Intelligent Technologies for Tourism

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INTRODUCTION

Nowadays, the tourism industry is a consumer of a diverse range of information (Buhalis & O'Connor, 2005). Information communication technologies (ICTs) play a critical role for the competitiveness of tourism organizations and destinations. According to Staab and Werthner (2002), ICTs are having the effect of changing:

- The ways in which tourism companies contact their business; reservations and information management systems;
- The ways tourism companies communicate; how customers look for information on, and purchase travel goods and services.

In the tourism industry, the supply and demand sides form a worldwide network in which tourism product's generation and distribution are closely worked together. Most tourism products (e.g., hotel rooms or flight tickets) are time constrained and nonstockable. Generally, the tourism product is both "perishable" and "complex," and itself is a bundle of basic products aggregated by intermediaries. Consequently, basic products must have well-defined interfaces with respect to consumer needs, prices, or distribution channels. In addition, a tourism product cannot be tested and controlled in advance. During decision-making, only an abstract model of the product (e.g., its description) is available. Besides, the tourism industry has a heterogeneous nature, and a strong small and medium-sized enterprises (SMEs) base. Undoubtedly, intelligent technologies are increasingly changing the nature of, and processes in, the tourism industry. This chapter reviews, in brief, such technologies applied to the e-tourism domain.

BACKGROUND

E-tourism is defined as the use of ICTs in the tourism industry. It involves the buying and selling of tourism products and services via electronic channels, such as the Internet, cable TV, and so forth. E-tourism includes all intranet, extranet, and Internet applications, as well as all the strategic management and marketing issues related to the use of technology. ICTs include the entire range of electronic tools that facilitate the operational and strategic management of organizations by enabling them to manage their information, functions, and processes, as well as to communicate interactively with their stakeholders for achieving their mission and objectives. Currently, e-tourism makes use of (syntactic) Web technology for tours, infrastructure, related interesting information, such as public transport, timetables, weather, online reservation, and so forth. However, the major barriers using the syntactic Web are:

- Creating complex queries involving background knowledge on tourism issues.
- Solving ambiguities and synonyms.
- Finding and using Web services for tourism

From another perspective, the characteristics of the tourism product require information on the consumers' and suppliers' sides, involving high information search costs and causing informational market imperfections. These outcomes sequentially lead to the establishment of specific product distribution information and value-adding chains. Given such a framework, Staab and Werthner (2002) state that intelligent Information Systems (ISs) should:

- Be heterogeneous, distributed, and cooperative.
- Enable full autonomy of the respective participants.
- Support the entire consumer life cycle and all business phases.
- Allow dynamic network configurations.
- Provide intelligence for customers (tourists) and suppliers as well as in the network.
- Be scalable and open.
- Focus on mobile communication enabling multichannel distribution.

Hereafter, we present intelligent technologies for tourism.

INTELLIGENT TECHNOLOGIES FOR TOURISM

Web intelligence combines two topics: (1) *Web analytics,* which examines how Web site visitors view and interact with a Web site's pages and features; and (2) *business intelligence*, which allows a corporation's management to use data on customer purchasing patterns, demographics, and

demand trends to make effective strategic decisions (Zhong, 2003). In tourism, the developments of artificial intelligence (AI) are at the cutting edge. Many applications are provided to the users, such as individualized pricing (http://www. priceline.com), reversed multiattribute auctioning (http:// www.mytraveldream.com), recommendations in bundling products, and semantic Web, as well as mobile applications (Kanellopoulos, 2006; Kanellopoulos & Kotsiantis, 2006). Using the Web, travelers can get information on routes, timetables, seat availabilities, accommodations, rental cars, and restaurants to help them plan their travels. Remarkable progress has been made in the automation of travel planning with the help of the easily accessible information. There are also many semiautomated commercial service Web sites like travelocity.com, expedia.com, and orbitz.com (Paprzychi, Gilbert, & Gordon, 2002).

WEB SERVICES

The Web services technology is a set of standards that could allow Web applications for the tourism domain to "talk" to each other over the Internet. These standards are:

- XML (eXtensible Markup Language: http://www. w3.org/XML/) for driving applications services.
- SOAP (Simple Object Access Protocol: http://www. w3.org/TR/soap) for communication.
- WSDL (Web Services Description Language: http:// www.w3.org/TR/wsdl/) as the service description language.
- UDDI (Universal Description, Discovery and Integration: http://www.uddi.org/) as the service discovery protocol.

The Web services technology offers distributed tourism services capability over a network (Ouzzani & Bouguettaya, 2004). The platform- and language-independent interfaces of Web services allow the easy integration of heterogeneous tourism ISs. Web services offer mechanisms for describing tourism-related Web documents, methods for accessing them, and discovery methods that enable the identification of relevant Web service providers. Recently, the OTA (Open Travel Alliance) has developed open data transmission specifications for the electronic exchange of business information for the travel industry, including but not limited to the use of XML.

SEMANTIC WEB

The *Semantic Web* is an extension of the current Web in which information is given well-defined meaning. It enables computers and users to work in cooperation, and allows the tourism content to become semantic annotated (Kanellopoulos, 2006). This characteristic allows users and software agents to query and infer knowledge from Web tourism information quickly and automatically. The semantic Web is based on formal domain models (ontologies) that define domain specific conceptualization and impose description on the domain knowledge structure and content. An ontology comprises the classes of entities, relations between entities, and the axioms that apply to the entities of the domain. Ontologies can provide a shared understanding of the tourism domain to sustain communication among users and software agents typically being represented in a machine-processable representation language like OWL (Web Ontology Language, http://www. w3.org/2004/OWL/). Through the use of metadata organized in several interrelated ontologies, information concerning tourism objects (e.g., hotels, attractions) can be tagged with descriptors that facilitate its retrieval, analysis, processing, and reconfiguration. Introducing semantics to Web services for tourism brings the following advantages:

- Ontologies offer a promising infrastructure to cope with heterogeneous representations of Web documents (Chandrasekaran, Josephson, & Benjamins, 1999). Semantically enriched Web services can handle the interoperability at the technical level, that is, they make Web applications "talk" to each other independent of their hardware and software platforms (Dell' Erba, 2004).
- Semantics can be used for the discovery and composition of Web services.
- The main mechanism for service discovery is *service registries,* and semantics can be used for the discovery of registries of Web services.

ONTOLOGIES FOR TOURISM

Tourism ontologies allow machine-supported tourism data interpretation and integration. The *e-tourism* ontology (http://e-tourism.deri.at/ont/) was deployed in the OnTour project, and describes the domain of tourism using OWL. It focuses on accommodation and activities, and it is based on an international standard: the "*Thesaurus on Tourism & Leisure Activities*" of the World Tourism Organization (WTO). This thesaurus is an extensive collection of terms related to tourism. The ISO 18513 standard ("tourism services–hotel and other types of tourism accommodation–terminology") defines terms used in tourism in relation to the various types of tourism accommodation and other related services. MONDECA's tourism ontology (http://www. mondeca.com) defines tourism concepts based on the WTO thesaurus. These concepts include terms for tourism object profiling, tourism and cultural objects, tourism packages, and tourism multimedia content. A reference ontology, named

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