Text Mining by Social Network Data towards Developing Attractiveness of Urban Park. Case Study: Thematic Parks in Bandung City, Indonesia

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Abstract. The existence of a thematic green open space in Bandung is one of the pioneers in the urban landscape of Indonesian cities. In addition, the thematic park in Bandung is also one of the efforts to realize the concept of a green city besides its function as a medium of channelling citizens’ aspirations. Furthermore, the thematic park concept is to make a difference between one park and other parks and to define its own uniqueness. As public spaces, such as parks, can also be functioned as a place to express an opinion, visitor’s opinion plays an important role. Recently, the online reviews data particularly has been considered as an important factor to influence consumers’ decision and are valued as assets based on valued information. In this research, we used the online reviews method from google maps to collect all information from reviewers about the thematic parks and to analyse the attractiveness of the thematic parks in Bandung City. Our approach is to evaluate visitor’s perceptions by identifying sentences from opinions or reviews regarding the fulfilment of thematic park functions based on its user or visitor, facilities, community activities, and atmosphere of the park. Social network data towards developing urban park attractiveness. The result shows the dominant factor attractiveness of thematic parks is the user or community factor. Moreover, user-oriented thematic park concept generates a special attraction for visitors to visit thematic parks.

1. Introduction

Urban parks, an essential component of urban green infrastructure, are known for their multiple ecosystem services to the residents in the cities [1]. Parks, as well as other urban open spaces, are seen as objects of urban regeneration and are also tangible entities, publicly lived and owned by everyone [2]. As successful places support and facilitate activities, the design of urban spaces should be informed
by an awareness of how people use them [3]. Bandung has its own approach to build city’s image. This city creates its image trough the development of public city parks. The provision of parks in the residential areas of the city of Bandung has experienced a radical paradigm shift: parks have become a key attraction at the city service scale and provide entertainment and recreation for urban communities through their new physical design and attractive facilities [5-6]. One of the concepts used to promote parks to people is place branding. It is done by revitalizing public spaces into several thematic parks. This strategy has helped Bandung stand out from other cities and has improved the city’s branding. Thematic parks are the parks with a variety of interesting themes and an artistic atmosphere that is prepared as a creative space [7]. Since human creative activities are varied, creative spaces can be used to link many different activities with urban spaces [8, 9]. In Indonesia, the existence of public open space has been the focus of government’s attention, not just the quantity, but the quality of public open space was also considered related to its major influence to the various aspects of people’s life. Based on Indonesian Law Number 26 of 2007 concerning spatial planning article 29, it is stated that the proportion of green open space is minimal in urban areas, which is 30% of the total area [10]. The study of the concept of development and management of green open space, especially thematic parks in the city of Bandung, explained that the condition of open green space is still far from the target. In addition, green open space also does not meet the applicable standards, due to the limited city government budget for maintenance, awareness of the poor to maintain open green spaces including existing thematic parks, the large number of green open space land allocations, the number of changes in green open space functions to sell, facilities.

As public spaces, such as parks, can also be functioned as a place to express opinion, visitor’s opinion plays an important role. Recently, the online reviews data particularly has been considered as an important factor to influence consumers’ decision and are valued as assets based on valued information. In this research, we used online reviews method from google maps to collect all information from reviewers about the thematic parks and to analyze the attractiveness of the thematic parks in Bandung City. Our approach is to evaluate visitor’s perceptions by identifying sentences from opinions or reviews regarding the fulfillment of thematic park functions based on its user or visitor, facilities, community activities and atmosphere of the park.

The regulation of the Minister of public works in Indonesia, the construction of a park must fulfill several basic functions of the park, namely ecological, socio-cultural, aesthetic and economic functions. The basic characteristics of thematic parks include function, location, and potential. Based on these functions, this research will evaluate dominant factors attractiveness of park based on online reviews of park users. One of the objectives of the development of thematic parks is to fulfill the creative space of the creative community in Bandung. Evaluation categories were take form literature studies from various sources. More detail can be seen in Table 1.

