

Travel and tourism are illustrating how e-commerce can change the structure of an industry—and in the process create new business opportunities.

E-COMMERCE AND TOURISM

Has e-commerce passed its prime or is it just resting? While business and stock market expectations have not been fulfilled, online transactions in the travel and tourism industry are continuously increasing despite tough economic problems in this arena and fewer travelers overall. This industry is the leading application in the B2C (business-to-consumer) arena. Whereas other industries are displaying a stronger hold to traditional processes, the tourism industry is witnessing an acceptance of e-commerce to the extent that the entire industry structure is changing. The Web is used not only for information gathering, but also for ordering services. A new type of user is emerging, one who acts as his or her own travel agent and builds a personalized travel package. _____

In 2003 more than 64 million Americans—30% of the U.S. adult population—used the Internet to look for information about destinations or to check prices and schedules. And two-thirds of them—42 million—booked travel via the Internet, an 8% gain over 2002, according to the Travel Industry Association of America (www.tia.org). In the same period European online travel sales increased by 44%, reaching over \$14 billion, according to the Danish Center

for Regional and Tourism Research (www.crt.dk). One survey predicts that by 2007, 30% of all B2C transactions in the German-speaking European countries will be enacted via the Internet [9], while other market research institutes have made predictions ranging on either side of this figure. All of these statistics are problematic in that researchers used different variables and measurement methods, with some researchers distinguishing between e-business and e-commerce and

some not. But even considering this lack of standardization, all statistics for the travel domain point upward.

In addition, terms such as e-commerce and e-business fall short in encapsulating tourism: such terms are transaction- and business-oriented and ignore the fact that the Web is also a medium of curiosity, of creating communities, or just having fun—all of which may or may not result in business being conducted. The tourism product in particular has to do with emotional experiences; it is not just business. The travel and tourism industry as a global (and a globalization) industry demonstrates the following features:

- Travel and tourism represent approximately 11% of the worldwide GDP, according to the World Travel & Tourism Council.
- The World Tourism Organization predicts one billion international arrivals in the year 2010. On average, tourism is expected to grow faster than other economic sectors.
- As an umbrella industry, it relates to many sectors such as culture or sports. Over 30 different industrial components have been identified that serve travelers, which explains the industry's heterogeneity.
- Due to its SME structure (especially when taking a destination point of view) it has great importance for regional development. For example, the E.U. hotel and restaurant sector accounts for more than 1.3 million enterprises, or 8.5% of all European enterprises. The majority of these enterprises are small, with 1 to 9 employees.
- The supply and demand sides form a worldwide network, where both production and distribution are based on cooperation.
- The product is perishable and complex; for example, an unsold hotel bed represents lost income. The supplier risk of loss can be reduced if information access is available.
- The tourism product itself is a bundle of basic products. To support the rather complex

bundling, products must have well-defined interfaces with respect to consumer needs, prices, and distribution channels.

Tourism is an information-based business, the product is a “confidence good,” and an a priori comprehensive assessment of its qualities is impossible. Tourists must leave their daily environment to consume the product. At the moment of decision making, only an abstract model of the product is available, based on information acquired through multiple channels, such as television, brochures, word-of-mouth, or the Web. Tourism products require information gathering on both the consumer and supply sides—and thus entail high information search costs. Such informational market

imperfections lead to the establishment of comparably long information and value chains.

Figure 1 differentiates between the supply and demand sides and the respective intermediaries. The nodes indicate the relevant types of players in the field, and links mark the relationships as well as the information flow, with only the most relevant links shown. We designate suppliers like hotels or restaurants, mostly SMEs,

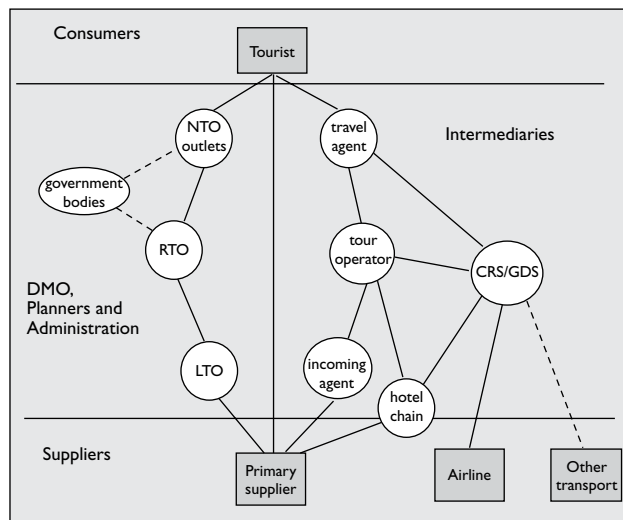
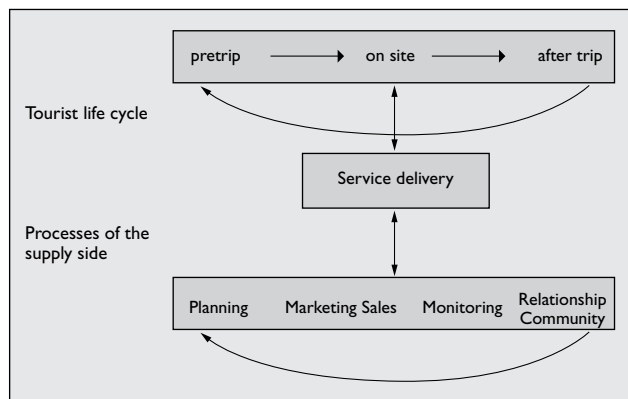


