



# Application of business intelligence in the tourism industry: A case study of a local food festival in Thailand



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## ABSTRACT

Local festivals and special events are known to have a great impact on the local community, society, economy, and culture. Massive data about products tourists purchase, services they experience, destination choices they evaluate, and accommodations they select at the events can be captured, but the key question is how to translate such data into meaningful information so that event organizers understand the behavior of tourists in order to increase their satisfaction and boost revenues and profits. This study outlines a way to integrate a business intelligence framework to manage and turn data into insights for festival tourism. This framework combines the architecture of database management, business analytics, business performance management, and data visualization to guide the analyst in drawing knowledge from the visitor data. A case study from a local festival in Thailand is conducted to demonstrate the practical validity of the proposed business intelligence framework.

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## 1. Introduction

Local festivals and special events are known to have a great impact on the local community, society, economy, and culture especially in creating new tourist segments and improving the identity and image of a destination (Getz, 2008; Jang & Feng, 2007). Visitors attend the events for different reasons. First-time visitors are more tourism and travel oriented, more active travel planners; repeat visitors, on the other hand, are more recreation and activity oriented and are more positive in post-trip evaluations than first-time visitors. Some enjoy visiting the destination for aesthetic reasons such as sentimentality, memory, and a sense of belonging; others visit for more utilitarian reasons such as better knowledge of a geographic area or for selected activities (Li, Cheng, Kim, & Petrick, 2008; Quintal & Polczynski, 2010). Conducting surveys to profile tourists visiting the festival, gain insights into potential event tourist segments, create new events for specific target segments, understand why tourists decide to revisit the event, or modify the marketing mix of existing events is fundamental in developing effective tourism management and marketing strategies (Getz, 2008; Jang & Feng, 2007; Li et al., 2008; Quintal & Polczynski, 2010).

As tourists travel around the world to visit local festival events, massive data about products they purchase, services they experience, destination choices they evaluate, or accommodations they select can be captured. The key question is how to translate such data into

meaningful information so that tourism service providers understand the behavior of tourists to increase their satisfaction or boost revenues and profits. This question is crucial because such data is usually analyzed in traditional ways through descriptive statistics or conventional Excel-based regression analysis. Consequently, not only are potentially important factors neglected, the results produced by traditionally applied statistical surveys may not appropriately represent and recognize patterns or behaviors of tourists visiting destination sites.

Fortunately, existing information technology has the capability to handle and support vast troves of data and content. Business intelligence is one of the application areas of growing importance in supporting business decisions. The concepts of business intelligence open the door to opportunities to integrate platforms to handle complex, unstructured data from emerging data sources and emphasize the analytical process of turning the data into actionable strategies for better business decisions (Phillips-Wren, Iyer, Kulkarni, & Ariyachandra, 2015). Although previous studies have employed business intelligence in exploring and analyzing large amounts of complex data in many different areas such as marketing, manufacturing, and supply chain management (Chen, Chiang, & Storey, 2012; Turban, Sharda, & Delen, 2011), the implications of the business intelligence schema in the tourism industry are yet to be well developed and established. This study seeks to fill this gap and outlines a way to implement a business intelligence framework to manage and turn data into insights for festival tourism. A case study from a local food festival in Thailand has been conducted to explore the implications of business intelligence and business analytics in the tourism industry. Specifically, the framework helps not only in answering the research question "What are the most important factors influencing visitors'

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intention to revisit the festival site,” but also in understanding the key attributes that impact visitors' satisfaction regarding the services they experience at the local festival event.

The rest of this study is organized as follows. After a brief literature review in Section 2, Section 3 presents the proposed business intelligence framework of this study. Section 4 explains the festival events and how the data used to evaluate the proposed framework are collected. Results and discussion are presented in Section 5, followed by managerial and practical contribution in Section 6, challenges and lessons learned in Section 7, and the conclusion in Section 8.

## 2. Literature review

Business intelligence (BI) and business analytics (BA) have drawn attention in both academic and business communities over the past decades. Organizations view both BI and BA in different ways, from tools, techniques, technologies, and systems to practices, methodologies, and applications that help enterprises make better and more timely decisions by analyzing critical business data (Chen et al., 2012). Business intelligence is an umbrella term that combines architectures, databases, analytical tools, methodologies, and applications to aid in decision-making processes (Turban et al., 2011). The architecture of business intelligence consists of four main components: data warehouse, business analytics, business performance management (BPM), and user interface (Turban et al., 2011). Database management and data warehousing are considered the foundation of BI, as they are concerned with how data is collected, organized, stored, extracted, and integrated so that end users can easily view or manipulate the data in a timely manner. Business performance management (BPM) focuses on monitoring, measuring, and comparing a variety of performance metrics defined as the core tenets of a business strategy (Chen et al., 2012; Turban et al., 2011). Business analytics refers to the broad use of data and quantitative analysis, usually grounded in data mining and statistical analysis, to develop new insights and understand business performance (Chen et al., 2012; Davenport, 2010). Gartner, the world's leading information technology research and advisory company, identifies four types of analytics capability which help enterprises move from traditional descriptive analytics (what happened?), to advanced diagnostic analytics (why did it happen?), predictive analytics (what will happen?), and prescriptive analytics (how can we make it happen?) (Rivera & Meulen, 2014). Data mining techniques such as decision trees, neural networks, support vector machines, and cluster analysis are adopted for data segmentation, predictive modeling, association analysis, clustering, and classification in various business applications (Chen et al., 2012). A user interface (UI), usually referred to as a dashboard or data visualization, allows bidirectional communication between the system and end users and provides a comprehensive view of corporate performance measures (Turban et al., 2011).