### Table 1. Topic category and variable of evaluation attractiveness of park

| No | Category                | Variable                      | Example of reviews by text                      |
|----|-------------------------|-------------------------------|------------------------------------------------|
| 1  | User or Community       | Park users                    | This park suitable for children                 |
| 2  | Activities              | Diversity of activities in the park | Nice place for jogging in the morning           |
| 3  | Facilities              | Facilities in the park         | This park has a playground for children         |
| 4  | Atmosphere              | Aesthetic of the park          | This park is beautiful                          |
|    |                         | Comfort of park               | But this park is so dirty                       |
|    |                         | Cleanliness                   |                                                 |

### 2. Methods

#### 2.1. Case study of thematic parks

Thematic parks [11] are parks created with a certain theme/concept as a unique characteristic. They include certain characters, so that when people see them they are able to interpret a more specific function of the park. The basic characteristics of thematic parks include function, location, and potential.
The added physical attractiveness of thematic parks invites citizens to come and enjoy activities in these public spaces [12]. The thematic concept has been adopted in Bandung, where renovations of parks with a thematic design has been used to revitalize urban parks to promote the characteristics of a happy city with increased interactions with public spaces and an increase in the quantity of open green spaces [11]. The theme of a place is developed by unique and distinctive elements; the theme needs to be specific [13]. Thematic parks aim to differentiate themselves from other parks [14]. Successful development of a theme park should further affect visitors’ experiences and increase their repeat visits. Ref. [15], theme park operators should attract visitors with an increased number of rides that cater to various segments, ranging from adventurous rides to those for kids. Ref. [16] mentioned the selection of the theme is extremely important to the operations of the park. In general, theme parks attempt to create an atmosphere of another place and time, and usually emphasize one dominant theme around which architecture, landscape, rides, shows, food services, costumed personnel, retailing are orchestrated. Attachment to the design and space is closely related to how the physical setting of the place.

Based on the distribution of thematic parks in the city of Bandung, the region of Cibeunying is an area with the largest thematic park intersection with a total of 18 thematic parks, 2 thematic parks in the region of Karees, and 1 thematic park in the Ujungberung region. Based on the number of the thematic park, the authors decided that the study locations in the Cibeuying area were in 3 districts, Sumur Bandung, Bandung Wetan, and Coblong. The park sample selected based on orientation of parks. Name of park appropriate to the theme and orientation to place, community and activity, consider the segmentation of park branding. The thematic parks based on the park orientation. Based on naming of the park according to the concept and design of the thematic parks we took 10 parks that represent these criteria.

Table 2. Thematic parks as case study

| No | Name of Park          | District     | Location                          |
|----|-----------------------|--------------|-----------------------------------|
| 1  | Centrum Music Park    | Sumur Bandung| Jl. Sumbawa No.32, Merdeka        |
| 2  | Photo Park            | Sumur Bandung| Jalan Kemuning No.4, Sumur Bandung|
| 3  | Gesit Park (Agile Park)| Coblong     | Jl. Dipatiukur, Lebakgede, Coblong|
| 4  | Fitness Park          | Coblong      | Jl. Teuku Umar, Lebakgede, Coblong|
| 5  | Jomblo Park (Single Park)| Coblong    | Jl. Taman Sari No.66, Lb. Siliwangi|
| 6  | Film Park             | Bandung Wetan| Jl. Layang Pasupati, Tamansari    |
| 7  | Lansia Park (Elderly Park)| Bandung Wetan| Jl. Cisangkuy, Bandung Wetan    |
| 8  | Superhero Park        | Bandung Wetan| Jl. Bengawan, Cihapit, Bandung Wetan|
| 9  | Pet Park              | Bandung Wetan| Jl. Ciliwung No.14, Cihapi, Bandung Wetan|
| 10 | Inclusion Park        | Bandung Wetan| Jln. Aceh-Jln Saporua            |

