Sentiment Analysis of Social Media Use in Public Transportation in Sweden

Azadeh Sarkheyli[1][a] and Elnaz Sarkheyli[2][b]
[1]School of Information Technology, Halmstad University, Halmstad, Sweden
[2]Institute for Urban Studies, Department of Urban Studies, Malmö University, Malmö, Sweden

Keywords: Social Media, Public Transportation, Sentiment Analysis, Sweden.

Abstract: The increasing impact of social media on public transportation is transforming communication strategies and user engagement. These platforms offer real-time service updates while allowing users to voice their concerns and suggestions, fostering trust and enhancing customer satisfaction. This research investigates public perceptions of the communication methods used by public transportation services in Sweden, highlighting user preferences for different social media platforms and content types. The study employs a four-step methodology. First, a literature review examines the advantages and challenges of integrating social media into public transportation systems. Next, a survey assesses Swedish users' interactions with social media in this context. The third phase involves sentiment analysis and text mining of the survey responses to evaluate public opinion. Finally, the research proposes potential steps for collecting and analyzing social media data. The findings contribute to a better understanding of effective communication strategies, ultimately improving the responsiveness of public transportation systems.

1 INTRODUCTION

Sentiment analysis utilizes natural language processing and machine learning techniques to identify and extract subjective information from text, allowing for the classification of sentiments as positive, negative, or neutral. This method has gained significant popularity due to its capacity to analyze vast quantities of unstructured data derived from sources such as social media (Yue et al., 2019).

Social media analytics encompasses the collection and examination of data from social media platforms to derive insights into user behavior and emerging trends. This process includes monitoring interactions and evaluating content performance, which can ultimately influence and shape public perception (Rodríguez-Ibánez et al., 2023; Chowdhury, 2024).

According to Rodríguez-Ibánez et al. (2023), sentiment analysis has become a prominent research area since 2008, as evidenced by the increasing number of published studies. The research focus has varied widely, encompassing emergencies, business intelligence, marketing, and the prediction of electoral outcomes.

Consequently, there are numerous examples of sentiment analysis within social media, including the work by Brahami et al. (2025), who developed a sentiment analysis model using Knowledge Graph Convolutional Networks (KGCN) to analyze over 410,000 tweets related to the Russia–Ukraine conflict. This model achieved an accuracy of around 89%, demonstrating that the incorporation of knowledge graphs significantly enhances sentiment classification. This method also offers promising potential for real-time monitoring of public opinion, with substantial implications for policy. Another example is the study by Salisu et al. (2024), which examined sentiments expressed in comments on the official Instagram account of Universitas Widyagama. Their findings indicate effective promotion of a positive image through social media and highlight the potential of sentiment analysis for strategic communication in higher education.

In addition, Abeysekera (2024) studies customer attitudes toward a pop-up tax clinic in Australia that helps disadvantaged taxpayers. Analysis of feedback

[a] https://orcid.org/0000-0002-5390-7509
[b] https://orcid.org/0000-0003-2618-8796

Sarkheyli, A. and Sarkheyli, E.
Sentiment Analysis of Social Media Use in Public Transportation in Sweden.
DOI: 10.5220/0013821100004000

In *Proceedings of the 17th International Joint Conference on Knowledge Discovery, Knowledge Engineering and Knowledge Management (IC3K 2025) - Volume 2: KEOD and KMIS*, pages 522-528
ISBN: 978-989-758-769-6; ISSN: 2184-3228

from 47 clients showed that free services and good customer care improved sentiment, while factors like tax year and location had little impact. The findings indicate the potential of such clinics to reduce inequality and offer a new method for evaluating social enterprises through sentiment analysis.

A pertinent example relevant to this research is the study conducted by Torres and de Picado-Santos (2025), which examines 81 open-access research papers published between 2014 and 2024 that focus on sentiment analysis and topic modeling within the field of transportation. It underscores the success of these techniques, particularly when applied to social media data, in gaining insights into user attitudes and fostering sustainable mobility. Significant obstacles include linguistic variety and the diversity of data types, prompting the authors to suggest a framework for selecting studies and performing bibliometric analysis. The paper points out the opportunities presented by integrating these methodologies to guide the development of more intelligent and inclusive transportation policies.