Business intelligence and analytics have been applied in many fields across all industries, from customer relationship management, behavioral profiling, healthcare, and genome analysis to supply chains (Davenport, 2006; Kusiak, 2006). Mayer-Schönberger and Cukier (2013) and Minelli, Chambers, and Dhiraj (2012) illustrate the applications of big data analytics to enabling competitive differentiation to discover and solve business problems. The key concept of big data and analytics is to use analytical techniques to describe, explore, and analyze large and complex datasets that require advanced data storage, management, and visualization technologies (Chen et al., 2012). Chase (2009) provides an overview of demand-driven concepts including forecasting methods and performance measures. With advanced analytics through predictive modeling, companies can not only analyze data for timely decision making but also uncover patterns in customer purchasing behavior and evaluate their marketing campaigns accordingly. Davenport (2006) presents the value of business analytics and how enterprises use analytics to build competitive strategies and extract maximum value from their business processes. Many data mining techniques have been applied to

improve inventory policies. For instance, Dhond, Gupta, and Vadhavkar (2000) present two case studies where the neural network technique is used for inventory optimization. The results show that at the same level of customer demand, the total level of inventory is reduced by 50%. Wang (2007) outlines the application of data mining in other areas in advanced manufacturing such as process and quality control, optimization of manufacturing yield, assembly selection, material requirement planning, and preventive machine maintenance. Ciflikli and Kahya-Özyirmidokuz (2010) develop a data mining solution for enhancing carpet manufacturing productivity. They employ attribute relevance analysis, decision trees, and rule-based induction, and the results indicate that the isolated machine breakdowns have been detected in the production process, and the proposed decision tree model shows a 72% improvement in the accuracy ratio. Narasimhan, Swink, and Kim (2005) apply cluster analysis to aid in examining the relationships between manufacturing practices and plant performance including new product development, flexibility, efficiency, and market-based performance.

Numerous studies have addressed various aspects of business intelligence applications in the tourism industry. Law, Leung, and Buhalis (2009) provide a comprehensive review of articles published in tourism and hospitality research journals regarding the evolution of IT applications, which can be grouped into the three categories of consumers, technologies, and suppliers (Law et al., 2009). Pyo, Uysal, and Chang (2002) outline how the discovery of knowledge in databases using data mining techniques can be applied in tourist destination management. The study discusses various aspects of knowledge discovery, from operational issues, tools, and techniques to applications regarding customers, markets, products and services, destination promoters, and tourism professionals (Pyo et al., 2002). Fuchs, Abadzhiev, Svensson, Höpken, and Lexhagen (2013) propose a business intelligence approach focusing on online analytical processing (OLAP) to illustrate how knowledge creation, exchange, and application processes for the Swedish tourism destination can be improved. The proposed knowledge destination framework outlines the integration of customer-based data sources, data extraction processes, data warehousing, and knowledge generation through data mining approaches (Fuchs et al., 2013). Kim, Wei, and Ruys (2003) apply an artificial neural network model to segment the market of West Australian senior tourists. Based on their demographics, motivations, and concerns regarding domestic and international holiday travel, all West Australian seniors can be segmented into 4 groups: 1) active learner, 2) relaxed family body, 3) careful participant, and 4) elementary vacationer (Kim et al., 2003). Bloom (2005) shows that the deployment of neural network models can enhance market strategies, especially in segmenting the tourist market for understanding changing behavior among tourists. For example, the model helps identify international tourists in profitable tourist segments who do not visit the travel site but have a profile similar to the tourists frequent the site (Bloom, 2005). Cluster analysis has also been used to segment tourists into subgroups based on their motivation to visit travel sites. For instance, a study from Park and Yoon (2009) finds four distinct segments among 252 tourists in Korea: family togetherness seekers, passive tourists, want-it-all seekers, and learning and excitement seekers (Park & Yoon, 2009). Lin and Huang (2009) employ a K-Mean data mining method to evaluate insightful patterns of destination images tourists consider when selecting a destination and to segment tourists' features into subclasses in the tourism market so that direct promotional campaigns toward specific classes can be launched (Lin & Huang, 2009). Kuo, Akbaria, and Subroto (2012) apply a particle swarm optimization algorithm to cluster Taiwanese tourists based on their motivation (such as cultural norms and values, family and reference groups, financial status, personality, and lifestyle) to visit Indonesia. The study also presents the preferred tourism destinations chosen by Taiwanese tourists, which range from heritage and culture to nature-based destinations (Kuo et al., 2012). Byrd and Gustke (2011) apply decision tree models to identify tourism stakeholders participating in tourism and political activities.

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