Journal of Information Systems Engineering and Management
2025, 10(15s)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

Teachers in the Digital Age: Sentiment Analysis of the Merdeka Mengajar Platform in the Indonesian Curriculum Policy

Andi Riansyah[1], Heriani[2], Teguh Arie Sandy[3], Admaja Dwi Herlambang[4], Noni Dwi Sari[5], Miftahus Surur[6]
[1]*Universitas Islam Sultan Agung Semarang, Indonesia*
[2]*Program Studi Pariwisata, Fakultas Ekonomi dan Bisnis, Universitas Terbuka, Indonesia*
[3]*Ahli Media Consultant, Indonesia*
[4]*Universitas Brawijaya, Indonesia*
[5]*Junior High School Insan Rabbany, Tangerang Selatan, Banten, Indonesia*
[1]*STKIP PGRI Situbondo, Indonesia*

ARTICLE INFO

Received: 30 Nov 2024

Revised: 25 Jan 2025

Accepted: 03 Feb 2025

ABSTRACT

Introduction: The Platform Merdeka Mengajar (PMM) was launched on February 11, 2022, as a digital tool to support the implementation of the Merdeka Curriculum in Indonesia. The platform provides teachers with references, learning materials, and professional development resources. Despite its intended benefits, user reviews on the PMM application vary, with both positive and negative feedback reflected in star ratings and comments. Understanding these sentiments is crucial for improving the platform's effectiveness and ensuring better adoption by educators.

Objectives: The Platform Merdeka Mengajar (PMM) was launched on February 11, 2022, as a digital tool to support the implementation of the Merdeka Curriculum in Indonesia. The platform provides teachers with references, learning materials, and professional development resources. Despite its intended benefits, user reviews on the PMM application vary, with both positive and negative feedback reflected in star ratings and comments. Understanding these sentiments is crucial for improving the platform's effectiveness and ensuring better adoption by educators.

Methods: This study employs a quantitative approach, analyzing 8,581 user reviews from Google Play. The dataset is processed using Orange 3 software, incorporating text preprocessing, sentiment classification, and emotion analysis. Three machine learning models—Naïve Bayes, Neural Networks, and Linear Regression—are compared for classification performance, evaluated through accuracy, precision, recall, and F1-score metrics.

Results: Findings indicate that 89.55% of reviews are positive, with joy (35.92%) and trust (33.31%) being the most frequently expressed emotions. Negative sentiment accounts for 5.21%, primarily due to performance-related issues. Public opinion analysis reveals that users appreciate the platform's content and usability, while technical challenges remain a concern. The Naïve Bayes model achieved an accuracy of 84.2%, demonstrating its effectiveness in sentiment classification.

Conclusions: This research contributes to the growing body of literature on educational technology adoption in Indonesia by employing big data sentiment analysis. It provides empirical evidence on user perceptions, offering valuable recommendations for digital transformation in education.

Keywords: Platform Merdeka Mengajar, Sentiment Analysis, Public Opinion, Emotion Analysis, Big Data

INTRODUCTION

The "Platform Merdeka Mengajar" (PMM) application became increasingly vital when considering its position as a technological platform designed to support teachers and principals in their teaching, learning, and creative endeavours. PMM not only acted as a companion for educators in fulfilling their daily tasks but also as an instrument facilitating the implementation of the "Merdeka Curriculum". This was a significant initiative that aimed to assist

Copyright © 2024 by Author/s and Licensed by JISEM. This is an open access article distributed under the Creative Commons Attribution License which permitsunrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

teachers in obtaining the necessary references, inspiration, and understanding to implement this curriculum Effectively. [1], [2]

By providing rich and integrated educational resources, the app could revolutionize how teachers and principals approach education, offering more structured guidance and diverse resources. Therefore, analyzing user sentiment towards this app could provide valuable insights into how far it succeeded in achieving its objectives. Furthermore, understanding user perceptions enabled developers to enrich the app with content and features that met user needs while better supporting the implementation of the Merdeka Curriculum. [3]

Through PMM, the ministry provided various teaching materials and references for each school to utilize all the features and content related to the Merdeka Curriculum. This enabled schools to independently choose and implement the three curriculum options [4]. The PMM not only enriched our understanding of the effectiveness and acceptance of the app among its target users but also aided in guiding the further evolution of this platform, making it a more robust and effective tool for educating future generations.

This research aimed to aid and support the initiatives undertaken by the Ministry of Education in Indonesia. It analyzed users' opinions of the PMM application using sentiment analysis. This analysis was expected to support the government in decision making to enhance the quality of the services provided. Additionally, the research was directed towards helping application developers improve and address potential issues that might have arisen within the application.

