

Identification of Public Space Vitality Factors during the Covid-19 Pandemic Using Cloud Computing (Case: DKI Jakarta)

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ABSTRACT

The Covid-19 pandemic has resulted in radical changes in urban life. People are encouraged to avoid crowds and public activities, which have been forming the vitality of urban life. Vitality as quality is a factor that is avoided and controlled, it will certainly affect the design of urban public spaces considering that the Covid 19 pandemic is not yet known when it will end. The vitality of public space is the result of the interaction of activities, the physical environment, and meaning. Research shows that during the pandemic, the intensity of activity in urban public spaces has decreased significantly, especially in commercial areas, but there has been an increase in natural public spaces. In conditions of restrictions on activities in public spaces, then in the retrieval of data through cloud computing by accessing data from the cloud built by the institution using the internet. This paper will discuss the characteristics and factors that determine the vitality of the public Space with the case of DKI Jakarta. Sports, recreation, fulfillment of daily needs, and socialization as characteristics of the vitality of public spaces. While the vitality factor comes from the internal characteristics of the public space, namely flexibility, fulfillment of needs, diversity, and design. Meanwhile, mixed land use factors and accessibility to public facilities have no significant effect. The method used is quantitative with the data source coming from the cloud which is accessed via the internet.

Keywords: Public space, Urban vitality factors, Cloud computing.

1. INTRODUCTION

Public spaces are all places that can be accessed and used by all people in the city for a wide range of activities [1-3]. Inclusiveness is an important quality of a public space, which is determined, among other things, by the provision of facilities and infrastructure that can support various community activities [4,5]. Infrastructure is an indispensable requirement in open spaces to meet user needs for means of social interaction, safety, and comfort in activities [6]. With inclusive accessibility and infrastructure, public spaces can create diversity in a city [7], where everyone should feel welcomed, and not differentiated by their gender, age, religion, cultural background, or socioeconomic status when they are in a space [4]. Various studies have shown that the diversity and inclusivity of public spaces will increase the community's well-being and invite people's presence in public spaces which drove the urban vitality [4,8,9].

Vitality is the strength and energy of a city, which needs to be concentrated and directed towards a goal to achieve the survival of the city. Creativity is the catalyst for vitality, which is the focus of the creative process. The creative process occurs continuously and with innovation so that it is beneficial for the city in the long term [10]. The concept of urban vitality can be defined as activities, diversity, and transactions, which are the vital force of "place", the presence of people on the streets at different times, and the diversity of human activities [11]. Urban vitality usually refers to the capacity of a place to encourage social and economic activities to continue or is defined as a dense population concentration in a well-organized functional space to produce adequate interactions and activities. The components of urban vitality consist of 1) continuous presence of people on the streets; 2) activities in public spaces 3) and the environment in which these activities occur [12,13]. Urban vitality is a process of accumulation of the density and buildings over time while maintaining accessibility [14]. Some of the

requirements for public spaces vitality are mixed land-use patterns, high density to attract people, and access to public facilities [15].

The Covid-19 pandemic has resulted in radical changes in urban life. Restrictions on social interaction, prohibition of gathering activities, the application of physical distance, and restrictions on the use of public spaces are general policies implemented to prevent the spread of disease [16]. The policy of restricting public activities is applied to cities with varying levels to prevent transmission, making people avoid public spaces and activities that have so far formed the vitality of urban life. However, the need to be in a public space cannot be prohibited as socializing is a human need to maintain mental health [2]. Research conducted by Jan Gehl [17] showed a change in the pattern of use of public space, which was visible at the beginning of the pandemic, especially in cities that imposed total restrictions on social activities (lockdown). This trend continued after the lockdown was reopened, but there was an increase in intensity approaching normal conditions before the pandemic [17].

Although the pandemic situation has been more under control with the discovery of vaccines, and more than 50% of the world's population has received at least the first dose [18], it is not certain that the danger of Covid-19 has disappeared. Even the threat of the emergence of new variants causes us to still need to implement health protocols. The use of public spaces may not fully return to normal as before the pandemic, but rather lead to the formation of new normal conditions as an adjustment to the situation. Gehl's study [17] has shown that the intensity of urban public spaces activity has decreased significantly, especially in commercial areas, but there has been an increase in natural public spaces. In addition, new users are consisting mostly of senior citizens and children with more activities of sports, recreation, and playing activities [17]. Further research is needed to find out what and how the vitality factors of urban public spaces are following the community's needs for activities during the Covid 19 pandemic. The limitations of primary data collection techniques due to the Covid 19 pandemic require innovation with the help of cloud computing as a method of data collection and storage. This paper will discuss the identification of factors and characteristics of public spaces vitality, and the use of cloud computing in the collection and storage of research data.

