

Article

An Analysis of the Sustainable Tourism Value of Graffiti Tours through Social Media: Focusing on TripAdvisor Reviews of Graffiti Tours in Bogota, Colombia

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Abstract: This study attempts to analyze the value of graffiti tours from the perspective of sustainable tourism by examining actual reviews by social media users using text mining and social network analysis. The text mining technique indicates that “artist,” “history,” “political,” “culture,” “social,” “city,” “background,” “great,” “recommend,” “excellent”, and “worth,” are frequently used keywords for the reviews. When comparing word frequencies per review between 2013–2016 and 2017–2019, the results show that the words, “history,” “political,” “culture,” and “social,” have been more frequently used over time. Furthermore, the network visualization shows that those words connoting socio-cultural sustainability are mutually connected. Therefore, the study suggests that graffiti tours can have potential for assuming the role of sustainable tourism, since the keywords from reviews are associated with the perspective of socio-cultural sustainability.

Keywords: sustainable tourism; graffiti; social media; text mining; social network analysis

1. Introduction and Research Backgrounds

Visual image is a medium containing a clear reality or truth. This visual communication is an important theoretical concept as it emphasizes various characteristics of the cultural process [1]. The mural, which was the first visual communication, is an example of a work that consists not only of an artistic aspect, but also depicts the culture and way of life at the time it was created. Graffiti has existed as a social phenomenon since the beginning of cave paintings. Graffiti is defined as writing or drawing on walls or other surfaces of public places by uneven scratching or spraying [2]. This rather unregulated form of artwork is often misinterpreted as an expression of crime and disorder, since “in its purest form,” street art is “artwork created without authorization, usually illegally, on either private or public property” [3]. In tackling vandalism, graffiti has been the subject of discussion among policymakers around the world. However, there is a certain complexity to the culture of graffiti; it is not a simple matter of acceptance of art or vandalism [4]. Recent urban policies, along with increasing discourse on the ‘creative city,’ have led to changes by encouraging communication among people to promote urban development [5]. In the same context, the importance of creativity in economies after industrialization has pushed urban managers to reevaluate graffiti [6]. Likewise, graffiti arts in some cities including Bogota, Colombia has been regarded as a tool for tourism development, heritage conservation, socio-economic regeneration and cultural empowerment.

For example, in 2007, graffiti was legalized in Colombia’s capital, Bogota, by the power of civil society. The city has since changed through the cooperation of the government, graffiti artists, and citizens. The first project involving graffiti was the 26th road environment improvement project,

which extended to Bogota's buildings, shops, and homes. Such efforts contribute to the transformation of the image of Colombia as a crime-ridden and depressed country [7]. Jose Andres Duarte, the head of the Research Institution of Local Tourism of Bogota, stated, "We have improved the competitiveness of Bogota through the development of tourism wherein local residents are put first and improvement of environment of internet connection." This was in line with its policy of prioritizing local residents, which it sought to implement by creating a new environment for the city and boosting tourism. According to the UNWTO's (United Nations World Tourism Organization) [8] country-specific inbound tourism data, Colombia had 4,282,000 people enter the country in 2018. The average increase rate of inbound tourists over the past 10 years was 9.7%; this is significantly higher than the 5.4% average growth rate of other 101 countries. Furthermore, in the Travel and Tourism Competitiveness Index of 136 countries in 2017, Colombia scored 3.37 in the Cultural Resources and Business Travel sector (average of 2.32 points in the whole country) [9]. In urban planning, resilience has become a complex interaction between society, nature, land use management, and policy. This dynamic ensures meaningful participation as the different arms prepare for the collapse of socio-economic change, thus achieving equality and meaningful stakeholder involvement. A policy-adaptable social infrastructure must be built to ensure participation of these sectors [10,11]. In other words, urban regeneration combines sustainability with economic, social, cultural, and environmental perspectives. Under the goal of urban regeneration, graffiti tours that interact with tourists through works containing cultural messages, along with the cooperation of local residents, are found to be linked to sustainability.

In a situation where concepts of sustainable and responsible tourism are gaining more attention, it is necessary to understand the role of graffiti tours as sustainable tourism. Studies on graffiti and graffiti tours mainly present graffiti's various social phenomena, roles, and utilization plans through case studies, spatial analysis, and in-depth interviews with local residents, graffiti artists, and policy-related individuals [4,6,12–15]. However, still there have been only few researches on the perspectives of tourists who have actually experienced graffiti tours and evaluated them. In particular, tourism is a major source of information for many tourists. Many tend to search online-based reviews of various users in evaluating experiential products [16]. These opinions spread to potential tourists through various social media platforms; as such, these data also serve as a tool for understanding the opinions of numerous tourists from diverse backgrounds.

Thus, this study assumes that graffiti tourists' online reviews may reflect economic, socio-cultural, and environmental aspects of sustainability beyond showing their satisfactions from travel experiences. Therefore, this study examines how sustainable issues have been discussed among actual tourists by examining their reviews on social media. In 2017, the United Nations General Assembly declared 2017 to be "the International Year of Sustainable Tourism for Development," and it was also the year that the UNWTO proclaimed the "2030 Agenda for Sustainable Development." For these reasons, the year 2017 is a pivotal period for sustainable tourism and was determined to be a reference point when analyzing the shift in views on graffiti tours.

Social media platforms are an important resource of big data, as they have become diversified by generalized use. They are suitable for text mining analysis because they consist mainly of unstructured texts [17–19]. For the above purposes, the study employed the technique of text mining in order to extract useful information in big data to analyze and interpret texts posted on social media. In addition, the structure of the network of words was examined based on the results of the analysis for the social network analysis. Through this analysis, we confirm the role of sustainable tourism in graffiti tours from a tourist's perspective, instead of in the indiscriminate development of graffiti tours, and draw implications accordingly.

