IMPLEMENTING A KNOWLEDGE-BASED TOURISM MARKETING INFORMATION SYSTEM: THE ILLINOIS TOURISM NETWORK

ULRIKE GRETZEL* and DANIEL R. FESENMAIER†

*Department of Recreation, Parks and Tourism Sciences, Texas A&M University
†National Laboratory for Tourism and eCommerce, Temple University

The development of knowledge-based tourism business-to-business (B2B) communities requires the adoption of a multidimensional, multilevel perspective on system design that incorporates processes of knowledge creation and transformation and takes organizational stages of effective technology use into consideration. This article illustrates how the Illinois Tourism Network (ITN) as an example for an interorganizational, knowledge-based tourism information system/community has successfully integrated the management of information and knowledge flows in a way that appeals to tourism organizations in different stages of effective technology use and fosters capacity building among community members.

Key words: Marketing information systems; Knowledge-based systems; Interorganizational networks; B2B community; Stages of technology adoption

Introduction

Business-to-business (B2B) communities have been identified as third-level Internet business models that provide tourism organizations with substantial opportunities to create competitive advantage through information exchange, partnering, and value chain integration (Luengo-Jones, 2001; Timmers, 1999; Yuan, Gretzel, & Fesenmaier, 2003). Knowledge-based B2B communities are electronic networks that support value creation through enhanced communication and collaboration platforms (Buhalis, 1998). The power of these B2B value networks or digital tourism ecosystems lies in the integration of an essential front-end understanding of customer needs with the back-end structure that is crucial for delivering holistic and coherent customer experiences (Bovet & Martha, 2000; Pollock & Benjamin, 2001). However, the adoption and use of such interorganizational networks and community systems requires extensive knowledge-building capacities and, thus, profound organizational learning and change (Contractor, Stohl, Monge, Flanagin & Fulk, 2000; Scott Morton, 1991; Sproull & Kiesler, 1991; Thorp, 1998).
Studies among American convention and visitors bureaus (Gretzel & Fesenmaier, 2001a; Yuan et al., 2003) and Canadian tourism organizations (Gretzel, Fesenmaier & O’Leary, 2001) indicate that technology adoption and use occur in stages and that most tourism organizations have not yet reached a level of Internet readiness that allows them to fully embrace and integrate knowledge-based B2B communities. However, the results of the surveys also show that some organizations already use Internet technologies in very sophisticated ways and are able to capture important information and quickly translate it into organizational knowledge and learning. These differences in organizational capacity to adopt and use B2B network technologies and the fragmented nature of the tourism industry pose an important challenge for the design and implementation of knowledge-based interfirm networks in tourism. The problem is not necessarily one of delivering relevant content to players in various tourism-related areas (e.g., accommodation, transportation, travel services, consulting, and research), but lies in providing a range of knowledge-building and communication functions that can be used in more or less sophisticated ways and, consequently, cater to the needs of tourism organizations in all stages of technology adoption and use.

The Illinois Tourism Network (ITN) is a knowledge-based, community-enabled B2B value network for tourism professionals involved in the Illinois tourism industry. Perhaps more than any other tourism marketing system such as TourMIS (Wöber, 2003), DATATUR (Navarro & Rubio, 2000), Decipher (Carson & Sharma, 2002), and the Canadian Tourism Exchange (Waksberg, Stevens, & Vales, 2000), it explicitly addresses the problem of heterogeneity in its design and tries to integrate sufficient flexibility in its structures in an effort to achieve high acceptance levels throughout the Illinois tourism industry. This article focuses on presenting the design pillars of effective knowledge systems and illustrates how the stages concept of organizational readiness and technology use has been translated into actual system functions in the ITN.