Figure 1. Structural view of the market [12].

as “primary.” With respect to a functional differentiation, these companies are on the same level as the big players like airlines. Tour operators can be seen as product aggregators, and travel agents act as information brokers, providing the final consumer with the relevant information and booking facilities. CRS/GDS (central reservation systems/global distribution systems), stemming from the airline reservation systems developed in the 1960s, also include products such as packaged holidays, or other means of transport. Whereas the intermediaries on the right side can be seen as the professional connection between supply and demand (mainly based on the electronic infrastructure and functionality of CRS/GDS), the left side is relevant for the management, planning, and branding of a destination. These national, regional, and local tourism organizations are normally publicly funded, act on behalf of all suppliers within a destination, and are not engaged in the booking process. The upstream flow of Figure 1 consists of product information, whereas



the downstream flow reports on market behavior, mostly represented in terms of statistical aggregates. Both information flows create a tourist information network linking all market participants and reflecting the economic relationships between them.

The Web is changing the needs of consumers, who are increasingly less loyal, take more frequent vacations of shorter duration, and take less time between choosing and consuming a tourism product. The Web is also forging new ways to satisfy consumer needs, as it allows for an “informatization” of the entire tourism value chain—resulting in numerous value-generating strategies [11]:

- *Value extraction.* Examples of this strategy, which increases efficiency and reduces costs, include process automation and client outsourcing, such as self-check-in of hotel guests or airline passengers.
- *Value capture.* Data mining for forecast or yield management is an example of this strategy, in which client and sales information supports marketing goals.
- *Value addition.* This strategy involves a linear combination of products and services to create richer product bundles. One example is the linkage of mobile services and existing Web sites, to advise tourists during their travel.
- *Value creation.* The focus here is on network effects, involving, for example, tourists participating in service definition and destination planning.

With such strategies, not only are processes changed, but new services can be designed, extending the range of options to customize and configure products. Customization describes the process of individualizing products or services based on IT-enabled mass customization. Configuration refers to the bundling of different product or service com-

ponents to integrated offerings. Companies combine their core products with layers of additional services.

Given the dynamics of the sector and the very competitive e-market, nearly all stakeholders have implemented their strategies. Tourism has also become the playing field for new entrants, either startups or companies from the media and IT sectors. Since tourism is an information-based business, it fits well with their respective background. One can observe a trend toward further specialization and an ongoing deconstruction of the value chain, paralleled by an integration of players and products. Companies compete and cooperate simultaneously, and boundaries within the industry are blurring. Each market player is affected:

- Tourists are addressed by more players, and they play a more active role in specifying their services, such as by using reverse-auction sites.
- Travel agents see a diminishing power in the sales channel, prompting them to put more emphasis on consulting and more complex products.
- Internet travel sites are providing new market functionality and technology, focusing on personalized intelligent tools for travelers (we will describe the recommendation functionalities).
- Destination management organizations are developing cooperation models within destinations. Here they will occupy a new role as consolidator and aggregator.
- Based on mass-customization and flexible configurations, tour operators will blur the boundaries between the individual and packaged tour. For example, the Italian operator Costa Crociere has developed a personalized cruise builder.
- CRS/GDS demonstrate an “Intel inside” marketing strategy by linking to major tourist Web sites to increase transaction volume. They also move into direct sales for the retail segment.
- Suppliers will increasingly form alliances and support electronic direct sales, increasing price competition as well as price differentiation. They will also redefine customer processes such as electronic ticketing or automated check-in.

Such developments are leading to an evolution of the market best described as an ongoing interplay between concentration (as in the U.S. with the major online travel sites such as Expedia, Orbitz, or Travelocity) and the simultaneous entrance of new players. The increased complexity associated with this evolution calls for technical innovations to generate superior consumer services such as transparent

Figure 2. Tourist life cycle and companies' processes (both suppliers and intermediaries).

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access, market overview, and price comparisons.

Tourism IT System Trends

The emerging business scenario is based on flexible network structures and increasing consumer integration. If one adds the tourist life cycle, taking into consideration the mobility of travelers, one can link the respective tourist phases with company processes (see Figure 2).