1.1. Function of Sustainable Tourism

The concept of sustainability originates in the report "Our Common Future," published by the WCED (World Commission on Environment and Development) in 1987. It defines sustainable development as the ability of humanity to make development sustainable to ensure that it meets

the needs of the present without compromising the ability of future generations to meet their own needs [20]. Ever since the report was published, sustainable development has received extensive public attention and provided many challenges worldwide [21]. There are several factors that explain why the tourism industry shows such an interest in sustainable development: Tourism has great economic significance, as it creates employment and generates income, it impacts various industries, and it depends on the cultural heritage and landscape of a place. Tourism also has negative and positive effects on the natural environment and tourist locations [22]. The UNEP (United Nations Environment Program) and UNWTO [23] also mentioned two relationships between tourism and sustainable development. First, tourism is a dynamic, growing industry that makes key contributions to many countries. Second, tourism is a set of activities that includes special relations among visitors, industries, the environment, and communities. Therefore, sustainable tourism is defined as tourism that protects and promotes the opportunities of future generations, while simultaneously meeting the present needs of tourists and communities by not only preserving and maintaining culture, essential ecological processes, biodiversity, and life support systems but also managing resources to meet economic, social, and aesthetic needs.

Donyadide [24] presented “The Magic Pentagon of Sustainable Tourism,” which describes five elements of sustainable tourism, from an ethical standpoint, in order to maintain a high level of balance with tourists in terms of the social and ecological characteristics of travel sites. The five elements are: economic health, the satisfaction of guests, a healthy culture, protection of resources, and the well-being of locals. Recently, the approach has been subdivided into more categories to emphasize the relevance to tourism of social values, such as population, peace, prosperity, pollution, and protection [25]. Tosun [26] mentioned that the operation of sustainable tourism development principles requires tough political and economic choices and decisions based on complicated socioeconomic and environmental transactions. Crouch and Ritchie [27] argue that not considering sustainability in discussing the competitiveness of travel destinations is an unsubstantial concept, and that it is necessary to reflect not only on the economic resources but also on the ecological, social, cultural, and political resources. Tourism competitiveness is the capacity to accumulate and create value-added products that make the value of resources sustainable, while maintaining the current market position [28]. Sustainable tourism is in line with tourism competitiveness—it creates and integrates product values and maintains resources.

As numbers of tourists increase each year, so do issues such as greenhouse gas emissions, financial leakage, resource management, or effects on communities and cultural heritage, which require strong partnership among all stakeholders of tourism in implementing critical measures through the “2030 Agenda for Sustainable Development” [29]. These efforts for sustainable tourism require an integrated policy that addresses multiple aspects. It is desirable to understand sustainable tourism not as a substitute for conventional mass tourism, but as a process to improve it and solve the current issues tourism faces, while meeting the needs of all the stakeholders of sustainable tourism, such as governments, local governments, residents, communities, tourism business operators, and tourists [30]. In other words, sustainable tourism is a concept that considers and promotes positive interactions among all residents, tourists, organizations, and business operations related to tourist sites. From the relationship-based perspective, the key components of the paradigm for sustainable tourism are enhancing the competencies of a community and building relationships and alliances to steer the regional economy in a sustainable direction that is beneficial for the environment [28]. In other words, sustainable tourism requires development in consideration of both the community and tourists. The indicators of sustainable tourism, according to the three perspectives proposed by UNEP and UNWTO [23], are presented in Table 1.

Table 1. Sustainable development of tourism [23].

Sustainability Perspective	Contents
Economic sustainability	long-term economic operations, stable employment, income-earning opportunities, social services to host communities, poverty alleviation
Socio-cultural sustainability	socio-cultural authenticity, cultural heritage, traditional values, inter-cultural understanding and tolerance
Environmental sustainability	essential ecological processes, conserve natural heritage and biodiversity

Richins [31] and Choi and Turk [32] summarized the details of each subcategory of sustainability in addition to the contents of previous research and viewpoints of international organizations. This information is shown in Table 2.

Table 2. Sub-categories according to sustainable tourism perspective [31,32].

Sustainability Perspective	Sub-Category
Economic sustainability	<ul style="list-style-type: none"> • Ensure the visitor economy is focused on achieving a viable tourism economy • Support brands or identities that enhance local tourism and related stakeholders • Achieve a viable tourism industry by developing new and existing products • Secure and retain quality employment • Enhance and achieve sustainable capital investment in assets and other financial assets • Support related and local businesses through the continuous improvement of quality tourism products and the visitor economy
Socio-cultural sustainability	<ul style="list-style-type: none"> • Strengthen identity by developing and enhancing a vibrant community identity and by integrating and connecting the city's brand and cultural identity • Preserve cultural experiences, history, and traditional values, including a variety of architecture, art, street events, beach and sports activities, cuisine, recreational activities, and indigenous traditions • Develop and maintain accessible and innovative transportation to achieve and maintain transportation accessibility • Achieve and maintain accessible and extensive community and tourism facilities • Strengthen opportunities for leisure activities • Achieve citizen empowerment and dedication to ensuring appropriate tourism development, development processes and decision-making, community competency, and effective governance • Improve accessibility and friendliness of the city, provide a safe and healthy environment, and manage tourism and town capacity • Create a friendly atmosphere by fostering social interaction and inclusion with visitors and locals • Increase tourist satisfaction and positive attitudes toward tourist attractions

Table 2. Cont.

Sustainability Perspective	Sub-Category
Environmental sustainability	<ul style="list-style-type: none"> • Provide sustainable technologies, systems, and requirements to new and existing buildings, and minimize environmental impact through regional improvements
	<ul style="list-style-type: none"> • Manage, maintain, and enhance natural assets; protect flora and fauna; minimize loss of habitat and biodiversity; and use minimal resources to attract visitors

In this study, economic, socio-cultural, and environmental sustainability, along with the subcategories of sustainability, form the framework for the analysis of the perspectives of Bogota graffiti tours that are reflected in sustainability as values of sustainable tourism

1.2. Graffiti Tour

Practical visual communication like the Altamira and Lascaux cave paintings are able to show the culture of an era. Their main purpose is the outcome of the image, which was the first visualization work [33]. Cave paintings were the first attempt to construct an effective visual layout system through the arrangement of visual elements and replace abstract concepts with visual forms. In the same vein, Jordan's 5th century BC mural includes geometric designs and hierarchical, complex social depictions, which help viewers understand the role of art in early visual communication systems and preliterate societies [34]. This allows art not to be appreciated simply as an aesthetic element, but also as an innovative creation that maximizes the use of natural objects and explains art from a semiotic perspective. In modern times, the visual communication of various artefacts, designs, social media platforms, etc., is ingrained in our lives and spreads different ideologies by controlling the time and space they create [35,36]. Visual image is a medium containing a clear reality or truth, and visual communication is an important theoretical concept as it emphasizes various characteristics of cultural processes [1].