Theoretical Background

Designing a knowledge-based B2B community for the tourism industry requires a profound understanding of the nature of knowledge and knowledge creation processes in organizations (Ritchie & Ritchie, 2002; Wöber, 2003). Nonaka and Takeuchi (1995) stress the importance of different forms of knowledge: tacit versus explicit and individual versus organizational/industry knowledge. It is argued by Nonaka and Takeuchi (1995) and supported by Davenport (1997) that a knowledge-based B2B network needs to foster the dynamic transformation of knowledge so that it can facilitate organizational learning and change (Senge et al., 1999). Fesenmaier, Leppers, and O’Leary (1999) translate this theory of knowledge creation and transformation into four basic system elements/functions for knowledge-based tourism information systems: 1) Marketing Intelligence System; 2) Marketing Research System; 3) Analytical Marketing System; and, 4) Internal Report System (see Fig. 1). They define Marketing Intelligence as a set of sources and procedures to obtain secondary information from outside the system. Marketing Research refers to efforts of gathering primary data relevant to the knowledge-based community. The Analytical Marketing function deals with the analysis and interpretation of data. Last, the Internal Report system incorporates elements related to the collection, storage, retrieval, and dissemination of knowledge.

However, this conceptual framework is limited as it examines knowledge management issues solely from a systems perspective and neglects to reflect organizational capabilities to integrate knowledge creation and transformation enabled by the technology into organizational structures, cultures, and approaches. Looking at knowledge management pro-

![Figure 1. A knowledge-based tourism information system (adopted from Fesenmaier et al., 1999).](image-url)
cesses and technology adoption of organizations within a knowledge-based system/community means extending the framework in terms of the dimensions it incorporates and adding levels of analysis (i.e., organizational capacity and organization/system relationships need to be integrated and investigated at the organizational or the community/industry level and across different industries). Existing research suggests that tourism organizations differ considerably in terms of their sophistication of technology use and their organizational capacity to change and fully integrate technological developments (Gretzel & Fesenmaier, 2001a; Gretzel, Fesenmaier, & O’Leary, 2001; Yuan et al., 2003). The findings of these studies indicate that the extent of benefits derived from the adoption and use of Internet technologies depends on organizational capabilities and the effectiveness with which technology is used. It is posited in this article that by recognizing the specific needs and capabilities of tourism organizations at different stages of technology adoption and use one can greatly increase the depth and breadth of participation and, consequently, enhance the value these organizations derive from knowledge-based marketing decision support systems.

Stages of Effective Technology Use

It is believed that technology adoption typically occurs in three stages (Contractor et al., 2000; Hanson, 2000; Scott Morton, 1991; Thorp, 1998) and that higher levels of technology use require increasing knowledge that needs to be carefully and actively managed. Further, in order to fully embrace the potential of new technologies, organizations need to support their technology use with an organizational culture that fosters sharing and innovativeness, structures that allow for open communication, and leadership that successfully communicates a technology-centered vision and actively participates in necessary change efforts. Also, the increasing pace of technological development and rapid changes in consumer and supplier markets demand new levels of organizational flexibility and effective change management (Tapscott, Ticoll, & Lowy, 2000). It is suggested that organizations need to develop such organizational capabilities in order to meet the challenges brought about by changes in tourist behavior as well as the industry itself. Following Contractor et al. (2000) and Gretzel and Fesenmaier (2001b), the following three stages of technology adoption and use by tourism organizations can be recognized.

Stage 1. The initial stage of technology use involves very basic Internet technology applications that are used as substitutes for existing technologies (e.g., brochure-like Web sites instead of printed flyers). This stage does not require substantial amounts of learning because the ways of conducting business are not significantly changed. Tourism organizations in this basic stage of technology use typically implement only few technologies and make little effort to adjust their structures, processes, and mind-sets to fully utilize current technologies.

Stage 2. With growing experience, even if it is on a less sophisticated level, organizations are able to capture more fully the benefits of technology in order to expand/improve their services. This second stage of technology use is characterized by enlargement in every aspect of their use of technology. However, most organizations in this phase have not yet reconfigured their organizational structures and processes and, therefore, encounter time and resource constraints as they try to accomplish more within existing settings instead of doing new things in a new way. Thus, effective technology use requires not only sophisticated technology applications, it demands organizational learning and active management of knowledge capital.

Stage 3. Organizations in the third stage reach effectiveness in their technology use through using a broad range of technologies in various ways. They are able to capture the information gained through their use of technologies and convert it into organizational knowledge through established learning processes. Their effective technology use is supported by a high organizational capacity to change and technology-ready structures and cultures throughout the fabric of their organization. Stage 3 is considered to be the ideal stage as it implies that organizations proactively learn and continuously adapt to changing technologies and markets, thus ensuring long-term competitive advantage. Whereas some impact of technology can be experienced in all stages, it is only in Stage 3 that organizations can realize the full potential of Internet technologies. Through their ability to translate information into
knowledge and to anticipate trends based on new insights, Stage 3 organizations are able to drive changes in their environment instead of having to respond to external developments.