Therefore, the role of social media in public transportation is increasingly recognized as vital for improving communication and user engagement. These platforms facilitate real-time updates on service statuses and allow users to voice concerns and suggestions quickly (Aman & Smith-Colin, 2021; Liu & Ban, 2017).

Social media creates a dynamic environment for two-way communication between transit authorities and the public, fostering trust and enhancing customer satisfaction by addressing user feedback directly (Liu & Ben, 2017; Zeng & Gerritsen, 2014; Kwok & Yu, 2013).

Additionally, engaging users on these platforms encourages community involvement and a sense of ownership over services (Han et al., 2020). This study explores public sentiment toward communication strategies used by public transportation services in Sweden, analyzing user preferences for social media platforms and content types that resonate most. Understanding these aspects is crucial for enhancing communication strategies and creating a more responsive public transportation system (Sarkheyli & Sarkheyli, 2024; Han et al., 2020; Bergman, 2012).

This study is structured into four phases. In the first phase, we conducted a literature review to examine insights into social media usage in research, particularly examining the advantages and disadvantages of employing social media within the scope of public transportation. The second phase involved a survey to understand how individuals in Sweden utilize social media for public transportation, serving as a medium-scale study. In the third phase, we performed sentiment analysis and text mining on the survey comments to evaluate public sentiment regarding the use of social media for public transportation in Sweden. The fourth phase, which is related to social media data collection and analysis, is mentioned for the next step of this research. It is informed by the findings from the preceding phases (refer to Figure 1).

2 SOCIAL MEDIA AND PUBLIC TRANSPORTATION IN SWEDEN

Social media has become an integral tool for public transportation agencies in Sweden and Europe to engage with passengers and improve services. Transit operators primarily use platforms like Facebook and X for real-time updates, service information, and addressing customer concerns (Sarkheyli & Sarkheyli, 2024; Georgiadis et al., 2020). A survey of European agencies found Twitter (or X as its new name) most effective for short communications and service updates. At the same time, Facebook was valid for announcements and community building (Georgiadis et al., 2020).

Transit agencies in the United States and Canada have adopted social media for timely updates, public service, and citizen engagement (Bregman, 2012). During unplanned rail disruptions, social media, particularly Twitter, proves valuable for providing concise, real-time information to passengers. However, challenges remain, including staff resourcing and managing passenger expectations (Nikolaidou & Papaioannou, 2018). Social media integration in public transportation offers new opportunities for improving urban mobility systems (Sarkheyli & Sarkheyli, 2024).

According to the SWOT analysis of using social media in public transportation, social media offers public transportation agencies valuable advantages such as data access, direct passenger communication, and cost-effective service promotion, enhancing customer satisfaction and loyalty.

However, it requires resources and presents challenges like data privacy issues, negative feedback, and limited accessibility. Opportunities for improvement include leveraging passenger feedback and building community partnerships, while threats consist of cybersecurity risks, evolving regulations, and competition from ride-sharing services. Agencies need to strategically manage these factors to

maximize benefits (Sarkheyli & Sarkheyli, 2024; Kaplan & Haenlein, 2010; Mangold & Faulds, 2009; Munar & Jacobsen, 2014).

3 RESEARCH METHODOLOGY

The research has been organized into four phases. In Phase I, a literature review was conducted to understand the main concepts of the study. Phase II involved distributing an online questionnaire to gather insights on how individuals in Sweden utilize social media platforms for public transportation. The survey targeted a diverse group of respondents, including students, teachers, researchers, engineers, doctors, and other professionals living and working in Sweden, to capture a different range of perspectives. In Phase III, the data collected from the survey underwent a thorough analysis using sentiment analysis and text-mining techniques to uncover patterns and sentiments expressed in the responses. Each response was categorized into three sentiment classes: positive, negative, or neutral. Finally, Phase IV analyzes social media platforms identified in the earlier phases. This paper presents results from Phases I, II, and III, specifically the sentiment analysis, as illustrated in Figure 1.