RELATED WORKS

Sentiment analysis on mobile applications has been a significant research focus in recent years. Numerous studies have been conducted to understand user perspectives on mobile applications through sentiment analysis. Some research indicates that understanding sentiment can provide valuable insights into user satisfaction, service quality, and potential improvements that can be made to mobile applications.

Researchers have developed models that automatically analyze user reviews to determine positive, negative, or neutral sentiments. This approach helps improve the efficiency of sentiment analysis on a large scale, especially when many reviews need to be evaluated. [5], [6], [7]

Moreover, some studies focus more on specific industry sectors, such as ecommerce, healthcare services, or education, to understand user sentiment contextually. These studies highlight the need to consider the characteristics of each industry in the development and improvement of mobile applications.

Here is a table summarizing some related research in the domain of sentiment analysis of mobile applications. These studies provide an indepth understanding of trends and innovations in mobile application sentiment analysis, forming a crucial foundation for future research and development.

Table 1. Research related to mobile sentiment analysis

Author	Target Apps	Algoritm
Zang, et.al. [8]	WeChat	• Support Vector Machines (SVM) • Naïve Bayes (NB)
Hadwan, et.al. [9]	Tawakkalna, Tetaman, Tabaud, Sehhaty, Mawid, and Sehhah.	• Decision Tree • Support Vector Machine (SVM) • KNearest Neighbor (KNN), • Naïve Bayes (NB)
Zai, et.al. [10]	Good Doctor Online	• Latent Dirichlet Allocation (LDA)
Mustopa, et.al. [11]	PeduliLindungi	• Support Vector Machine (SVM) • Naive Bayes (NB)
Rahman et.al. [12]	Moble Banking in Malaysia	• Support Vector Machine (SVM) • Naïve Bayes (NB)
Balakrishnan, et.al. [13]	Mobile payment app, Boost	• Support Vector Machine (SVM) • Naïve Bayes (NB)

		• Decision Tree • Random Forest

Based on Table 1 above, it can be concluded that, in general, sentiment analysis often utilized Support Vector Machines (SVM) [14], [15] and Naïve Bayes (NB) algorithms [16], [17]. Both algorithms have been chosen extensively for their advantages and suitability for sentiment analysis tasks. The SVM algorithm is renowned for effectively handling high dimensional and complex data. SVM can accurately separate data, especially in nonlinear and complex sentiment patterns.

On the other hand, the Naïve Bayes algorithm is well-known for its simplicity and efficiency. Based on Bayes' theorem and assuming independence between features, the algorithm allows for quick training and implementation. Despite its naive assumptions, Naïve Bayes often yields good results in practice, especially when dealing with high dimensional datasets. This advantage makes Naïve Bayes a popular choice in sentiment analysis, particularly when seeking a balance between performance and model complexity.

The choice between SVM and Naïve Bayes in sentiment analysis often depends on the specific characteristics of the data at hand and the study's goals. Both algorithms offer significant flexibility and good performance, making them solid choices for implementing sentiment analysis in various contexts [18], [19], [20].

METHODS

Method Design

The method used consisted of four main steps, namely:

1. Data Preparation: This step involved collecting data by crawling Google Play and labeling the gathered data.
2. Data Preprocessing: In this stage, case folding, tokenizing, filtering, stemming, and normalization were performed to prepare the data before further processing.
3. Data Modeling: In this research, three algorithms were employed for comparison, namely Naive Bayes, Neural Network, and Linear Regression. These algorithms were applied to obtain results and calculate accuracy.
4. Data Visualization: This step involved presenting findings, such as sentiment analysis, emotion analysis, public opinion, and word clouds, in a visual format.
5. Data Evaluation: The final step involved checking the reliability and validity of the study's data to ensure the obtained results' accuracy.

By following these steps, the research generated more detailed and relevant findings in analyzing the sentiment and opinions of users regarding the selected applications. The steps can be seen in Figure 1.

