

The implementation of GPS tracking and GIS technology for park visitor monitoring: a key to managing visitor assets and experiences

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Introduction

To achieve visitor satisfaction, park management needs to provide a range of recreational opportunities and ensure that these are resourced with an appropriate level of facilities. However, due to budget constraints, managers are required to target resources in relation to visitor needs and preferences. Visitor use of protected areas varies with the popularity of sites and specific assets within sites. Given this local-scale variation in usage, precise visitor monitoring methods are required to assess whether the provision and maintenance of facilities matches recreational demands.

We employed GPS tracking and GIS technology in combination with questionnaire-based surveys to monitor visitors in selected national parks within the Sydney Metropolitan area in Australia. The project consisted of two components: (1) An observational study in which we examined how visitor usage of assets varies with type of visitor activity. (2) An experimental study in which we examined how the provision of various interpretive media, affects the spatio-temporal behaviour of visitors along a scenic walk.

Visitor asset management (1)

In many protected areas worldwide, park agencies need to manage the provision and maintenance of a wide range of visitor assets to accommodate visitor needs and expectations. These facilities encompass a broad range of infrastructure such as benches, picnic tables, barbecues, walking tracks, roads, parking lots and entire visitor precincts. Facilities that maintain the natural and cultural values of a park and provide a high quality of service are integral to visitor satisfaction. Close alignment of supply and demand will ensure cost-effective management of such facilities whilst reducing unnecessary development with unwanted facilities.

The aims of this study were to determine how demand for visitor facilities depends on their intrinsic characteristics, and their relationship with other site features and with visitor attributes. We also used this study to evaluate the performance of our methodological approach.

Methods

Demand for visitor facilities has been traditionally determined by questionnaire-based surveys. However, surveys tend to generate demand data on a coarse spatial scale as the data collected are typically tempered by the memory of visitors and their ability to reference their movements on a map (Wolf et al., 2012a). We capitalised on recent advances in visitor monitoring and used GPS tracking (Shoval and Isaacson, 2010) to determine demand for facilities. Ques-

tionnaire-based surveys complemented the GPS tracking and both were analysed in conjunction with the New South Wales National Parks Service's comprehensive visitor asset management database.

Preliminary Results

According to preliminary results, demand for point assets, such as tables and seating, was strongly influenced by their spatial relationship with other assets. This included proximity to barbecues, parking lots, playgrounds, toilets and garbage bins. Whilst the former three attracted or repelled visitors depending on their primary motivation to visit, the latter two repelled visitors universally. Natural landscape features that increased the appeal of point assets included scenic views, trees and proximity to water.

Asset type was another predictor for demand. For instance, open picnic tables were more popular than pavilion-style sheltered picnic tables. Shelters containing numerous picnic tables, along with other facilities, were popular among larger visitor groups and families but repelled others. In contrast, asset condition was of minor importance presumably because the overall level of asset maintenance was high.

A limited number of point assets attracted significant numbers of visitors while some were seldom visited. Regular visitors were very loyal to specific point assets. Interestingly, first-time visitors frequented park information centres less than expected. Follow-up surveys indicated that a considerable number of visitors missed two of the centres due to lack of signage and the inconvenient location of one of the centres away from the major visitor precinct.

Interpretive media (2)

In addition to the provision of facilities, effective interpretation is another important tool for park managers to attract visitors and enhance their experiences. Although, advances in technology have expanded the range of interpretive media available, their effectiveness in nature-based settings has not been well established. In this study we used GPS tracking and GIS analysis to compare the performance of modern technical media with traditional media along a scenic walking track in a national park in Sydney (Wolf et al., 2012b).

Methods

Participants were provided with one of two types of modern media: (1) an MP3 player (audio tour), (2) a GPS-triggered multi-media tour; or with one of four types of traditional

media: (1) text-rich or (2) image-rich pamphlets, or (3) text-rich or (4) image-rich signs. The media were evaluated by measurement of their relative attracting, distracting (number of detours that people take to access sights) and holding power via GPS tracking of visitors and GIS analysis. These measurements were accompanied by a questionnaire-based survey to assess visitor satisfaction with the media, willingness to give word-of-mouth recommendations and short-term factual learning.

Results

The GPS navigation tour performed well compared to traditional media, achieving an intermediate attracting power, highest distracting power and highest holding power. It was also rated more highly than the audio tour for overall experience with the medium and for facilitating fun. Further, visitors were more willing to provide word-of-mouth recommendation for the GPS navigation tour than the audio tour. Both modern media achieved the highest satisfaction ratings for discovery and learning and were most efficient at facilitating factual learning. Traditional media were considered most conducive to socialising and relaxation and were more consistent with a nature-based experience. Signage outperformed pamphlets on most performance measures.

Conclusions

Both studies exemplify how the implementation of GPS tracking and GIS technology was crucial in determining the ways that local park management should manage existing visitor assets and the types of assets and experiences that should be provided in the future. Our methodology was suitable for identifying small differences in the attracting and holding power of visitor assets and experiences, which are exceedingly difficult to capture with traditional visitor monitoring techniques. Analysing fine-scale spatial data of visitor movements in light of traditional criteria, such as visitor satisfaction, enabled a more comprehensive assessment of the performance of visitor assets and experiences. Hence, we recommend that the GPS tracking of visitors be embedded in a mixed-method approach using questionnaire-based surveys, analysis of visitor asset databases and field verification of visitor behaviour. Whilst the former detects differences in the usage of assets, the latter may ascertain the underlying reasons.

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