Recently, the stages model was tested empirically through a study among the users of the Canadian Tourism Exchange (CTX), a B2B tourism community established by the Canadian Tourism Commission (Gretzel et al., 2001). Survey respondents were assigned to one of three stages of effective technology use based on their description of the way their organization uses technologies and its approach toward knowledge management and organizational learning (see Table 1 for a description of the items within the scales used). The two scales (i.e., IT Use and Knowledge Management) were divided into three levels based on expected means for knowledge management and actual sample means and standard deviations for the IT use scale, resulting in a 3 × 3 matrix (see Fig. 2). The low/low, medium/medium, and high/high conditions were defined as the three “normative” (i.e., expected) stages of effective technology use (see Gretzel & Fesenmaier, 2001b, for a more detailed description of the construction and testing of the scales and the stages model). Responses outside the normative stages were reassigned according to their probabilities of group membership as defined through a multiple discriminant analysis.

Analyses were conducted to assess differences among the respondents assigned to one of the three stages in terms of their evaluation of their organization’s environment, organizational culture, organizational structure, change management, capacity to change, the successful development of informational strategies, and IT use. Respondents who indicated that their organization uses technology extensively and in sophisticated ways and actively manages knowledge and learning (which are the characteristics that define Stage 3 tourism organizations) were more likely to describe their organization as:

- flat and extremely flexible;
- engaged in extensive partnerships within and across industries;
- led by individuals who are committed to technology and change;
- having an open and sharing culture that rewards innovativeness;
- actively engaged in change management;
- able to quickly react to a changing environment;
- experiencing very high impacts of the Internet throughout its business.

Respondents who were assigned to Stage 3 based on the description of their organization’s technology use and knowledge management are also more

Table 1
Effective Technology Use Scales

<table>
<thead>
<tr>
<th>Knowledge Management Scale</th>
<th>IT Use Scale</th>
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<tr>
<td>Knowledge is seen as an asset.</td>
<td>Number of applications used.</td>
</tr>
<tr>
<td>Knowledge management procedures have been established.</td>
<td>Number of functions used.</td>
</tr>
<tr>
<td>The organization provides incentives for information sharing.</td>
<td></td>
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<tr>
<td>Learning is actively managed.</td>
<td></td>
</tr>
<tr>
<td>Failures are seen as opportunities to learn.</td>
<td></td>
</tr>
<tr>
<td>The organization provides employees with sufficient opportunities to learn.</td>
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extensive, more frequent, and more sophisticated CTX users. Further, they were more likely to see the system as a decision support tool than respondents in any of the other groups. Thus, the study results suggest that there are significant differences among organizations in terms of organizational capabilities to benefit from the use of B2B networks and that variation in organizational capacity and effective technology use result in distinctive uses and perceptions.

ITN System Design and Implementation

The ITN was developed by the National Laboratory for Tourism and eCommerce (NLTec) at the University of Illinois, Urbana-Champaign, in cooperation with the Illinois Bureau of Tourism. This knowledge-based tourism information system (http://www.ILtourism.net) provides a synopsis of important tourism and travel data and technology applications that support learning and change within the Illinois tourism industry. ITN is a knowledge-based system that fosters value creation through communication, knowledge exchange, and collaboration and represents an implementation of the theoretical framework proposed by Fesenmaier et al. (1999) and the stages of effective technology use model developed by Gretzel et al. (2001). The value creation processes within ITN are based on the following components (see Fig. 3): 1) Market Intelligence; 2) Knowledge Building and Implementation; and 3) Collaboration and Community Building, which are supported through information distribution mechanisms, communication platforms, and the necessary enabling technology infrastructure. The focus of the Market Intelligence component is on presenting both explicit and tacit (“interpreted”) knowledge. The Knowledge Building and Implementation component stresses the creation of knowledge, its translation into actual learning, and the transformation of individual to organizational/industry knowledge. Third, the Collaboration and Community Building component emphasizes access and cooperation, relationship building, and network effects.

