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Does spatial layout matter to theme park tourism carrying capacity?

Yingsha Zhang [a,*], Xiang (Robert) Li [b], Qin Su [c]

[a] School of Hotel, Restaurant, and Tourism Management, University of South Carolina, Columbia, SC, 29208, USA
[b] Department of Tourism and Hospitality Management, Temple University, Philadelphia, PA, 19122, USA
[c] College of Territorial Resources and Tourism, Anhui Normal University, Yijiang District, Wuhu, Anhui, 241003, China

HIGHLIGHTS

- A mixed-methods approach combining statistical and spatial analyses was employed to examine theme park visitor movement.
- Theme park visitor movement was found to be influenced by the theme park's attraction attributes and spatial layout attributes.
- Theories on intuitive and rational choices explained the effects of attraction and spatial layout attributes on theme park visitor movement.
- Recommendations on theme park capacity management are provided based on the findings.

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ABSTRACT

In order to optimize theme parks' tourism carrying capacity, one must understand how park spatial structure influences visitor distribution and, in turn, congestion. This study applied a mixed-methods approach of statistical and spatial analyses of survey data from a theme park in China, to determine how attraction and spatial layout attributes affect theme park visitor movement. Results indicated that visitor movement is influenced by attraction attributes (e.g., attraction type, experience value, facility capacity, floor area, and indoor feature) and spatial layout attributes (e.g., distance between attractions, path network, entrance location, and attraction distribution). Theories relating intuitive and rational choices supported the effects of attraction and spatial layout attributes on visitor movement in light of the objective environment, benefits, costs, available information, and available options. Overall, these findings may inform theme park capacity design and management.

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1. Introduction

Physical expansion and modification are common capacity management strategies for tourist attractions to address increased tourism demand (Orams, 1996). In particular, the spatial organization of a tourist destination influences visitors' perception of crowding (Stokols, 1972) with optimally designed space splitting tourist flow and reducing congestion. In theme parks, well designed space could decrease waiting time and optimize a park's tourism carrying capacity (TCC). However, theme parks' spatial structure has received little scholarly attention (Ahmadi, 1997) despite its being a prime consideration in theme park TCC (Zhang, Li, Su, & Hu, 2017).

Studies on theme park capacity management often focus on strategies that increase facility capacity and improve patrons' wait experience through management tactics (Cope III, Cope, & Davis, 2008; Lith, 2000; Lutz, 2008; Zhang, Su, & Hu, 2012) or virtual queuing systems (Grimm, Waters, Woodbury, & Jones, 2002; Natsuyama, Blum, & Schwartz, 2011). The effects of spatial structure on visitor movement has received less attention, despite its central role in optimizing theme parks' spatial structure and improving TCC. Although many studies have addressed either inter-destination (Lau & McKercher, 2006; Lue, Crompton, & Fesenmaier, 1993; Marrocu & Paci, 2013; Yang & Wong, 2012) or intra-destination visitor movement (Flognfeldt, 1999; Lew & McKercher, 2006; Mings & McHugh, 1992), few have examined visitor movement within a tourist attraction (e.g., in a theme park). Furthermore, studies modeling tourists' spatial movement (Ahmadi, 1997; Mednick, 1975; Xia, Zeephongsekul, & Packer, 2010) generally emphasize methodological applications (Shoval & Isaacson, 2007), such as GPS tracking (e.g. Siła-Nowicka et al., 2015), mobile phone data (Yuan & Raubal, 2016), network

* Corresponding author.
E-mail addresses: yingsha84@gmail.com (Y. Zhang), robertli@temple.edu (X. Li), ahsuqin@263.net (Q. Su).

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analyses (e.g. Shih, 2006), and cluster analyses of visitor movement patterns (e.g. Huang & Wu, 2012; McArdle, Demšar, van der Spek, & McLoone, 2014). Despite their contributions in respective areas, these studies have provided limited statistical and theoretical substantiation for visitors' activity choices and movement patterns within a destination. This study examined the relationship between spatial structure and visitor movement in the context of TCC through a case study of China's Wuhu Fantawild Adventure theme park.

2. Literature review and conceptual model

Theme park visitors' movement may affect their spatial distribution and waiting times and, thus, TCC. Yet most studies on visitor movement assess inter-site rather than intra-site mobility (Zillinger, 2007). Lau and McKercher (2006) noted that tourist movement patterns are affected by three types of physical factors: destination configuration, attractions, and transport networks. Details of theme park attractions may be referred to as *attraction attributes*, and a park's configuration and transport networks may be considered *spatial layout attributes*. In the following sections, the authors explain how these attributes affect visitor movement.