The mural—the first visual communication and the origin of art—again emerged in the present and developed into a genre of art that conveys social messages and expresses the artist's values and personality. Graffiti, which can be seen as a representative model of cave murals, is defined as a writing or painting that is irregularly scratched or sprayed upon walls or other surfaces in a public place [2]. Graffiti has existed for as long as mankind. Cave paintings can be considered to be an example of graffiti [2]. In the 1970s, graffiti was derived from hip-hop culture, which played a significant part in representing the culture of the young generation through the expression of a new form of music, dance, and art [6]. From the 1970s to the 1980s, graffiti was regarded negatively, as it was characterized as a key factor in profit loss, depreciation, and decrease in retail sales in certain regions or communities [37]. However, recent urban policies, along with increasing discourse on the "creative city," have led to changes by encouraging communication among people to promote urban development [5]. In the same context, the importance of creativity in economies after industrialization has pushed urban managers to reevaluate graffiti [6]. The urban environment has countless surfaces and objects for expression and, at the same time, provides an audience with an opportunity to see these expressions. The aesthetic image of graffiti is being magnified in galleries, on the internet, and via social media [38]. This suggests that the aforementioned visual communication is directly connected to graffiti.

Gomez [39] distinguished art in the form of graffiti as "graffiti art" and stated that it is characterized as "high art" and "folk art" in which the desire for artistic creation has become its motivation. This art also plays an important role in tourism. All of the cultural elements experienced by tourists are included in the category of cultural tourism, which is expanding in an artistic sense. As seen in Table 3, art tourism refers to a set of tourism-related activities of consuming contemporary culture. These include participation in the fine arts, performing and exhibiting arts, artistic events, festivals, and entertainment.

Table 3. Definition of art tourism.

Researcher	Definition of Art Tourism
Weiler and Hall [40]	Tourism activities in which one participates in performing arts and exhibiting arts
Zeppel [41]	Experiential art in which one participates and is motivated by art practices, visual arts, and art festivals
Gratton and Taylor [42]	Tourism activities consuming contemporary culture
Hughes [43]	Tourism activities that include participation in the fine arts, performing arts, cultural events, as well as festivals and entertainment

From the commercial aspect, art invigorates tourism products, increases market attractiveness, provides new value to a region, and performs an important role in sales and promotion, while also improving product quality and appeal [41]. Graffiti has become an art tourism space that contributes not only to the creation of new tourism assets, but also to its revitalization [15]. For example, through the promotion of graffiti tours, graffiti has now come to be perceived as valuable rather than negative in terms of urban aesthetics, and as contributing to place-making by performing a key role that gives an identity to a city [4,38]. Graffiti can be linked to urban morphologies and the social identity of a place, [13] leading to it ultimately becoming a tourist attraction. In other words, a city's graffiti can be promoted as a new tourist spot and become a communication tool that leads to interaction between residents and tourists.

1.3. Graffiti Tours in Bogota, Colombia

Initially, graffiti art in Bogota was not recognized as art and was seen as spoiling the cityscape. Following an action brought by a civic organization to legalize graffiti-art activities in 2007, the city began to view graffiti art as an important activity of art and culture. According to the "Bogota graffiti tour", a representative cooperative and commercial site related to Bogota graffiti tours [44], graffiti tours in Bogota began with Austrian and Canadian graffiti artists who wanted to show the unique and diverse aspects of the work of local artists to international tourists. Since then, graffiti art in Bogota has been growing, and art sites have become famous sightseeing spots. Graffiti art painted on commercial places or on the walls of private houses covers culture, history, and messages related to society, such as the indigenous people of Colombia, female aborigines, racial discrimination, preservation of life, and feminism. The Bogota Graffiti Tour provides tourists with an introduction to graffiti tours in Bogota, free or private tours led by guides, bike tours, city tours, and workshops. The Bogota Graffiti Tour is guided by a graffiti promoter, manager, artist, anthropologist, and designer. They guide tourists throughout the city, providing noteworthy information and key facts about the Bogota graffiti scene to facilitate appreciation of the artwork. The bike tour is significant as it can help reduce environmental issues related to traffic. Graffiti artists and associated creators have become members of a team that plans the best alternatives to help artists' projects. This differentiated approach to the cultural development of Bogota is "Responsible Graffiti Practice." The "Responsible Graffiti Practice" is a participative process aiming to develop new cultural policies for graffiti art, wherein graffiti is recognized as a form of art in which the participation of citizens in making decisions on public spaces is encouraged. Such efforts contribute to the transformation of the image of Colombia as a crime-ridden and depressed country [7]. As examined earlier in the theoretical background, sustainable tourism coincides with the process of solving problems in current tourism with satisfying the needs of relevant stakeholders. As such, graffiti in Bogota incorporates the virtuous cycle.

According to UNWTO statistics [8] on the number of inbound tourists to countries each year, the rate of increase in the number of tourists to Colombia from 2008 to 2018 (4,282,000) exhibited a 9.7% annual average increase, whereas the annual average in the other 112 countries over the same period was 5.4%. In particular, the number of inbound tourists to Colombia in 2010 and 2011 were 1,719,000 and 3,324,000—the rate of increase was 93.4%. According to UNWTO's October 2010 report, tourism in

Colombia showed a trend of recovery through new investment and active promotion, despite disasters, such as flooding from the end of 2010 to the middle of 2011. Tourism was concentrated in business tours, and domestic sightseeing in Bogotá, Cali, Medellín, and Cartagena increased [45]. Figure 1 presents graffiti in Bogota, Colombia.



Figure 1. Graffiti in Bogota, Colombia. Source: Photo: Hwayoon Seok.

