



Investigating viewer engagement dynamics through toxicity and social network analysis in the muara enggelam documentary video

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ABSTRACT

This study delves into the dynamics of viewer engagement and sentiment surrounding the Muara Enggelam documentary video, employing the Cross-Industry Standard Process for Data Mining (CRISP-DM) methodology across six distinct stages. Rooted in the imperative of comprehending audience perceptions and interactions within digital media contexts, particularly in exploring community livelihood and socio-economic dynamics depicted in documentary content, the research traverses through stages encompassing Business Understanding, Data Understanding, Data Preparation, Modeling, Evaluation, and Deployment. Leveraging toxicity analysis utilizing the Perspective API, the study reveals profound insights into the prevalence of negative language within comments, unveiling a low overall toxicity score of 0.04307, with nuanced breakdowns across categories such as Severe Toxicity (0.00476), Identity Attack (0.00978), Insult (0.02652), Profanity (0.03234), and Threat (0.01468). Additionally, Social Network Analysis (SNA) unveils the intricate network structure and interaction patterns among viewers, identifying 1754 nodes and 126 edges in the directed graph, with Modularity at 0.376, Number of Communities at 1653, and an Average Path length of 1.9559594547361063. This analysis highlights the significant role of content creators, exemplified by Kacong Explorer, in shaping discourse and fostering community engagement.

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1. INTRODUCTION

In the digital era, a notable challenge lies in broadening comprehension of community livelihoods within societies through documentary videos. These documentaries serve as conduits for disseminating knowledge about diverse societal ecosystems and cultural practices (Barceló et al., 2024; Everard & West, 2021; Kristiansen et al., 2023). By harnessing the power of visual storytelling, documentaries provide an immersive experience that transcends geographical barriers, enabling viewers to gain profound insights into the intricacies of community life (Al Zoubi, 2023; Hassinger &

Pivnick, 2022; Loucaides et al., 2024; Rogoff & Mejía-Arauz, 2022; Zhang et al., 2022). Moreover, they offer a platform for marginalized voices to be heard and for preserving indigenous knowledge systems (Hausknecht et al., 2021; McGinnis et al., 2020; van de Haterd et al., 2021). Consequently, the utilization of documentary videos presents an indispensable opportunity for fostering cross-cultural understanding and promoting socio-economic development on a global scale.

Within the socio-economic context of communities, the identification and contextual, comprehensive analysis of factors supporting sustainable livelihoods are paramount. These factors encompass a broad spectrum, ranging from access to resources and infrastructure to the resilience of local economies and the efficacy of governance structures (Barford et al., 2024; Geleta & Hirpa, 2023; Kindie et al., 2023; Mengistu & Belda, 2024; Mishra & Debata, 2021). Understanding these elements holistically enables policymakers and stakeholders to formulate targeted interventions and development strategies that address communities' specific needs and challenges (Intason et al., 2021; Kapembwa et al., 2021, 2021; Tefera et al., 2023; Vogel et al., 2020). By systematically examining these factors, societies cultivate environments conducive to long-term prosperity and resilience, fostering sustainable socio-economic development.

This study aims to analyze the content of a documentary video focusing on Muara Enggelam, reflecting the livelihoods of its community, employing the CRISP-DM approach to discern public understanding of livelihoods through the documentary content. The CRISP-DM methodology facilitates a structured and systematic examination of the documentary's thematic elements, enabling this research to dissect the nuances of community livelihoods portrayed therein. By employing this approach, the study offers insights into public perceptions and interpretations of community livelihoods depicted in the documentary, thereby contributing to a more nuanced understanding of socio-economic dynamics within Muara Enggelam and similar contexts.

The urgency of this research lies in its potential to provide valuable insights into the socio-economic dynamics of Muara Enggelam's community livelihoods, thereby informing targeted interventions and policy initiatives aimed at fostering sustainable development in the region. This research catalyzes evidence-based decision-making processes at both local and regional levels by elucidating public perceptions and understanding of community livelihoods through documentary content (Casemajor et al., 2021; Heyward & Krikowa, 2023; Loucaides et al., 2024; Mercer & Thomas, 2024). Furthermore, given the increasing importance of preserving and promoting cultural heritage and indigenous knowledge systems in the face of globalization and socio-economic change, the findings of this research hold significant implications for the preservation and revitalization of Muara Enggelam's cultural heritage and socio-economic fabric.

