Evaluation of Tourism Recovery Innovations in D.I. Yogyakarta based on Data Analytics

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Abstract.
Sector tourism is one of the sectors hardest hit by the Covid-19 pandemic. To accelerate recovery tourism, D.I. Yogyakarta stakeholder collaboration a series of innovations. From the supply side, D.I. Yogyakarta is trying to improve attractions and amenities, following the shifting in preferences of tourists. For increasing demand side, collaboration to intensified promotion healthy tourism. This study trying to measure how effective the innovation efforts to tourism recovery and identifying factors that affect them. Furthermore, efforts necessary to conduct could accelerate the satisfaction level of tourists and increase D.I. Yogyakarta tourism branding power, leading to an increase in the quantity and quality of visit travelers to the D.I. Yogyakarta territory. This study has a combined approach, both qualitative and quantitative. Primary data was obtained from Focus Group Discussions with tourism stakeholders. Secondary data mainly used is the unstructured data obtained from TripAdvisor, Twitter, and Instagram. Analysis tools are used based on sentiment analysis, deep learning, and social network analysis. Generally, the innovations made by D.I. Yogyakarta have an positive impact to the satisfaction traveler and strengthen the D.I. Yogyakarta tourism brand. Even in 2021, when the Covid case reach the peak, the rating even reach the highest rating value. Increasing of the satisfaction, as an impact from the improvement of service, comfort, and cleanliness objects and amenities. Meanwhile strengthening brand and image of D.I. Yogyakarta tourism also tends to increase except for some conditions.

Kata Kunci:
Pariwisata, Analisis data, Analisis sentimen, Analisis jaringan sosial.

Abstrak.
Sektor pariwisata merupakan salah satu sektor yang paling terpukul oleh pandemi Covid-19. Untuk mempercepat pemulihan pariwisata, kolaborasi stakeholder D.I. Yogyakarta melakukan serangkaian inovasi. Dari sisi supply D.I. Yogyakarta berusaha untuk melakukan perbaikan atraksi dan amenitas, mengikuti perubahan preferensi wisatawan. Untuk meningkatkan sisi demand, kolaborasi promosi pariwisata sehat juga terus digencarkan. Penelitian ini dimaksudkan untuk mengkaji sejauh mana efektivitas upaya-upaya pemulihan tersebut serta mengidentifikasi faktor-faktor yang dapat mempengaruhinya. Selanjutnya, upaya-upaya apa yang perlu dilakukan untuk dapat mengakselerasi level kepuasan wisatawan dan meningkatkan kekuatan branding pariwisata D.I. Yogyakarta yang berujung pada peningkatan kuantitas dan kualitas kunjungan wisatawan ke wilayah D.I. Yogyakarta. Penelitian ini menggabungkan pendekatan kualitatif dan kuantitatif. Data primer diperoleh dari Focus Group Discussion dengan stakeholder pariwisata. Data sekunder utama yang digunakan adalah data unstructured yang diperoleh dari TripAdvisor, Twitter, dan Instagram. Alat analisis yang digunakan berbasis sentiment analysis, deep learning, dan social network analysis. Secara umum, inovasi yang dilakukan oleh D.I. Yogyakarta memiliki dampak positif terhadap kepuasan wisatawan maupun penguatan brand pariwisata D.I. Yogyakarta. Hal ini tercermin dari rating yang diberikan oleh wisatawan kepada destinasi wisata maupun hotel yang memiliki tren meningkat, bahkan pada 2021 mencapai nilai rating tertinggi. Sementara penguatan branding dan citra pariwisata D.I. Yogyakarta juga cenderung meningkat kecuali pada beberapa kondisi

1.   Introduction

More countries that have the service or service like tourists as a main engine of growth, have the more risk significantly affected by the Covid-19 pandemic (Sugihamretha, 2020). By structure economy, tourist activities have a direct and indirect impact to real sector with total 55,37% contribution to the economy of the Special Region of Yogyakarta (D.I. Yogyakarta) (Bank Indonesia, 2020). This structure implies that a decline in tourist activity means less than half the D.I. Yogyakarta economy motor. The decrease drastically in the sector of D.I. Yogyakarta tourism during the Covid-19 pandemic also had an impact on significant sectors more connected direct with tourists, like hospitality, culinary industry, transportation, trade, destination tour as well as consumption house stairs. as a result, during 2020 pandemic, D.I. Yogyakarta economy contracted for 4 (four) quarters consecutively (BPS, 2020).