2.2. Data Collection

Social networks, in one form or another, have existed since people first began to interact. Today’s Internet-everywhere world, online social networks have become entirely ubiquitous. A social network is defined as a social structure of individuals, who are related (directly or indirectly to each other) based on a common relation of interest, e.g. friendship, trust, etc. Social network analysis is the study of social networks to understand their structure and behavior. Social network analysis has gained prominence due to its use in different applications - from product marketing (e.g. viral marketing) to search engines and organizational dynamics (e.g. management) [17]. People are addicted to social network features, updating their profile page and collaborating virtually with other members have become daily routines. Social networks contain massive collection of data [18-20]. Large collection of data is available on Social networks. There is confidential information plus general details. General details comprise of members’ interests, fan
pages, birthdays, relationship status, networks etc. Most of the members of these networks display this information on their profiles.

The extracted data from Google Maps were used to find the parks’ locations. We collected data from online reviews by Google Maps based on locations of the parks. We used web crawler to extract all data from Google Maps User reviews. A web crawler (also known as a search engine spider, search bot, and robot) is a program which is used by search engine to find what is new on internet (website) [21]. All extracted data is stored in an excel file with user data, evaluation in the form of star scores and opinion texts from reviewers. Table 3 shows data collected of online reviews. We used only reviews data with reviews text opinion.

Table 3. Distribution of total online reviews data

| Name of Park        | Total reviewers |
|---------------------|-----------------|
| Superhero Park      | 1409            |
| Centrum Music Park  | 906             |
| Photo Park          | 781             |
| Gesit Park          | 149             |
| Fitness Park        | 409             |
| Jomblo Park         | 1234            |
| Film Park           | 1319            |
| Lansia Park         | 2815            |
| Pet Park            | 414             |
| Inclusion Park      | 46              |
| **Total**           | **9482**        |

2.3. Topic Extraction

We collected all reviews from google website for 10 thematic parks in Bandung city. Then, data extraction is established through google maps website to the given location for each thematic park. The overview of conducted methodology and proposed system flows is shown in the figure 2. This study used auto-operation order for a web crawler to collect data from Google maps website. We collected all online reviews of 10 thematic parks in Bandung city as study location. Typical verbal description shows in Table 4, which transforms users name and reviews.

Latent Dirichlet Allocation model, a generative probabilistic model, to collect discrete text data [22]. The LDA (Latent Dirichlet Allocation) model is a three-level (documents-topics-words) hierarchical Bayesian model based on unsupervised learning, which refers to the analysis used to draw inferences from unlabeled datasets (i.e., datasets without an output variable). Each document is assumed to be a random mixture of several underlying topics in which each topic is characterized by some over different words.

Latent Dirichlet Allocation is widely used to extract the latent topic information from vast amounts of documents.

Assume that we have a corpus with collection documents donated by:

\[ D = \{d_1, d_2, \ldots, d_{|D|}\} \]

Where \(|D|\) is the document number. The vocabulary is donated by:

\[ V = \{w_1, w_2, \ldots w_{|V|}\} \]

Where \(|V|\) is the word number. Each document in the corpus is a sequence of \(Nd\) words donated by:

\[ d = \{w_{1d}, w_{2d}, \ldots w_{Nd}\} \]

Where \(w_{Nd}\) refers to the latent \(N\)th word in document \(d\). The latent topic set is donated by:

\[ K = \{\Phi_{1d}, \Phi_{2d}, \ldots \Phi_{|K|}\} \]
Where $|K|$ is the topic number. Figure 8.2 shows the graphical model representation of the Latent Dirichlet Allocation.

