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Modeling daily visits to the 2010 Taipei International Flora Exposition

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ABSTRACT

The 2010 Taipei International Flora Exposition (Flora Expo) was held in several urban parks in the center of the city. Over the course of the Expo, substantial variation was observed in the number of visitors per day. The aim of this study is to investigate the factors associated with the daily number of visitors to the Flora Expo. Our results suggest that there were periodic changes in the number of daily visits over time as well as with differences between the days of the week. In addition, temperature, duration of sunshine and precipitation were significantly correlated with the number of daily visits. Regression models suggest that the day of the week, long holiday, proximity to the closing date, temperature, duration of sunshine and hours of rainfall showed strong correlation with daily visits. Higher visits were recorded on Saturdays, Sundays and long holidays. When the temperature at noon increased by 1 °C, an average of 1435 additional visits was recorded. When the duration of sunshine increased by 1 h, an average of 895 additional visits was recorded. Approximately 1232 fewer visits were recorded when the duration of rainfall increased by 1 h. Our results also show significant closing effects on daily visits over the last four weeks. These findings may provide useful information for the operation and management of similar festivals in urban parks and help managers to accurately assess and predict the number of visitors.

Introduction

Urban parks provide important recreational opportunities for urban residents that help maintain their leisure quality of life. The numbers of visitors are therefore very important information for urban green space planning and management. With the development of society, the role of urban parklands has gradually diversified (Cranz, 1982). In particular, seasonal activities or festivals are often held in parks (Dines and Brown, 2002; Getz, 1991). These festivals offer the public opportunities to participate in social activities and enhance their quality of life. Such festivals typically do not last long, as gathering a large number of visitors for a longer time may damage environmental resources or reduce the quality of recreation services. Understanding the general patterns of recreation use could not only help managers and planners prepare for rapid increases in use on certain seasons or at specific times (Dwyer, 1988); but also foresee potentials for user conflicts (Arnberger, 2006; Arnberger and Eder, 2007). Thus, an accurate prediction of the daily visitor attendance during festivals enables administrators to plan and implement management strategies in advance in order to mitigate the impacts on society (Ritchie and Smith, 1991; Deery and Jago, 2010; Reverté and Izard, 2011), the environment (Collins et al., 2009; Ahmed and Pretorius, 2010; Mallen et al., 2010) and the economy (Gelan, 2003; Kim et al., 2003; Lee and Taylor, 2005). A number of studies have therefore been dedicated to estimating the number of visitors to urban forests and parks (Dwyer, 1988; Dwyer et al., 1990; Arnberger and Hinterberger, 2003; Arnberger, 2006; Arnberger and Eder, 2007) as well as festivals (Snowball, 2004; Baumann et al., 2009; Xu et al., 2009; Jiang et al., 2011; Zhang, 2011).

Previous studies have demonstrated that the number of visitors to urban parks is associated with numerous factors, including the season (Ritchie and Beliveau, 1974; Getz, 1991; Butler, 2001; Koenig-Lewis and Bischof, 2005), the day of the week (Dwyer, 1988; Dwyer et al., 1990; Arnberger and Hinterberger, 2003; Ploner and Brandenburg, 2003; Arnberger, 2006; Arnberger and Eder, 2007), special holiday (Van Wagtendonk, 1981; Butler, 2001; Lim and McAleer, 2001) and the weather (Dwyer, 1988; Allcock, 1989; Dwyer et al., 1990; Butler, 2001; Arnberger and Hinterberger, 2003; Ploner and Brandenburg, 2003; Arnberger, 2006; Hall and Page, 2006; Hartmann, 1986; Brandenburg et al., 2007; Scott et al., 2007; Xu et al., 2009; Moore, 2010; Becken, 2012; Finger and Lehmann, 2012). Furthermore, studies of marketing and consumer behavior have observed a so-called closing effect, in which the number

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of transactions significantly increases as the end of a transaction period approaches (e.g., Auter and Moore, 1993; Curras-Perez et al., 2011; Kauffman and Wang, 2001). Many park festivals are organized to take place within a limited time frame. However, few, if any, studies have addressed the question of the closing effect, which means that its association with the number of visitors to a festival remains to be clarified. The 2010 Taipei International Flora Exposition (Flora Expo) was a six-month festival based in several existing parks, and provided a good opportunity for understanding visitation patterns for an urban park festival.

The purpose of this study is to examine the correlations among day and its location within the week/Expo, weather conditions, the closing effect, and the number of daily visitors by analyzing the fluctuation pattern of daily visitors to the event in urban parks (the Flora Expo). The following research questions were investigated: (1) Are there temporal fluctuations in daily visits to urban parks, including week and the day of week? (2) Are the daily visitor numbers on long holidays different from visitation on normal days? (3) Do the daily visits vary with different weather conditions? (4) Does a closing effect exist in such an event in urban parks? With the increasing tendency of holding festivals and events in urban parks, the results could provide information regarding similar activities being considered for other urban parks.

Literature review

Estimation of visitor attendance

Estimating visitor attendance has been important to the fields of recreation and tourism. An accurate estimate can help managers develop more effective strategies to meet visitor needs. A number of studies have therefore focused on predicting demands for recreation. Such studies typically use explanatory models that are based on the assumption that correlations exist between these variables and the number of visitors. For example, Dwyer (1988), Dwyer et al. (1990), Vries and Goossen (2002), Ploner and Brandenburg (2003), Brandenburg et al. (2007) and Neuvonen et al. (2007) predict visitor use of urban forests, recreation areas and protected areas using explanatory models.