These design components were translated into the following system categories that include numerous features that implement the design principles embedded in the three system components: 1) News; 2) Industry Stats; 3) Market Reports; 4) e²Tools; and, 5) Industry Connect. As shown in Figure 4, the most basic functions within ITN concentrate on information representation using easy-to-read brochure-like formats, whereas the more sophisticated Stage 2 functions provide users with searching and posting capabilities and information needed for higher level knowledge creation and learning processes. Stage 3 functions are those that are highly interactive and more likely to serve strategic rather than operational management needs. The five system categories are described below.

News

The News category presents Illinois tourism news published by the Illinois Bureau of Tourism and general (both national and international) tourism news compiled from a variety of news sources. The general news is especially focused on eCommerce and technology issues beyond the immediate context of tourism to provide industry members with

![Figure 3. ITN system components.](image1)

![Figure 4. ITN design matrix.](image2)
relevant information that is typically not readily available through industry sources. ITN News also includes a Web site of the week feature. Together, these three news elements provide basic market intelligence in a straightforward and ready-to-use way that caters especially to Stage 1 tourism organizations. A Stage 2 community building opportunity was incorporated in the form of a so-called News Space where tourism professionals can make their own news accessible to other members of the ITN community.

**Industry Stats**

Industry Stats is a comprehensive data resource that addresses explicitly the stages concept of technology adoption and use (see Fig. 5). Specifically, tourism professionals can select preassembled data tables based on most frequently conducted data queries (using a FAQ format). Alternatively, users can display data tables based on predetermined data categories such as year. ITN Interactive is the most interactive approach for accessing industry information, whereby tourism professionals can search for specific data entries, select specific parameters to display, and customize the look of the resulting data table.

**Market Reports**

Presentations and reports included in the Market Reports category provide interpreted data collected through studies conducted for the Illinois Bureau of Tourism. Reports are available for both domestic and international markets. A subcategory within Market Reports that is currently being developed focuses on case studies to present users with best practice examples in tourism, such as the Illinois Heritage Tourism Demonstration Areas already featured in this section.

**eTools**

The eTools category is comprised of a collection of interactive tools that facilitate knowledge creation and learning. Supporting uses at the very basic level, the eDictionary explains important tourism-related terms and a tourism bibliography supports search and information functions. More ad-
advanced uses are supported through interactive eGuides (see Fig. 6), which are written in an FAQ format to enhance the knowledge about specific topics in tourism and which are dynamically linked to the tourism dictionary. Currently, eGuides have been developed on a variety of topics including the economic impact of tourism, benchmarking, advertising evaluation, creating a virtual community, and promoting sports marketing. Also, a series of interactive assessment tools guide tourism professionals through a sequence of steps and provide summary results and feedback at the end of each assessment procedure. These tools enable tourism professionals to easily assess the capacity of their community to develop tourism, to develop surveys that can be used to assess visitor satisfaction, and to benchmark their progress in developing their tourism resources.

Industry Connect

Industry Connect was developed to provide easy access to industry directories of Illinois tourism organizations as well as lists of research-related tourism Web sites. Thus, these very basic functions address what might be best described as Stage 1 information needs. More advanced Stage 2 communication functions are realized within the News Space component, which enables tourism enterprises to post news about the local community as well their firm/organization. A so-called Marketplace represents a Stage 3 function within Industry Connect in that it enables a number of more sophisticated collaboration opportunities whereby tourism bureau directors and other tourism-related firms can seek to match/build cooperative ventures. The Marketplace feature essentially consists of a bulletin board
that allows tourism organizations to post job offers, consulting opportunities, bid invitations and partnering possibilities and needs, and products and services offered. Last, the IKNOW Illinois Tourism tool provides a system that fosters collaboration among members of the ITN community as it allows cognitive knowledge networks to be mapped and answers basic questions related to “who knows who” and “who knows what” in the Illinois tourism industry (Contractor, Zink, & Chan, 1998). Through this tool, users are given the opportunity to analyze and exploit existing knowledge networks within the Illinois tourism industry.