Advances in Information and Communication Technology encourage the use of data sources and storage using cloud computing, including for research purposes. Cloud Computing in simple terms means storing and accessing data and programs via the Internet [19] as well as a centralized remote server to maintain data and applications. Cloud Computing enables

consumers and businesses to use applications without installation and access their files on any computer with internet access [20] or environment to provide information resources delivered as a service to end-users via the internet [21]. One of the uses of cloud computing is the storage of data stored on third-party servers which do not exist, only virtual on one or more computers [22].

2. MATERIAL AND METHODS

This study uses a mixed-method, with a sequential-explanatory strategy where quantitative and qualitative approaches are carried out sequentially, with a greater weight of quantitative analysis. A quantitative approach is used to analyse user evaluation on urban vitality characteristics and its factors. The results of the quantitative analysis are used as information in the qualitative analysis process to explain urban vitality and its factors.

The research was conducted in the Jakarta area with the target of public spaces in this city and users consisting of residents and from around the city. Public activity is the main indicator of vitality [15,23], so the main variable of this research is public space and its use. Variables of public space characteristics include the typology of form, function, and location of public space, while the variables of vitality are the type of activity, the intensity of use, and user characteristics.

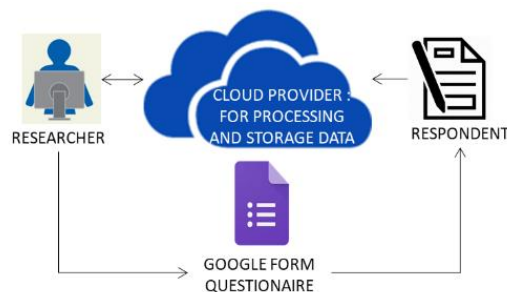


Figure 1 Primary data collection method.

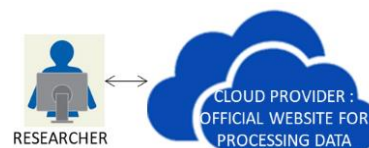


Figure 2 Secondary data collection method.

The research was carried out in several stages. In the preparation stage, research variables are identified based on literature and empirical logic, as well as the unit of analysis, data types, instruments, and data collection techniques. The data collection stage consists of primary and secondary data collection. Primary data was obtained through a survey using the google form

instrument, which results were stored in cloud storage (Figure 1), and direct field observations or using visual data from Google Street view. Meanwhile, secondary data like land and building functions, accessibility, and facilities around public spaces were obtained from the city planning and mapping website (Figure 2).

Quantitative analysis of survey data using JMP11 software to identify the vitality characteristics from the user's view. The results were confirmed by qualitative analysis of the characteristics of public spaces using the superimpose technique on thematic maps to determine the type of urban vitality and the factors that affect vitality during the pandemic.

3. RESULTS AND DISCUSSION

3.1. Cloud Computing as Data Collection and Analysis Method

Cloud computing is a collection of configurable computing networks, such as networks, servers, storage, applications, and services that can be accessed as an on-demand network with minimal management effort or service provider interaction. There are three models in cloud computing services, namely: Cloud Software as a Service (SaaS), Cloud Platform as a Service (PaaS), and Cloud Infrastructure as a Service (IaaS) [24]. The study uses a SaaS service model where a capability is provided to consumers by using provider applications that work on cloud infrastructure. The application can be accessed from various devices through an interface such as a web browser, so consumers do not need to manage or control the cloud infrastructure [25]. The benefits of cloud computing for research include data accessibility that can be done and accessed anytime and anywhere if it is connected to the internet network. Cloud computing can increase data storage capacity without having to add equipment such as hard drives or the like, and data security is sufficiently protected from risks due to data storage hardware damage. However, the implementation of cloud computing in this study still encounters several obstacles, especially the infrastructure of internet access providers. The lack of internet access in some places is the reason why this technology can't be used optimally and widely at any place. Moreover, there are still doubts about data security assurance because researchers cannot control the cloud infrastructure in the SaaS service model.