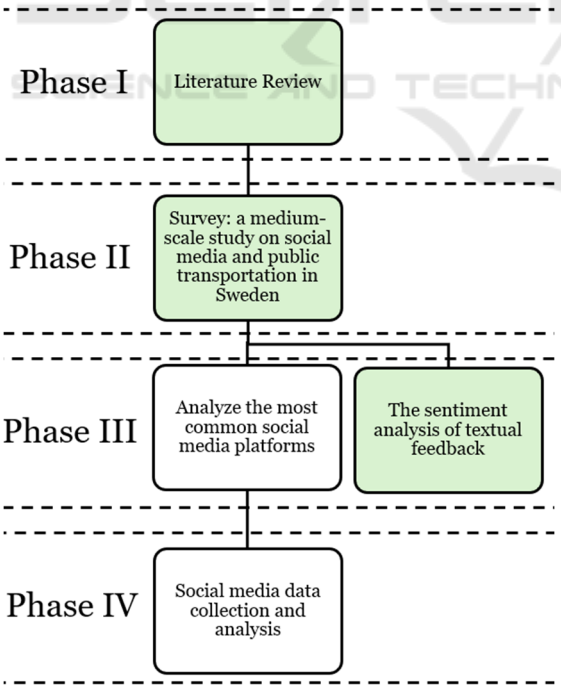

Figure 1: The research process.

The sentiment analysis utilized two tools: VADER (Valence Aware Dictionary and sEntiment Reasoner), which employs a lexicon-based approach, and XLSTAT, which incorporates statistical and machine learning techniques (Yordanova et al., 2021). VADER is ideal for sentiment analysis as it effectively handles social media nuances like slang and emoticons, which traditional methods often miss. It uses a scoring system to assess positive, negative, and neutral terms, providing accurate and fast analyses (Dixit et al., 2025).

The research combines XLSTAT and VADER for sentiment analysis, enhancing accuracy with user feedback on public transportation. Key themes were identified and visualized in charts for clarity and comparison.

4 RESULTS AND DISCUSSION

An online survey gathered 106 responses, with approximately 49% females and 46% males, averaging 37 years of age. The educational attainment showed that 36% held Doctorates or University/College degrees, 21% had Master's degrees, 4% were High School graduates, 2% completed Vocational training, and 1% fell into the other category. In terms of geographical distribution in Sweden, Skåne accounted for 71% of the responses, followed by Halland at 20%, while Stockholm, Västra Götaland, Kronobergs, and Östergötland represented smaller shares of 4%, 3%, 1%, and 1%, respectively (see Figure 2).

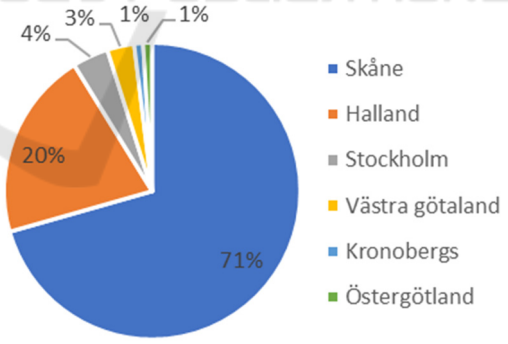

Figure 2: The city/region of the respondents.

Figure 3 illustrates the use of various social media platforms for communication purposes. Instagram is the most frequently used platform, with a value slightly above 60, followed closely by Facebook, also above 60. LinkedIn is the third most utilized platform, with usage close to 50. Other types of social media have moderate use, reaching around 30, while X (formerly Twitter) is used less, with a value of 20. TikTok has the lowest usage for communication purposes, with a value below 10.

The chart indicates that visual and text-based platforms like Instagram and Facebook are the most preferred for communication, while TikTok, known for short-form videos, is the least used in this context.

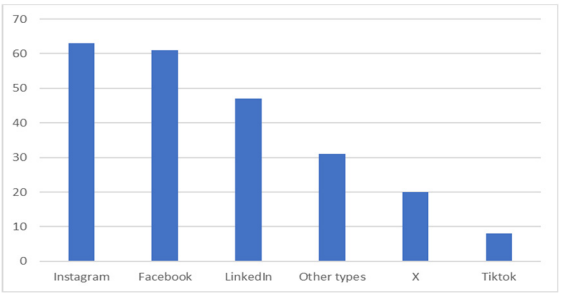

Figure 3: Use of social media for communication purposes.