The theoretical and practical contributions of this research are multifaceted and significant. Firstly, by applying the CRISP-DM methodology to analyze documentary content, this study advances methodological approaches in qualitative research, particularly visual media analysis. By employing a systematic and structured framework, this research enhances the rigor and reliability of findings, thereby enriching scholarly discourse on interpreting and understanding documentary representations of community livelihoods (Argaw et al., 2023; Lontoc, 2020; Nyaupane et al., 2022; Stone et al., 2021). Secondly, the insights generated from this analysis have practical implications for policymakers, development practitioners, and community stakeholders involved in formulating and implementing socio-economic development initiatives (Argaw et al., 2023; Sisay, 2023). By providing nuanced insights into public perceptions and understanding of community livelihoods, this research informs the design of targeted interventions and policy strategies to promote sustainable development and enhance community well-being in Muara Enggelam and similar contexts.

The limitation of this research is contingent upon both the content analyzed and the methodology employed. Firstly, the scope of the study is constrained by the availability and representativeness of the documentary content on Muara Enggelam, which may not fully encapsulate the diversity and complexity of community livelihoods in the region. Additionally, while the CRISP-DM methodology offers a structured framework for analyzing documentary content, its application may overlook nuanced cultural and contextual factors that shape public perceptions and

understanding of community livelihoods. Consequently, while this research provides valuable insights into the subject matter, its findings should be interpreted with caution and supplemented by additional research employing complementary methodologies and sources of data to ensure a comprehensive understanding of the topic.

In considering similar research and further research recommendations, it is imperative to explore comparative studies examining the portrayal of community livelihoods in documentary content across diverse geographical and cultural contexts. This research elucidates commonalities and differences in public perceptions and understanding of community livelihoods by conducting cross-cultural analyses, enriching our knowledge of worldwide socio-economic dynamics. Furthermore, future research endeavors should delve deeper into the methodological intricacies of visual media analysis, exploring innovative approaches that integrate quantitative and qualitative techniques to provide a more nuanced understanding of documentary representations of community livelihoods. Such endeavors hold the potential to enhance the methodological rigor and theoretical underpinnings of research in this domain, paving the way for more robust and comprehensive insights into the complexities of community livelihoods in the digital age.

2. RESEARCH METHOD

Gap Analysis of Digital Content Analysis for Community Livelihood in Watershed Areas.

Gap analysis is essential for identifying research studies about community livelihoods, particularly among populations residing in watershed areas. By thoroughly examining existing literature, this research pinpoints areas where empirical evidence is lacking or additional investigations are warranted to address specific gaps in knowledge. This process enables scholars to tailor the research endeavors to address pertinent issues and challenges faced by communities residing in watershed areas, thereby contributing to a more comprehensive understanding of these regions' socioeconomic dynamics and environmental vulnerabilities. In conclusion, gap analysis serves as a valuable tool for guiding research efforts and prioritizing areas of inquiry, ultimately facilitating the development of targeted interventions and policy initiatives to promote sustainable development and enhance the well-being of watershed communities.