3.2. Characteristics of The Vitality of the Public Space During the COVID-19 Pandemic

The vitality of public space is the result of the interaction between physical settings, both softscape and hardscape, natural and built environments, human experiences that shape meanings, conceptions, and images, and the use of space in the form of individual

and collective activities [26-28]. During the Covid-19 pandemic, the public space vitality was observable by the presence of several types of the most dominant activities as shown in Figure 3. Exercising was the most dominant activity, followed by socializing, recreation, eating and drinking, as well as activities to fulfill daily necessities. These activities are the use of public space because of the interaction of the physical characteristics of the environment and the experiences experienced by visitors to public spaces.

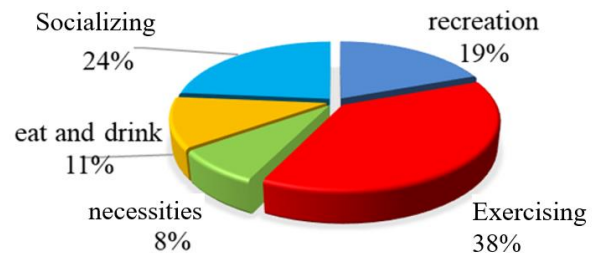


Figure 3 Activities in public space during Covid-19 pandemic.

Table 1 shows the results of cluster analysis which groups public space typology according to its physical elements and the use of space. Characteristics of activities that vitalize the public space are exercising, recreation, cultural attractions, commercials, and socializing activities. The physical characteristics of the environment are formed by linear elements of pedestrian paths as places for exercising, open space, or plazas as places for cultural attractions and recreational activities, as well as buildings as places for commercial, recreational, and socializing activities.

Table 1. Public Spaces typology and places based on the characteristics of vitality factors.

Typology	Characteristics	The particular place
Urban Streets and Plaza (USP)	Use: Physical exercise, recreation	Gelora Bung Karno (GBK)
		The Epicentrum Kuningan
	Physical elements: road (linear) and open space (square)	Cibubur Camping ground
		Menteng Park
		Jl. Sudirman side walk
		Lake Sunter
		National Monument
		Lapangan Banteng park

Table 1. Cont.

Typology	Characteristics	The particular place
		National Library
Urban Cultural and Commercial	Use: recreational, cultural attractions, and	Suropati park
		Kota Tua Jakarta

Area (UCC)	commercial activities	Kelapa Gading Mall
	Physical Elements: buildings and gardens	Gandaria City Mall
		Ciracas Market
		Bunderan HI MRT Station
		Taman Mini Indonesia Indah park (TMII)
Urban Parks (UP)	Use: recreational and commercial	Central Park Mal Grogol
	Physical elements: parks and buildings	Ragunan Zoo Park
		RPTRA Kalijodo Park
		Central Park Mal Grogol
Private Owned Public Space (POPS)	Us: commercial and socializing	Grand Indonesia mall
		Universitas Trisakti Campus
		Artha Gading mall
	Physical elements: buildings and open spaces	Kota Kasablanka Mall
		Pondok Indah Mall

Data analysis, 2021

People choose public space based on a consideration that is following their particular interests and is driven by the attractiveness of the place. Figure 4 shows that people's considerations in choosing public spaces during the pandemic are mainly the spaciousness to ensure that they can keep distance from other people, as well as ease of accessibility to reduce the use of public transportation. Then followed by consideration of diversity, the aesthetic of the design, and completeness of facilities. But some people also consider the tranquility of the atmosphere.

Meanwhile, the attractiveness of places that draw people to come varies more from one typology of places to another as shown in Figure 5. The Urban Street and Plaza (USP) typology is more attractive for sports and recreational activities because it is supported by physical elements of sports facilities such as the Gelora Bung Karno, or spacious outdoor places that are suitable for dynamic activities such as the National Monument, Lapangan Banteng Parks, as well as Jalan Sudirman sidewalks. The same typology also attracts recreational activities for its natural character of vegetation or water elements, such as Cibubur camping ground, Taman Menteng, or Lake Sunter. But people also like the National Library for educational recreation with the support of environmental facilities. These findings support Jahn Gel's statement that the quality of physical elements supports recreational activities in public spaces [29]. With the COVID-19 pandemic, activities are more focused on physical exercise to increase immunity and

recreation to reduce boredom due to regulations restricting activities in public spaces.

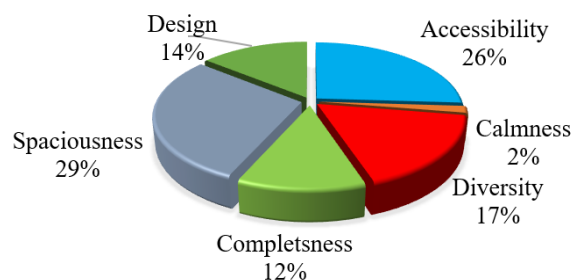


Figure 4 Respondent's consideration in choosing public space during Covid-19 pandemic.