1.4. Value of Sustainability of Graffiti Tours

In general, the behaviors associated with environmental conservation are frequently counted as those of sustainability. Therefore, a survey of tourists' perception on sustainable tourism in the Netherlands and the differences between the types of tourists and the perception of sustainability in certain places were analyzed. Particular importance was given to the ecological view of sustainability, followed by socio-cultural and economic views [46]. The ecological perspective is considered an environmental perspective, which measures the perception of sustainable tourism by classifying it into three categories of sustainability. In general, it can be assumed that the tourists' perception of sustainability focuses on the environment. The economic perception is given the lowest weight because it affects the locals more than the tourists. Currently, it is the environment that inhabits the recognition of consumers and takes precedence to everything else, along with the efforts made to secure sustainability in diverse industries. Thus, as for sustainable tourism, alternative tourism comprising ecotourism, responsible tourism, and fair tourism, is often characterized by recognition of environment [47]. It is the form of positive tourism insisting conservation of current sites of tourism for the sustainable tourism. However, there exist aspects wherein the educational element rather than entertainment ones are spotlighted by tourist conscious of morality and regulations on tourism. From the standpoint of traditional socio-tourism, tourists experience the 'communitas' wherein the morality and regulations set forth in the space of ordinary life are ignored through migration into sites of tourism [48,49]. Undoubtedly, though the introspection and moral norm are taken seriously in contemporary tourism along with the changes in ages, the evidence implies that sustainable tourism needs newness and to be interesting if it is to be presented to tourists.

As examined previously, sustainability comprises environmental sustainability together with economic and socio-cultural sustainability. By taking this viewpoint into account, the preservation of socio-cultural resources, based on the conservation of environmental resources, posits the economic value thereof. In the field of tourism, the concept of sustainability was defined by Inskeep [50] as the sustainment of a life conservation system comprising cultural preservation, the sustainment of necessary ecological processes, and biodiversity together with all resources that can fulfill economic, social, and aesthetic needs to improve opportunities for future tourism. This is compatible with the thinking intending to protect resources for tourism and contemporary tourists. UNEP and UNWTO [23] also mentioned sustainable tourism as the promotion and protection of the opportunities of tourism for future generations, balanced with the fulfillment of the needs of contemporary tourists and local communities to maintain cultural integrity, ecological processes, biodiversity, and systems for sustainable life, as well as to control all resources for the fulfillment of economic, social, and aesthetic needs. Graffiti tours, which construct a new environment by creating mural paintings of stories of society and culture, can be regarded as a rearrangement of resources and the composition of a new environment to attract the interest of tourists. Moreover, culture is the way that members respond to specific political situations facing the city [7]. The proliferation of cultural planning and public art policies, along with

the right of a large city to promote creativity, provides an opportunity to symbolize graffiti as a productive creative practice [6]. In the current trend of increasing tourism, the balanced development of cities can offer a solution to the concentration of tourists visiting famous sights. The importance of the effectiveness of local tourism and its sustainable competitiveness, through improving attitudes to accommodate tourists, has been growing gradually [28,51]. Graffiti tours align with sustainable tourism in how they develop socio-cultural functions based on their aesthetic functions, environmental functions by relocating the urban environment, and the revitalization of local economic functions due to job creation and tourism through the cooperation of citizens and graffiti artists. Therefore, it is necessary to conduct an empirical analysis to confirm whether graffiti tours reflect the value of sustainability from the perspective of sustainable tourism. Recently, with the increasing popularity of social media, reviews by consumers enable them to exchange product information more easily and be affected by other people's choices [52–54]. As tourism products—experiential products—cannot be evaluated before the actual experience, consumers find useful information about tourist spots, activities, and experiences on a real-time basis through online reviews, which influence decision-making and behaviors when traveling [55,56]. For these reasons, many previous studies [57–61] used online reviews of hotels, Airbnb, restaurants, and other tourist attractions to examine customer satisfaction attributes, causes, perception, and destination characteristics. Therefore, we intend to measure the sustainability of graffiti tours by analyzing the online reviews on social media based on the three perspectives of sustainable tourism. In 2017, the United Nations General Assembly declared the international year of sustainable tourism for development, and UNWTO promulgated the '2030 Agenda' for sustainable development. Given that this is a major starting point for the development of sustainable tourism, it is necessary to look at the changing issues by cycle. Based on this theoretical background, the following research questions were identified:

Research question 1: How are perspectives on sustainability reflected in the online reviews about graffiti tours in Bogota?

Research question 1-1: Which keywords in the online reviews about graffiti tours in Bogota are related to perspectives on sustainability?

Research question 1-2: How have perspectives on sustainability in the online reviews about graffiti tours changed over time?

Research question 1-3: What are the structural characteristics, meanings, and roles of the key words network from the online reviews about graffiti tours for reflecting sustainability over time?

Research question 1-4: How are keywords in the online reviews about graffiti tours associated with the perspectives of sustainability?

2. Data and Methods

2.1. Data

Online travel communities that share tourist information include TripAdvisor, Lonely Planet, Travellerspoint, VirtualTourist, and Yahoo! Travel. Many studies have analyzed the utility of tourist information by reviewers and its effects on the decision-making of other tourists to assess the reliability of information on the largest online travel community, TripAdvisor. The results proved that such information had significant effects, indicating that there is high utility value in terms of information delivery [62,63]. TripAdvisor provides countless reviews and feedback on accommodation, restaurants, experiences, airline tickets, and cruises, and has the ability to influence approximately 500 million travelers. Travelers compare prices of hotels, flights, and cruises; book popular tours and attractions; and make restaurant reservations. Currently, TripAdvisor offers its services across 49 markets in 28 languages [64].

Accordingly, this study examines 1991 online reviews in English for "The Original Bogota Graffiti Tour" on tripadvisor.com to analyze the direct perception of tourists who experienced this tour. As there were only seven reviews in 2012, this study analyzed a total of 1984 reviews from January 2013 to July

2019. Moreover, to examine changes in the issues of each period, an analysis was conducted on online reviews from 2013 to 2016 and from 2017 to 2019 on the basis of the year 2017, which was declared the International Year of Sustainable Tourism for Development by the United Nations General Assembly, and in which the “2030 Agenda” was introduced for sustainable development by UNWTO.

For traveler ratings, TripAdvisor’s “The Original Bogota Graffiti Tour” was rated excellent in 1843 reviews (92.9%) and terrible in six reviews (0.3%). On the basis of the date of experience, there were 764 reviews from January 2013 to December 2016 and 1220 reviews from January 2017 to July 2019. Examined by month, most travel experiences were in December, followed by similar numbers in February, March, July, and August. December is the month in which the dry season begins in Colombia, with most Colombians taking a vacation between December and mid-January (see Figures 2 and 3).

