Tourism Knowledge Destination

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INTRODUCTION

Although information and communication technologies (ICT) were an important issue for *Travel & Tourism* (T&T) since the 1960s (i.e. computer reservations systems, global distribution systems; Werthner & Klein, 1999), the difference today is that ICT has become a strategic issue for every business (Buhalis, 2006). The special benefit tourism gains from ICT can be put down to the characteristics of the tourism product, being a service bundle ideally portrayed by electronic media and being jointly delivered by (usually) small-sized enterprises. Indeed, T&T is a highly information intensive sector, and not surprisingly, within the e-Commerce sector T&T represents the largest branch. In 2009, 25.7% (€ 65.2 Bn.) of the EU online sales volume has been generated by the T&T sector, whereat in 2001 this figure stood only at € 5 Bn. (Marcussen, 2009). Moreover, in the US already 59% of the total travel revenue is generated online (NewMedia TrendWatch, 2012). However, although tourism shows high penetration rates with respect to Web-based marketing & distribution, shortcomings become evident with respect to e-business networks (supply-chains) and integrated (internal) process automation (e-procurement, enterprise resource planning, etc.). Finally, most significant adoption gaps are ascertained for ICTs in tourism SMEs to support market research, product development and strategic decision making (eBusiness Watch, 2006).

The attractiveness of tourism destinations particularly depends on how communication and information needs of tourism stakeholders can be satisfied through information and communication technology (ICT)-based infrastructures, so that sustainable knowledge sources can emerge (Buhalis, 2006). Although huge amounts of customer-based data are widespread in tourism destinations (e.g. Web-servers store tourists' Website navigation, data bases save transaction and survey data, respectively), these valuable knowledge sources typically remain unused (Pyo, 2005). However, managerial effectiveness and organisational learning could be significantly enhanced by applying methods of business intelligence (BI; Sambamurthy & Subramani, 2005; Wong et al., 2006; Shaw & Williams, 2009), offering highly reliable, up-to-date and strategically relevant information, such as tourists' travel motives and service expectations, information needs, channel use and related conversion rates, occupancy trends, quality of service experience and added value per guest segment (Min et al., 2002; Pyo et al., 2002). This makes clear why ICT and methods of BI are playing a crucial role in effectuating a knowledge destination by enhancing large-scale intra and inter-firm knowledge exchange. Indeed, the major challenge of knowledge management for *tourism destinations* is to make individual knowledge about customers, products, processes, competitors or business partners available and meaningful to others (Back et al., 2007).

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The objective of this chapter is to address the above deficiencies in tourism by presenting the concept of the *tourism knowledge destination* – a specific knowledge management architecture that supports value creation through enhanced supplier interaction and decision making. Information from heterogeneous data sources categorized into explicit feedback (e.g. tourist surveys, user ratings) and implicit information traces (navigation, transaction and tracking data) is extracted by applying semantic mapping, wrappers or text mining (Magnini et al., 2003; Lau et al., 2005). These extracted data are stored in a central data warehouse, enabling a destination-wide and all-stakeholder-encompassing data analysis approach. By using machine learning techniques interesting patterns are detected and knowledge is generated in the form of validated models (e.g. decision trees, neural networks, association rules, clustering models). These models, together with the underlying data (in the case of exploratory data analysis) are interactively visualized and made accessible to all destination stakeholders. The technical architecture and implementation issues are discussed based on a prototypical implementation for the leading Swedish tourism destination, *Åre* (Höpken et al., 2011).

The chapter is structured as follows: the background section introduces into past and current applications of business intelligence and data mining in the tourism domain. The main section, titled The Knowledge Destination Architecture, presents an overall architectural framework for applying methods of BI and data mining to the specific context of a whole tourism destination. As core aspects are presented: a dimensional data model for a tourism destination data warehouse; typical visualization and analysis techniques, like OLAP or decision trees as means of decision support; the technical architecture and implementation issues, covering the components data extraction (ETL), data warehousing, data mining, and the destination management information system (DMIS) as the interface to the end-user. Finally, the section titled Future Research Directions sketches two important veins of research to further improve the effectiveness of decision support through BI and data mining techniques in the tourism domain: (1) the integration of data mining results directly into the dimensional structures of the data warehouse to be subsequently used by OLAP or reporting activities and, (2) the application of meta learning and recommendation techniques to support an adaptive analysis process and user interface, respectively. The chapter concludes with a short summarization of results.

BACKGROUND

Since the widespread adoption of computerized reservation and booking systems in the 1980ies, comprehensive databases are available for all types of tourism transactions, i.e. the complete booking and consumption behavior (e.g. *Passenger Name Record* (PNR) databases of *global distribution systems* (GDS) or the airline on-time performance database of the Bureau of Transportation Statistics; BTS, 2012). Immediately, especially airline companies started to analyze such data as input to process and product optimization. A first prominent example in the area of revenue and yield management is the *DINAMO* system, introduced by American Airlines in 1988 (Smith et al. 1992). Further early examples can be found in the area of demand forecasting (McGill & Van Ryzin, 1999; Subramanian et al., 1999), prediction of cancellation or no-show behavior (Hueglin & Vannotti, 2001; Lawrence et al., 2003; Garrow & Koppelman, 2004), or customer segmentation (Min et al., 2002).

Only very recently, data mining (DM) became increasingly important for tourism branches, due to its ability to discover previously unknown patterns in huge data bases through explorative techniques and - compared to most statistical methods - to also identify non-linear relationships (Fuchs & Höpken, 2009; Fuchs et al., 2010, Höpken et al., 2011). Although, the potential of DM is not fully used in tourism, yet, all major DM techniques are