New ITN features are currently under development that will further implement this concept of levels of sophistication and the stepwise approach used throughout the system. Future eTools to be included will concentrate on benchmarking applications to transform organizational knowledge into industry intelligence. Following the foundation laid out in Nonaka and Takeuchi (1995) and elaborated in Fesenmaier et al. (1999), these tools will specifically tackle the problem of knowledge sharing through making individual assessment outcomes available in summary form so that they can be used by the entire ITN community for comparison and evaluation/benchmarking purposes. This process is seen as crucial to encouraging active learning within the system. Further development of the stages concept is considered essential as it opens the system to a wider user base that can engage in using the system at various levels of sophistication. Supporting sophisticated and less advanced uses at the same time is vital for capacity building within the Illinois tourism industry as it allows industry players to interact with and learn from other members of the ITN community.

Evaluation of ITN

Informal system evaluations are being conducted on an ongoing basis; these include analyzing the numerous feedback messages and questions submitted by the users as well as actively seeking input from industry members regarding the improvement of specific content/functions and future development of the system. Following Wöber (2003) and Gretzel and Fesenmaier (2001b), preliminary analyses were conducted to identify the depth and breadth of use of the various ITN functions using the system log files. However, due to the openness of the system (a login is only required for specific tools), the analysis of these system log files can only provide basic summary information and lacks details regarding the behavior of specific user groups, etc. Specifically, the log file data indicate that the system has been used quite extensively; 7970 persons (as measured by distinct IP addresses) made 37,715 page requests from ITN between May 23 and November 6, 2002, excluding those that resulted from spiders and crawlers indexing the site as well queries by NLTec personnel. Of these, the large majority is located within the US; however, the reach of ITN appears to be well beyond the immediate boundaries of the Illinois tourism industry as 12.6% of the visits were from a domain outside of the US. The most frequently accessed sections within ITN (as indicated by the percent of pages accessed) are News (29.4% of the pages accessed) closely followed by eTools at just over 28% of the pages accessed (see Table 2). As expected, Industry Stats also represents a substantial portion of the pages accessed at 22.1%. In addition, it appears that the section offering reviews of innovative Web sites (i.e., Web site of the Week) was accessed quite frequently, representing 8.2% of the total pages accessed during this time period. The pattern of use within ITN seems to indicate that the sections providing higher level knowledge creation functions (e.g., IKNOW Illinois Tourism) were accessed much less frequently. Analyses of email que-

<table>
<thead>
<tr>
<th>Category</th>
<th>Percent of Total</th>
</tr>
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<tbody>
<tr>
<td>Administration</td>
<td>0.9</td>
</tr>
<tr>
<td>Web site of the Week</td>
<td>8.2</td>
</tr>
<tr>
<td>Industry Stats</td>
<td>22.1</td>
</tr>
<tr>
<td>Market Reports</td>
<td>5.7</td>
</tr>
<tr>
<td>News</td>
<td>29.4</td>
</tr>
<tr>
<td>Industry Connect</td>
<td>4.7</td>
</tr>
<tr>
<td>eTools</td>
<td>29.0</td>
</tr>
<tr>
<td>eDictionary</td>
<td>1.9</td>
</tr>
<tr>
<td>eBibliography</td>
<td>1.0</td>
</tr>
<tr>
<td>eGuides</td>
<td>25.3</td>
</tr>
<tr>
<td>IKNOW IT</td>
<td>0.8</td>
</tr>
<tr>
<td>Percent of pages accessed</td>
<td>100</td>
</tr>
<tr>
<td>Users (distinct IP addresses)</td>
<td>7,970</td>
</tr>
<tr>
<td>Requests for pages</td>
<td>37,715</td>
</tr>
</tbody>
</table>

*Pages accessed between May 23 and November 6, 2002.*
ries and informal discussions with leaders of Illinois tourism organizations through telephone-based queries supports this conclusion, indicating a general need for overall market information but that only a small number of tourism-related organizations take advantage of the full range of capabilities within the ITN system. Nevertheless, many Illinois tourism professionals have provided strong support for the system, arguing that it provides easy access to critical marketing information developed by the leading state tourism agency. In addition, conversations with these individuals seem to indicate that as users gain knowledge and experience with ITN, they identify additional ways in which the knowledge bases can be used within their organization. Perhaps the clearest example of this process is the use of a new benchmarking tool that is currently undergoing testing. The benchmarking e²Tool requires complete and accurate budget information from each convention and visitors bureau and provides the means with which the bureau director can evaluate performance based upon a number of measures. Interestingly, the directors were initially highly skeptical of the system and, therefore, reluctant to provide the necessary information. However, as development and integration of the tool within ITN progressed, a few of the bureau directors developed new strategies including more focused marketing and adding public relations capabilities, which exploited the knowledge gained through the benchmarking system. This anecdotal information seems to indicate that ITN has begun to address, in part, the informational needs of the Illinois tourism industry, that its flexible formats enable relatively easy access to this information, and that it enables/encourages industry professionals to extend their capability in addressing the needs of the organization. However, a much more comprehensive evaluation among the various Illinois tourism industry constituencies is needed.