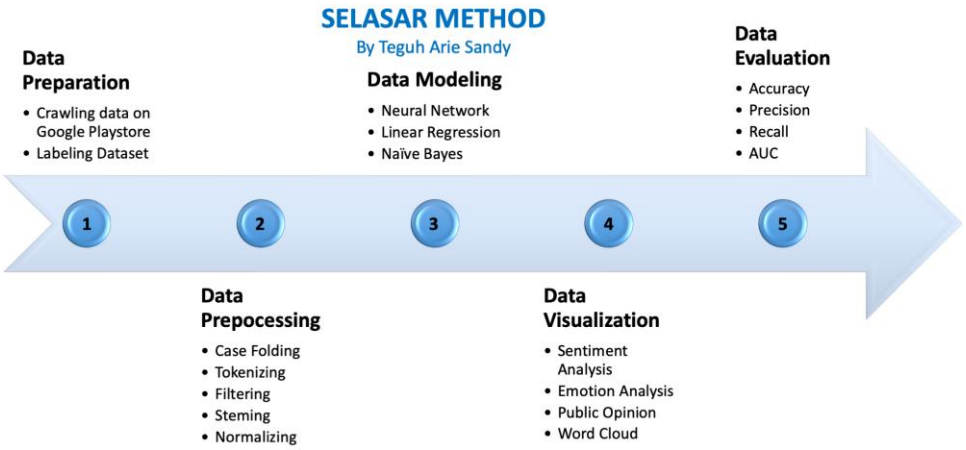

Figure 1. Steps of Research Method

Data Set

The dataset utilized in this study was gathered from user reviews of the PMM App, comprising a comprehensive total of 8,581 reviews. Table 2 presented below, delineates the classification of the data according to its respective star ratings. This dataset is a valuable resource for analyzing user sentiments and experiences, providing insights into the varying degrees of satisfaction or concerns expressed by users through their ratings and reviews of the PMM App. The extensive nature of the dataset enhances the robustness of the analysis, allowing for a nuanced understanding of user perspectives and preferences associated with the application.

Table 2. Dataset based on star ratings

Star Rating	Total dataset
1	352
2	105
3	284
4	852
5	6988

Data Processing

Orange 3 data mining software was utilized to process the acquired dataset in this research. This software not only facilitated the analysis process but also provided various features and modules that supported the analysis steps efficiently. Additionally, to provide a clearer and more detailed overview of the analysis process, the workflow could be observed and explained in detail through the visual representation depicted in Figure 2.

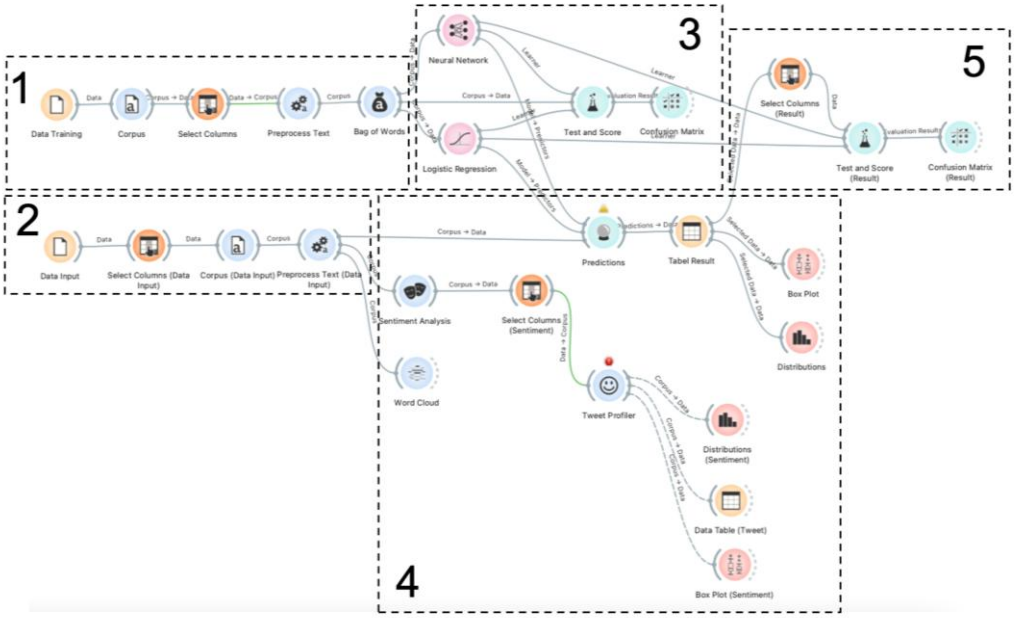

Figure 2. Workflow data processing with Orange 3 Software

Here is the explanation for each section:

1. Number 1: Training Data
   This section comprised training data consisting of examples of comments related to the application, such as Function & Feature, Content, Support & Security, Payment, Performance, and User Interface & Experience (UI/UX).

2. Number 2: Crawled Data from Playstore
   This section represented data obtained by crawling comments on Playstore. The collected data included comment dates, comment content, and star ratings.
3. Number 3: Reliability of Training Data
   This section discussed the reliability of the training data. The research used linear regression and Neural Network algorithms to test the reliability of the training data.
4. Number 4: Data Visualization
   This section covered data visualization, including sentiment analysis, emotion analysis, opinion analysis related to the application, and a word cloud in this research.
5. Number 5: Validity of Predictions from Application Comments
   Data This section explained the use of linear regression and Neural Network algorithms to test the validity of predictions from application comment data.

RESULTS

Result of Field Tests

PMM is an educational super app designed by the Ministry of Education, Culture, Research, and Technology (Kemendikbudristek) to assist teachers in teaching, developing their competencies, and creating better outcomes. Figure 3 represents the results of a search using the data.ai website.