They are responding to think that, as one area of Destinations Super Priority Tourism, accelerating recovery tourism in D.I. Yogyakarta is crucial. Since the beginning pandemic, businesses, government, and academics in D.I. Yogyakarta have had to do a series of innovative act to boost from supply side following a change in preference for tourists (Bhinadi, 2020). For an increase from the demand side, collaboration campaigns to keep tourists stay healthy too intensified. With dynamics tourism still high as the implication from an ongoing pandemic, then need to conduct evaluation innovation periodically. We hope this study may evaluate which innovations effective to speed up the recovery of D.I. Yogyakarta tourism.

2.   Literature Review

In line with the decline in global economic performance, most ASEAN countries experienced a decline due to the Covid-19 pandemic. In general, only Vietnam will be able to experience economic growth throughout 2020. Meanwhile, Singapore has a positive outlook, where this condition is supported by the low number of Covid-19 cases and high demand for technology and medical products. Meanwhile, Indonesia, Malaysia, and the Philippines are estimated to have positive outlooks due to the low 2020 economic base effect. However, the risk of economic downfall is still high due to the high number of Covid-19 cases (Eijkelenburg, 2021).

Table 1. ASEAN Countries Economic Growth (%, yoy)

ASEAN	GDP (%, yoy)		
	2019	**2020**	**2021**
Indonesia	5,0	-2,0	5,2
Malaysia	4,3	-5,6	6,3
Philippines	6,1	-9,5	9,7
Singapore	0,7	-5,8	7,2
Thailand	2,4	-6,1	4,0
Vietnam	7,0	4,2	8,0

Source: Eijkelenburg (2021)

Almost all countries have responded to the Covid-19 pandemic by restricting their mobility. The policy responses adopted tend to vary, ranging from the strictest, namely a total lockdown, to no restrictions. The choice of this policy response is highly dependent on the characteristics of each country's geography, demographics, economy, and political system (Siahaan, 2020). But generally from the real sector, transportation and tourism are the industries that are most negatively affected. Mobility restrictions cause human movement to be minimal. The 2020 global flight average was recorded to have fallen 50% from normal conditions in 2019. It is estimated that it will take until 2025 for the transportation and tourism sector to recover to pre-pandemic conditions.

Tourism is one of the main engines of growth for the D.I. Yogyakarta economy. The tourism industry and tourism support have contributed 55.37% to the D.I. Yogyakarta economy. The massive decline in the tourism sector during the Covid-19 pandemic had a significant impact on the D.I. Yogyakarta economy, especially sectors that were directly connected to tourism, such as hotels, the culinary industry, transportation, trade, tourist destinations, and household consumption (Bank Indonesia, 2020). The decline in D.I. Yogyakarta's economic performance, which has occurred significantly for three consecutive quarters since the first Quarter of 2020, is estimated to affect the increase in the poverty rate of D.I. Yogyakarta. The percentage of poor people in D.I. Yogyakarta in March 2020 was 12.28%, higher than in September 2019 (i.e., 11.44%) and the same period the previous year (i.e., 11.70%). The poverty rate in D.I. Yogyakarta is also higher than the national poverty rate (Bank Indonesia, 2020). Other indicators also indicate the decline in tourism in D.I. Yogyakarta. Based on Badan Pusat Statistik (BPS) data, the number of tourists staying at five-star hotels recorded a negative growth in the second quarter of 2020, which was -88.30% (YoY), contracted in comparison to the previous quarter and the same quarter in the previous period, which were respectively -0.15% (yoy) and 20.53% (yoy).

3.   Methodology

This study use triangulation that combines both qualitative and quantitative. Primary data was obtained from Focus Group Discussions with tourism stakeholders, including regulators, associations, tourism efforts, and academia. Secondary data mainly used is the unstructured data obtained from TripAdvisor, Twitter, and Instagram. Besides that, structured data was obtained from the BPS and Bank Indonesia. For analysis, we used 3 tools based on i) sentiment analysis, ii) deep learning, and iii) social network analysis (SNA).

3.1.   *Sentiment Analysis*

Sentiment analysis is used to measure tourist satisfaction, with qualitative data using a proxy from a user review. Sentiment analysis is a study of natural language to determine whether a sentence has been written to describe various perspectives (Ottom, 2021). Critical review analysis is conducted because it could evaluate more detailed experiences experienced by tourists. The procedure used for sentiment analysis review is as follows:

1. The data used is obtained from scraping from the TripAdvisor web.
2. Scraping data other than Indonesian and English will be translated into English.
3. The data is then pre-processed, which includes text normalization, removing unwanted characters, tokenization, punctual removal, and stop word removal using the literary library in Python.
4. The pre-processing results were carried out by sentiment analysis using lexicon-based multilingual sentiment for Indonesian and English reviews.
5. Sentiment analysis results are formed into a box plot.
6. For word cloud needs, all data is standardized by translating into Indonesian.

