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The Flexibility of Parking Space of Traditional Market in the City Center (Case Study: Pasar Gede Of Surakarta, Indonesia)

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Abstract. The economic growth in the city of Surakarta could be seen in its trading activities. The existing condition of the current parking space is located on the side of the road or on street parking. This has an impact on traffic jams during peak hours. Therefore, the purpose of this research is to discover the flexibility of parking space at Pasar Gede Trade Area. The method began with empirical data collection based on Category Based Analysis method in grouping the duration of use, area extent, and technical arrangement of parking space. The result of grouping was then analyzed in terms of temporary spatial flexibility. The results show that the use of parking space area temporarily can be regarded as a space with the flexibility of Time Cycle and Time Management, whereas conceptually, it is due to the flexibility of Convertibility that occurs naturally from the consciousness of the users. The contribution of the theory which can be generated is the flexibility of space in the context of spatial constraints through the diversity of spatial planning techniques.

Keywords: flexibility, parking space, traditional market area, City Center

1. Introduction

Nowadays, all regulations relating to the provision of facilities of health, education, shopping and praying are allocated in consideration of the distribution of services referring to the Central Place Theory [1]. Various decisions on city planning and development are taken on the basis of the service-scale rule in accordance with population and demands of community service needs from social and economic aspects [2]. On the other side, the economic growth in Surakarta is seen in trading activities, one of them is in the biggest and oldest traditional market in Surakarta, Pasar Gede Hardjonagaro. Traditional markets are not merely seen as a space of trading activity but are viewed as an organizational system consisting of interconnected, integrated elements forming a complex unity of mutual support to each other. Traditional market is a part of urban activities having various functions. Traditional market’s location occupies a certain area in the city center [3]. Pasar Gede is located in downtown of Surakarta precisely on Jenderal Urip Sumoharjo Street and RE Martadinata Street junction; thus, it has strategic location and most-visited by buyers from inside and outside Surakarta. These activities have an impact on the high demand for
motor vehicle parking spaces. The existing condition of the current parking space is located on the side of the road or on street parking. This has an impact on the stagnation of regional traffic flow during peak hours. Parking errors in very limited spatial dimensions and traditional market position in the city center require a flexible management of space utilization, so that activities can be better accommodated. Planning by creating Flexible Space becomes one of the strategies to overcome the limitations of space and time [4]. Therefore, the objective of this research is to discover the flexibility of parking space at Pasar Gede Trade Area. Potential and strategic location affects the rapid development of Surakarta and has an impact on the increasing number of city dwellers, as one of the demands on the number of supporting facilities for community activities, especially in terms of transportation. Demand for parking has been growing due to the possibility to own and use private vehicles increases. In most cases, private vehicle users require two parking spaces: at the beginning and at the end of the movement [5]. Parking problems are very important to be studied deeply, as all the activities of trading areas require parking facilities, which should be adequately available due to greater volume of traffic in Pasar Gede Trade Area. The currently used parking system is inefficient as the driver is allowed to park unlimitedly and parking facilities cannot be fully used [6]. Various regulatory efforts have been made to overcome parking problems, ranging from the variety of space and parking management techniques. Hence, it is necessary to conduct a study of the flexibility of parking space in traditional market areas at the city center.

1.1 Literature Review

1.1.1 The Definition of Spatial Use Flexibility

Flexibility has been discussed since the 1950s, and at present the concept and application continues to experience renewal. Therefore, flexibility can be considered as the ability of space to provide differences in rules, configurations, and conformity [7]. Based on the Great Dictionary of Indonesian Language (2007), the flexibility of spatial use presents the characteristics of a space for various characteristics and activities, dealing with the arrangement of space by preserving the order of the building [8]. Meanwhile, Carr & Dionisio (2017) review Flexible Spaces in cities by analyzing the advantages of under-utilized, abandoned, or empty spaces, along with urban revitalization needs. Carr & Dionisio integrate the possibility of using Flexible Space as a tool in urban planning [4]. Three concepts of flexibility include: 1) Expansionibility, which is the flexibility of space that can accommodate growth through expansion; 2) Convertibility, which is the flexibility of space with a change of governance in one space; 3) Versatility, which is the multi-functional spatial flexibility [9] and the building is said to be flexible when other activities can be used without changing its shape [10]. Temporal flexibility can be temporarily analyzed in three aspects of the temporal dimension suggested by Carmona, et. al. (2003), including: 1) Time Cycle and Time Management, emphasizing that activity is always changing according to space as well as time; 2) Continuity and Stability, stating that although the environment is always changing over time, a space is able to adapt to change; and 3) Implemented Over Time, indicating that a space can overcome all changes to the environment without much changes [11].