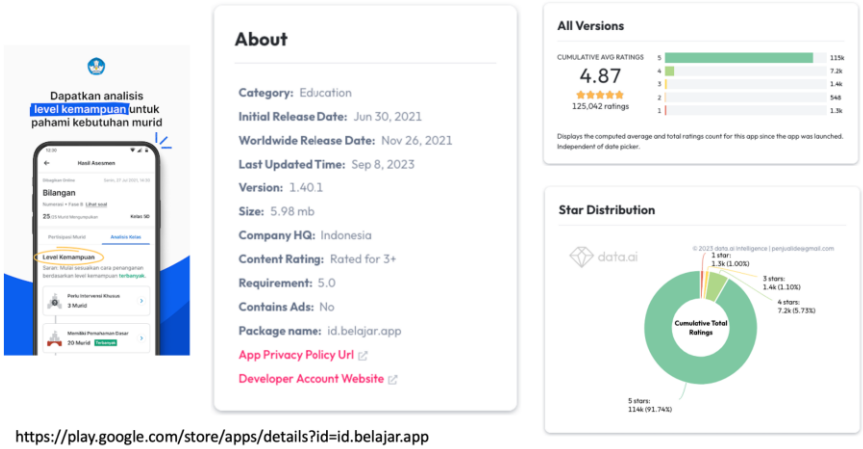

Figure 3. PMM overview from data.ai

Using the data.ai website, it was found that PMM had its inaugural launch on June 30, 2021. The number of downloads exceeded 1 million, with a total rating count of 125,000, and an impressive 90% of these ratings were 5star reviews.

Sentiment Analysis

This research employed sentiment categorization based on the star rating scale, where stars 1 and 2 were considered negative sentiment, star 3 as neutral sentiment, and stars 4 and 5 as positive sentiment. The following is the analysis table 3.

Table 3. Sentiment analysis result

Sentiment	Total data	Percentage
Negative	457	5,21%
Neutral	284	3,24%
Positive	7840	89,55%

The analysis result from the table 3 indicates that negative sentiment, consisting of reviews with a rating of stars 1 and 2, accounted for approximately 5.21% of the total reviews. These reviews reflect disappointment or dissatisfaction from a small fraction of users towards the application. Neutral sentiment, associated with a star rating of 3, comprised around 3.24% of the total reviews, indicating that most users provided a balanced assessment of the application. On the other hand, most users, approximately 89.55%, expressed positive sentiment by giving a rating of stars 4 and 5. These positive reviews indicate high satisfaction from users towards the application, with appreciation for the features, performance, or services provided. This analysis provides a general overview of user responses to the application, serving as valuable guidance for further development and improvement.

Emotion Analysis

Emotion analysis of application reviews involves studying the emotional expressions contained in user reviews of an application. The goal of this analysis is to identify and understand the emotions expressed by users about their experience with the application. The process of emotion analysis in application reviews may involve understanding the language used, the use of keywords, and the sentence context to determine the emotions conveyed. [21], [22], [23]

Emotion analysis using the Plutchik theory [23], [24], [25] refers to the application of an emotion model developed by psychologist Robert Plutchik. This theory identifies eight basic emotions arranged in the form of an emotion wheel. The overall Plutchik emotion model includes basic emotions such as joy, surprise, fear, anger, sadness, anticipation, disgust, and trust. Figure 4 represents the results of emotion analysis for the PMM application.

