Daniel R. Fesenmaier
Stefan Klein
Dimitrios Buhalis (eds.)

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A Typology of Tourism Related Web Sites: Its Theoretical Background and Implications

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Abstract

The application of thriving information technology, especially the World Wide Web, is changing our way of life and doing business. In the tourism area, a well-defined typology is necessary to facilitate the information search process and therefore provide guidance to the building of web sites. A typology of tourism-related web sites should be based on both the analysis of the nature of information provided by web sites and the channels of information flows the web sites created. The implications of this typology for website design is discussed as well.

1 Introduction

Undoubtedly, we are witnessing an information revolution in which the information technology, especially the Internet, has changed and continues to change our way of life. According to Forrester Research, 17 million US households were shopping online during 1999, and by 2004, the retail sales will reach $184 billion [1]; compared with other industries, travel related transactions have become the number one in terms of sales [2]. This implies that the web as a communication channel has been become an important part of our daily life. Also, more and more researchers are using the Internet as a source for information and a way to communicate among each other.

The extraordinary effects of the Internet rely on the power of its networking. In the business area, information technology, especially the development of electronic commerce, has changed the paradigm of doing business from the one-to-many communication process of traditional mass media (e.g., newspaper) into a many-to-many communication model. Because of the interaction and navigation capabilities hypertext can provide, the Internet is not only a medium for the market, but also a market by itself [3, 4]. Tourism, as an “extremely information-intensive” industry [5], has been greatly affected and mostly benefited by this information revolution.

The web interface has a very important role in this arena. Since there is a trend toward integration of technologies (for example, newsgroups, email and ftp all can be
implemented through web browser in this virtual market of Internet [6], web sites are gaining more and more popularity and weight in the business world. As the single identity in the computer-mediated environment, web sites will be the most important and probably the only one communication channel between corporations and their customers. Thus, the importance of domain names cannot be overemphasized (a company just bought the domain name business.com with $7.5 million USD, New York Times, 1999).

Most major tourism organizations have already gained Internet-presence, including commercial organizations (destination web sites, airline companies, hotels and restaurants, cruise, travel agencies, newly emerged virtual online portals) and non-commercial organizations (like researching organizations TTRA, IFFIT and industrial organization like Cruise & Freighter Travel Association and American Society of Travel Agents). These web sites provide the potential traveler with relevant information or offer tourism professionals and researchers with tourism related information. Some web sites also provide real-time electronic transactions.

Behind this optimistic view of the use of web sites in tourism area, there are still many problems need to be clarified, including:

Poor Usability

According to J. Nielsen [7], about 90% of commercial websites have poor usability. In tourism, lots of people get easily frustrated when trying to book online, even including those CEOs of online travel portal companies [8]. One reason for it is that the virtual market of Internet can be seen as mostly technology-driven and the research of electronic commerce and Internet can hardly keep up with the development of new technology. Sometimes research published one or two year ago has already been outdated. On the other hand, the design of web sites needs multi-disciplinary research in a number of areas including psychology, advertising, marketing, computer science and others. Especially in tourism area, the information needs and the process of information search by travelers are even more complex.

Overwhelming Quantity of Tourism Related Web Sites

A search of Yahoo! using the keyword “travel” yields 285 categories and about 17,000 web sites (accessed Nov 11, 1999). The extreme variability and complexity of tourism related web sites causes confusion not only for customers but also for tourism professionals and researchers. The phenomenal number of tourism related web sites provide overwhelming information with lots of redundancy.

From the above analysis, we can see the importance of a typology of tourism related web sites. According to the Merriam-Webster Dictionary, typology is the “study of or analysis or classification based on types or categories”. The building of a typology
can be seen as the examination of the hidden structure in accordance with certain attributes of the interested objects. From the view of information inundation in cyberspace, a typology or taxonomy can reveal the structure of online tourism and travel related community and facilitate the use of web regarding either customers’ or tourism professionals’ information searching process. More importantly, a typology of travel and tourism related web sites can illustrate the difference between them and establish a basis for guiding the design and maintenance of different web sites.

In order to build a typology for tourism related web sites, this paper begins with a review of existing perspectives on the structure and characteristics of cyberspace. The investigation of the nature of web sites using an information exchange perspective is then conducted. Last, a typology of tourism related web sites is proposed.

2 Literature Review

It’s not a surprise that the Internet and the World Wide Web has attracted lots of attention from various research areas. A number of studies have been conducted regarding the functions, characteristics, structure and uses of the Internet and the web in different fields. The following provides a brief review of the major ideas on this topic.

2.1 Definition of Web Sites

In order to establish a typology of travel and tourism related web sites, a clear definition of the concept of web sites is necessary. Unfortunately, many terms related with the Internet, including the definition of web sites, are ambiguous and ill-defined. In an attempt to clarify the terminologies, O’Neill and Lavoie defined web site as "a cluster of pages" which is composed of "a unique node on the web" and always associated with one domain name. Web site can be seen as an information concept instead of physical and tangible entity, since one logical web site can have multiple mirrored sites. Most of the time, the logical web site is the main interest when analyzing the content of web sites [9]. The URL is the global address of documents and other resources on the World Wide Web [10], which is the most important access information for an organization in the virtual marketplace.

2.2 Existing Web Typologies

The typology or taxonomy of web sites depends on one’s view of the whole cyberspace. From the date of birth of the Internet, cyberspace has been viewed as an advertising media, a marketing tool, a mass communication channel [11], and recently as a computer-mediated environment (CME) [4]. The WWW, as "the first and current networked global implementation [4], is becoming more and more ubiquitously used for travel planning and purchasing of travel-related products. Numerous researches
have tried to categorize different web sites from a variety of perspectives. The following are some major concepts and models (see Table 1).