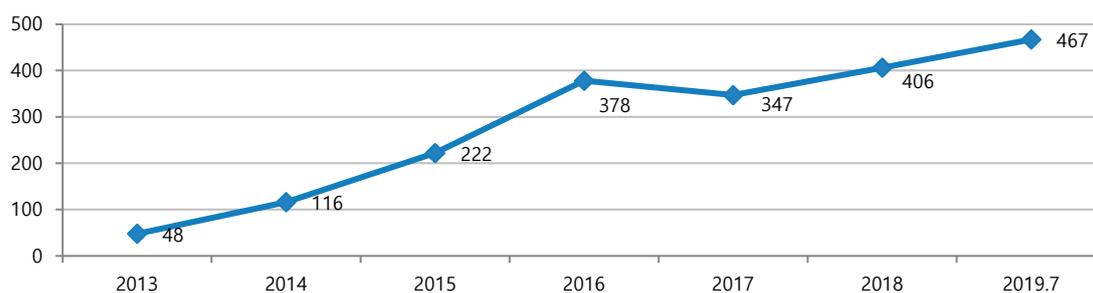


Figure 2. Bogota Graffiti Tour annual trend (No. of reviews based on experience date).

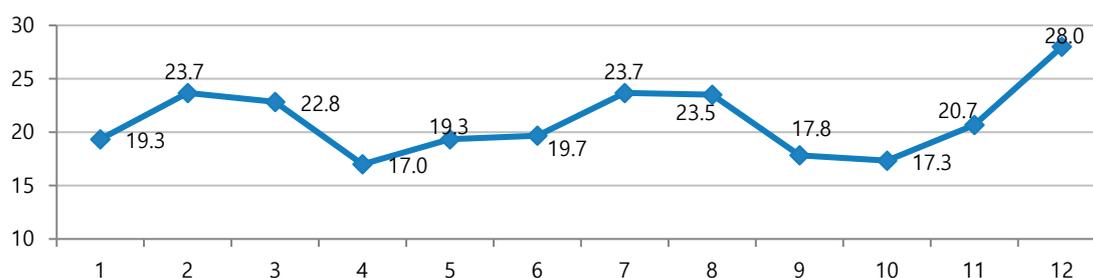


Figure 3. Bogota Graffiti Tour monthly average (No. of reviews based on experience date in 2013–2018).

2.2. Analysis

Recently, big data has been employed as a means of analyzing trends and customers, predicting sales, and developing marketing strategy in diverse industries. Social media has contributed to the rapid emergence of big data [17]. Social media platforms are an important resource of big data, as they have become diversified by generalized use. They are suitable for text mining analysis because they consist mainly of unstructured texts [17–19]. Text mining was introduced initially as a concept of knowledge discovery in a textual database [65]. It is a process of extracting relevant information automatically through the interaction of interest between language (text) and a mechanical algorithm (analysis) for the purposes of finding useful patterns and knowledge based on the technology of natural language processing (NLP) from text-based data. It can, therefore, be seen as an extraction of interesting and non-ordinary knowledge from unstructured language [66–68]. Thus, text mining is employed as a theoretical approach and a corresponding method in diverse fields, as well as a means of searching for information in disciplines associated with information retrieval [69].

Therefore, this study analyzed the online reviews available on TripAdvisor using text mining to address the research questions established earlier. In the present study, the program R (Version 3.5.0, RStudio Inc., Boston, MA, USA) was used to analyze source codes of the homepage TripAdvisor to examine online reviews posted there, by text mining. Upon acquisition of the data of ‘online reviews’ in ‘TripAdvisor,’ the following jobs were carried out: the preprocessing of data, the extraction of keywords, the identification of the relationship between the extracted words, and the visualization

of the extracted words based on frequencies through word cloud [69]. Then, the structure of the network of words was examined based on the results of the analysis for the social network analysis. In addition, unnecessary or inappropriate words for this study were removed through the general refinement procedures like tokenization, normalization, stop words, strip whitespace, tolower, and stemming. By those procedures, special symbols, spaces, numbers, English punctuation marks, and stop words were eliminated; capital and lower letters were differentiated; word roots were extracted from phrases. Furthermore, some words which could imply graffiti tours, such as graffiti, mural, tour, trip, travel, and art were excluded, since the issue of ‘nested patterns’ could occur during the text mining procedure. Next, the structure of the network of words was examined based on the results of social network analysis. To analyze the network structure between words, a co-occurrence matrix based on the frequency of occurrence between words was generated through text mining. Each word is a node in the network based on $N \times N$ matrix structure (S). From this network, degree centrality is calculated. Here, each cell, S_{ij} , indicates the intensity between word i and word j [70]. Therefore, the word network structure based on the frequency of co-occurrence between words was presented as visualized data. Such an approach to network analysis can be regarded as appropriate to examine and compare relationships inside a network [71]. These matrices were utilized as inputs for the social network analysis software package UCINET (Version 6.624, Analytic Technologies, Lexington, KY, USA). The word networks were analyzed and visualized by NetDraw (Version 2.160, Analytic Technologies, Lexington, KY, USA).

3. Results

RQ1-1. The Table 4 shows the results of keywords analysis of “The Original Bogota Graffiti Tour” reviews.

Table 4. Review data set word frequencies results (2013~2019).

Rank	Word	Frequency	Rank	Word	Frequency
1	artist	1024	26	worth	214
2	great	959	27	love	209
3	history	849	28	area	208
4	recommend	815	29	local	206
5	city	780	30	excellent	197
6	political	608	31	experience	189
7	knowledge	588	32	like	187
8	interesting	550	33	nice	176
9	informative	541	34	beautiful	165
10	learn	494	35	understand	157
11	way	465	36	social	152
12	well	426	37	background	148
13	culture	424	38	fantastic	142
14	amazing	383	39	incredible	134
15	highly	379	40	friendly	133
16	know	352	41	meaning	133
17	good	326	42	want	129
18	work	320	43	place	122
19	different	270	44	first	121
20	best	248	45	suggest	120
21	insight	236	46	style	119
22	behind	231	47	highlight	113
23	definitely	231	48	miss	112
24	story	224	49	awesome	111
25	enjoy	221	50	country	111

The top 50 words from the keywords analysis show that “artist” had the highest frequency with 1024 appearances, followed by “great.” Excluding sentiment words, words such as “history,” “city,” “political,” “culture,” “work,” “story,” “social,” and “background” showed high frequency.