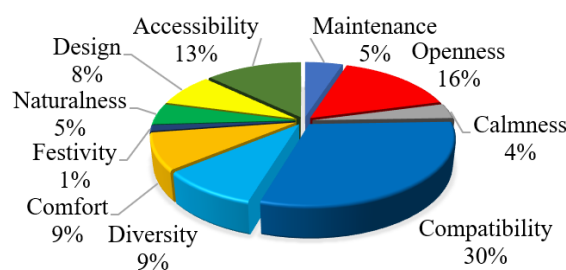


Figure 5 Attractiveness of public space that draw people during Covid-19 pandemic.

In the public space typology of Urban Cultural and Commercial Area (UCC) there are cultural attractions, recreational, and commercial activities. Those activities occur in a relationship with the physical characteristics of the environment. Recreational activities are supported by the physical characteristics of the environment in the form of parks and open spaces such as Taman Suropati and the plaza of Kota Tua Jakarta. Likewise, commercial activities are also in accordance with the characteristics of the physical environment, such as the Ciracas Market, various malls, and the Bundaran HI station. While cultural attraction activities are supported by environmental characteristics with cultural themes, such as the Taman Mini Indonesia Indah, where there are traditional house models and cultural activities.

Activities in public spaces with the typology of Urban Park (UP) consist of recreational and commercial activities, while the characteristics of the physical elements are parks and buildings. Recreational activities take place in the parks such as Taman Marga Satwa, RPTRA Kalijodo, and Taman Lembang, while commercial activities take place in the buildings such as Central Park Mall. Public space in the Privately Owned Public Space (POPS) typology has the physical characteristics of open space in the form of geometric shapes and buildings that accommodate commercial and socialization activities. Commercial activities and outreach took place in malls, such as Grand Indonesia, Pondok Indah, and Kelapa Gading. Meanwhile, open

spaces in the campus environment, such as at Trisakti University, are mostly used as a place for socialization. Thus, it can be said that the support of physical elements is also following the meaning of the public space itself, namely the availability and completeness of facilities in accordance with what is desired or needed by the user.

3.3. Factors that Determine the Vitality of Public Spaces in the Context of the Covid-19 Pandemic

To increase the vitality of urban areas, it is necessary to have factors that can attract people to come. According to Jacob [15] those factors are as follows:

- Mixed land use patterns with a minimum of two uses
- Small block sizes
- High density,
- Various ages and styles of buildings,
- Ease of accessibility to public facilities,
- Control to an empty edge such as major highways.

Existing facilities around public spaces are also driving factors of vitality besides activities, physical elements, and meanings. The factors of facilities are related to their types, diversity, density, as well as accessibility to the facilities. However, the results of the correlation analysis conducted on the use of public space in Jakarta during the pandemic and surrounding facilities based on the "Walk score" cloud data, show that there is no significant relationship between their vitality and the number, diversity, density, and accessibility of existing facilities in the vicinity.

Figure 6 shows that there is no significant correlation between the level of vitality with the number of facilities, as well as with the diversity of facilities (Figure 7), the density of facilities (Figure 8), and the accessibility of activities (Figure 9). It means that the vitality of public space in Jakarta during the Covid-19 pandemic is only determined by the embedded quality or the attractiveness of each space and the user's recognition of the suitability of the public space with the activities to be carried out.

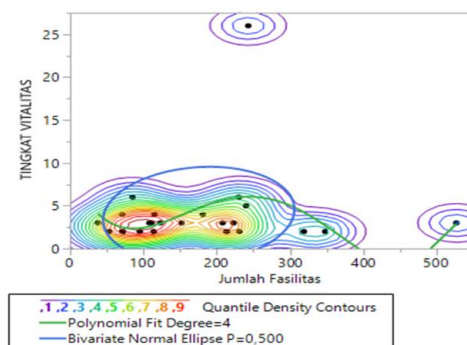


Figure 6 Correlation of vitality with number of facilities.

