



Measuring tourism destinations using mobile tracking data



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HIGHLIGHTS

- We develop a methodology for measuring visitor flows in destination.
- We distinguish tourism destinations inside Estonia with mobile positioning data.
- The movement tracks of tourists help to delimit destinations spatially.
- Seasonality and the duration of the visits differentiate destinations temporally.
- Nationality of visitors has clear spatial and temporal patterns in destinations.

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ABSTRACT

We develop a methodology for measuring visitor flows to destinations using space-time tracking data. Based on a review of the literature on this topic we propose that a tourism destination has five dimensions – spatial, temporal, compositional, social and dynamic – that can be measured using space-time tracking data. We analyse three of these dimensions, namely the spatial, temporal and compositional, using the mobile positioning data of foreign visitors in Estonia from 2011 to 2013. Results show that smaller destination areas can be differentiated inside the whole country by the geographical, temporal and compositional parameters of the visits. These findings demonstrate applications of “BIG” data in destination management. A monitoring tool based on this methodology and data is currently being used by the Estonian Tourist Board.

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1. Introduction

The rapid development of information and communication technology (ICT) is changing the essence of tourism, modifying research methods, management tools (Buhalis & Law, 2008; Law, Buhalis, & Cobanoglu, 2014), and marketing (Roberts, Kayande, & Stremersch, 2014). The substantial increase in new ICT-based data sources has given researchers the opportunity to rethink and renew concepts and methodologies used in tourism studies. One area of research in which it is possible to see the change afforded by new ICT-based datasets is in the tourism destination.

Many of the definitions explaining the tourism destination tend to be rather vague due to the large number of users with different

interests (Framke, 2002; Hall, 2005; Murphy, Prichard, & Smith, 2000; Saraniemi & Kylänen, 2011). In fact, the term ‘tourism destination’ is often taken for granted and left undefined (Pearce, 2014). The official quantitative statistics relating to a tourism destination are collected based on the idea that the destination is either the place or area central to the decision to take the trip, or the place where most of the time is spent (UNWTO, 2010). Hence, a tourism destination is traditionally seen as a geographical entity (Framke, 2002; Saarinen, 2004; UNWTO, 2007), the identity of which is often based on the image formed in the minds of travellers (Buhalis, 2000; Saraniemi & Kylänen, 2011). In recent decades a destination has also been considered to be a social construct (Framke, 2002; Iwashita, 2003; Saarinen, 2004; Saraniemi & Kylänen, 2011).

The idea of a tourism destination as a geographical entity with a distinct image is of the utmost importance for the marketing of different destinations because it helps to promote a place to potential visitors (Buhalis, 2000). On the other hand, the notion of a

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destination as a geographical entity can sometimes be rather unhelpful when comparing between destinations, monitoring changes, or modelling future developments. Such types of analysis require clearer and more measurable indicators. One possibility for measuring visitor flows in destinations quantitatively is via the use of different ICT-based tracking technologies. Various tracking datasets have been applied to the study of tourism and tourist movements, including mobile positioning data (e.g., Ahas, Aasa, Roose, Mark, & Silm, 2008; Calabrese & Ratti, 2006; Nilbe, Ahas, & Silm, 2014), GPS data (e.g., Grinberger, Shoval, & McKercher, 2014; Shoval & Isaacson, 2007; Shoval, McKercher, Ng, & Birenboim, 2011), bluetooth data (e.g., Versichele et al., 2014; Yoshimura et al., 2014), user-generated data such as geo-located tweets from Twitter (e.g., Hawelka et al., 2014), and geo-referenced photos from the photo-sharing webpage Flickr (e.g., Girardin, Fiore, Ratti, & Blat, 2008).

The use of tracking technologies in travel and tourism studies has seen rapid development, beginning in the early 2000s with explorative and conceptual studies (e.g., Ahas & Mark, 2005; Asakura & Hato, 2004), followed by numerous descriptive studies exploiting new data sources (e.g., Ahas, Aasa, Mark, Pae, & Kull, 2007; Shoval, 2008) and the use of tracking data to analyse more sophisticated aspects of tourists' spatial behaviour (e.g., McKercher, Shoval, Ng, & Birenboim, 2012; McKercher, Shoval, Park, & Kahani, 2015; Nilbe et al., 2014; Shoval et al., 2011). Compared with traditional accommodation and survey data, GPS and mobile phone based tracking technologies enable us to study tourism more precisely and effectively because (a) the spatial and temporal accuracy of the data are better; (b) the tracking periods are longer; (c) tracking allows us to follow a tourist throughout his/her visit; and (d) digital data collection and processing are easy and timeliness.