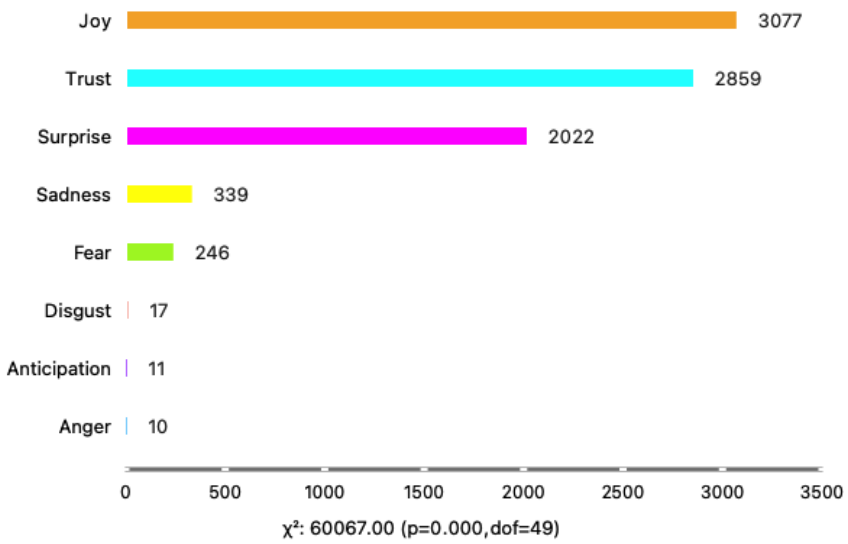

Figure 4. Emotion Analysis Result

Based on the Plutchik emotion theory, the analysis of emotions in Mobile PPM application reviews reveals a predominantly positive sentiment. Joy takes the lead with a percentage of 35.92%, followed by Trust with 33.31%, and Surprise with 23.53%. Meanwhile, negative emotions such as Sadness, Fear, Disgust, Anticipation, and Anger each have relatively low percentages of 4.00%, 4.23%, 0.21%, 0.14%, and 0.13%, respectively. This analysis indicates that users of the Mobile PPM application tend to have a positive experience, filled with joy and trust. The low percentage of negative emotions suggests a high level of satisfaction and strong trust in the application. Although there is some sadness and fear, their overall impact is relatively low, indicating a good quality user experience.

Public Opinion Analysis

The analysis of public opinion on PMM application reviews is focused on comments related to various aspects such as Function & Feature, Content, Support & Security, Payment, Performance, and User Interface & Experience (UI/UX). To gain deeper insights into users' perceptions of the application, this research concentrates on various features and services, including functionality, content, support and security, payment systems, performance, as well as interface and user experience. The results of this public opinion analysis are expected to provide a comprehensive overview of the strengths and weaknesses of the PMM application from the user's perspective, offering valuable

insights for continuous development and improvement. Table 4 presents the results of the public opinion analysis categorized based on star ratings.

Table 4. Public opinion result

Star Rating	Opinion	Total data	Percentage
1	Content	67	19,03%
	Function & Feature	19	5,40%
	Payment	10	2,84%
	Performance	219	62,22%
	Support & Security	15	4,26%
	UI/UX	22	6,25%
2	Content	20	19,05%
	Function & Feature	7	6,67%
	Payment	2	1,90%
	Performance	63	60,00%
	Support & Security	3	2,86%
	UI/UX	10	9,52%
3	Content	78	27,46%
	Function & Feature	13	4,58%
	Payment	6	2,11%
	Performance	158	55,63%
	Support & Security	5	1,76%
	UI/UX	24	8,45%
4	Content	274	32,16%
	Function & Feature	23	2,70%
	Payment	12	1,41%
	Performance	483	56,69%
	Support & Security	10	1,17%
	UI/UX	50	5,87%
5	Content	2559	36,62%
	Function & Feature	82	1,17%
	Payment	90	1,29%
	Performance	3818	54,64%
	Support & Security	80	1,14%
	UI/UX	359	5,14%

Based on the analysis of comments for each star rating, the following trends and patterns emerge:

1. Users giving a 1star rating predominantly expressed dissatisfaction with the application's performance. Notably, comments related to content and UI/UX also contributed to the negative sentiment.
2. Similar to 1star ratings, users giving a 2star rating emphasized concerns about the application's performance. Content and UI/UX were also mentioned as areas of improvement.
3. Users providing a 3star rating exhibited a more balanced assessment across various aspects. The comments touched on content, performance, and UI/UX, indicating a moderate level of satisfaction.
4. A 4star rating showed diverse comments across content, performance, and UI/UX. Users were generally satisfied, with performance being a notable highlight.

5. Users giving a 5star rating provided overwhelmingly positive feedback, particularly praising content, performance, and UI/UX. The large number of comments indicates high satisfaction with various aspects of the application.

In summary, the distribution of comments across different features provides valuable insights into user sentiments and priorities. These findings can guide future improvements and enhancements to meet user expectations effectively.

In addition, this study also examined the patterns of the formed word clouds [26]. The results are presented as explained in Figure 5.

Figure 5. Wordcloud result

From the results of the word cloud, frequently appearing words such as "membantu," "bagus," "guru," "aplikasi," "bermanfaat," "merdeka," "belajar," "mantap," "good," and "kurikulum" reflect users' positive responses to the application. Users express that the application provides significant assistance, is of good quality, and delivers tangible benefits. The presence of words like "teacher" and "curriculum" indicates users' acknowledgment of the application's role in supporting the teaching learning process and enriching the curriculum. Additionally, words like "freedom" and "learn" suggest that the application is perceived as a tool that provides freedom and convenience in the learning process. Overall, these positive words reflect users' satisfaction and provide a positive overview of the application's quality.

Data Reliability and Validity

The reliability of training data refers to the consistency and dependability of the data used to train a model [27]. It assesses the extent to which the training dataset accurately represents patterns and characteristics of the overall dataset. In the context of machine learning, a reliable training dataset is crucial for building a model that can generalize well to new, unseen data.