4.1 Social Media Usage for Public Transport

Figure 4 shows the distribution of social media usage for public transport-related purposes across different platforms. Facebook dominates with 59%, indicating that it is the most used platform for sharing and accessing public transport information, updates, or discussions. Instagram follows with 17%, suggesting moderate engagement, possibly for visual content related to public transport. Both X (formerly Twitter) and LinkedIn have equal shares of 12%, indicating a lower but still notable usage, likely for real-time updates (X) and professional discussions or policy-related content (LinkedIn).

The chart highlights that Facebook is the primary platform for public transport engagement, while other social media channels have significantly smaller shares. Regarding social media engagement, the survey found that 54% of respondents expressed dissatisfaction with public transportation. In contrast, 14% of posts or comments conveyed appreciation, another 14% were focused on providing information, 7% were recommendations, and the remaining 11% encompassed a range of other topics (see Figure 5).

As highlighted by the survey results (refer to Figure 6), nearly half of the respondents, precisely 49%, reported not participating in posting or commenting on social media. Conversely, a smaller percentage, precisely 20% of the respondents, indicated they were actively engaged on various social media platforms.

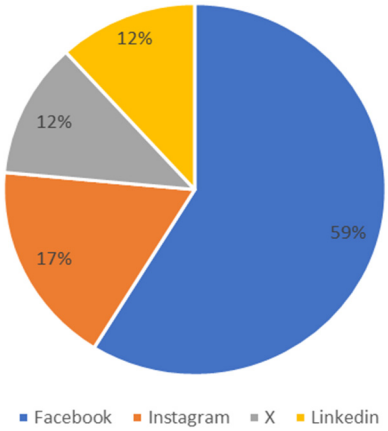

Figure 4: Usage of social media platforms for public transportation.

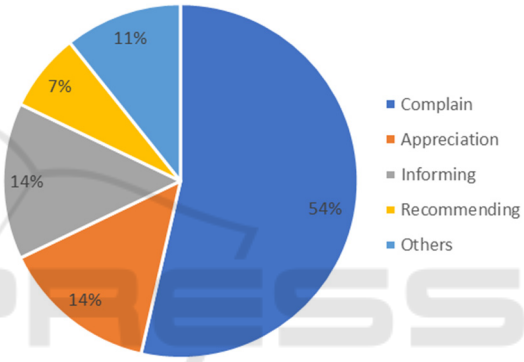

Figure 5: Category of social media posts and comments about public transportation by people.

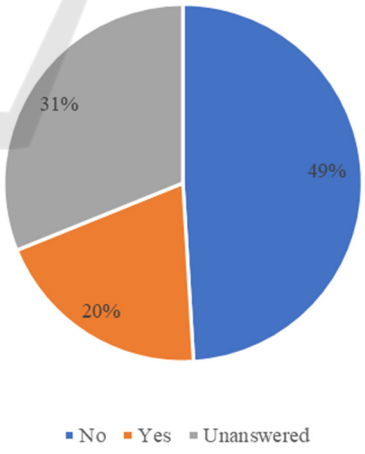

Figure 6: Engaged in posting and/or commenting on social media platforms about public transportation.

4.2 Sentiment Analysis

The sentiment analysis performed with XLSTAT uncovered a spectrum of feedback from respondents

about their experiences. Significantly, 60% of the analyzed comments reflected positive sentiments, with many users expressing appreciation for the timely information updates and real-time alerts. Conversely, 30% of respondents reported dissatisfaction, citing concerns over outdated information and a perceived lack of responsiveness. Finally, 10% of the responses were categorized as neutral, providing general feedback without strong emotional overtones.

The comment word cloud is illustrated in Figure 7, while Figure 8 displays the document sentiment scores. Additionally, Figure 9 presents the distribution of document scores, and Figure 10 shows term frequencies, indicating that a term's frequency increases with the number of times it appears in the documents.