The aim of this paper is to develop a methodology for measuring and distinguishing destinations based on space-time tracking data. In pursuit of this aim we first review the theoretical and empirical research on tourism destinations. Based on this literature we deduce five conceptual dimensions of tourism destinations that can be characterised by parameters measurable in quantitative terms using space-time tracking data. These parameters enable us to analyse, monitor and compare destinations based on data describing actual visits. Such measurable dimensions of a destination also have great potential to enable evaluation of the impact of marketing campaigns or investments on destinations. We test the applicability of our methodology in Estonia, using a passive mobile positioning dataset (Ahas et al., 2008). We believe that this conceptual framework could also be applied in future to analyse destinations using different kinds of datasets such as GPS, smart phones, social media, photo uploads, etc.

2. Theoretical concepts for the tourism destination

The concept of tourism destination has often been neglected in discussions due to its complicated nature. Framke (2002) has studied the concept in greater depth and stated that each approach to define the destination (e.g., destination as a narrative, as an attraction, as a geographical unit, as an empirical relationship, as a marketing object, as a place where tourism happens) emphasises only one aspect and ignores any others. Framke (2002, p. 105) himself combined the views of economic and socio-cultural writes in the field of tourism research and concluded "that the sum of interests, activities, facilities, infrastructure and attractions create the identity of a place - the destination."

However, few authors have tried to create a holistic framework for defining destinations. One of the first was Lew (1987), who divided studies on tourism attractions into three general groups based on the following perspectives: ideographic, organisational,

and cognitive. Saraniemi and Kylänen (2011) also identified three conventional views of the tourism destination: economic geography-oriented, marketing- and management-oriented, and customer-oriented. They also proposed an alternative cultural approach. Pearce (2014) used five sets of concepts found in tourism literature to describe destinations: industrial districts, clusters, networks, systems, and social constructs. He identified the key elements of each concept and synthesised them to create a new integrative framework for destinations consisting of a geographical dimension, a mode of production, and a dynamic dimension (Pearce, 2014).

Although the need for empirical research on destination concepts has been highlighted (Framke, 2002; Pearce, 2014; Saarinen, 2004), not many studies have been undertaken in this area. Based on previous theoretical and empirical studies, we propose that the tourism destination is a combination of five measurable dimensions: geographical, temporal, compositional, social and dynamic.

2.1. Geographical dimension

Traditionally, a destination has been observed on several different geographical levels. Continents, countries, regions, local government units, resorts, or even individual attractions designed for tourists can be regarded as destinations (Framke, 2002; Saarinen, 2004; UNWTO, 2007). For example, all of Europe can be the destination of a Japanese holiday tourist who visits six different cities within two weeks, while London alone may be the destination of a German business tourist (Buhalis, 2000). In many cases, a larger destination comprises several smaller attractions or places (Lew & McKercher, 2006). The differences that appear in respect of the spatial extent and scale of tourism destination are also emphasised in Lew's (1987) organisational perspective and Pearce's (2014) geographical dimension.

Destinations are also often artificially separated by geographical or administrative borders. These are often of no importance to tourists and remain unnoticed (Saarinen, 2004). This is evidenced by the case of the Alps, which cover several countries but are perceived as a unitary area by skiers (Buhalis, 2000). Framke (2002) researched in detail the physical geographical borders of a destination. He concluded that both business- and sociology-oriented authors see destinations as places without specifically defined geographical boundaries (Framke, 2002), whereas economic authors tend to see destination as "a territorial system which supplies at least one whole tourism product aimed at satisfying the complex requirements of the tourist." (Candela & Figini, 2012, p. 74).

Tourists' movements in space can be seen on inter- and intra-destination levels. Inter-destination movements are strongly connected to destination choice, which is mostly dependent on overall supply and demand factors such as income, price level, time availability, etc., human 'push' factors (personal motivations, prior visits, etc.) and physical 'pull' factors (destination geomorphology and configuration) (Lau & McKercher, 2006). On the other hand, intra-destination movements are influenced by destination characteristics (e.g., trip origins and destinations, locations of accommodation and attractions, transportation accessibility) and tourist characteristics (e.g., time budget, tourists' motivations and interests, knowledge and information of destination, emotional attachment) (Lew & McKercher, 2006).

Based on previous studies, Lau and McKercher (2006) summarised the patterns of inter-destination movements into six categories comprising single, multiple and complex patterns. The single destination pattern (from home to a single main destination and returning back home) is the only one that does not raise any questions concerning the identity of the tourism destination (Lew

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