Soegyanto *et al.*, 2022). The confusion matrix of this analysis demonstrated that the model managed to correctly classify 287 negative data, but 32 negative data were misclassified as positive. Meanwhile, 84 positive data were classified accurately, but 108 positive data were misclassified as negative.

The implementation of sentiment analysis based on the Naïve Bayes Classifier on public opinion on the Twitter platform (X) produced in-depth insights into public perception of the quality of dental poly services in Indonesian hospitals. This methodological approach allows the extraction of strategic information from social media data, which is then transformed into a comprehensive policy evaluation framework through SWOT analysis. The process of transforming raw data into strategic intelligence begins with the identification of the dominant words that emerge in public discussions, reflecting the most significant aspects of the patient experience. The stages of terminology conversion from the results of sentiment analysis show a structured systematics in transforming textual data into strategic variables that can be measured. The transformation of keywords such as “teeth”, “rs”, “doctors”, “revoked”, “refer”, “bpjs”, “sick”, “gue”, “bungsu”, and “use” into more contextual phrases indicates the ability of this methodology in capturing the essence of the problem and the potential for service development. This conversion process is not only linguistic, but also involves semantic interpretation that takes into account the context of dental health services in Indonesia.

Further elaboration of the terminology conversion resulted in twenty strategic factors distributed in four SWOT dimensions, reflecting the complexity of the hospital polydental service ecosystem. These factors not only identify operational aspects but also uncover policy dimensions that affect accessibility, quality, and sustainability of services. This transformation shows that public sentiment can be effectively translated into measurable and actionable performance indicators for policymakers.

The assessment methodology involves triangulating the perspectives of three main stakeholder categories: hospital administration experts, hospital directors, and practicing

TABLE 1. Word/Phrase Conversion

The most popped words in sentiment analysis with NBC	Customized phrases/words for SWOT analysis
<i>tooth</i>	<i>Patient Teeth</i>
<i>Rs</i>	<i>Hospital</i>
<i>doctor</i>	<i>Dentist</i>
<i>pluck out</i>	<i>Tooth Extraction</i>
<i>Cf.</i>	<i>Reference</i>
<i>bpjs</i>	<i>BPJS</i>
<i>sick</i>	<i>Patient's Toothache</i>
<i>I</i>	<i>Patient</i>
<i>youngest</i>	<i>Wisdom teeth</i>
<i>use</i>	<i>Use</i>

Source: Processed by the authors

TABLE 2. SWOT Strategic Factor Conversion

Phrases/Words	SWOT Strategic Factors
Toothache	The medical risk when handling patients' toothache is higher if the facilities or competencies of the Dental Polytechnic Hospital are inadequate.
Hospital	The facilities of the Dental Polytechnic may not be the same in all hospitals.
Hospital	The competition between the Dental Clinic and the Private Dental Clinic that offers faster and more personalized services.
Hospital	Stigma towards the services of Dental Polytechnic Hospital which is considered less friendly than clinics.
Reference	A clear dental referral administration system for cases that require follow-up care to the Dental Polytechnic Hospital.
Reference	Collaboration with other clinics or hospitals to improve the efficiency of the referral system to the Dental Polytechnic Hospital.
Patient	Long waiting time at the Dental Polytechnic Hospital due to the high number of patients.
Patient	The development of specialty services such as oral surgery can attract more patients to the Dental Polytechnic of the Hospital.
Patient	The hospital's well-organized Dental Poly environment ensures patient safety and comfort.
Patient Teeth	The Dental Poly facilities of the hospital are complete to support the patient's dental services.
Patient Teeth	The increasing public awareness of the importance of patient dental care has created a higher demand for the Hospital Dental Polytechnic.
Wisdom teeth	Wisdom teeth surgery often requires certain specialties and equipment that are not always available at the Hospital Dental Polytechnic.
Dentist	Poly Dental Hospital medical personnel (dentists and/or dental nurses) are professional and certified.
Dentist	Poly Dental Hospital lacks specialist dentists in several areas.

Phrases/Words	SWOT Strategic Factors
Use	Training dentists to use the latest technology can improve the quality of services at the Dental Polytechnic Hospital.
Tooth Extraction	The hospital's dentist's experience in handling complex dental cases such as tooth extraction and wisdom teeth.
BPJS	The JKN program from BPJS in collaboration with hospitals helps patients access dental care at a more affordable cost.
BPJS	Not all dental procedures are covered, causing limited services for BPJS patients.
BPJS	The administrative bureaucracy of BPJS can slow down the service process of the Dental Polytechnic Hospital.
BPJS	Changes in BPJS policies that can affect the accessibility of patients at the Dental Polytechnic Hospital.