1.1.2 Trade Area Parking Space

According to the Decision of the Director General of Land Transportation No. 272 of 1996 on the Technical Guidelines for the Implementation of Parking Facility, the definition of parking is a non-moving condition of a vehicle that is not temporary. According to Taju, (1996) in Rinaldi Mirsa (2012), the definition of parking is a space to place a vehicle (for transport/goods or motorized/non-motorized) by stopping at a place at a certain time period. According to Joseph Dechiara & Lee Koppelmen (1975) [12] and revealed by Ririh Sudiraharjo (2004), the ways of parking placement are: 1) on street parking; and 2) off street parking. According to the status, parking is divided into five, consisting of: 1) public parking; 2)
special parking; 3) emergency parking; 4) parking park; and 5) parking lots [13, 14]. On the other hand, normatively, the parking space of the Directorate General of Land Transportation has determined the size of the parking space (PSU) that is affected by: 1) the standard vehicle dimension; 2) vehicle-free parking spaces, vehicle-free spaces are provided for lateral and longitudinal vehicles; and 3) width of vehicle door openings. The size specification of parking space requirement and parking space unit is illustrated in Table 1 and Table 2.

Table 1. Parking Space Requirement Size

| Designated | Unit (PSU for Cars) | Parking Space Requirement |
|------------|---------------------|--------------------------|
| Trade Center, consists of: | PSU / 100 m² effective floor area | 3.5 – 7.5 |
| • Pertokoan | | |
| • Pasar Swalayan | | |
| • Pasar | | |
| • Shops | | |
| • Supermarkets | | |
| • Market | | |
| Office Center, consisting of: | PSU / 100 m² effective floor area | 1.5 – 3.5 |
| • Non-Public Service | | |
| • Public service | | |
| School | PSU / College Students | 0.7 – 1.0 |
| Hotel / Place to stay | PSU / Bedroom | 0.2 – 1.0 |
| Hospital | PSU / Bed | 0.2 – 1.3 |
| Cinema | PSU / Seat | 0.1 – 0.4 |

Source: Decree of the Director General of Land Transportation No. 272 of 1996

Table 2. Parking Space Unit Standard

| Vehicle type | Parking Space Unit (m²) |
|--------------|-------------------------|
| Passenger Cars, classified into: | |
| a. Group I | 2.30 x 5.00 |
| b. Group II | 2.50 x 5.00 |
| c. Group III | 3.00 x 5.00 |
| Bus/ Truck | 3.40 x 12.50 |
| Motorcycle | 0.75 x 2.00 |

Source: Decision of the Director General of Land Transportation No. 272 of 1996

1.1.3 The Definition of Traditional Markets

Traditional markets especially those in urban areas have grown in Indonesia since the beginning of the emergence of settlements or kingdom. There are several definitions of traditional market based on experts’ opinion, such as expressed by Rutz that traditional market as the center of socio-economic activity of democracy; thus, the pattern of economic relations occurs in traditional markets resulting in the intertwined social interaction among sellers-buyers, sellers-sellers, and sellers-distributors as a social heritage of need representation for socializing among individuals [15, 16]. Traditional markets are in kiosk, stalls and open land buildings. In the main part, there are kiosks in permanent buildings, stalls in the form of makeshift or semi-permanent buildings, and the ‘oprokan’ or open parts which are used by temporary sellers with a smaller area than stalls [17]. Formally, traditional market institutionally is a market built and managed by government, private, cooperative or self-supporting local community with business premises in the form of shops, kiosks, stalls and tents, or other similar terms owned/managed by small and medium scale sellers, with small business and small capital, with the process of buying and selling through bargaining [18]. Modern markets and traditional markets in social and cultural aspects
have different functions and roles, depicted by the empirical facts in the field, due to similar role as the city’s economic facilities.

2. Methods

Data collection methods employed in this study include Spatial Data, Parking Space Width Data, Parking Capacity Data, Parking Space Need Data, and Duration of Parking Space Use. Spatial data was obtained by conducting field observation to calculate the number of available parking space. Furthermore, it was supported by additional data in the form of basic maps and satellite imagery maps utilizing Geographic Information System (GIS). Meanwhile, Parking Space Width Database was obtained by interviewing parking attendants in charge. The interview was conducted within a period of 2 days, Monday representing weekday and Sunday representing weekend with data on the number of vehicles parked in Pasar Gede Area during the time span between 02.00 a.m. - 06.59 a.m.; 07.00 a.m. - 11.59 a.m.; and from 12:00 p.m. to 03:00 p.m. After all data was obtained, the data was recapitulated to examine whether there was the required data for analysis purposes. Parking Space Capacity is a number stating the total number of vehicles including the parking load, reporting the number of vehicles for a given period of time, in units per hour or per day [19]. The following is the formula to calculate the capacity of parking space with vehicle as the unit used.