Moreover, people used words related to knowledge acquisition and influence, such as “informative,” “learn,” “know,” “insight,” “worth,” “understand,” and “meaning.” The results showed that these words played an important role in tourists’ perceptions of the Bogota Graffiti Tour. Figure 4 presents a word cloud of word frequencies results.

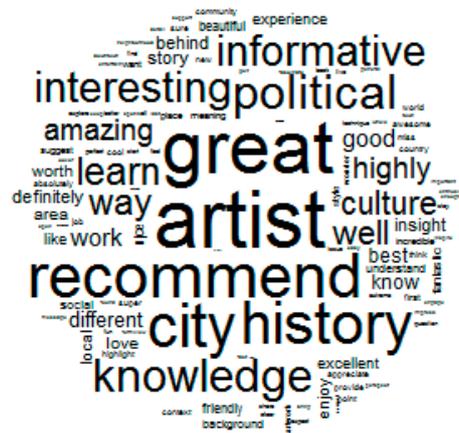


Figure 4. Online review word frequencies results in word cloud format (2013~2019).

RQ1-2. In 2017, the United Nations General Assembly declared “the International Year of Sustainable Tourism for Development,” and UNWTO promulgated the “2030 Agenda for Sustainable Development.” On the basis of date of experience, there are 764 reviews from January 2013 to December 2016 and 1220 reviews from January 2017 to July 2019. Then, frequency of each word per the number of total reviews were calculated, and the differences of those scores between the two time periods of 2013–2016 and 2017–2019 were presented in Table 5. In a comparison of the results of the analyses done between 2013–2016 and 2017–2019, words such as “artist,” “great,” “knowledge,” and “city” appeared with decreased frequency per number of total reviews. However, the words that show an increase, excluding sentiment ones, are “history,” “political,” “culture,” “behind,” “story,” “social,” “background,” “context,” “artwork,” and “community.” Considering the rank of word frequency, there are new words ranked the top 50 for 2017 to 2019, such as “context,” “artwork,” and “community.” New words also appeared, such as “fantastic,” “wonderful,” “super,” and “perfect” signifying more intense, positive feelings.

Table 5. Review data set word frequencies results.

No.	Word	2013~2016			2017~2019			② - ①
		Rank	Word Frequency	Frequency/The Number of Total Reviews ①	Rank	Word Frequency	Frequency/the Number of Total Reviews ②	
1	artist	1	440	0.58	1	584	0.48	-0.10
2	great	2	412	0.54	2	547	0.45	-0.09
3	history	5	307	0.40	3	542	0.44	0.04
4	recommend	4	316	0.41	4	500	0.41	-
5	city	3	330	0.43	5	450	0.37	-0.06
6	political	11	205	0.27	6	394	0.32	0.05
7	knowledge	6	257	0.34	7	331	0.27	-0.07
8	informative	8	231	0.30	8	310	0.25	-0.05
9	learn	10	220	0.29	9	306	0.25	-0.04
10	interesting	7	245	0.32	10	304	0.25	-0.07
11	culture	14	152	0.20	11	272	0.22	0.02
12	amazing	18	128	0.17	12	255	0.21	0.04
13	way	9	222	0.29	13	244	0.20	-0.09
14	highly	16	144	0.19	14	233	0.19	-
15	well	12	201	0.26	15	224	0.18	-0.08

Table 5. Cont.

No.	Word	2013–2016			2017–2019			② – ①
		Rank	Word Frequency	Frequency/The Number of Total Reviews ①	Rank	Word Frequency	Frequency/the Number of Total Reviews ②	
16	good	13	155	0.20	16	171	0.14	−0.06
17	work	15	152	0.20	17	168	0.14	−0.06
18	behind	29	75	0.10	18	157	0.13	0.03
19	story	32	75	0.10	19	149	0.12	0.02
20	definitely	26	93	0.12	20	138	0.11	−0.01
21	different	19	133	0.17	21	137	0.11	−0.06
22	know	17	126	0.16	22	137	0.11	−0.05
23	insight	24	100	0.13	23	136	0.11	−0.02
24	best	20	113	0.15	24	135	0.11	−0.04
25	excellent	38	64	0.08	25	133	0.11	0.03
26	love	27	87	0.11	26	121	0.10	−0.01
27	experience	30	75	0.10	27	114	0.09	−0.01
28	enjoy	21	108	0.14	28	113	0.09	−0.05
29	beautiful	43	57	0.07	29	108	0.09	0.02
30	local	25	99	0.13	30	107	0.09	−0.04
31	area	23	102	0.13	31	106	0.09	−0.04
32	worth	22	108	0.14	32	106	0.09	−0.05
33	nice	34	71	0.09	33	105	0.09	−
34	fantastic	67	39	0.05	34	103	0.08	0.03
35	like	28	85	0.11	35	102	0.08	−0.03
36	social	46	55	0.07	36	97	0.08	0.01
37	understand	40	64	0.08	37	94	0.08	−
38	background	45	55	0.07	38	93	0.08	0.01
39	meaning	49	48	0.06	39	85	0.07	0.01
40	context	85	29	0.04	40	79	0.06	0.02
41	friendly	41	59	0.08	41	74	0.06	−0.02
42	highlight	60	41	0.05	42	72	0.06	0.01
43	miss	63	40	0.05	43	72	0.06	0.01
44	artwork	70	36	0.05	44	71	0.06	0.01
45	absolutely	65	40	0.05	45	70	0.06	0.01
46	community	79	32	0.04	46	68	0.06	0.02
47	super	78	32	0.04	47	68	0.06	0.02
48	wonderful	64	40	0.05	48	68	0.06	0.01
49	awesome	50	46	0.06	49	65	0.05	−0.01
50	perfect	83	30	0.04	50	65	0.05	0.01

RQ1-3. Figures 5 and 6 show the results of the structural characteristics of the network formed by the words' co-occurrence. These figures are visualized images of a network based on words with a stronger connection. "Artist," which was ranked the highest, was strongly connected to "great," "history," "culture," "city," "recommend," and "political," indicating that they frequently appeared together. This shows a common feature in each period. In other words, people tend to refer to "artist," while associating it with history, politics, culture, and society, and they feel that it is "great," or "amazing," so they "recommend" it to others. This result is similar to that of the previously conducted keywords analysis. The words with the second-highest connectivity vary across the different periods. While words such as "style," "technique," "amazing," and "suggest" are observed between 2013 and 2016, "community," "context," "mean," and "fantastic" are observed between 2017 and 2019. That is, these words appeared with the words that play a key role in understanding graffiti in line with concepts such as society, community, and context.