![Graphical Model Representation](image)

**Figure 1.** Latent topic generate example [20]

![Procedure Diagram](image)

**Figure 2.** Procedure to identify attractiveness of parks
Table 4. Verbal description example on Google Maps Reviews

| Location         | Verbal Descriptions (translate from Indonesian Language)                                                                 |
|------------------|--------------------------------------------------------------------------------------------------------------------------|
| Superhero Park   | One place of recreation for inviting children to play. There is a playground, also a photo spot for superheroes.             |
| Centrum Music Park | Cool hangout for the musicians, here you can while training and sharing knowledge and experience with other musicians in Bandung. |
| Photo Park       | I love this place since the huge trees make the atmosphere become fresher.                                                    |
| Gesit Park       | The place is small but shady & comfortable. Unfortunately, there are a lot of cables that are not neat.                     |
| Fitness Park     | Good place for free exercise.                                                                                               |
| Jomblo Park      | Nice place to play or hang out with friends and your community, but have to be careful because it is near traffic.           |
| Film Park        | Nice, clean and not smelly even though using grass synthesis is not like in the square. But unfortunately, the socket only runs |
| Lansia Park      | Nice place. Recommended place to walk or run.                                                                                |
| Pet Park         | The one and only park special for pets in Bandung (as I know). Need more attention for maintenance the facilities.          |
| Inclusion Park   | The place is comfortable. Fun relaxing with family. There is free Wi-Fi too.                                                 |

The LDA model trades of two goals in the learning process. The first is the allocation of words to different topics in each document. The second goal is the assignment of high probability to a few terms in each topic. Figure 8.3 show visualization of the entire process of LDA. The word-topic matrix, one output of LDA, represents the co-occurrence probability of one word and one latent topic. For each topic, we use the word-topic matrix to present the top 20 words and to present the corresponding weight of each word. The weights of each word reflect the relative importance of each topic. Accordingly, the total of these weights reflects the relative importance of each topic.

![Figure 3. Topic extraction process of LDA model (adapted from [23])](image)

As for topic naming based of the naming process manually summarizes the meaning of extended top words [24-28].
3. Finding and Discussion

Of the result of this study indicated 4 topics category regarding keywords prioritization for identifying attractiveness of thematic parks based on online reviews. Then, we classified the topic category into four categories namely: user/community; activities; facilities, and atmosphere of the park. We named the extracted four topics. “User or Community”, refers to attraction user of park visiting of park. “Activities” refers to activities of visitors in the park. “Facilities” refers to attraction of facilities in the park. “Atmosphere”, refers to visitor’s experience of park. The term of keywords text review of 10 parks will be discussed in this following part. As for the appropriate topic with number K=4 for Superhero Park reviews (Table 5), we can distinctly each topic by summarizing the corresponding top 20 words. The four topics include “user/community”, “activities”, “facilities”, and “atmosphere”. As shown in Table 4, the total weights of each topic represent the relative importance of each topic.

| Topic 1. User/Community 0.1629 |
|--------------------------------|
| batman | 0.0018 | entertainment | 0.0018 | good | 0.0098 | play | 0.0141 |
| characters | 0.0014 | families | 0.0011 | hangout | 0.0016 | playground | 0.0058 |
| children's | 0.0377 | family | 0.0042 | inviting | 0.0014 | statues | 0.0068 |
| comfortable | 0.0064 | free | 0.0084 | park | 0.0205 | suitable | 0.0094 |
| crowded | 0.0038 | fun | 0.0033 | place | 0.0166 | superhero | 0.0070 |

| Topic 2. Activities 0.1414 |
|----------------------------|
| park | 0.0205 | enjoy | 0.0005 | relaxing | 0.0020 | especially | 0.0012 |
| place | 0.0166 | activities | 0.0003 | refreshing | 0.0002 | recreation | 0.0009 |
| inviting | 0.0014 | visiting | 0.0007 | children's | 0.0377 | meeting | 0.0001 |
| play | 0.0141 | sport | 0.0002 | crowded | 0.0038 | comfortable | 0.0064 |
| free | 0.0084 | cool | 0.0072 | good | 0.0098 | suitable | 0.0094 |