Source: Processed by the authors

dentists. This multi-stakeholder approach ensures the validity and reliability of the assessment, considering that each group has different but complementary expertise and viewpoints. Administrative experts provide operational and managerial perspectives, hospital directors contribute strategic vision and institutional policies, while dentists provide clinical insights and hands-on experience with patients. The scoring results of DM stakeholders as hospital administration experts show a conservative assessment pattern with an emphasis on operational and administrative aspects. The assessment reflects a deep understanding of the constraints and opportunities faced from an operational management perspective. The level of significance given indicates priority to factors that have a direct impact on service efficiency and patient satisfaction. The perspective of hospital directors represented by NY stakeholders shows a more strategic orientation with an emphasis on competitive advantage and long-term sustainability aspects. The assessment given tends to be more optimistic about the internal strengths of the organization, reflecting confidence in the institutional capabilities it has. This is consistent with the role of the director as a visionary leader who is responsible for the strategic positioning of hospitals within the healthcare landscape.

The evaluation from the perspective of clinical practitioners represented by three dentists (DL, IR, and AY) has different nuances with a focus on quality of care and patient

experience. Their assessment reflects a deep understanding of the technical aspects of the service and the clinical outcomes. Variations in scoring between dentists show heterogeneity in clinical experience and perspectives, which in turn enriches the comprehensiveness of the analysis. The synthesis of all stakeholder assessments resulted in a SWOT configuration that shows a favorable strategic positioning for hospital dental poly services. An Internal Factor Analysis Summary (IFAS) value of 7.04 indicates the dominance of internal strengths over weaknesses, while the External Factor Analysis Summary (EFAS) of 6.84 indicates relatively conducive external conditions with opportunities that can still be optimized despite threats that need to be anticipated.

Visualization of strategic positioning through the SWOT quadrant shows that the hospital's polydental services are in a position to enable the implementation of growth-oriented strategies that utilize internal strengths to capitalize on external opportunities. This position indicates that the organization has a solid foundation to develop an aggressive strategy that focuses on expanding services and increasing market share. The strategic implications of the analysis result that hospitals need to adopt a proactive approach in service development by leveraging their competitive advantages, especially in terms of the professionalism of medical personnel and the completeness of facilities. Simultaneously, organizations need to develop strategies to mitigate internal weaknesses, particularly

TABLE 3. SWOT Analysis

NO	STRATEGIC FACTORS	TS	WEIGHT	RATING	SCORE
A	Strengths				
1	The Dental Poly facilities of the hospital are complete to support the patient's dental services.	2,80	0,17	4,60	0,79
2	The hospital's well-organized Dental Poly environment ensures patient safety and comfort.	2,60	0,16	4,50	0,72
3	Poly Dental Hospital medical personnel (dentists and/or dental nurses) are professional and certified.	3,00	0,18	5,00	0,92
4	The hospital's dentist's experience in handling complex dental cases such as tooth extraction and wisdom teeth.	3,00	0,18	4,80	0,88
5	The JKN program from BPJS in collaboration with hospitals helps patients access dental care at a more affordable cost.	2,40	0,15	4,30	0,63
6	A clear dental referral administration system for cases that require follow-up care to the Dental Polytechnic Hospital.	2,50	0,15	4,40	0,67
		16,30	1		4,62
B	Weaknesses				
1	Long waiting time at the Dental Polytechnic Hospital due to the high number of patients.	2,20	0,19	2,60	0,48
2	The facilities of the Dental Polytechnic may not be the same in all hospitals.	2,40	0,20	2,60	0,53
3	Wisdom teeth surgery often requires certain specialties and equipment that are not always available at the Hospital Dental Polytechnic.	2,70	0,23	2,60	0,59
4	Not all dental procedures are covered, causing limited services for BPJS patients.	2,10	0,18	2,40	0,43
5	BPJS administrative bureaucracy can slow down the service process of the Dental Polytechnic Hospital	2,40	0,20	1,90	0,39
		11,80	1		2,42
C	Opportunities				
1	The increasing public awareness of the importance of dental care has created a higher demand for the Dental Polytechnic Hospital.	2,80	0,27	4,10	1,10
2	Training dentists to use the latest technology can improve the quality of service at the Dental Polytechnic Hospital	2,80	0,27	4,80	1,29
3	The development of specialty services such as oral surgery can attract more patients to the Dental Polytechnic of the Hospital.	2,80	0,27	4,80	1,29