\[
Parking\ Space\ Capacity\ (unit) = \frac{Parking\ Area\ Width\ (m^2)}{Parking\ Space\ Unit\ (PSU)}
\]

(1)

Meanwhile, the Data of Parking Space Requirement was collected by calculating parking space requirement with the unit in PSU (Parking Space Unit). Calculation can be performed with the following Parking Space Requirement formula:

\[
Parking\ Area\ Needs\ (m^2) = Quantity\ of\ Vehicles\ (unit) \times Parking\ Space\ Unit\ (PSU)
\]

(2)

Parking duration covers the time span (length of time) of vehicles parked at a certain place. Parking duration can be calculated by the formula (Suwardi, 2008). The result of the subsequent grouping process was analyzed temporarily in terms of spatial flexibility.

3. Result and Discussion

3.1. Pasar Gede Constellation as Traditional Market in the City Center

Traditional market provides a place unlimited to purchase and selling activities of goods and service exchange, but also to the exchange of information and knowledge activities in traditional markets. This is in line with Geertz’s theory that pasar is an economic order as well as a way of life. Within the scope of Javanese society, the power of economic activity is centered on traditional market. Traditional market is viewed as an interrelated and interdependent part of organizational system to form a complex and mutually supportive unity between components. Meanwhile, the components in the market system include rotation, production, distribution, transportation and transaction. In its development, traditional market reaches a wider scope as a node of regional exchange of goods and services which then grows and evokes activities in the city. The displacement of traditional market location is able to change the land use planning, road pattern, movement and pattern or type of building, circulation line distribution, and land use. The constellation of Pasar Gede to Surakarta is depicted in Figure 1 indicating that the area around Pasar Gede is a densely populated settlement, such as Pecinan (Chinese-dominated settlement).
3.2. Existing Parking Area in Pasar Gede Trade Area

Pasar Gede area consists of two main buildings, each consisting of two floors and each separated by a highway. At the front of the building on the east side, there is a writing of “Pasar Gede Hardjonegoro” above the main gate as an identity which is so far maintained. The parking location in Pasar Gede of Surakarta is linear with parking placement on road side or on street parking. The parking area in Pasar Gede is illustrated in Figure 2.

3.3. Categorization of User and Parking Space Service in Pasar Gede Area

Users of parking spaces in Pasar Gede can be classified into: a) Cars, b) Motorcycles, c) Trucks, and d) Non-Motorized Vehicles. This unfortunately has an impact on the reduced comfort of pedestrians who will use the sidewalk because the pedestrian area is reduced and sometimes pedestrians choose to walk along the shoulder of the road rather than down the sidewalk. It is different from research on Modern Market of Pasir Pengaraian City which merely classifies the type of vehicle into car types (sedan, jeep, and pick up) and motorcycle [20]. Goods loading and unloading in Pasar Gede usually take place in the early morning between 2 a.m. to 6.59 a.m. by using trucks which size ranges from small trucks to large trucks. As for the motorcycle, it refers to motorcycles with 2 or 3 wheels, and three-wheeled vehicles in accordance with the Bina Marga classification system. Parking service at Pasar Gede is illustrated in Figure 2.

**Figure 1.** Constellation of Pasar Gede at Surakarta City Center

**Figure 2.** The Use of Parking Area at Pasar Gede
In contrast to the provision of parking services in Hanoi Vietnam, the term “para-parking” is a type of parking service utilizing a private area used for semi-automatic parking. The concept of “para-parking” is expected to increase the supply of legal parking to urban areas in developing cities. Besides, parking is expected to benefit transportation planners to control unplanned land use, legalized illegal parking, parking business in urban areas with reasonable pricing schemes and effective regulations [21].

3.4. Parking Duration in Pasar Gede Area
Parking duration is the time span or the length of time a vehicle is parked at a certain place. Parking duration is stated in minutes. The vehicle parking duration in Pasar Gede Trade Area differs from a research in Tomohon Central Trade Area which calculates the parking duration from 08.00 a.m. to 06.00 p.m. [22]. The highest average parking duration of cars during the research period occurred on Sunday at 7 a.m. - 11.59 a.m. which reached 52 minutes, while the lowest occurred on Monday at 12 p.m. to 3 p.m., reaching 36 minutes. On the other hand, the highest average parking duration of motorcycles during the research occurred on Sunday at 7 a.m. - 11.59 a.m., reaching 68 minutes, while the lowest occurred on Monday at 12 p.m. to 3 p.m., reaching 42 minutes. Meanwhile, the highest average parking duration of trucks during the research occurred on Sunday at 2 a.m. - 6.59 a.m., reaching 92 minutes, while the lowest occurred on Monday at 12 p.m. to 3 p.m., reaching 79 minutes. It can be seen that of the three types of motor vehicles having the highest parking duration is truck occurring on Sunday from 2 a.m. - 6.59 a.m. reaching 92 minutes. Meanwhile, the lowest parking duration is car occurring on Monday at 12 p.m. to 3 p.m. which only reached 36 minutes. This result indicates that the truck’s parking is required for urban goods shipping which is different from commuter’s parking. Unlike cars, trucks usually need a place to park temporarily to load or unload goods at their destination in the central business area. Trucks take more space and time and also require a short distance to the desired destination.