Figure 11 shows the sentiment-based word cloud, where the larger a term is in the word cloud, the more frequent the term is in the document. Each color represents an emotion. In addition, Figure 12 shows the term scores, showing that the more positive a term is, the higher its sentiment score will be.

Figure 7: Word cloud of the comments.

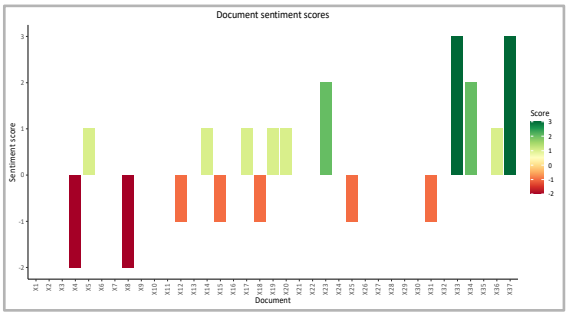

Figure 8: Document sentiment scores.

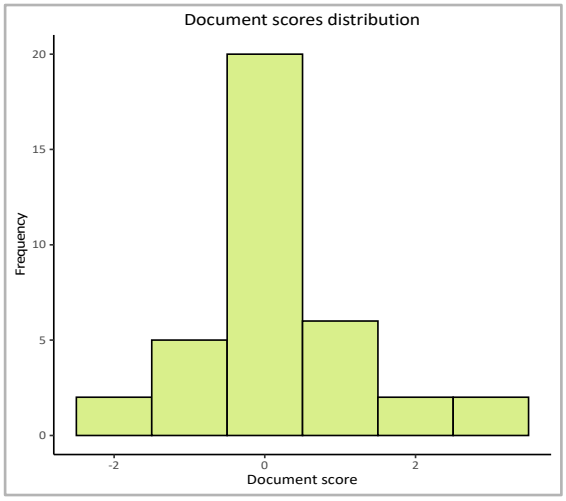

Figure 9: Document scores distribution.

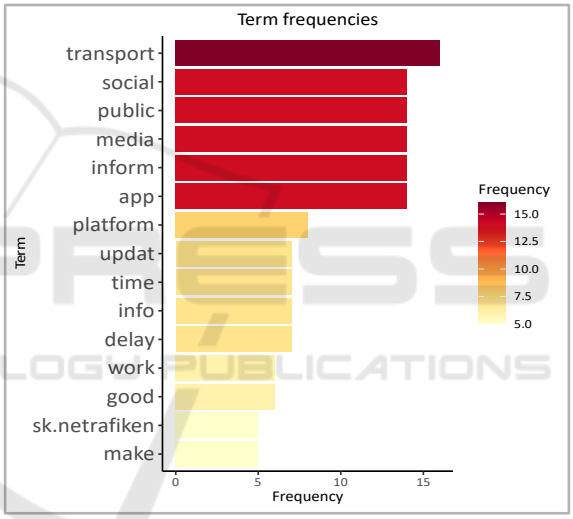

Figure 10: Term frequencies.

Figure 11: Sentiment-based word cloud.

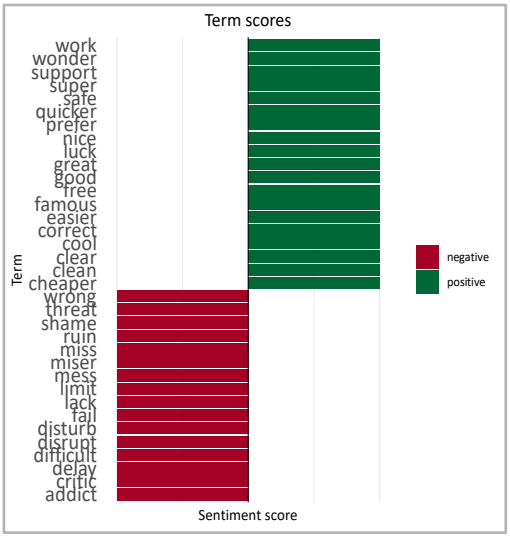

Figure 12: Term scores.