Validity of prediction data refers to the extent to which the predictions or outputs of a model can be relied upon or are accurate [28]. It assesses the consistency and alignment between the model's predictions and the actual data or realworld outcomes. Validity of prediction data is crucial to assess how well a model can generalize patterns from training data to previously unseen data.

The reliability of the training data in this research was evaluated using the Naive Bayes algorithm used evaluation metrics such as accuracy, precision, recall, and F1Score. The results are presented in Table 5.

Table 5. Reliability and validity data with Naïve Bayes Algoritm

Data	AUC	CA	F1	Prec	Recall
Reability	0.995	0.940	0.940	0.940	0.940
Validity	0.916	0.842	0.849	0.884	0.842

For reliability, the Area Under the Curve (AUC) value is exceptionally high at 0.995, indicating a robust and consistent performance of the model. Additionally, various performance metrics, such as Classification Accuracy (CA), F1Score, Precision, and Recall, all exhibit strong values around 0.940. These results affirm the high reliability and consistency of the training data, suggesting that the model has learned patterns effectively.

In terms of validity, the AUC is 0.916, indicating a strong ability of the model to distinguish between different classes. The Classification Accuracy (CA) is 0.842, reflecting the overall correctness of the model's predictions. Furthermore, F1Score, Precision, and Recall metrics show respectable values, emphasizing the model's validity in making accurate predictions.

In summary, the Naïve Bayes algorithm has demonstrated outstanding reliability and validity in handling the sentiment analysis task based on the provided data. The high AUC values and consistent performance metrics attest to the model's effectiveness in both learning from the training data and making reliable predictions on unseen data.

DISCUSSION

The sentiment analysis results indicate that the majority of users provided positive reviews by giving a 4 or 5star rating. This positive sentiment is reflected in words such as "helpful," "good," and "beneficial" in the word cloud. However, it is important to note that there is a small portion of users who expressed negative sentiment with a 1 or 2star rating, reflecting disappointment or dissatisfaction with the application.

The emotion analysis adds insight into how users respond to the application. Based on Plutchik's theory, the dominance of positive emotions such as joy and trust is evident in the highest scores for emotions like "joy" and "trust." This reflects a positive experience and user satisfaction with the application.

Furthermore, the analysis of public opinion focuses on various aspects of the application. The dominance of positive sentiment, especially in the categories of Function & Feature, Content, and UI/UX, indicates that users appreciate the features and user experience of the application.

The word cloud provides a visual representation of frequently used words in reviews. Dominant positive words reflect a satisfying user experience, particularly in supporting learning with words like "teacher" and "curriculum."

Finally, the evaluation of the reliability and validity of data provides additional confidence in the quality of the analysis. High scores on metrics such as AUC, Classification Accuracy, and F1Score indicate that the model can be relied upon and is consistent in predicting sentiment based on the given data.

Regarding the government's role in disseminating PMM to the wider community, positive findings from sentiment analysis and public opinion support these efforts. The community welcomes the application, especially in the context of learning and improving the quality of education [29], [30]. Ongoing recommendations may involve the government intensifying the promotion and socialization of PMM, ensuring that its benefits are effectively conveyed to the entire population. Thus, collaborative efforts between the government and application developers can strengthen the positive impact of PMM in supporting education on a national level.

CONCLUSION

From the results of sentiment, emotion, and public opinion analysis on the PMM application, it can be concluded that most users provided positive responses to the application. The dominance of 4 and 5star ratings, along with positive sentiments such as "helpful" and "beneficial" in the word cloud, reflects user satisfaction with the functionality and benefits provided by the application. Emotion analysis underscores the dominance of positive emotions such as joy and trust, indicating a satisfying and positive user experience.

Furthermore, the analysis of public opinion provides in-depth insights into user perceptions of various aspects of the application, such as Function & Feature, Content, and UI/UX. The positive sentiment dominating these categories indicates that the PMM application has successfully met user expectations in terms of features, content, and user experience. Overall, these findings provide a positive overview of the success of the PMM application in supporting the teaching and learning process.

The analysis of the validity and reliability of data strengthens the credibility of the results, showing that the model used can be relied upon to predict user sentiment. Recommendations for further development can be derived from this in-depth understanding of the strengths and weaknesses of the application. Thus, this research contributes

valuable insights for the understanding and development of the PMM application, providing guidance for future improvements in quality and user satisfaction.

REFRENCES

[1] D. Anggraeni and R. Rizaldi, "Sosialisasi Platform Kampus Merdeka Sebagai Wadah Berkarya Guru," *JISS*, vol. 1, no. 2, pp. 76–81, Jun. 2023, doi: 10.59435/jiss.v1i2.119.

[2] L. Elviana, G. Sainanda, and M. Setiawati, "Penggunaan Platform Merdeka Mengajar oleh Guru SMA Negeri 1 Lembang Jaya," *edu*, vol. 1, no. 1, pp. 61–72, Jun. 2023, doi: 10.55352/edu.v1i1.477.