2.1. Effects of attraction attributes on visitor movement

In this paper, *attraction attributes* include attraction experience value, facility capacity, floor area, attraction type, and indoor/outdoor features, all of which may influence visitor movement (e.g. Brandenburg, Matzarakis, & Arnberger, 2007; Kemperman, Borgers, Oppewal, & Timmermans, 2000; Lau & McKercher, 2006). For instance, tourist attractions with high experience value usually attract more visitors than those with lower experience value. Lau and McKercher (2006) noted that destination tourist attractions can be divided into primary, secondary, and tertiary attractions according to their relative attractiveness (i.e., pulling ability). In the context of theme parks, *primary attractions* are those with greater experience value and potential to attract more visitors (i.e., visitors' choices of itinerary is influenced by attractions' pulling ability, which is determined primarily by their experience value). Therefore, the authors proposed the following:

Proposition 1. *Ceteris paribus, attraction experience value affects visitor movement in a theme park.*

An attraction's facility capacity (i.e., the maximum number of visitors an attraction can hold) inherently limits how many visitors an attraction can receive at any given time (Healy, 1994). Demand can easily exceed supply for attractions with smaller facility capacity, requiring visitors to wait longer to enter with some deciding not to enter at all. Hence, facility capacity may influence visitors' itineraries, which in turn determines movement as expected in the second proposition.

Proposition 2. *Ceteris paribus, attraction facility capacity affects visitor movement in a theme park.*

"Access to information is crucial for choosing the travel route and the attractions to visit on the way" (Zillinger, 2007, p. 68). Theme park visitors often gather attraction information based on what they see. Because attractions with large floor areas are easily visible, they are more likely to attract passersby. Thus, the authors proposed the following:

Proposition 3. *Ceteris paribus, attraction floor area affects visitor movement in a theme park.*

Lau and McKercher (2006) asserted that tourist movement patterns are also affected by attractions' uniqueness within a destination. Theme park attractions take various forms (e.g., rides, shows, games) (Birenboim, Anton-Clavé, Russo, & Shoval, 2013). In general, rides and shows are theme parks' primary attractions, although Kemperman et al. (2000) found that theme park visitors often prefer to participate in different types of activities during their stay because "novelty and strangeness are essential elements in the tourist experience" (Cohen, 1972, p. 166). This assumption informed the fourth proposition.

Proposition 4. *Ceteris paribus, attraction types affect visitor movement in a theme park.*

Although weather influences leisure and recreational activities (Brandenburg et al., 2007), few studies have examined the effects of weather on visitor movement within a destination. In theme parks, weather may directly affect visitors' experience and movement: most outdoor attractions are closed during inclement weather, essentially forcing visitors to select indoor attractions. Even on sunny days, visitors may prefer indoor attractions in an effort to avoid the heat or cold, suggesting the fifth proposition.

Proposition 5. *Ceteris paribus, attractions' indoor feature (i.e., being indoors or not) affects visitor movement in a theme park.*

Altogether, attraction attributes (e.g., attraction experience value, facility capacity, floor area, attraction type, and indoor feature) are likely to affect theme park visitor movement.

2.2. Effects of spatial layout attributes on visitor movement

For the purposes of this paper, a theme park's spatial layout attributes refer to distance between attractions, path network, entrance location, and attraction distribution. Existing studies suggest these may influence visitor movement (e.g. Balli, Balli, & Cebeci, 2013; Dietvorst, 1995; Kelley, van Rensburg, & Jeserich, 2016; Lew & McKercher, 2006; Yun & Park, 2015). Distance in particular has been found to negatively affect visitor flows (Balli et al., 2013) and is used frequently as a control variable in gravity models (Marrocu & Paci, 2013), which explain and predict visitor flows. Distance is a pertinent consideration in theme parks as well. Typically, visitor flows decrease as travel distance increases, known as the rule of distance decay (Mckercher & Lew, 2003). Many studies on tourism and distance decay are inter-destinational in nature; thus, the authors proposed the following to examine the role of distance in intra-attraction visitor movement:

Proposition 6. *Ceteris paribus, distance between attractions affects visitor movement in a theme park.*

A theme park's spatial pattern may likewise determine visitor movement. Dietvorst (1995) found that theme park footpaths are used most heavily in the morning and late afternoon. Footpaths can also function as overflow space for crowded attractions (Dietvorst, 1995). Additional entertainment options around path networks (e.g., cast members, small events, an open-air theatre) may reinforce this function (Dietvorst, 1995). Extant literature suggests that visitors' spatial movement, travel preferences, and demand for walking trails may be influenced by a destination's path network (e.g., spatial pattern, number of paths), characteristics (e.g., types of paths, path surfaces, number of path curves), accessibility attributes (e.g., trail information boards, signage, maps, parking, fences, stiles, footbridges), and/or path elements (e.g., viewing platforms, sight distance, resting places) (Kelley et al., 2016; Kuo, 2002; Lew & McKercher, 2006; Smith, 1983). Among these factors, path

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