3.2.   *Deep Learning – Natural Language Processing (NLP)*

Deep learning also used by text mining with an unsupervised learning algorithm, namely Natural Language Processing (NLP). NLP is the analysis of data based on text, commonly processed in words or sentences using computational methods. The goal of NLP is to build a representation of the text which adds structure to the unstructured natural language (Verspoor, 2013). At the same time, NLP is used to look for meaning implicit through grammar. The procedure used for analysis is as follows:

1. The data is obtained from the Twitter API crawling, with the keywords "Jogja Tourism" and "Jogja Holidays". The time range used is daily tweets from April 2020 to July 2021. Based on these criteria, 26,034 tweets were obtained.
2. The tweet data is then translated into English.
3. The conversion results are pre-processed, which includes text normalization, deleting hashtags, removing links, removing unwanted characters, removing double spaces, deleting text that only consists of one character, and removing the twitter handler.
4. NLP sentiment analysis using the Text Blob library in Python.

3.3. *Social Network Analysis (SNA)*

Last we used SNA analysis for mapping the social interconnectedness data originated from Twitter and Instagram using the Gephi. Gephi is an application that can disclose the degree of graphic illustration, centrality, and society interconnection, or cluster-forming from individuals on the network (Kennedy et al., 2013). On the Twitter platform, the data was captured using the keywords "Travel", " Vacation", and "Jogja". The network logic used is a User Network, so the data obtained will be an interaction between users on Twitter. The period used is a tweet from 2009 to 2021, with domination from recent tweets. Using these parameters, we get 1557 users in the form of becoming nodes, and edges form 2146 interactions. As for the Instagram platform, the data taken use hashtags #wisatajogja and #liburanjogja. Based on these parameters, obtained 3931 nodes and 3328 edges.

The data from Twitter dan Instagram is then analyzed using closeness centrality. Analysis strives for count closeness value, which refers to users who have proximity with all other nodes on the network. The value helps look for the shortest track among all nodes in each cluster. Next, each node will be given a score based on the amount tracked and the shortest. The closeness value is given between 0 (zero) to 1 (one), where 0 (zero) is the minimum closeness value, and 1 (one) is the maximum closeness value. The taller the closeness score, the node could be a broadcaster/influencer in one cluster/group. We also used analysis was conducted with the use centrality degree method. Degree calculation is done by measuring the number of edges in one node. The taller score of the degree will cause the size of the nodes is getting big. The degree itself is divided into 2 (two) namely, i) indegree, i.e., edges that lead in nodes, and ii) outdegree, which is the leading edges exit nodes.

4.   **Result and Analysis**

4.1. *Tourism Innovation in the New Normal Era*

From the study show that the Covid-19 pandemic has caused a shift in preference from tourists (Bhinadi, 2020). Based on the results study, at least there are 3 (three) aspects of experience base change. First, preferences for traveler visits D.I. Yogyakarta post-Covid-19 pandemic lead to cleanliness and hygiene. Second, the preference for the traveler to visit D.I. Yogyakarta switch to quality. Post-pandemic, tourists start selectively in determining election destination travel. Third, tourists tend to be interested inclined activities safe from Covid-19 transmission. For resolving shift preferences and recovery tourism at the moment, the Covid-19 pandemic requires extra effort. one critical success in recovery tourism is a collaboration with various stakeholders (Yeh, 2020). For that, D.I. Yogyakarta responds to effort recovery tourists with to do synergy collaboration. In the middle of disruption from the Covid-19 pandemic, the perpetrator's business, government, and academics in D.I. Yogyakarta have to do collaborate in the *Sinergi Pariwisata Ngayogyakarta*.

Travelers preferences has shifting, and becomes disruption for tourism ecosystem, which is necessary to respond with innovation. Based on the creative destruction concept, the condition stagnant economy then needs existence destruction from the perpetrator's effort to smash the pattern of the

prevailing conventional (Schumpeter, 1942). Destruction will develop and become a disruption, an initiation for developing innovation. Innovation will strive to find new points of efficiency to push the economy. Based on the results of 4 (four) group discussions with regulators, associations, actors, businesses, and academia, we have mapped the innovations made by D.I. Yogyakarta during the pandemic. At least innovations made during the pandemic were grouped into three classifications: Attractions, Amenities, and Promotions. Improvement from the supply side is reflected in the upgrade of attractions and amenities. As for the increased demand side, innovation promotion (Table 2).