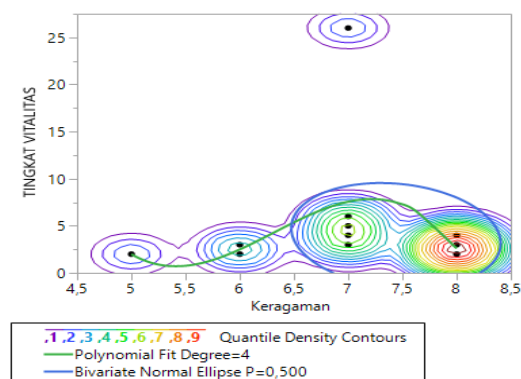


Figure 7 Correlation of vitality with diversity of facilities.

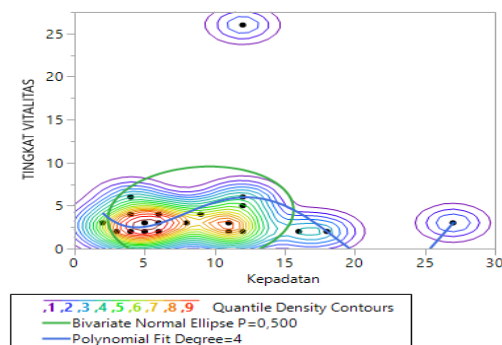


Figure 8 Correlation of vitality with density of facilities.

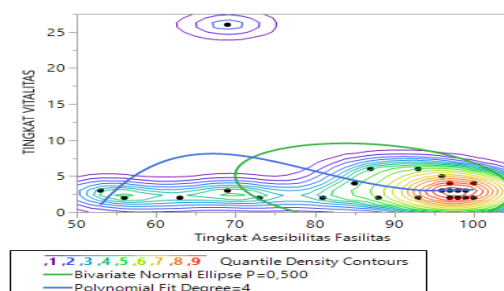


Figure 9 Correlation of vitality with density of facilities.

It turns out that external factors, especially facilities around public spaces, have no effect on vitality during the COVID-19 pandemic. Only internal factors as the "meaning" of the public space have a significant effect on its vitality. These factors include consideration of visitor needs, the attractiveness of public spaces, and the variety of activities. This is because people visited public spaces during the COVID-19 pandemic is more to maintain immunity by exercising and doing recreation to relieve boredom due to mobility restrictions. In addition, people also use public spaces to socialize, to maintain relationships and business meetings in places that support these activities, as well as to fulfill daily needs such as buying daily necessities at malls or markets.

4. CONCLUSION

The use of cloud computing in research has advantages and disadvantages. The advantage is the ease of accessibility of data and information via the internet using various types of hardware, both desktop, and smartphones. With cloud computing, data can be accessed from anywhere and at any time as long as an internet network is available. Data security is also reliable, especially from the risk of damage to hardware or data storage devices.

The main weakness is its very high, if not to say absolute dependence on the internet network. Since there are still many places that do not have good quality internet networks, and also if there are technical problems with the existing network. Threats to data security also still exist related to the spreading of information via the internet which cannot be controlled by researchers.

During the Covid-19 pandemic, the characteristics of the vitality of public space were formed by sports, recreation, socialization, and commercial activities. The supporting factors for the characteristics of the vitality of public spaces are their meaning for visitors. The meaning of public space is the result of the consideration of visiting and the attractiveness of the public space itself. Considerations for visiting involve spaciousness, accessibility, diversity, design, and completeness. While attractiveness consists of the compatibility of facilities, openness, accessibility, diversity, comfort, naturalness, maintenance, calmness, as well as festiveness. The meaning of public space is supported by the characteristics of physical elements, especially the fulfillment of needs, completeness, and diversity. During the COVID-19 pandemic, visitors tend to fulfill their needs to increase immunity, reduce boredom due to restrictions on activities by the government, as well as fulfill daily needs and maintain business relations, so the public spaces visited are those that can support the fulfillment of these needs.

Based on the research findings, mixed land use manifested by the diversity of building functions around public spaces does not significantly affect the level of vitality of public spaces. Likewise, the high density embodied by the density of facilities also does not provide a significant correlation to the level of vitality of public spaces. Accessibility to public facilities also has very little effect on the level of vitality of public spaces. The level of vitality increases due to the interaction of internal factors in the form of activities, meanings, and physical elements of public space. Thus, the definition of public space during the COVID-19 pandemic is a public space that can truly meet people's needs in the new-normal era, namely a public space that can support the intention to increase immunity, to reduce boredom, socializing and to meet daily necessities. To support the vitality of public space, it is also necessary to consider the physical characteristics of public space that can support the activities and meaning of public space, namely the fulfillment of needs, diversity, and design.

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