Figures 13 and 14 display the results of the VADER sentiment analysis conducted on the textual comments. The pie chart (Figure 13) illustrates the distribution of comments' sentiment categories. Positive sentiment comprises 62%, showing a clear majority, while 24% is classified as neutral, indicating a lack of strong feelings. Only 14% of the data reflects negative sentiment, representing a smaller portion. Overall, the chart highlights the dominance of positive sentiments, with neutral and negative sentiments being less prevalent. In addition, Figure 14 shows that most sentiment scores are positive, with values predominantly clustering between 0.4 and 0.8.

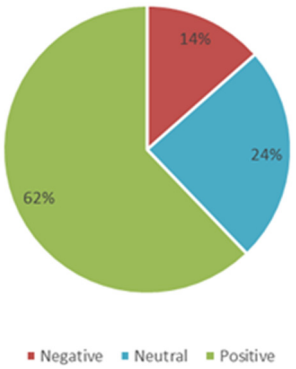

Figure 13: VADER sentiment analysis result.

However, a few instances, specifically at indices around 9, 25, 29, and 31, exhibit negative sentiment scores, indicating some negative sentiment. The data reflects fluctuations in sentiment, with occasional dips into negative values, yet there is a clear overall trend toward positive sentiment.

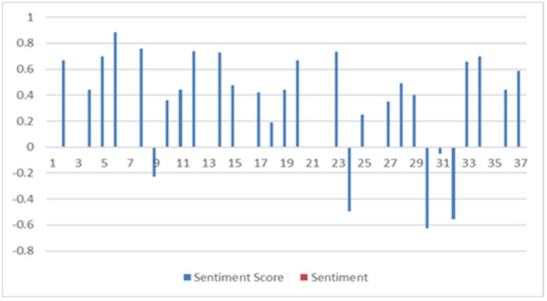

Figure 14: VADER sentiment scores.

4.3 Common Themes in Feedback

In analyzing the feedback, several key themes surfaced prominently. Many respondents underscored the importance of information accuracy, expressing a strong desire for more reliable and timely updates concerning transport services. Additionally, there was a clear demand for enhanced engagement and interaction, as users wished for more direct communication from transport authorities on social media platforms. Furthermore, the need for real-time alerts was emphasized, with numerous users noting that instant notifications regarding delays and disruptions would greatly improve their overall experience.

The satisfaction levels among respondents were notably varied. Approximately 40% reported feeling neutral or having no strong opinion. Meanwhile, 35% expressed dissatisfaction due to outdated or inadequate information. On a more positive note, 25% of respondents indicated that they were satisfied with the current state of social media communication.

5 CONCLUSIONS

Recent advancements in social media have made it essential for companies to connect with a broader audience and improve relationships.

This research examines how the public transportation sector in Sweden uses social media to enhance communication and services, structured into four phases (see Figure 1). This paper presents survey results and conducts sentiment analysis on comments relevant to Phases I, II, and III.

The first phase involved a literature review on the use of social media and its regulations in Sweden, along with relevant studies on its application in public transport. The second and third phases included a survey of 106 Swedish residents to evaluate their use of social media for public transportation.

The results indicated that apps like SJ and Skånetrafiken are the most popular sources for

transportation updates and information. A strong preference for receiving updates through social media was noted, particularly concerning service changes and travel disruptions.

The study emphasizes that while social media plays a crucial role in communicating about public transport, there is considerable room for improvement in terms of information accuracy, user engagement, and real-time updates. Public transport authorities should enhance their digital strategies by improving the responsiveness of their social media channels and ensuring timely, accurate information. Proactive engagement with users can also enrich the passenger experience, fostering a more informed ridership and increasing overall satisfaction.

ACKNOWLEDGEMENTS

This paper is part of a research project titled "Exploring Citizen Satisfaction with Public Transportation through Social Media and Open Text Surveys." The project is conducted by Malmö University in collaboration with Halmstad University and has been supported and funded by K2 (The Swedish Knowledge Centre for Public Transport).

REFERENCES

Abeysekera, I. (2024). Sentiment analysis of a nomadic tax social enterprise. Journal of Open Innovation: Technology, Market, and Complexity, 10(1), 100179.