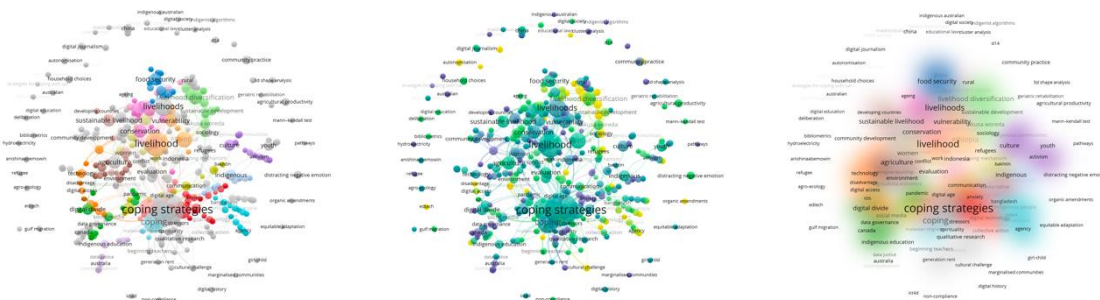


Figure 1. Gap Analysis Using Vosviewer

Figure 1 shows the gap analysis result using Vosviewer. Based on the gap analysis results, it is evident that research focusing on content analysis utilizing the CRISP-DM framework in documentary content concerning watershed community livelihoods remains limited, underscoring the importance of further investigation in this area. This observation highlights the need for empirical studies that apply rigorous methodological approaches to examine the portrayal of community livelihoods in watershed areas through visual media, thereby enhancing our understanding of the socio-economic and environmental dynamics shaping these regions. Consequently, prioritizing research endeavors that employ the CRISP-DM methodology yields valuable insights into public perceptions and understanding of watershed community livelihoods, informing evidence-based interventions and policy decisions to foster sustainable development and enhance the resilience of watershed communities.

Implementation of Cross-Industry Standard Process for Data-Mining (CRISP-DM)

This research adopts the CRISP-DM methodology to analyze the content of documentary videos focusing on Muara Enggelam. By employing the CRISP-DM framework, which encompasses six iterative stages—business understanding, data understanding, data preparation, modeling, evaluation, and deployment—the study aims to systematically dissect the thematic elements and narrative structures of the documentary content. This methodological approach facilitates a structured and rigorous visual media analysis, enabling this research to discern patterns, themes, and insights related to community livelihoods depicted in the videos. Consequently, using CRISP-DM in this research underscores the commitment to methodological rigor and systematic inquiry, ultimately contributing to a nuanced understanding of Muara Enggelam's socio-economic dynamics and cultural heritage portrayed in the documentary medium.



Figure 2. Cross Industry Standard Process for Data Mining (CRISP-DM)

Figure 2 shows the implementation of the CRISP-DM framework. CRISP-DM offers several advantages, notably its capacity to generate relevant and accurate recommendations aligned with the data processing objectives. This structured methodology provides a systematic framework for understanding and manipulating complex data sets, ensuring that insights derived from the analysis are meaningful and actionable by guiding this research through iterative stages, from initial business understanding to the final deployment of insights. CRISP-DM facilitates a thorough exploration of data, identifying patterns, trends, and relationships that may inform decision-making processes. As such, using CRISP-DM enhances analytical outcomes' reliability and validity, empowering stakeholders to make informed decisions and optimize outcomes based on robust data-driven insights.

Business Understanding

During the business understanding stage, the evaluation of video content with the ID rL4Hb9hWEhA, garnering 1,387,847 views as of February 10, 2024, alongside 3,354 comments, serves as a pivotal step in comprehensively grasping the landscape of public engagement and perception. This quantitative data, indicative of the video's reach and audience interaction, provides valuable insights into the level of interest and discourse surrounding the topic of Muara Enggelam's community livelihoods portrayed in the documentary. Additionally, examining viewer comments offers qualitative insights into audience sentiment, concerns, and interpretations, enriching the understanding of public perspectives and informing subsequent stages of the CRISP-DM methodology. Thus, by leveraging both quantitative and qualitative indicators, the business understanding stage lays a robust foundation for data-driven analysis and decision-making processes in the study of documentary content.