Processes obviously cross company borders, leading to distributed B2B2C applications, supporting both company cooperation as well as mobile communication with consumers. Technology based on a common pervasive infrastructure will become transparent, or invisible to the consumer, and information will be available at home, work, and during travel. In such a scenario IT systems should:

- Support heterogeneous data formats and business functions as well as distributed data sources. Such systems must account for different types of participating entities, with their functional differences;
- Be scalable and open with regard to geographical and functional extensions. They will support the entire consumer life cycle and all business phases;
- Enable full autonomy of the respective participants but enhance cooperative behavior, providing sophisticated tools for suppliers as well as dynamic network configurations;
- Integrate mobile and fixed services, enabling multichannel access to services provided by the various players;
- Support attentive user interfaces and personalization through extensive exploitation of user modeling, taking into consideration user behavior and cognition as well as emotional aspects.

The research and development activities crossing travel and tourism applications have addressed these themes, producing some remarkable results. Quite naturally, many such activities follow an AI-based approach, using horizontal technologies that

can be exploited in applications such as travel planning and scheduling, visitor guidance systems, individual pricing, reverse auctions, or workflow management for supporting cooperative marketplaces. Some of the technologies expected to have a major impact include the following:

Information extraction. Tourist information portals are still largely based on unstructured information. A critical problem in developing distributed systems involves accessing information formatted for human use and transforming it into a structured data format, such as XML. This problem is tackled by wrapping techniques. Such techniques provide highly accurate extraction rules that adapt to structural site changes, ensuring the correct extraction of data [5, 6].

Information integration. Wrappers can be built atop structured or semistructured information sources. This sets the stage for systems that answer queries based on the extraction and combination of data fetched from multiple wrappers [4]. Tourism-related information sources represent a perfect application for such technologies. For example, Theaterloc is an information integration application that lets users retrieve information about theaters and restaurants in the U.S. from five distinct online sources [1]. The core components of this application are a mediator that exploits AI planning technologies, a domain model (containing a unifying ontology), and a set of axioms describing mapping relationships between the integrated data view and the sources. When queries are posed, the system reasons about the domain model and source descriptions in order to build a plan for retrieving and integrating data.

Information presentation. Tourism, particularly cultural heritage, is a privileged application domain for intelligent information presentation techniques [10]. Natural language technologies have been used to build contextual presentations and speech and gesture recognition. Also, animated characters support an augmented interactivity involving users in the appreciation of their cultural heritage. Applications have been developed where the exhibit and the information presentation are blended. For example, the user, monitored by a set of sensors, can activate per-

sonalized windows on a mobile device to receive information regarding a given museum exhibit. In addition, unsolicited suggestions about supplemental topics or objects can be delivered.

Recommendations. Recommender systems suggest products and provide consumer information to facilitate the decision process. In tourism, some notable applications focus on destination selection and travel products bundling [2, 8]. In these applications the user is asked explicitly about his needs and constraints. These systems, combining content-based filtering technologies, interactive query management, and variations of the collaborative-filtering approach or case-based reasoning, rank suggestions extracted from structured catalogs. Tourism recommendation poses peculiar requirements related to the complexity and intangibility of the travel product. Recommendations must refer to a variety of products, such as locations, attractions, accommodations, and flights, in order to provide a meaningful picture of the proposed travel.

Semantic Web. The Semantic Web vision, or the idea of having Web data defined and linked so it can also be used by machines for automation, integration, and reuse across various applications, provides a unifying view of the previous technologies. In tourism, this technology may have a major impact (see, for example, the European project [3]). The industry provides a challenging test bed for peer-to-peer semantic Web services, based on the integration of the semantic Web with peer-to-peer Web services. For instance, services for finding or integrating information providers eventually need to directly exploit resources present at other nodes without intervention of any central server, where nodes may join and be integrated in an ad-hoc manner [7].

Mobility. Travelers expect to get access to services and information from various devices, whenever and wherever they need it. Typical mobile applications can be found in the following areas: airlines, hotels and restaurants, transportation, city guides, traffic and weather conditions, and other services like translation or currency conversion. Mobile terminals create new and enhanced ways to support tourists while on tour. While the new technologies promise benefits and added value, they also raise challenges concerning usability, accessibility over different devices, trustworthiness, and interactivity. The challenge is a context-sensitive, personalized, and effective model of interaction that accounts for the constraints of ubiquitous access. Here, sophisticated user models developed in the tourism domain, such as the recommendation systems described previously, may help surmount these obstacles.

Conclusion

Travel and tourism have illustrated how e-commerce may change the structure of an industry, and in the process create new business opportunities. The deployment of more specialized services, flexible network configurations, and further consumer integration will lead to smart marketplaces that integrate all stakeholders. The underlying pervasive IT scenario enables as well as enforces this development, demonstrating that tourism is an interesting field of application as well as research. As such it may also be of interest for other industries to learn from this development and to understand emerging e-marketplaces. ■

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