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Increasing the use of large-scale public open spaces: A case study of the North Central Axis Square in Shenzhen, China

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ABSTRACT

Urban public open space is a main component of urban space and an important carrier of public life. To explore the factors that influence the use of these spaces and to identify an effective technique for improving these areas, this paper focuses on the absence of spatial communication between large-scale public space users and characteristics of these spaces. A spatial database containing precise and detailed activity data on 13,468 public space users was created by systematically investigating the behavior of users in the North Central Axis Square in Shenzhen. Using ArcGIS, common patterns of user behavior were analyzed through a spatial analysis technique. The spatial characteristics of open space, including the provision and distribution of enough facilities, the meticulous division of space, the various and colorful edges, the moderate coverage ratio of vegetation, and the presence of shadow, are important factors that influence user behavior in large-scale public open spaces. To improve the use of these space, (1) various facilities must be established in public spaces, particularly regular and auxiliary seats with a recommended total length of 40 m per 1000 m^2, to meet different demands; (2) the whole space must be divided into sub-areas with proper sizes (the recommended size is 1500 m^2 to 2000 m^2) and colorful interior edges; and (3) necessary shading facilities, such as roofs or tree sheds, must be provided depending on the climate in the area. A moderate vegetation coverage ratio (the recommended ration is 40%–50%) in every sub-area is also necessary.

1. Introduction

Urban public open space is a main component of urban space that caters to the urban public life daily. The amount of green space in a neighborhood is significantly correlated with the health of its residents (Maas, Verheij, Groenewegen, de Vries, & Spreeuwenberg, 2006; Villanueva et al., 2015). Public open space promotes health by relieving mental fatigue (Kaplan, 2001), decreasing mortality rates (Mitchell & Popham, 2008), promoting physical activities (Koohsari et al., 2015), and reducing stress levels (Nielsen & Hansen, 2007). Therefore, urban planning must aim to provide high-quality public spaces (Schipperijn, Stigsdotter, Randrup, & Troelsen, 2010). Given that the current urban planning in China has shifted from "incremental planning" to "inventory planning" (Zou, 2013), public space has become the core focus of urban design, eliciting the interest of both local and foreign researchers. Landscape design of large-scale urban public spaces, which usually covers a large area with complex components and functions, has become a challenging task in the field of urban planning and landscape design (Koohsari, Kaczynski, Giles-Corti, & Karakiewicz, 2013).

Landscape research generally employs size, location, landscape characteristic, accessibility, and tourist capacity to measure the advantages and disadvantages of public space. However, the behaviors and feelings of public space users have often been ignored in past studies. Environment behavior researchers argue that public space evaluation must consider the use value of a public space from the perspective of its users. For example, according to Low, Taplin, and Scheld (2005), pp. 16, the value of a public space must be assessed according to its ability to meet the different needs of its users. An increasing number of studies have empirically investigated public space use (Frick, 2007), and the integration of GPS technology (e.g., mobile GPS tracking, GIS spatial analysis, and mapping tools) into urban studies provides new methods for investigating user behavior and allows for a thorough analysis of

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the relationship between public space and the spatial characteristics of its users.

Many large-scale civic plazas have been built in China and in other countries in recent years, but most of these spaces are deemed useless. Huge monetary and human capital has been spent on the construction and maintenance of these spaces, but only few studies have investigated their actual usage. Therefore, in relation to this issue, the design of large-scale public spaces must be examined by considering the circumstances of their precursors. The use of Public open spaces varies in different areas depending on their attributes and the socio-economic attributes of their potential users (Giles-Corti, Broomhall, & Knuiman, 2005). Numerous observable factors may influence the use of public space, including the quality and quantity of space (Corti, Donovan, & Holman, 1996), the characteristics of potential users (e.g., age and gender) (Golicnik & Thompson, 2010), the congruence between the attributes of the park and the needs of the local users, and the maintenance of these areas (Gobster, 2002).

Current evidence suggests that the attributes of public open spaces provide cues as to who are using these spaces and how they are being used. However, less has been known about the actual use patterns of large-scale public spaces and the factors that influence user behavior. Moreover, the urbanization of China and other developing countries has led to the construction of many additional large-scale public open spaces in urban areas.