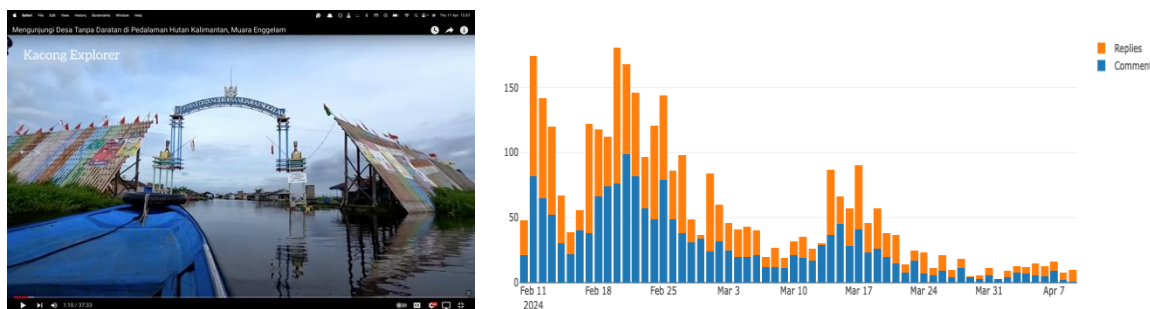


Figure 3. Muara Enggelam Video and Post-Per-Day Statistic (Youtube & Communalytic)

Figure 3 shows the Muara Enggelam video and post-per-day statistics. Based on the documentary video about Muara Enggelam, the post-per-day statistics data reveal viewer interest, characterized by the volume of comments on specific dates. The fluctuation in comment numbers provides insights into audience engagement dynamics and the resonance of the documentary content over time. Higher comment counts on specific dates, such as February 21st with 99 comments, may signify key moments or topics within the documentary that elicited more incredible audience reaction and discussion. Conversely, lower comment counts on other dates, such as February 13th with 52 comments, may indicate periods of lesser engagement or topics of less interest to viewers. Consequently, analyzing post-per-day statistics offers valuable quantitative indicators of audience engagement and reception, complementing qualitative assessments of viewer sentiment and interpretation.

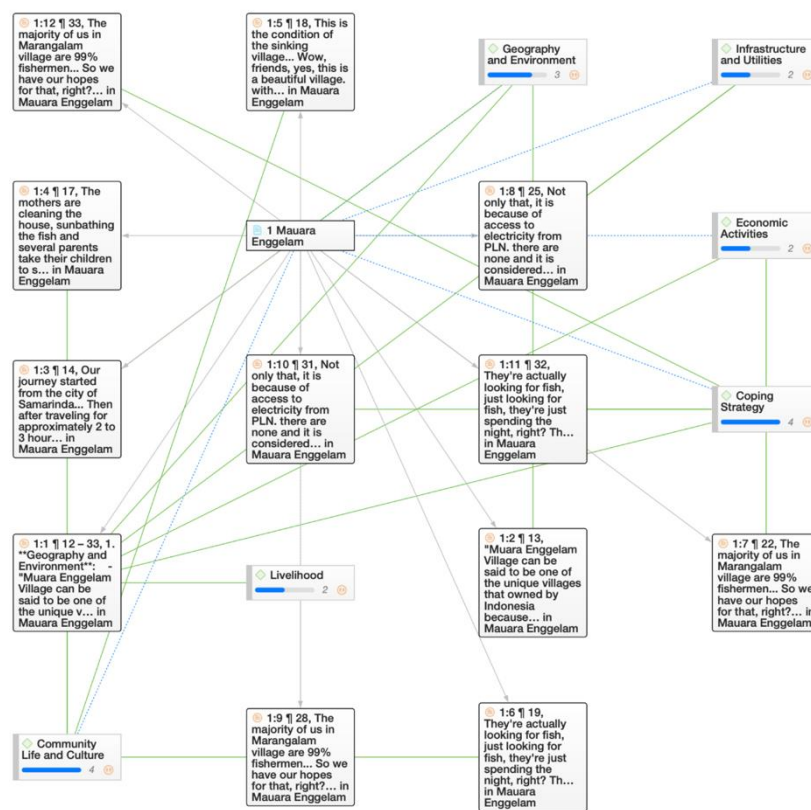


Figure 4. Content Analysis of Muara Enggelam (Atlas.Ti)

Figure 4 shows the result of axial coding in AtlasTi. Based on the identification results, several crucial topics warrant analysis concerning the Muara Enggelam video content, including Community Life and Culture, Coping Strategy, Economic Activities, Geography and Environment, Infrastructure and Utilities, and Livelihood. These thematic areas encompass diverse aspects of community dynamics, ranging from socio-cultural practices and traditional knowledge systems to economic livelihoods and environmental resilience. By systematically examining these topics, this research understands the multifaceted challenges and opportunities facing Muara Enggelam's community, informing targeted interventions and policy initiatives to foster sustainable development and enhance community well-being.