Table 2. D.I. Yogyakarta Tourism Innovation During 2020 to 2021

Classification	Innovation

Attractions	1. Philosophy Axis tourism development, namely by:
	   a. Reviving the cultural village around the square for cultural activities such as macapat, keris making, and wayang kulit performances,
	   b. Bergodo Rakyat Festival (Prajurit Keraton) as a tourism icon, as well as helping oversee the implementation of health protocols,
	   c. Digitizing the MSME payment system around the philosophy axis through the QRIS GUMATON (Tugu Malioboro Palace) program,
	   d. Revitalize and restore cultural buildings around the Yogyakarta Palace according to their functions.
	   e. Pedestrian revitalization along Malioboro, starting from adding walking facilities, garden chairs, and street lighting.
	 2. Development of the Visiting Jogja Application as a tracking tool for tourist visits as well as online reservation of destination tickets,
	 3. Encouraging MSMEs to support tourism by:
	   a. Purchase of Mutiara Hotel in the center of Jalan Malioboro, which will be converted as a center for MSMEs
	   b. Prawirotaman market revitalization as a creative industry center
	   c. On-Boarding MSMEs through the SiBakul application, which is supported by postage subsidies, integration into e-commerce, and digitization of the payment system through QRIS.
	 4. Development of community-based tourism (CBT) villages
	 5. Encouraging gastronomic tourism

Amenities	1. Joint preparation of the "Pranatan Anyar Plesiran Jogja" as a standard regulation by regulators, associations, and business actors, as a Standard Operation Procedure (SOP) for Health Protocols for the entire tourism industry 2. Acceleration of Cleanliness, Health, Sustainability, and Environment (CHSE) Certification Implementation 3. Increasing the competence of tourism industry players through the Online Tourism Training Program 4. Improved internet network connectivity in D.I. Yogyakarta
Promotions	1. Joint campaign for D.I. Yogyakarta new normal tourism through a partnership scheme 2. Organizing Jogja Sehat promotions on various social media platforms 3. Organizing several tourism business matching events

Source: Focus Group Discussion Regulators, Associations, Tourism Business Actors, and Academics in D.I. Yogyakarta (2021)

4.2. *Tourist Satisfaction with D.I. Yogyakarta New Normal Tourism*

The impact of innovative attractions and amenities on the supply side is measured using the level of satisfaction travelers to D.I. Yogyakarta tourism. Parameters used to measure satisfaction are the rating and review given to destination tours and hotels in D.I. Yogyakarta listed on the TripAdvisor platform. Analysis results from the data show that innovative D.I. Yogyakarta tourism can increase satisfaction among tourists. Based on the rating given by tourists, destination tourism (Figure 1) and

hotels (Figure 2) have a trend increase, even the highest increase during the new normal. In 2021, satisfaction with destination tours scored 4.5 on the temporary 5.0 scale satisfaction with hotels reached 4.5 on the 5.0 scale.
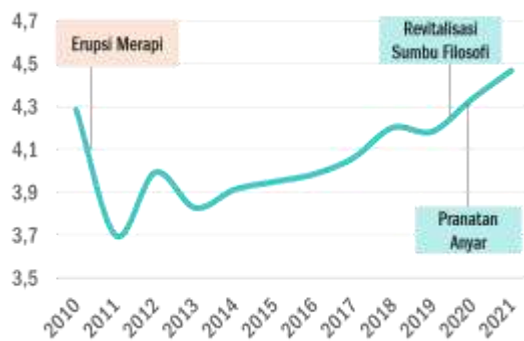

Figure 1. Tourist Rating of Tourist
Destinations in D.I. Yogyakarta

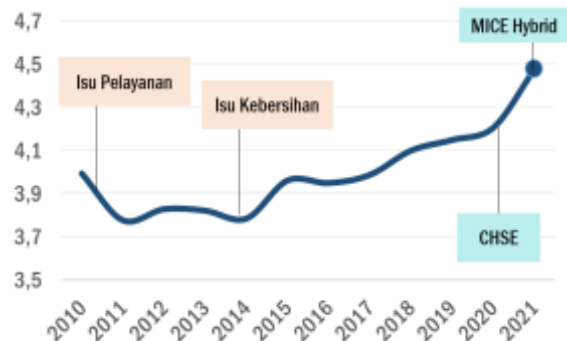*Source*: Scraping from TripAdvisor (2022)

Figure 2. Traveler Ratings Against Star Hotels
in D.I. Yogyakarta

Source: Scraping from TripAdvisor (2022)

The results of sentiment analysis on reviews given by tourists show similar results. Generally, most travelers' experiences give positive sentiment on the destination tour and hotels in D.I. Yogyakarta, reflected in positive reviews in Figures 3 and 4. Even by trend, rate good review sentiment on review destinations from travelers kept going positive even during the pandemic.
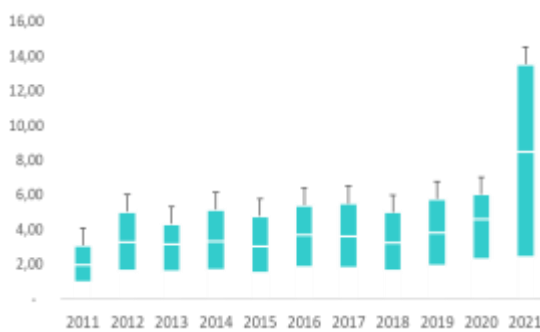