[3] Y. F. Riti and L. I. Trisyanti, "Pelatihan Penggunaan Aplikasi Merdeka Mengajar bagi Guru-Guru TK Citra Bangsa," *komatika*, vol. 2, no. 2, pp. 48–52, Dec. 2022, doi: 10.34148/komatika.v2i2.579.

[4] D. Dike and A. Antonius, "TRANSFORMASI BUDAYA BELAJAR MELALUI PLATFORM MERDEKA MENGAJAR DI SEKOLAH DASAR KABUPATEN SINTANG," *VOX*, vol. 14, no. 1, pp. 37–52, Apr. 2023, doi: 10.31932/ve.v14i1.1999.

[5] N. Wang, "Online robust non-negative dictionary learning for visual tracking," *Proceedings of the IEEE International Conference on Computer Vision*, no. Query date: 2021-11-05 16:22:59, pp. 657–664, 2013, doi: 10.1109/ICCV.2013.87.

[6] R. Watrianthos, M. Giatman, W. Simatupang, R. Syafriyeti, and N. K. Daulay, "Analisis Sentimen Pembelajaran Campuran Menggunakan Twitter Data," *mib*, vol. 6, no. 1, p. 166, Jan. 2022, doi: 10.30865/mib.v6i1.3383.

[7] R. Arief and K. Imanuel, "ANALISIS SENTIMEN TOPIK VIRAL DESA PENARI PADA MEDIA SOSIAL TWITTER DENGAN METODE LEXICON BASED," *jurnalmatrik*, vol. 21, no. 3, pp. 242–250, Dec. 2019, doi: 10.33557/jurnalmatrik.v21i3.727.

[8] L. Zhang, K. Hua, H. Wang, G. Qian, and L. Zhang, "Sentiment Analysis on Reviews of Mobile Users," *Procedia Computer Science*, vol. 34, pp. 458–465, 2014, doi: 10.1016/j.procs.2014.07.013.

[9] M. Hadwan, M. A. Al-Hagery, M. Al-Sarem, and F. Saeed, "Arabic Sentiment Analysis of Users' Opinions of Governmental Mobile Applications," *Computers, Materials & Continua*, vol. 72, no. 3, pp. 4675–4689, 2022, doi: 10.32604/cmc.2022.027311.

[10] Y. Zhai, X. Song, Y. Chen, and W. Lu, "A Study of Mobile Medical App User Satisfaction Incorporating Theme Analysis and Review Sentiment Tendencies," *IJERPH*, vol. 19, no. 12, p. 7466, Jun. 2022, doi: 10.3390/ijerph19127466.

[11] A. Mustopa, Hermanto, Anna, E. B. Pratama, A. Hendini, and D. Risdiansyah, "Analysis of User Reviews for the PeduliLindungi Application on Google Play Using the Support Vector Machine and Naive Bayes Algorithm Based on Particle Swarm Optimization," in *2020 Fifth International Conference on Informatics and Computing (ICIC)*, Gorontalo, Indonesia: IEEE, Nov. 2020, pp. 1–7. doi: 10.1109/ICIC50835.2020.9288655.

[12] N. A. Rahman, S. D. Idrus, and N. L. Adam, "Classification of customer feedbacks using sentiment analysis towards mobile banking applications," *IJ-AI*, vol. 11, no. 4, p. 1579, Dec. 2022, doi: 10.11591/ijai.v11.i4.pp1579-1587.

[13] V. Balakrishnan, P. K. Selvanayagam, and L. P. Yin, "Sentiment and Emotion Analyses for Malaysian Mobile Digital Payment Applications," in *Proceedings of the 2020 the 4th International Conference on Compute and Data Analysis*, Silicon Valley CA USA: ACM, Mar. 2020, pp. 67–71. doi: 10.1145/3388142.3388144.

[14] R. A. Rizka Akmalia, I. Slamet, and H. Pratiwi, "Analisis Sentimen Twitter Berbahasa Indonesia Terhadap Aplikasi PeduliLindungi dengan Algoritma SVM, KNN, dan Regresi Logistik," *PSNMU*, pp. 150–156, May 2022, doi: 10.30862/psnmu.v7i1.21.

[15] A. Ariansyah and M. Kusmira, "ANALISIS SENTIMEN PENGARUH PEMBELAJARAN DARING TERHADAP MOTIVASI BELAJAR DI MASA PANDEMI MENGGUNAKAN NAIVE BAYES DAN SVM," *FaktorExacta*, vol. 14, no. 3, p. 100, Oct. 2021, doi: 10.30998/faktorexacta.v14i3.10325.