3.5. Parking Space Capacity in Pasar Gede Trade Area
Parking capacity can be interpreted as the maximum number of vehicles which can be parked in a parking area under certain conditions and time. Parking space capacity is a value stating the total number of vehicles including the parking load, including the number of vehicles in a certain period of time which usually uses per hour or per day unit. The capacity of car and truck parking space can be calculated together because in Pasar Gede Trade Area there is no distinction between the parking space specifically for cars and the parking space specifically for trucks. As a result, the loading and unloading activities are done in the same parking space for cars. Furthermore, it is known that the area of parking for cars and trucks is 2196.5 m² with Parking Space Unit that is 11.5. Therefore, the calculation is made to determine the capacity of parking space. Meanwhile, in the case of the parking space capacity for motorcycle, it is revealed that the area of the motorcycle parking area is 253 m² with the Parking Space Unit that is 1.5. From the calculation, it can be seen that the capacity of parking spaces in Pasar Gede Area for cars and trucks is 191 units, while for motorcycle is 169 units. It indicates that the available parking space in Pasar Gede area can merely accommodate 191 units of cars and trucks. On the other hand, the available parking space in Pasar Gede area can only accommodate 169 units motorcycles. Thus, it shows that the
availability of parking space in Pasar Gede area cannot yet meet the need of parking space there. The intensity of the demand is so high that it causes even without the edge of the road allocated for parking, the curb is still utilized as a parking space that will increase traffic congestion [23].

3.6. Parking Space Need in Pasar Gede Trade Area
The need for parking space is a condition of which the available parking area is not yet able to accommodate all vehicle units in a particular parking location. It is revealed that the availability of parking space for cars and trucks is 2196.5 m², while the need of parking space for cars and trucks is 9180 m². Indeed, the available space does not fulfill the demand for parking space for cars and trucks, thus the addition of parking space of 6911.5 m² is needed. Meanwhile, the available parking space for motorcycles is 253 m² and the need of parking space for motorcycles is 1410 m². The available space is indeed insufficient for fulfilling the demand for parking spaces for motorcycles, hence the addition of parking space of 1157 m² is required. Therefore, it can be concluded that currently additional parking space is required to accommodate the number of vehicles that will be parked in Pasar Gede area with a minimum area of 8069 m², consisting of 6911.5 m² to accommodate cars and trucks, and 1157 m² to accommodate motorcycles. Besides adding the parking space in Pasar Gede area, a good parking policy and management can also be enforced. Parking policy is considered as one of the strongest steps to manage travel demand pattern and travel reallocation in urban areas [24, 25, 26]. Other efforts that can be approach to identify improved availability of parking facilities and better implementation of parking regulations are by encouraging easy and efficient urban traffic performance. The implementation of parking on the roadside with time variation becomes one of the ways to overcome traffic jam [27].

4. Conclusion
The existence of traditional market as a node of regional exchange of goods and services, which then grows and develops, generates various activities within a city. The existence of traditional markets in the city center is able to change land use, road patterns, movement and pattern or type of building, distribution of circulation path, and land use as parking area. The findings of this research indicate that the highest average parking duration is 52 minutes for cars, 92 minutes for trucks, and 68 minutes for motorcycles. From the analysis of parking space, it is found that the area of on street parking in Pasar Gede trade area is insufficient. Thus, it is necessary to add parking space of 8068.5 m², consisting of 6911.5 m² to accommodate cars and trucks, and 1157 m² to accommodate motorcycles. Meanwhile, the parking arrangement technique in Pasar Gede area is conducted conventionally and by valet parking. The use of parking space in Pasar Gede area temporarily can be regarded as a space with the flexibility of Time Cycle and Time management, belonging to the flexibility of Convertibility. On the other hand, the spatial constraints management strategy in Pasar Gede is different from the results of research conducted by Carr and Dionisio. In this case, Pasar Gede area creates the spatial use strategy in the parking area with the flexibility of Time Cycle and Time management, while Carr and Dionisio manages with Flexible Space strategy to overcome the excess space which has not been or has been likely utilized, abandoned, or left empty. The theoretical contribution that can be generated from this research is the spatial flexibility in the context of spatial constraints through the strategy of diverse spatial planning techniques.

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