Figure 3. Tourist Sentiment Against Tourist
Destinations in D.I. Yogyakarta

Source: Text Mining TripAdvisor (2022)

Figure 4. Tourist Sentiment Against Star
Hotels in D.I. Yogyakarta

Source: Text Mining TripAdvisor (2022)

To know factors that cause positive satisfaction among tourists, then conducted an analysis using a word cloud. Reviews given to travelers during the pandemic in 2020 until 2021 were compiled into a word cloud in Figure 5. From the mapping, the tourist sees that the main factor of service, comfort, and cleanliness is the main trigger for increasing tourist satisfaction. This is in line with effort innovation through standardization of "pranatan anyar" and CHSE (Sugiyah, 2021), which tourists appreciate because it feels in accordance with the needs moment.

Figure 5. *Word Cloud* Tourist *Reviews* of Tourist Destinations and Hotels in D.I. Yogyakarta
Source: Text Mining Trip Advisor (2022).

4.3.   D.I. Yogyakarta Tourism Brand Sentiment Analysis

For push the demand side, D.I. Yogyakarta has done brand strengthening for tourism through several innovation promotion. D.I. Yogyakarta tourism brands are measured using the Sentiment Analysis method, which is carried out to analyze sentiment opinions from the Public about D.I. Yogyakarta tourism on the Twitter social media platform. Destination from analysis this for i) knowing sentiment Twitter user's opinions on what D.I. Yogyakarta tourism is positive, negative, or neutral and ii) knowing conditions that cause negative sentiment to D.I. Yogyakarta tourism.
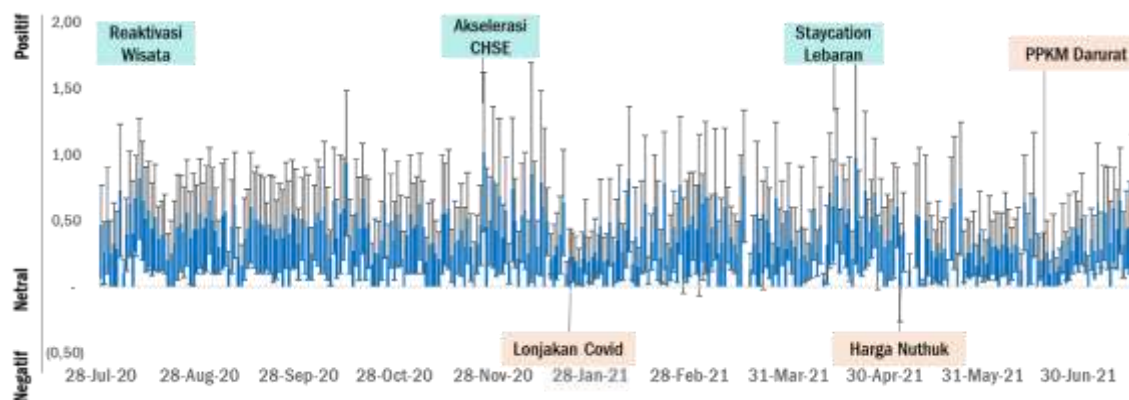

Figure 6. Sentiment D.I. Yogyakarta Tourism Analysis on Twitter
Source: Text Mining Twitter (2022)

With the NLP procedure, the conversation about D.I. Yogyakarta tourism on Twitter has been positive. We have seen in Figure 6, which shows the box plot of tweet sentiment, almost no one under the number 0 (zero) or negative. The box plot means that most conversation on Twitter about tourism in D.I. Yogyakarta tends to be nuanced and neutral-positive. This condition is an effort of D.I. Yogyakarta tourism promoters such as the D.I. Yogyakarta Tourism Office, tour and travel, etc., which routine to do campaign promotion D.I. Yogyakarta tourism. This promotional effort has positive implications for the sentiment of D.I. Yogyakarta tourism.