| Topic 3. Facilities 0.2064 |
|---------------------------|
| superheroes | 0.0020 | Play | 0.0250 | Superman | 0.0009 | place | 0.0173 |
| Playground | 0.0012 | comfortable | 0.0064 | toilet | 0.0013 | free | 0.0084 |
| facilities | 0.0030 | Parking | 0.0026 | trees | 0.0012 | cool | 0.0072 |
| statue | 0.0068 | free | 0.0085 | children's | 0.0377 | family | 0.0042 |
| children's | 0.0380 | Wi-Fi | 0.0048 | suitable | 0.0094 | park | 0.0205 |

| Topic 4. Atmosphere 0.084 |
|---------------------------|
| friendly | 0.0008 | play | 0.0141 | bad | 0.0017 | cosy | 0.0004 |
| suitable | 0.0094 | playground | 0.0058 | unique | 0.0006 | happiness | 0.0004 |
| atmosphere | 0.0009 | comfortable | 0.0064 | exiting | 0.0010 | enjoy | 0.0005 |
| cool | 0.0072 | Recommended | 0.0003 | shady | 0.0011 | attractions | 0.0008 |
| good | 0.0098 | park | 0.0205 | thematic | 0.0013 | entertainment | 0.0018 |
The weight (probability value) of each extended word denotes the proportion of the extended word frequency within each topic out of the total word number. The relative weight of each topic is calculated as the sum of the relative weights of its 20 words.

The result show that “facilities” the most important factor attractiveness of thematic park in Superhero Park. Many visitors share their experience about the facilities in the park. Superhero Park is thematic park with concept especially for children and family with playground facilities and also there are many statues are children’s idols.

Summarizing of attractiveness factor thematic parks online reviews, as topic have been categorized into attractiveness variable, the topic prioritization process focusses to evaluate topic categories from the all probability statistics all thematic parks. To compare each park, the summary of topic prioritization is illustrated as these following Table 6.

| Name of Park         | User/Community | Topics Category | Atmosphere |
|----------------------|----------------|-----------------|------------|
| Superhero Park       | 0.1629         | 0.1414          | 0.2064     | 0.0847     |
| Centrum Music Park   | 0.0562         | 0.0899          | 0.0938     | 0.0941     |
| Photo Park           | 0.0998         | 0.0711          | 0.1108     | 0.0940     |
| Gesit Park           | 0.0622         | 0.0767          | 0.0897     | 0.1274     |
| Fitness Park         | 0.0790         | 0.0818          | 0.0726     | 0.0640     |
| Jomblo Park          | 0.0419         | 0.0607          | 0.0260     | 0.0528     |
| Film Park            | 0.0869         | 0.0496          | 0.0492     | 0.0295     |
| Lansia Park          | 0.0665         | 0.0218          | 0.0408     | 0.0605     |
| Pet Park             | 0.0740         | 0.0307          | 0.0433     | 0.0303     |
| Inclusion Park       | 0.0901         | 0.0641          | 0.0780     | 0.0745     |
| Average              | 0.0820         | 0.0688          | 0.0811     | 0.0712     |
| Percentage           | 27.05%         | 22.70%          | 26.75%     | 23.49%     |
Figure 5. Distribution of percentage attractiveness factor of thematic parks

Figure 5 shows that percentage of summarization of topic categories thematic parks from text visitor reviews and average explained in table 6 previous. The dominant attractiveness factor of thematic parks is user/community factor which percentage average corresponding is 27.05%. The uniqueness and attractiveness of thematic parks invite visitors to come from many regions even from outside the city of Bandung [29]. One of the purposes of thematic park in Bandung is to make a different design of park based on visitor characteristic.