Data Understanding

During the data understanding stage, the identification of frequently used words in the comments of the Muara Enggelam documentary video content is conducted to discern public

indicating a sense of humor or enjoyment among viewers. Moreover, emojis such as 👍 and 🙏, denoting approval and gratitude, respectively, underscore the audience's engagement and appreciation for the depicted content. Furthermore, national flag emojis like 🇮🇩 may reflect expressions of patriotism or pride among viewers from Indonesia. Overall, the diverse range of emojis used in the comments contributes to a rich and nuanced understanding of viewer sentiments and reactions towards the Muara Enggelam documentary video, enhancing the interpretation of public perceptions and engagement with the content.

Modeling

The Perspective API model is implemented during the modeling stage to identify viewer responses to the Muara Enggelam documentary video based on toxicity scores. This process involves leveraging machine learning algorithms to analyze and classify comments according to the potential toxicity or harmfulness. By utilizing the Perspective API, which utilizes natural language processing techniques, this research automates the assessment of comment sentiment and detects toxic or abusive language instances. Consequently, integrating the Perspective API model in the modeling stage enables a more efficient and systematic approach to understanding viewer reactions and engagement with the documentary content, ultimately enriching the analysis of public perceptions and discourse surrounding Muara Enggelam's community livelihood.

	Average for dataset	Highest value
Toxicity 🗨️	0.04307	0.60204
Severe Toxicity 🗨️	0.00476	0.35220
Identity Attack 🗨️	0.00978	0.47743
Insult 🗨️	0.02652	0.61204
Profanity 🗨️	0.03234	0.60019
Threat 🗨️	0.01468	0.44383

Figure 7. Toxicity Scores (Communalitic)

Figure 7 shows the toxicity scores in Communalitic. In addition, a Social Network Analysis (SNA) analysis is conducted based on metrics such as diameter, modularity, path length, and others to identify patterns of social interaction networks among viewers. This analytical approach enables this research to examine the structural characteristics of the social network formed by viewer interactions, including the extent of connectivity, clustering, and information flow within the network. By quantifying these metrics, insights were gleaned into the nature and dynamics of viewer engagement and communication patterns surrounding the Muara Enggelam documentary video. Consequently, employing SNA offers a systematic and rigorous method for elucidating the underlying social dynamics and relationships among viewers, enhancing understanding of audience behavior and sentiment within the digital space.

Evaluation

During the evaluation stage, the calculation results of the toxicity score depict viewer responses concerning the video content. At the same time, Social Network Analysis (SNA) illustrates the network of interactions among actors in the video comment section. This dual approach provides complementary perspectives on viewer engagement and behavior, with the toxicity score indicating the level of harmfulness or negativity in comments and SNA revealing the structural characteristics and dynamics of social interactions within the viewer community. By integrating these evaluations, this research understands audience sentiment and behavior comprehensively, facilitating informed interpretations and insights into the public discourse surrounding the Muara Enggelam documentary video.

Deployment

During the deployment stage, documentary video content creators should include comprehensive and in-depth information on specific topics regarding the livelihood and coping

strategies of the Muara Enggelam community in facing various challenges. By delving into these topics with specificity and depth, content creators provide viewers with a more nuanced understanding of the community's socioeconomic dynamics and resilience mechanisms. This targeted approach enriches the documentary content and enhances its relevance and potential impact, empowering audiences with valuable insights and knowledge to foster greater awareness and understanding of the challenges and strengths of the Muara Enggelam community.