Although the whole sentiment of D.I. Yogyakarta tourism is still optimistic, several incidents caused negative pressure. Factor the main being source sentiment negative originated from the Covid-19 pandemic. From Figure 7, there is a correlation Between enhancement cases daily Covid-19 in D.I. Yogyakarta with movement sentiment. Besides the factor pandemic, other negatives, like the price of food and fare parking above the regular price, went viral in May 2021. This is causing a drop in sentiment toward D.I. Yogyakarta tourism, even when the relative Covid-19 pandemic is under control.
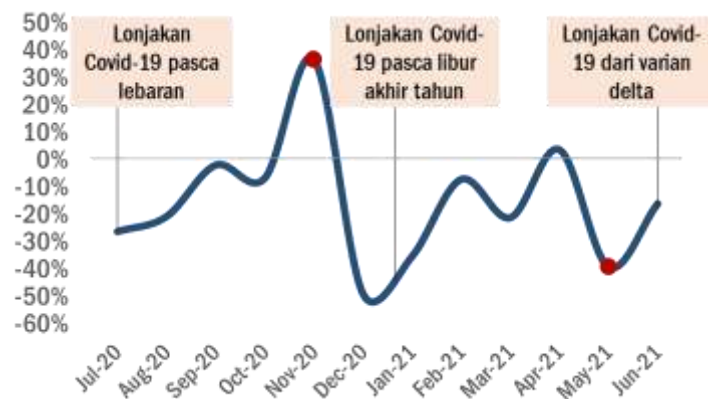

Figure 7. Correlation of D.I. Yogyakarta Tourism Sentiment with D.I. Yogyakarta
Covid-19 Daily Cases

Source: Text Mining Twitter and Ministry of Health (2022)

From the results of the sentiment analysis of D.I. Yogyakarta tourism on the Twitter platform, we can conclude two main things. First, the brand of D.I. Yogyakarta tourism in the Twitter platform conversation tends to be positive during the pandemic. This thing often with effort reactivation D.I. Yogyakarta tourism and responded to attractions and amenities in D.I. Yogyakarta appreciated by tourists. Second, the negative issue about D.I. Yogyakarta can be responded to quickly by periodically promoting content positively. Throughout 2020 to 2021, negative news about D.I. Yogyakarta tourism leading from the level of Covid-19 pandemic that tends to increase in a massive movement (Prasojo, 2020). In Indonesia especially happed in the moment national holiday such as Eid and year new. Besides that, negative issue that goes viral soon closed with news pitched positive, so sentiment opinion D.I. Yogyakarta tourism is always maintained at a positive level.

4.4.   Social Network Analysis (SNA) Twitter and Instagram

From the demand side, apart from measuring the D.I. Yogyakarta tourism brand is also done analysis pattern interaction from promotions carried out. To measure pattern interaction conversation about this D.I. Yogyakarta tourism, use SNA analysis. From analysis, this is for knowing i) the most influential users in connection network social on the topic D.I. Yogyakarta tourism and ii) the shape and size of network social topics D.I. Yogyakarta tourism.
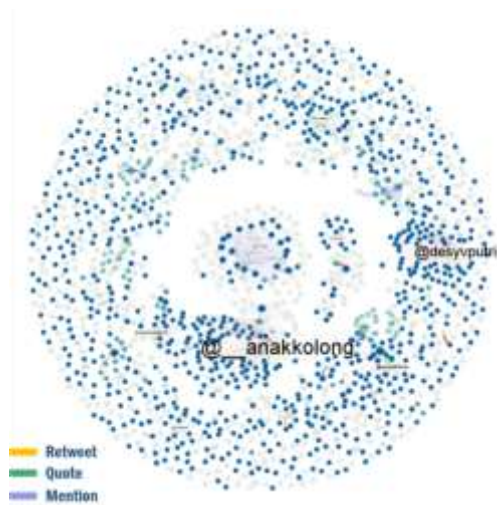
Figure 8. *Closeness Centrality* Twitter *Platforms*
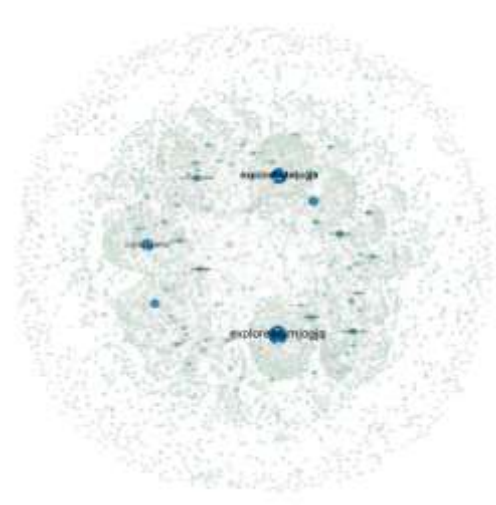*Source*: Text Mining Twitter (2022)

Figure 9. *Closeness Centrality* Instagram *Platform*
Source: Text Mining Instagram (2022)