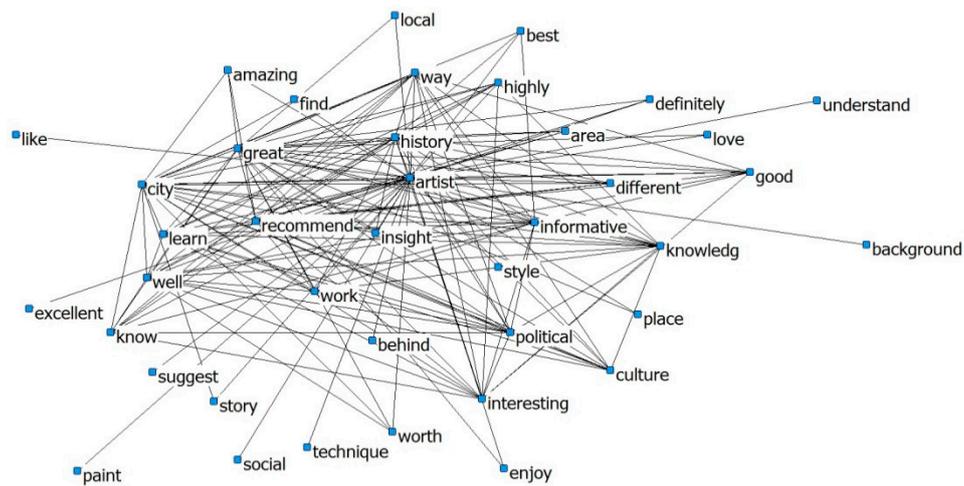


Figure 5. Word co-occurrence network (2013–2016).

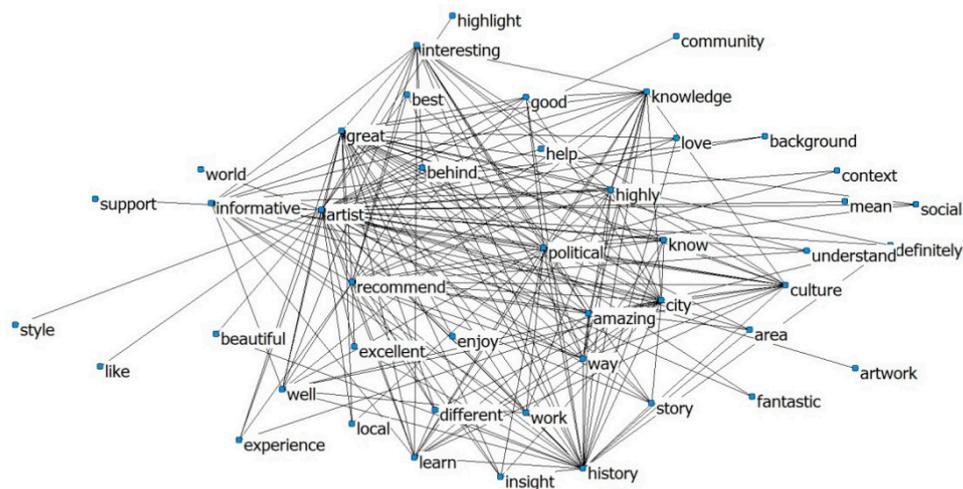


Figure 6. Word co-occurrence network (2017–2019).

RQ1-4. The words of high rank, such as “artist,” “history,” “city,” “political,” “culture,” “work,” “story,” “social,” and “background,” which are associated with societal and cultural aspects were found from the keywords. There are also words associated with satisfaction and an experience of significance felt by tourists, including, “great,” “recommend,” “interesting,” “informative,” “learn,” “amazing,” “insight,” “worth,” “excellent,” “incredible,” and “awesome” etc. The significance of these words can be understood in the context associated with socio-cultural sustainability among viewpoints of economic, socio-cultural, and environmental sustainability. The actual reviews from tourists that include the words that show increased frequencies per total reviews between 2017 and 2019 are highlighted in Table 6.

Table 6. Samples of tourist's reviews.

No.	Word	Reviews
1	political	"Great tour of Bogota's graffiti, really insightful analysis of the political undertones and history that is incorporated into the art." "The art work may seem just pretty but if you take a closer look, it's very political with Strong messages."
2	history	"The artists styles, their political views, plus history of the native Colombians and their struggle to keep their identity." "Learned a lot about the history of people here and how changes in their socio-economic environment leads to freedom of expression through art."
3	behind	"The art is impressive and the stories behind it are captivating." "It was great to have a description of what the political and historical meanings were behind the art and artists."
4	culture	"The graffiti tour was an excellent way to explore Bogota's neighborhoods through the artistic and cultural lense of street art." "Street art is a significant part of Colombian culture so you can see it everywhere - to understand the context is great."
5	story	"As well as the art work being visually beautiful it was backed up with history, politics and stories of the artists." "The Bogota Graffiti Tour is a brilliant way to explore the city and understand some of its political background and the stories behind Bogotas street art and it's artists."
6	context	"I've been living in Bogota for a while now and this greatly enriched my understanding of local street art as well as its social and political contexts in Colombia." "Good knowledge shown of the street art and context social and political and the importance of this art in Bogota reflecting some of the indigenous people and political struggles as well as the legalities."
7	community	"It was interesting and eye opening to hear the history and politics/political discord of Colombia through the artists' eyes and how these artworks have worked with the community as well to strengthen them." "I've learned a lot about graffiti artists and how graffiti can really make a difference for some troubled communities."
8	artwork	"The tour was excellent, really informative, gave me a sense of the history and current issues of Bogota in such a short stay as well as seeing some amazing artwork." "The tour captures not only the artists and how they create the work but also what the artwork represents which in turn informs you of Colombian society."
9	background	"A complete different view on the city, but with many details on the history of the town, background stories on the art scene and as well as some political stuff." "The tour not only gave an in-depth look at graffiti in the neighbourhood of the walk, but also a background of graffiti/street art in Colombia along with a recent history of the political state of the city of Bogota, and the country in general."
10	social	"Pretty much the best thing to do in Bogota, not just for the art, but also to understand some of the social and political issues facing Bogota." "Since the street art movement in Bogota began pretty much in 2011 most of the information is recent and relevant to the current social and political climate in Bogota."