The current large-scale public space designs are all challenged by the lack of effective communication between the designer and users of these spaces. How well can designers predict the use of spaces that they create? How well can a place that is designed for certain activities serve the needs of its users? What kinds of spaces and landscapes do users prefer? (Golicnik & Thompson, 2010; Maruani & Amit-Cohen, 2007)More importantly, the problems of current large-scale public open spaces are expected to happen continuously in others in the future, unless substantial improvement can be achieved in landscape design of public spaces based on reliable research with systematic survey data on users' behavior. In relation to this, investigating the usage of large-scale public open spaces and user-friendly landscape designs from the perspective of users can effectively prevent the construction of additional large-scale public open spaces that are poorly utilized or underused.

This study focuses on this knowledge gap, and also attempts to identify the factors that influence the use of large-scale public open spaces. Therefore, the aim of this study is threefold: (1) to identify the spatial patterns of activities in a typical large-scale public open space, (2) to explore the factors that influence the spatial distribution of users in a large-scale public space, and (3) to seek for design methods that improve the use of urban public spaces. A case study was conducted in a large-scale public open space in the urban center area of Shenzhen, a pioneering city in South China. The problems in Shenzhen were also observed in the other cities of China and other developing countries. To this end, the current study focuses on the communication between the characteristics of public spaces and their users, using the method of post occupancy evaluation.

2. Methodology

2.1. Study area

We selected the North Central Axis Square in the urban center of the *Futian* Central Business District (CBD) of Shenzhen as the study area. The Square is a large-scale public open space that attracts thousands of users daily with a total area of approximately 27 ha. As implied by its name, the North Central Axis Square serves as the axis of the urban center. This 2000-m long Square with a width of 300 m–600 m is also expected to connect the main public buildings and create a vital public space for the CBD. This research focused on the northern part of the Square (north to Lotus Foothill, south to *Shennan* Avenue). Many bus and subway lines pass through this area. The Civic Center (Municipal Hall), Central Bookstore, and Musician Hall inside the Square attract many visitors, especially during the weekends. A second-floor platform passes from north to south with connections to the ground floor. The Lotus Hill Park, a large popular urban park with a total area of 200 ha, is also located to the north of this platform.

The Central Axis project was first conceptualized in 1985, and its construction officially began in 2002 (Chen, 2011). Except for the central Crystal Island, the project was completed in 2010. The Square is directly connected not only to skyscrapers on both sides but also to other public spaces surrounding the area. As an initial attempt to merge political and cultural centers with a CBD, the Square serves as a multifunctional large-scale public space that integrates civic life with central business activities. This area not only provides open spaces for workers from the surrounding office buildings but also offers playgrounds for nearby residents and other citizens. Therefore, the Square has become a multi-functional public recreational destination for several groups, including visitors to the public municipal facilities, workers from the CBD, residents from nearby residential areas, and other visitors to the Square. However, since its opening, the number of visitors in the Square has failed to meet expectations because of its crude design and incompatible spatial structure. This phenomenon is reflected vividly and ironically in the locally prevailing doggerel, “no citizens in the civic Square.”

2.2. Data collection

Behavior mapping, a popular method for behavior recording, was employed for the activity observation and data collection. Since its development, this method has been widely utilized in many relevant fields, including urban public space research, because of its capabilities to record various human activities in public spaces that are linked with the socioeconomic attributes of citizens and to keep track of information on the places and surrounding landscapes.

The entire Square was divided into 20 sub-areas for observation according to their landscape structure, facilities, space form, and vegetation. These sub-areas are relatively homogenous and independent units that shared similar internal physical attributes (i.e., pavage, vegetation, and facilities) and spatial structures yet differed from their neighboring sub-areas. Those spaces enclosed by trees, fences, walls, steps, or other clear boundaries were allocated to different sub-areas, while successive spaces are not allocated into different sub-areas. Each sub-area had an average area of 1.25 ha (maximum of 6.48 ha, minimum of 0.16 ha, and median of 0.36 ha). These sub-areas were divided into four groups for observation, namely, the Shuyuan and Yueyuan Plaza group, the northern second-floor platform group, the southern second-floor group, and the Civic Plaza and Gardens group. Four groups of undergraduate landscape architecture students from Shenzhen University were trained as observers and were tasked to observe and collect data from each of the four groups of sub-areas. After the first and second hours of observation, the observers were assembled to unify the recording standard and to solve the problems they encountered during observation. To avoid observation bias, the data of the first two hours were dismissed. The observers first went on a systematic walkthrough of the sub-areas in each group, in order to develop their overall impression and general concept of all areas and their activities. Each round of observation involved a 10-min visual scan of each sub-area. All users observed in the 10 min visual scan were