Using closeness centrality measurement, a node is expected to be central if it is close to most of the nodes on the network (Golbeck, 2013). Analysis result from closeness centrality shows a different pattern of conversation related to D.I. Yogyakarta tourism on Twitter and Instagram platforms. However, conversations on the Twitter platform are formed from tiny groups with close interaction short. This thing is seen in Figure 8 and 9, where the colored nodes are blue and old is an influencer on colored users gray. From mapping, 51% of conversation nodes about D.I. Yogyakarta tourism have the highest closeness value. That thing means the majority of users are influencers from a conversation that is formed. Different from conversations on the Instagram platform, which only consists of 2% nodes with the highest closeness value. This thing shows on the Instagram platform, conversation formed by a few influencers only.
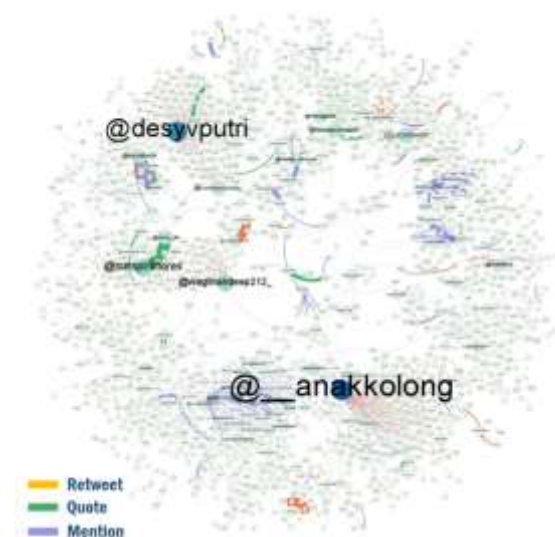

Figure 10. *Centrality Degree* Twitter *Platforms*
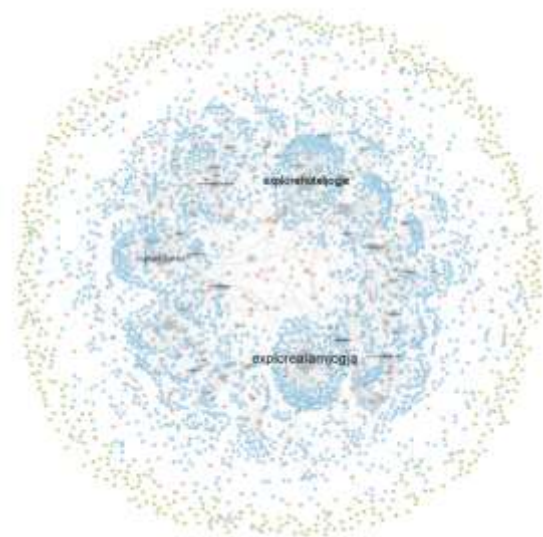*Source*: Text Mining Twitter (2022)

Figure 11. *Centrality Degree* Instagram *Platform*
Source: Text Mining Instagram (2022)

Using degree centrality, the more central the node's place on the network, the more edges owned by a node (Golbeck, 2013). Analysis of the centrality degree on the Twitter platform shows there are 2 (two), dominant users, with nano and micro categories. The classification of influencers based on the number of followers is divided into 4 (four). Namely, i) Nano Influencers are users with <10 thousand followers, ii) Micro-Influencers are users with 10 thousand to 10,000 followers. 100 thousand, iii) Influencer Macro is a user with followers from 100 thousand to 100 thousand. 1 million, and iv) Mega influencers are users with more than 1 million followers (Zarei, 2020). From the in-degree calculation, the dominant user, namely @__anakkolong and @desyvputri. The two users are most often alluded to in conversations related to D.I. Yogyakarta tourism on Twitter. As for the calculation of out-degree, relative no, there is a dominant user. User @budiarth4 owns the highest out-degree score even though have far edges lower compared to users @__anakkolong and @desyvputri (Table 3).

The analysis of the centrality degree on the Instagram platform shows that macro influencers are able to push interaction about D.I. Yogyakarta tourism. From the result, in-degree calculations of several macro influencers, such as @explorealamjogja and @explorehoteljogja, and @explore.bantul, were able to attract other users to interact. Meanwhile, in the out-degree calculation, the micro-influencer @staycationjogja is the most active user in giving comments on related posts about D.I. Yogyakarta tourism (Table 4).