To compare our hypothesis that the attractiveness of thematic parks is four categories, “user/community”, “activities”, “facilities”, and “atmosphere” with topic extraction from online reviews, we use analysis of variance (ANOVA). A one-way ANOVA using to test that compares the variance in the group means within a sample whilst considering only one independent variable or factor. A single factor used to test the null hypothesis that the means of several populations are all equal.

Table 7. Analysis of variance attractiveness of thematic parks

| Groups          | Count | Sum     | Average | Variance |
|-----------------|-------|---------|---------|----------|
| User/Community  | 10    | 0.8195593| 0.081956| 0.001103 |
| Activities      | 10    | 0.6878566| 0.068786| 0.001119 |
| Facilities      | 10    | 0.8105613| 0.081056| 0.002667 |
| Atmosphere      | 10    | 0.7117668| 0.071177| 0.000924 |

| Source of Variation | SS   | df  | MS     | F      | P-value | F crit |
|---------------------|------|-----|--------|--------|---------|--------|
| Between Groups      | 0.001| 3   | 0.000454| 0.312126| 0.816474| 2.866266|
| Within Groups       | 0.052| 36  | 0.001453|        |         |        |
| Total               | 0.054| 39  |        |        |         |        |

From Table 7, shows the conclusion of importance factor of attractiveness thematic parks from four category there are not significant differences between the means. The one-way ANOVA compares the means between the groups are interested in and determines whether any of those means are statistically significantly different from each other. Specifically, it tests the null hypothesis. Where μ = group mean and k = number of groups. If, however, the one-way ANOVA returns a statistically significant result, we accept the alternative hypothesis (HA), which is that there are at least two group means that are statistically significantly different from each other.
The result shows that \( F < F_{-Cryp} \), we accept the null hypothesis. This case, \( 0.312 < 2.866 \), we accept null hypothesis. The means of the four population are equal. We can be used that the attractiveness of thematic parks is 4 factors, “user/community”, “activities”, “facilities”, and “atmosphere”.

4. Conclusion

This research confirms the capacity of online reviews to understanding of attractiveness of thematic parks. Online reviews show great information to assess landscape as there are volumes data available which implicitly shows public opinions though text. Based on the topic extraction found, to developing or improving of the park.

We used analysis of variance to identification that assume that attractiveness factor of thematic park is “user/community factor”, “activities factor”, “facilities factor”, and “atmosphere factor”. The result shows that accept null hypothesis which the four population are equal. We can be used that the attractiveness of thematic parks is 4 factors, “user/community”, “activities”, “facilities”, and “atmosphere”.

Dominant factor attractiveness from 10 thematic parks, Superhero Park is facilities factor with 34.15%, Centrum Music Park is atmosphere factor (28.18%), Photo Park is Facilities factor (29.48%), Gesit Park is atmosphere factor (35.77%), Film Park is activities factor (27.52%), Jomblo Park is activities factor (33.43%), Gesit Park is activities factor (33.43%), Film Park is activities factor (40.40%), Photo Park is user/community factor (35.43%), Pet Park is user/community factor (41.50%), and Inclusion Park is user/community factor (20.29%), but percentage corresponding weight is not significant different each factor from 10 thematic parks.

Based on the result of topic extraction that the attractiveness of the thematic park can to conclude that there are 4 categories in the attraction of thematic parks namely user or group communities, facilities, activities, and atmosphere. Dominant factor attractiveness of thematic parks is user/community factor, related to one of purpose of thematic park in Bandung is make different design of park based on visitor characteristic.

Particularly, the attractiveness summarization of 10 thematic parks as an example shows that the availability of diverse activities in the park is influenced by the availability of facilities supporting the concept of the thematic park. Moreover, providing space for the community in the form of a thematic park concept generate a special attraction for visitors to visit thematic parks. Thematic concepts in the park provide an attraction with provision of facilities in realizing the purpose of the thematic park that was built. The result of this analysis is expected to be important information in the development of the park, especially in the provision of parks with the thematic concept.

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