[16] Fitriani Fitriani, Ema Utami, and Anggit Dwi Hartanto, "ANALISIS SENTIMEN MASYARAKAT TERHADAP PELAKSANAAN P3K GURU DENGAN ALGORITMA NAIVE BAYES DAN DECISION TREE," *teknimedia*, vol. 3, no. 1, pp. 23–30, Jun. 2022, doi: 10.46764/teknimedia.v3i1.53.

[17] I. Mulya and C. M. karyati, "Analisis Sentimen Terhadap Universitas Gunadarma Berdasarkan Opini Pengguna Twitter Menggunakan Metode Naive Bayes Classifier," *jikstik*, vol. 19, no. 4, Dec. 2020, doi: 10.32409/jikstik.19.4.354.

[18] D. F. Zhafira, B. Rahayudi, and I. Indriati, "Analisis Sentimen Kebijakan Kampus Merdeka Menggunakan Naive Bayes dan Pembobotan TF-IDF Berdasarkan Komentar pada Youtube," *JUST-SI*, vol. 2, no. 1, Aug. 2021, doi: 10.25126/justsi.v2i1.24.

[19] P. Dedeepya, "Detecting Cyber Bullying on Twitter using Support Vector Machine," *Proceedings of the 3rd International Conference on Artificial Intelligence and Smart Energy, ICAIS 2023*, no. Query date: 2023-09-26 19:47:34, pp. 817–822, 2023, doi: 10.1109/ICAIS56108.2023.10073658.

[20] H. Santoso, A. Armansyah, and D. Desliani, "Analisis Sentimen Mahasiswa Terkait Pembelajaran Tatap Muka Menggunakan Metode Naive Bayes Classifier," *tc*, vol. 21, no. 3, pp. 644–654, Aug. 2022, doi: 10.33633/tc.v21i3.6262.

[21] R. Plutchik, "A GENERAL PSYCHOEVOLUTIONARY THEORY OF EMOTION," in *Theories of Emotion*, Elsevier, 1980, pp. 3–33. doi: 10.1016/B978-0-12-558701-3.50007-7.

[22] M. Cleveland-Innes, "Emotional presence, learning, and the online learning environment," *International Review of Research in Open and Distance Learning*, vol. 13, no. 4, pp. 269–292, 2012, doi: 10.19173/irrodl.v13i4.1234.

[23] H. Kellerman and R. Plutchik, "Emotion-Trait Interrelations and the Measurement of Personality," *Psychol Rep*, vol. 23, no. 3_suppl, pp. 1107–1114, Dec. 1968, doi: 10.2466/pr0.1968.23.3f.1107.

[24] R. Buck and K. Oatley, "Robert Plutchik (1927-2006).," *American Psychologist*, vol. 62, no. 2, pp. 142–142, Feb. 2007, doi: 10.1037/0003-066X.62.2.142.

[25] H. R. Conte and R. Plutchik, "A circumplex model for interpersonal personality traits.," *Journal of Personality and Social Psychology*, vol. 40, no. 4, pp. 701–711, Apr. 1981, doi: 10.1037/0022-3514.40.4.701.

[26] N. Venkatesh and A. Kalaivani, "Word Cloud for Online Mobile Phone Tweets towards Sentiment Analysis," *IJEAT*, vol. 8, no. 6, pp. 683–689, Aug. 2019, doi: 10.35940/ijeat.F7964.088619.

[27] S.-L. Wang, I.-E. Chiang Honours, A. Kuo, and J.-Y. Lin, "Mobile Emotion Healthcare System Applying Sentiment analysis," in *2022 IEEE International Conference on Big Data (Big Data)*, Osaka, Japan: IEEE, Dec. 2022, pp. 2814–2820. doi: 10.1109/BigData55660.2022.10021053.

[28] L. Chambers, E. Tromp, M. Pechenizkiy, and M. Medhat Gaber, "Mobile Sentiment Analysis," in *Advances in Knowledge-Based and Intelligent Information and Engineering Systems*, IOS Press, 2012, pp. 470–479. doi: 10.3233/978-1-61499-105-2-470.

[29] S. Rohimat, S. Sanusi, and M. Munthahanah, "DISEMINASI PLATFORM MERDEKA MENGAJAR UNTUK GURU SMA NEGERI 6 KOTA SERANG," *ABDIKARYA*, vol. 4, no. 2, pp. 1–9, Aug. 2022, doi: 10.47080/abdikarya.v4i2.2035.

[30] S. Wijaya and A. Marini, "PENGUNAAN APLIKASI MERDEKA MENGAJAR DALAM MENINGKATKAN HASIL BELAJAR SISWA PADA SEKOLAH PENGGERAK," *JP*, vol. 7, no. 2, pp. 1167–1178, Dec. 2022, doi: 10.23969/jp.v7i2.6404.