The highlight of tourist's reviews is "The art work may seem just pretty but if you take a closer look, it's very political with Strong messages," "The artists styles, their political views, plus history of the native Colombians and their struggle to keep their identity," "The art is impressive and the stories behind it are captivating," "The graffiti tour was an excellent way to explore Bogota's neighborhoods through the artistic and cultural lense of street art," and "Good knowledge shown of the street art and context social and political and the importance of this art in Bogota reflecting some of the indigenous people and political struggles as well as the legalities." This can be interpreted as socio-cultural sustainability in the Bogota graffiti tour.

4. Discussion and Conclusions

The purpose of this study was to analyze the value of graffiti tours from the perspective of sustainable tourism by examining actual reviews by social media users using text mining and social network analysis. The text mining technique indicated that “artist,” “history,” “political,” “culture,” “social,” “city,” “background,” “great,” “recommend,” “excellent”, and “worth,” were frequently used keywords for the reviews. When comparing word frequencies per review between 2013–2016 and 2017–2019, the results showed that the words, “history,” “political,” “culture,” and “social,” had been more frequently used over time. Furthermore, the network visualization showed that those words were mutually connected. From the results of contents analysis of reviews, it is suggested that tourists have gradually focused on not only artistic aspects, but also social, cultural, historical and political aspects of graffiti in Bogota. In addition, the results imply that tourists have been aware of the function of graffiti for establishing and preserving the identity of the community. Thus, this study may suggest that graffiti tours can have potential for assuming the role of sustainable tourism, since the keywords from reviews are associated with the perspective of socio-cultural sustainability, which comprises the appreciation of socio-cultural authenticity, conservation of cultural heritage and traditional values, and intercultural understanding and tolerance [23]. Based on these results, three more implications can be made.

First, the mentions of history, politics, culture, and society in graffiti tours are connected with positive emotions, interest, and the insight of tourists. The results of the network analysis on words, and their frequency of use, comprise words like the above. The factors that have the most influence over tourists’ positive recognition of sightseeing spots are complex ones, comprising history, politics, culture, and society, together with the artistic perspective of graffiti. As discussed earlier, Zeppel [41] stated art invigorates tourism products, increases market attractiveness, provides new value to a region, and performs an important role in sales and promotion, while also improving product quality and appeal. Graffiti art can be a way to inspire tourists’ sympathy through content associated with politics, culture, and society. This should be considered in the development or improvement of graffiti tours.

Second, tourists’ viewpoint of the sustainability of graffiti tours is expanding over time. In a comparison of the results of the analyses done between 2013–2016 and 2017–2019, words such as “history,” “political,” “culture,” “behind,” “story,” “social,” “background,” “context,” “artwork,” and “community” appeared with increased frequency per number of total reviews. This suggests a gradual increase in the recognition of the importance of sustainability in the consciousness of tourists confronted with graffiti tours. Expressions of more intensified positive feelings demonstrate that consequent satisfaction of tourists growing. This is in accordance with the study by Parker et al. [38] and Haworth et al. [4] that states graffiti has now come to be perceived as valuable rather than negative in terms of urban aesthetics, and as contributing to place-making by performing a key role that gives an identity to a city. Moreover, Dovey et al. [13] stated graffiti can be linked to urban morphologies and the social identity of a place. Therefore, areas where graffiti appears should be encouraged to be evolving spaces for the art through the creation of additional space to reflect contemporary issues.

Third, observing the keywords of the review, there was more content mainly related to socio-cultural sustainability, which also proves that tourists mainly perceive graffiti tours through the socio-cultural sustainability lens. This also supports Richins [31] and Choi and Turk’s [32] study that explained how socio-cultural sustainability includes preserving cultural experiences, history, and traditional values, including a variety of architecture, street scenes, and art. In addition, socio-cultural sustainability’s subcategory consists of tourist satisfaction/attitude toward tourist attractions, strengthening identity by developing and enhancing a vibrant community identity, and integrating and connecting brand and cultural identity. Given that the arts are at the center of elaborate visual discourse on neoliberalism, democracy, and the battle against public space, researchers can continue to examine how street artists inscribe social justice in, on, and around the streets [72]. The frequent mention of socio-cultural sustainability in the ‘online review,’ compared to economic or environmental sustainability—which is more relevant to local residents—is attributable to the

viewpoints of tourists. However, greater recognition of the significance of environmental sustainability is necessary, as it is important for both tourists and local residents. This also supports the idea presented in the literature review that Cottrell et al. [46] stated environmental sustainability is the most important perspective in tourists' perception of sustainable tourism. Therefore, the stories of the role of graffiti art in environmental improvement and sustainability, as well as socio-cultural sustainability in the places in which graffiti appears, should be researched.

5. Limitations and Future Studies

This study assumes that graffiti tourists' online reviews may reflect the economic, socio-cultural, and environmental aspects of sustainability, beyond showing their satisfactions from travel experiences. Nevertheless, since only the case of Bogota graffiti tours was analyzed in this study, it would be prudent to gain a deeper understanding of the topic through a comparative analysis of various cases. Through this, it would be possible to draw the direction and policy implications for graffiti tours as sustainable tourism. This study analyzed only English reviews, despite the subject of the study being a Hispanic country. By analyzing reviews in other languages such as Spanish, the diversity and practicality of opinion would be better represented. Furthermore, the meaning and significance of the relationship between each word in diverse contexts can be concretized through emotional analysis on the results of network analysis.

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