3. RESULTS AND DISCUSSIONS

The Muara Enggelam community and settlement portrayed in the video content with the ID rL4Hb9hWEhA have garnered significant viewer attention, evidenced by the substantial viewer count of 1,387,847 views since the video's upload on February 10, 2024. This notable viewership underscores the compelling nature of the content, suggesting a widespread interest among audiences in the socio-economic dynamics, cultural heritage, and environmental context of the Muara Enggelam community. The substantial viewer engagement with the video content reflects a growing interest in understanding and appreciating the challenges and resilience of communities in coastal areas like Muara Enggelam, highlighting the importance of documenting and disseminating such narratives to raise awareness and foster greater empathy and support for vulnerable communities.

The creator responsible for producing the documentary video is Kacong Explorer, who actively engages with the 3,354 comments regarding the content. This active engagement reflects Kacong Explorer's commitment to fostering dialogue and interaction with the audience, enriching the viewing experience, and strengthening the connection between content creator and viewer. By responding to comments and addressing viewer inquiries or feedback, Kacong Explorer demonstrates a proactive approach to audience engagement, enhancing the overall impact and relevance of the documentary content. Consequently, this collaborative interaction contributes to a more dynamic and participatory viewing environment, fostering a sense of community and mutual understanding among viewers and content creators alike.

Based on the description provided in the video content, Muara Enggelam emerges as a remote village in the Muara Wis District of Kutai Kartanegara Regency, East Kalimantan. Accessible via a land journey of approximately 2-3 hours from the Tenggarong District, the capital of Kutai Kartanegara, followed by a two-hour boat ride, the village rests amidst Lake Melintang. This landless village is inhabited by around 180 households, predominantly from the Kutai ethnic group, whose primary livelihood revolves around fishing. This depiction offers valuable insights into the geographical and demographic characteristics of Muara Enggelam, highlighting its unique and isolated setting and the socio-economic activities that sustain its community.

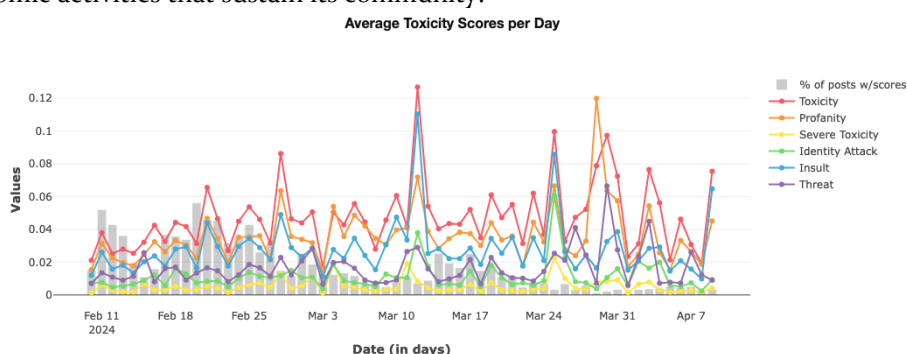


Figure 8. Toxicity Score per Day (Commalytic)

Figure 8 shows the toxicity score. The toxicity analysis results from 2,854 posts out of 3,349, utilizing the Perspective API, reveal varying toxicity levels across different categories. The analysis indicates a low overall toxicity score of 0.04307, with Severe Toxicity at 0.00476, Identity Attack at 0.00978, Insult at 0.02652, Profanity at 0.03234, and Threat at 0.01468. These metrics offer quantitative insights into the prevalence of harmful language within the comments, facilitating a nuanced understanding of the discourse surrounding the

Muara Enggelam documentary video. Moreover, they provide valuable data for content creators and platform administrators to assess and address potentially harmful interactions within the online community, ultimately fostering a safer and more constructive digital environment for viewers and participants alike.

Subsequently, the results of Social Network Analysis (SNA) indicate that Kacong Explorer's responses to viewer comments generate a network pattern predominantly dominated by the channel owner. This finding suggests that Kacong Explorer plays a central role in shaping and facilitating interactions within the comment section of the Muara Enggelam documentary video. By actively engaging with viewers and responding to the comments, Kacong Explorer fosters community and dialogue and establishes itself as a key figure within the online network. As a result, the SNA results underscore content creators' significant influence and engagement in shaping viewer interactions and discourse surrounding the video content.