Discussion

Advances in Internet technology development have enabled the creation of marketing systems that can support an increasing variety of interorganizational relationships. However, not all tourism organizations are capable of capturing the full benefits of Web-based collaboration platforms. Following Nonaka and Takeuchi (1995), Davenport and Prusak (1998), Senge et al. (1999), Fesenmaier et al. (1999), and Gretzel et al. (2001), it is important to design B2B network communities that allow leading technology users to build on their knowledge and capacities while helping less advanced organizations in their efforts to reach higher levels of effectiveness in technology use. The system described in this article represents an extension of the initial system-level model proposed by Fesenmaier et al. (1999) into a multidimensional and multilevel approach of knowledge-based tourism marketing systems based on the integration of knowledge management and technology adoption into a stages model of effective technology use.

An evolution in tourism marketing systems is critical in meeting the increasing need for accurate, reliable and up-to-date information and in supporting the knowledge creation and learning process within the tourism industry. Indeed, recent studies of the tourism industry (Buhalis, 1998; Gretzel et al., 2001; International Association of Convention and Visitors Bureaus, 2000; Wöber, 2003; Yuan et al., 2003) suggest that most tourism businesses and organizations lack significant understanding/knowledge of the competitive climate in which they exist; indeed, many forgo investing in or purchasing primary market research because of its cost and complexities. Wöber (2003) further suggests that most tourism operators lack procedural knowledge—an understanding of the processes with which to integrate market information into the strategic planning process (Pfeffer & Sutton, 2000). Knowledge-based systems such as ITN that at the same time provide detailed market information and support the creation of knowledge by providing a means within which to obtain procedural knowledge are, therefore, essential in addressing these “gaps.”

There are a number of recent studies that have begun to address many of the issues raised in this article. Indeed, research in tourism (Yuan, 2001) and elsewhere (Von Krogh, Ichijo, & Nonaka, 2000) has focused on the processes that lead to the creation/transmission of knowledge across organizations through means of technology. This research has found that easy access to systems such as ITN per se does not lead to knowledge creation within organizations; rather, it is the social capital gained from establishing interorganizational relationships, sharing, and trust in virtual communities that empowers
organizations and provides the foundations for organizational learning. It is suggested here that the successful implementation of knowledge-based systems such as ITN, TourMIS, CTX, Decipher, and DATATUR need to better reflect these processes. Bulletin boards, FAQs, newsletters, or more sophisticated functions such as IKNOW Illinois Tourism provide important communication features and sharing opportunities; however, such system elements need to be actively promoted (through announcements, incentives, workshops, etc.) and sometimes moderated or seeded with information so that information sharing and community participation can be encouraged.

Further development and evaluation of systems that support and encourage learning are consequently critical to further growth and development of tourism enterprises. We believe that this is one of the most important challenges facing the tourism industry today. Thus, it is hoped that this article and the recent work of Buhalis (1998), Wöber (2003), Wöber and Gretzel (2000), and Yuan et al. (2003) provide the basic foundation for further development in this very important arena of knowledge-based systems in tourism.

Biographical Notes

Ulrike Gretzel is an Assistant Professor of Tourism at Texas A&M University. She received her Ph.D. in Communications from the University of Illinois at Urbana-Champaign and holds a Master’s degree in International Business from the Vienna University of Economics and Business Administration. Her research focuses on persuasion in human–technology interactions, the representation of tourism experiences on the Web, as well as intelligent system design and use in tourism.

Daniel R. Fesenmaier is a Professor in the School for Tourism and Hospitality Management and Director of the National Laboratory for Tourism and eCommerce, Temple University. His main research and teaching interests focus on the use of information and the Internet in travel decisions, the use of information technology for tourism marketing, and the development of knowledge-based systems for tourism marketing organizations.

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