Aman, J. J., & Smith-Colin, J. (2021). Leveraging social media to understand public perceptions toward micromobility policies: The dallas scooter ban case. Findings.

Bregman, S. (2012). Uses of social media in public transportation (No. 99). Transportation Research Board.

Chowdhury, R. H. (2024). Sentiment analysis and social media analytics in brand management: Techniques, trends, and implications. World Journal of Advanced Research and Reviews, 23(2), 287-296.

Dixit, M., Bali, M. S., Kour, K., Ioannou, I., Ghantasala, G. P., & Vassiliou, V. (2025). Video sentiment analysis on social media using an advanced VADER technique. International Journal of Data Science and Analytics, 1-33.

Georgiadis, G., Nikolaidou, A., Politis, I., & Papaioannou, P. (2020). How public transport could benefit from social media? evidence from european agencies. In Conference on Sustainable Urban Mobility (pp. 645-653). Cham: Springer International Publishing.

Han, X., Wang, J., Zhang, M., & Wang, X. (2020). Using social media to mine and analyze public opinion related to COVID-19 in China. International journal of environmental research and public health, 17(8), 2788.

Kaplan, A. M., & Haenlein, M. (2010). Users of the world, unite! The challenges and opportunities of Social Media. Business Horizons, 53(1), 59-68.

Kwok, L., & Yu, B. (2013). Spreading social media messages on Facebook: An analysis of restaurant business-to-consumer communications. Cornell Hospitality Quarterly, 54(1), 84-94.

Liu, J. H. I., & Ban, X. J. (2017). Measuring the impacts of social media on advancing public transit (No. NITC-RR-654). National Institute for Transportation and Communities.

Mangold, W. G., & Faulds, D. J. (2009). Social media: The new hybrid element of the promotion mix. Business Horizons, 52(4), 357-365.

Menaouer, B., Fairouz, S., Meriem, M. B., Mohammed, S., & Nada, M. (2025). A sentiment analysis of the Ukraine-Russia War tweets using knowledge graph convolutional networks. International Journal of Information Technology, 1-18.

Munar, A. M., & Jacobsen, J. K. S. (2014). Motivations for sharing tourism experiences through social media. Tourism Management, 43, 46-54.

Nikolaidou, A., & Papaioannou, P. (2018). Utilizing social media in transport planning and public transit quality: Survey of literature. Journal of Transportation Engineering, Part A: Systems, 144(4), 04018007.

Rodríguez-Ibánez, M., Casánez-Ventura, A., Castejón-Mateos, F., & Cuenca-Jiménez, P. M. (2023). A review on sentiment analysis from social media platforms. Expert Systems with Applications, 223, 119862.

Salisu, I. A., Ramadhan, I. R., Matdoan, S., Arifin, Z., & Praseptiawan, M. (2024). Sentiment Analysis of Comments on Higher Education Social Media Using Naïve Bayes Algorithm. Journal of Information Technology application in Education, Economy, Health and Agriculture, 1(3), 57-62.

Sarkheyli, A., & Sarkheyli, E. (2024). Social Media Integration in Public Transportation: A Case Study of Sweden. In 2024 IEEE International Conferences on Internet of Things (iThings) and IEEE Green Computing & Communications (GreenCom) and IEEE Cyber, Physical & Social Computing (CPSCom) and IEEE Smart Data (SmartData) and IEEE Congress on Cybermatics (pp. 595-600). IEEE.

Torres, E. C. M., & de Picado-Santos, L. G. (2025). Sentiment Analysis and Topic Modeling in Transportation: A Literature Review. Applied Sciences, 15(12), 6576.

Yordanova, L., Kiryakova, G., Veleva, P., Angelova, N., & Yordanova, A. (2021). Criteria for selection of statistical data processing software. In IOP Conference Series: Materials Science and Engineering (Vol. 1031, No. 1, p. 012067). IOP Publishing.

Yue, L., Chen, W., Li, X., Zuo, W., & Yin, M. (2019). A survey of sentiment analysis in social media. Knowledge and information systems, 60(2), 617-663.

Zeng, B., & Gerritsen, R. (2014). What do we know about social media in tourism? A review. Tourism Management Perspectives, 10, 27-36.