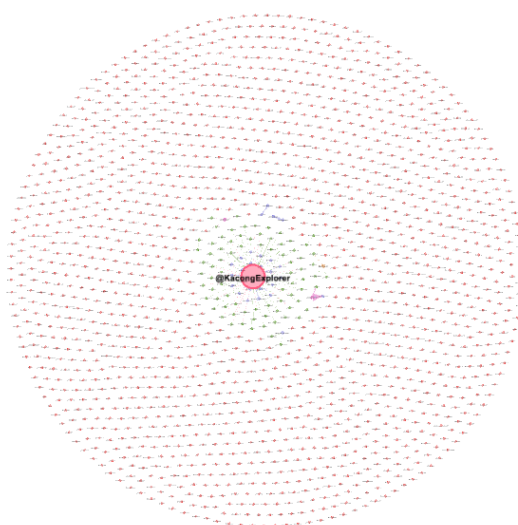


Figure 9. Fruchterman Reingold Layouts of Social Network Rank by Degree (Gephi)

Figure 9 shows the results of the social network analysis using Gephi. Based on the results of social network analysis, it is evident that there are 1754 nodes and 126 edges in the directed graph, with the following test outcomes: Average Degree: 0.072, Average Weighted Degree: 0.083, Diameter: 2, Radius: 0, and Average Path length: 1.9559594547361063. These metrics provide valuable insights into the social network's structural characteristics and connectivity patterns formed by viewer interactions. The average degree and weighted degree metrics indicate the average number of connections per node and the average strength of these connections, respectively. Additionally, the diameter, radius, and average path length metrics offer insights into the network's size, density, and efficiency in information propagation. Overall, these findings facilitate a deeper understanding of the underlying dynamics and relationships within the viewer community surrounding the Muara Enggelam documentary video.

Furthermore, the analysis reveals a modularity of 0.376 and a modularity with a resolution of 0.376, indicating the extent to which the social network is divided into distinct communities or clusters based on the strength of connections within and between them. With 1653 identified communities, this partitioning highlights the diverse and interconnected nature of the viewer community surrounding the Muara Enggelam documentary video. Additionally, the average path length of 1.9559594547361063 underscores the efficiency of information dissemination within the network, suggesting a relatively short average distance between nodes and facilitating the flow of information and interactions among community members. Collectively, these metrics provide valuable insights into the organization and dynamics of the social network, enhancing our understanding of viewer engagement and interaction patterns within the digital space.

The limitation of this study lies in the reliance on video content exclusively published by Kacong Explorer. Consequently, the outputs generated may include recommendations for optimizing video capture across diverse locations to enhance viewer engagement. This constraint underscores the

necessity for future research endeavors to encompass a broader spectrum of content sources, facilitating a more comprehensive understanding of audience dynamics and preferences in digital media contexts.

4. CONCLUSION

In conclusion, the comprehensive analysis, incorporating toxicity scoring and Social Network Analysis (SNA), elucidates the intricate dynamics of viewer engagement surrounding the Muara Enggelam documentary video. The toxicity analysis revealed a low overall toxicity score and detailed breakdown across categories such as Severe Toxicity (0.00476), Identity Attack (0.00978), Insult (0.02652), Profanity (0.03234), and Threat (0.01468), provides quantitative insights into the prevalence of negative language within comments. Additionally, the SNA results unveil a complex network structure comprising 1754 nodes and 126 edges, with metrics including Modularity (0.376), Number of Communities (1653), and Average Path length (1.9559594547361063). These findings collectively underscore the multifaceted nature of online interactions, highlighting the pivotal role of content creators, such as Kacong Explorer, in shaping discourse and fostering community engagement. Thus, this research contributes valuable insights into viewer interactions and sentiment dynamics, facilitating a deeper understanding of audience behavior and the socio-cultural context surrounding the Muara Enggelam community.

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