4	Collaboration with other clinics or hospitals to improve the efficiency of the referral system to the Dental Polytechnic Hospital.	2,00	0,19	3,80	0,73
		10,40	1		4,42
D Threats					
1	The competition between the Dental Clinic and the Private Dental Clinic that offers faster and more personalized services.	2,40	0,19	2,30	0,45
2	Stigma towards the services of Dental Polytechnic Hospital which is considered less friendly than clinics.	2,20	0,18	2,00	0,35
3	Changes in BPJS policies that can affect the accessibility of patients at the Dental Polytechnic Hospital.	2,20	0,18	2,40	0,43
4	Poly Dental Hospital lacks specialist dentists in several areas.	2,80	0,23	2,60	0,59
5	The medical risk when handling patients' toothache is higher if the facilities or competencies of the Dental Polytechnic Hospital are inadequate.	2,80	0,23	2,70	0,61
		12,40	1		2,42

Source: Processed by the authors

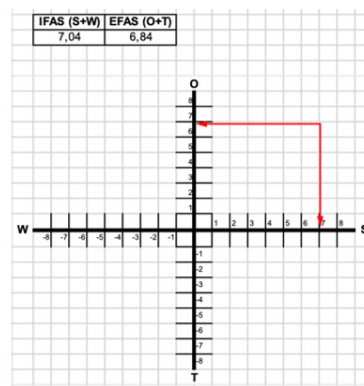


FIGURE 3. SWOT Quadrant

in the aspects of operational efficiency and service standardization between units. The momentum of increasing public awareness of dental health must be capitalized on through strategic promotional programs and the development of specialized services that can provide differentiation to competitors. Finally, anticipation of external policy dynamics, especially changes in BPJS regulations, is a critical success factor in maintaining the sustainability and accessibility of services for all

segments of society.

The SWOT analysis of the results of the analysis of public sentiment on social media X towards the hospital's dental poly services identified a number of strengths, weaknesses, opportunities, and threats faced by this service unit. Based on the results of the sentiment analysis obtained through NBC, the main strengths include comprehensive facilities and medical professionals. Singh & Purohit (2017) confirming that dental polys serve as treatment

centers for various dental health problems, from routine procedures to complex treatments such as wisdom teeth extraction. A significant weakness in hospital dental poly services is the extensive waiting time. Suwandi *et al.* (2024) mention that general dental clinics must have specialties to deal with specific problems, which are often an obstacle in some hospitals due to limited facilities and experts. The limitation of services for BPJS patients is also a major concern, often caused by the limitation of facilities and inadequate medical personnel to handle complex treatments. This is in line with the view of Balaji *et al.*, which emphasizes that the quality of service does not only rely on the final outcome, but also on the service process received by patients (Balaji *et al.*, 2020; Raj *et al.*, 2024).

Opportunities identified include increasing public awareness of the importance of dental care and the development of specialty services. According to the Regulation of the Minister of Health Number 89 of 2015, dental polyclinics also play a role in public education. However, the threat of competition with private clinics and changes in BPJS policies need to be anticipated. Hariyani *et al.* (2023) underline that understanding customer needs is the key to assessing service quality. The integration of all elements of SWOT analysis into strategic planning allows hospitals to create a responsive, high-quality, and patient-oriented dental healthcare ecosystem (Budiman & Nadirawati, 2020; Keddington & Gee, 2025; Mohezar *et al.*, 2017; Swain *et al.*, 2022). This holistic approach ensures that hospitals not only survive in a competitive environment but also thrive as innovative and trusted healthcare providers, creating positive and sustainable synergies.

Conclusion

The implementation of the big data methodology through sentiment analysis of 3,075 tweets using the Naïve Bayes Classifier algorithm succeeded in revealing the factual condition of hospital dental poly services in Indonesia with an accuracy rate of 73%. The fundamental findings showed the dominance of negative sentiment at 61.54% compared to positive sentiment at 38.46%, indicating the prevalence of public dissatisfaction with the

quality of services received. The disparity in the model's performance in identifying the two sentiment categories, with the negative category recall reaching 0.90 but the positive category only 0.44, reflects the linguistic characteristics of complaints that are more explicit than expressions of satisfaction. The transformation of textual data into 20 SWOT strategic factors resulted in a favorable institutional positioning with IFAS values of 7.04 and EFAS 6.84, showing the dominance of internal strengths over weaknesses and external conditions that are conducive to opportunities that can be optimized despite threats that require strategic anticipation.

A comprehensive evaluation through triangulation from a multi-stakeholder perspective confirmed that the hospital's dental poly services have a solid foundation of professional medical personnel, comprehensive facilities, and an organized referral administration system, yet face structural challenges in terms of operational efficiency and service standardization between units. The momentum of increasing public awareness of the importance of dental care creates strategic opportunities for the development of specialized services and the implementation of the latest technologies, providing competitive differentiation to private service providers. The recommended policy implications include the adoption of a growth-oriented strategy that utilizes existing competitive advantages, the development of internal weakness mitigation programs through workflow optimization and procedure standardization, and proactive anticipation of external regulatory dynamics, especially changes in BPJS policies that can affect the accessibility and sustainability of services for all segments of Indonesian society.

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