Table 3. Top In-Degree and Out-Degree Users on the Twitter Platform

	User	Score	Followers
In- degree	@__anakkolong	141	25.597
	@desyvputri	115	1.409
	@sunspiritflores	52	305
	@wagimandeep212_	47	34,184
	@potretlawas	36	245,663
Out-degree	@budiarth4	19	1,735
	@lusiani48292192	18	52
	@completed_5k	17	5.248
	@agama_nusantara	15	11,656
	@madesua53966194	14	44

Source : Text Mining Twitter (2022)

Table 4. Top In-Degree and Out-Degree Users on the Instagram Platform

	User	Score	Followers
In- degree	@explorealamjogja	229	146.893
	@explorehoteljogja	189	104.158
	@explore.bantul	132	123,600
	@panoramakulonprogo	63	31.023
	@iniyogyakarta	62	103,017
Out-degree	@staycationjogja	13	31,984
	@victory_cell_amplaz	6	98
	@dony_chard	4	3,669
	@jogja_event_tour	3	32,083
	@iniyogyakarta	2	103,017

Source : Text Mining Instagram (2022)

From the results of the D.I. Yogyakarta tourism SNA on the Twitter and Instagram platforms, it can be seen that concluded 2 (two) main things. First, the conversation about D.I. Yogyakarta tourism on Twitter has a small network. The majority of conversations on the Twitter platform are opinions from the majority of users, only causing interaction with a limited range. Second, the Instagram platform has more shares big for influencers to push the conversation. Promotions by agents traveling on the Instagram platform can have interesting interactions with users, compared to promotions done through the Twitter platform.

5. Conclusion and Recommendation

The effects of the Covid-19 pandemic have disrupted the tourism sector. Tourists experience changes in their preferences for tourism during a pandemic. This was responded to quickly by business actors, the government, and academics in D.I. Yogyakarta to innovate both in terms of supply to improve aspects of attractions and amenities and encourage the demand side of promotions. In general, the innovations made by D.I. Yogyakarta to improve the supply side have a positive impact on tourist satisfaction. This is reflected in the ratings tourists give to tourist destinations and hotels that have an increasing trend, even in 2021, reaching the highest rating value. Based on the analysis using the word In the cloud, it can be seen that the main factors of service, convenience, and cleanliness are the main factors that trigger increased satisfaction. This is inseparable from the innovations made by business actors to increase capacity and quality through the standardization of new instruments and CHSE. Tourists appreciate these innovations because they feel that they are in line with current needs.

Efforts to encourage demand through strengthening promotions, in general, can maintain a positive image of the D.I. Yogyakarta tourism brand amid the pandemic. Based on sentiment results analysis on the Twitter platform, it is seen that the image of D.I. Yogyakarta tourism in the conversation is always at a positive level. In some conditions, the image of D.I. Yogyakarta tourism is always under pressure from negative sentiment, especially from the level of the Covid-19 pandemic and negative viral issues such as food prices and parking above normal prices. However, these negative sentiments can be countered quickly with regular promotions. By conducting in-depth analysis through social network analysis, there are fundamental differences related to D.I. Yogyakarta tourism promotion on Twitter and Instagram platforms. On the Twitter platform, the majority of conversation is the opinion of the majority of users who only cause interaction with a limited range. Promotional efforts on the Twitter platform succeeded in increasing positive sentiment but could not attract interaction. Meanwhile, D.I. Yogyakarta tourism promotions carried out by influencers on the Instagram platform are more able to attract user interaction.

The tourism innovations during covid-19 era implemented in D.I. Yogyakarta from the supply side can be considered successful. Therefore, the study proposed, at least 4 (four) strategies are needed to maintain the quality of the D.I. Yogyakarta tourism supply side, namely:

1. Always maintain health aspects by accelerating vaccinations and monitoring the implementation of health protocols continuously.
2. Periodically evaluate tourist preferences so business actors, associations, and the government can immediately fill the gap between tourist desires and current conditions. The need for quality is increasing, so a balancing strategy is needed between mass tourism and quality tourism.
3. Implementation standardization of health protocols, such as new regulations and CHSE, must be monitored regularly. Ownership of certification does not guarantee the consistent application of the protocol, so regulators must continue to check the implementation of standardization in the field.

4. All parties must collaborate to ensure that no tourism business actor is left behind in future changes.

In efforts to encourage demand, promotions carried out by promoters from both the government and business actors have succeeded in encouraging a positive image of D.I. Yogyakarta tourism. However, due to the ongoing pandemic, demand for D.I. Yogyakarta tourism is still not very strong. Therefore, there are 3 (three) strategies to strengthen innovation in driving demand, namely:

1. Strengthening the promotion of attractions and amenities on the Instagram platform, focusing on increasing the network. This is useful for adding references to potential tourists so that D.I. Yogyakarta tourism demand will increase more quickly when activity mobility begins to increase.
2. Considering involving big influencers for D.I. Yogyakarta tourism promotion on social media.
3. Continue to monitor negative issues regarding D.I. Yogyakarta tourism that are trending on social media and immediately respond to these issues with positive content. Thus, the negative issues circulating can be immediately suppressed and do not reduce the image of D.I. Yogyakarta tourism.

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