Festivals in urban parks only last a short time, during which a large number of visitors appear. To provide better services, an accurate prediction of the number of visitors per day is required. Accordingly, many studies have tried to predict number of visitors for various festivals, such as the Shanghai World Expo (Xu et al., 2009; Jiang et al., 2011; Zhang, 2011), the Korea International Travel Fair (Lee et al., 2008), the South African National Arts Festival (Snowball, 2004), the South Africa Science Fair (Snowball, 2004) and sporting events in Hawaii (Baumann et al., 2009). Xu et al. (2009) investigated the associated variables for visitor numbers in large-scale exhibition activities in order to provide strategic recommendations for visitor management. Lee et al. (2008) combined a quantitative model and a qualitative method to predict the number of visitors to the 2012 Korea International Travel Fair. In all of these aforementioned studies, however, visitor attendance at urban park festivals is rarely studied.

Factors associated with seasonal fluctuation

Visitor numbers to scenic sites usually vary over time. This seasonal fluctuation or cyclic demand (Ritchie and Beliveau, 1974) has been considered the most important feature of visitor numbers with respect to festivals (Butler, 2001; Getz, 1991). Butler (2001) defined seasonal fluctuation as the "temporal imbalance in the phenomenon of tourism, which may be expressed in terms of dimensions in such elements as numbers of visitors, expenditure of visitors, traffic on highways and other forms of transportation, employment and admissions to attractions."The fluctuation phenomenon typically only receives brief discussions in textbooks (e.g., Getz, 1991; Cooper et al., 1993; Burns and Holden, 1995; Hall and Page, 2006), and only a small number of studies have addressed it (Allcock, 1989; Butler, 1994; Highama and Hinch, 2002).

Two main reasons are generally believed to cause seasonal fluctuations in daily visitor numbers: natural factors and institutionalized factors (Baron, 1975; Hartmann, 1986). Typical natural factors include climatic factors, such as temperature, rainfall, snowfall, and sunshine (Hartmann, 1986; Dwyer, 1988; Allcock, 1989; Dwyer et al., 1990; Butler, 2001; Arnberger and Hinterberger, 2003; Ploner and Brandenburg, 2003; Hall and Page, 2006; Arnberger, 2006; Brandenburg et al., 2007; Scott et al., 2007; Moore, 2010). It is widely accepted that pleasant climatic factors increase visitor numbers. Dwyer (1988) suggests that deviations of the daily temperature at noon, percentage of the day with sun, and percent of the day with rain from the respective monthly average are associated with the percentage change of daily use of urban forest recreation sites. Arnberger and Hinterberger (2003) suggest that the recreation use patterns of some activities, such as biking, hiking and jogging, are associated with temperature, so higher use levels of urban forests could be observed in warmer weather (Arnberger, 2006). Becken (2012) indicates that higher maximum temperature is associated with the monthly overnight stays in Westland and confirms that the warmer summer is associated with more overnight stays. Furthermore, rainfall also has a strong and significant correlation with visits in outdoor recreation activities (Finger and Lehmann, 2012). Dwyer et al. (1990) suggest that an increase in the percentage of the day when it was raining above the monthly average tends to decrease use of an urban lake. Brandenburg et al. (2007) indicate that cycling is an activity performed during mild weather, which is generally sunny with a temperature greater than 5 °C, few clouds and no precipitation. There were differences in the association between precipitation with the behavior of commuting and recreational cyclists on workdays.

The second factor that causes seasonal fluctuations in daily visitor numbers is primarily related to human behavior and regulations, in particular the existence of fixed activities such as major holidays and festivals. Even the economic cycle can affect travel behavior (Cooper et al., 1993). In comparison to natural factors, institutionalized factors are subject to major changes and are less stable (Butler, 2001). The most common institutionalized factor with seasonal fluctuations is holidays, with school holidays (Lim and McAleer, 2001) and factory holidays (Butler, 2001) of particular importance. Van Wagtendonk (1981) conducted a study of visitors to the Yosemite National Park in the United States from 1972 to 1979 and found that peaks in visitor numbers coincided with national holidays; in particular, the number of visitors increased significantly on Memorial Day, July 4th, and Labor Day.

Social norms or fashion also cause seasonal fluctuations in recreational use (Baum and Hagen, 1999; Butler, 2001). Social phenomena often lead to the designation of specific times for specific activities, thereby causing seasonal fluctuations in visits. In Taiwan, common examples are popular activities such as the flowering season and the Music Festival, which bring a large number of visitors to attractions. To some degree, fluctuation in visits due to popular societal activities also occurred in the case of the Flora Expo. Sports seasons are also believed to be a common cause of seasonal fluctuations in visitor numbers (Butler, 2001; Van Wagtendonk, 1981). Day to day variations have been identified as a major pattern in the use of urban parks or forests; with the highest daily use on weekends (Dwyer, 1988; Ploner and Brandenburg, 2003; Arnberger and Hinterberger, 2003; Arnberger, 2006; Arnberger and Eder, 2007). For example, there are higher use levels at weekends in the urban forests (Arnberger, 2006), and the use intensities in