**Table 1 Existing web typologies**

<table>
<thead>
<tr>
<th>Name</th>
<th>Users or Authors</th>
<th>Classification Scheme</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technical Classification</td>
<td>O’Neill and Lavoie (1998)</td>
<td>Classify web sites according to their accessibility</td>
<td>Content is not addressed.</td>
</tr>
<tr>
<td>Dewey Decimal Classification</td>
<td>Yahoo! and other online portals</td>
<td>Hierarchical structure, mostly used in library material classification</td>
<td>Multi-faceted, cannot be easily applied to large quantity of web sites</td>
</tr>
<tr>
<td>North American Industrial Classification System</td>
<td>O’Neill and Lavoie (1998)</td>
<td>Economic activity of a web site is the only criteria.</td>
<td>Excluding those sites including more than one industrial area and those non-commercial web sites</td>
</tr>
<tr>
<td>Functional Classification</td>
<td>Hoger, Cappel and Myerscough (1998)</td>
<td>Classify corporate uses of web sites according to their functions in the corporate operation</td>
<td>Excluding those non-commercial web sites</td>
</tr>
<tr>
<td>Value Chain</td>
<td>Ho (1997)</td>
<td>Classify the different values created on the web sites</td>
<td>Targeting at commercial web sites</td>
</tr>
</tbody>
</table>

### 2.2.1 Technical Classification

O’Neill and Lavoie discussed three types of web sites from a technological perspective [9]:

1. Public web sites: Those web sites have at least one portion of the web site open to the public;
2. Private web sites: Those web sites intend to be accessed by specific customers or only homepage can be accessed by the public, and prohibit other parts of web sites unless password or IP address is recognized;
3. Provisional sites: Those web sites serve meaningless content, such as server-templates, web page re-directing or under construction and not ready for access.
2.2.2 Dewey Decimal Classification System and Industrial System

The Dewey Decimal Classification system (DDC) conceived by Melvil Dewey in 1873 is "a general knowledge organization tool that is continuously revised to keep pace with knowledge", which is the most widely used library classification system in the world [12]. The DCC system follows a hierarchical structure in which the world of knowledge is divided into ten main classes where each class is divided into ten divisions and in turn, each division is divided into ten sections. Many online portals follow a similar structure as the DCC system. Take Yahoo! as an example, its highest level includes 14 broad areas which is similar to DCC system (Table 2). Another important characteristic of Yahoo! is that one entry (web site) can appear in more than one directory, which is also similar to the DCC system.

O'Neill suggested that just because of the "multi-faceted" characteristics of the DCC system, it cannot be easily applied to the largest proportion of public web sites. Instead, he proposed to use the North American Industrial Classification System as a taxonomy of web sites; it is "single-faceted" and the economic activity of a web site is the only criteria for classification [9].

<table>
<thead>
<tr>
<th>Table 2. Highest level of Yahoo! classification system</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arts &amp; Humanities</td>
</tr>
<tr>
<td>Business &amp; Economy</td>
</tr>
<tr>
<td>Computers &amp; Internet</td>
</tr>
<tr>
<td>Education</td>
</tr>
<tr>
<td>Entertainment</td>
</tr>
<tr>
<td>Government</td>
</tr>
<tr>
<td>Health</td>
</tr>
<tr>
<td>News &amp; Media</td>
</tr>
<tr>
<td>Recreation &amp; Sports</td>
</tr>
<tr>
<td>Reference</td>
</tr>
<tr>
<td>Regional</td>
</tr>
<tr>
<td>Science</td>
</tr>
<tr>
<td>Social Science</td>
</tr>
<tr>
<td>Society &amp; Culture</td>
</tr>
</tbody>
</table>

2.2.3 Functional Classification

Hoger and his colleagues [13] discussed a typology of corporate uses of web sites. He pointed out that corporations may use webs for promotion, advertising and communication tools. Five categories of corporate use of web sites were identified:

1. Promoting awareness;
2. Providing customer support;
3. Selling products or service;
4. Selling advertising space on web sites;
5. Offering electronic information services.

2.2.4 Value Chain

Another schema uses value chain analysis to evaluate web sites [14]. Ho argued that since technical issues regarding bandwidth and security can be resolved eventually along with the technological development, the more important question to ask is what “value” can be created on the web. Based on his evaluation of 1000 commercial web sites, he classified commercial web sites into three categories:

I. Promotion of product and services;
II. Provision of data and information;
III. Processing of business transactions.

Four types of value creation are identified: 1. Timely; 2. Custom; 3. Logical; 4. Sensational. Based on this analysis, Ho built a framework in the form of a three by four matrix (Table 3):

<table>
<thead>
<tr>
<th>Value\Purpose</th>
<th>Promotion</th>
<th>Provision</th>
<th>Processing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Timely</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Custom</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Logistic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensational</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2.3 Limitations of Above Frameworks

The frameworks discussed above provide different perspectives on cyberspace. However, the limitations in these views cannot be ignored. The technical classification of public, private and provisional web sites clarified the technological aspect of web sites in terms of accessibility. Nevertheless, it does not differentiate web sites according to their contents; thus, it does not provide insights into strategies for the design and management of web sites. Classifying web sites through their economic activities basically exclude the web sites that are either too comprehensive to summarize using one or two economic activities or non-commercial web sites which intend to provide free online communities. The frameworks focusing on functionality of web sites and particularly on the commercial use of web sites also ignore the fact that the WWW is more than a virtual market that provides product information and electronic exchange functions. It also offers the ability to create a
virtual community, a "global village" whereby we as villagers can share our experiences, emotions and thoughts.

3 A Typology For Tourism Related Web Sites

3.1 Broad View of Web Sites from Information Perspective

Beyond the view of merely comparing the functions and the usage in a marketing environment, web sites can be seen as a tool for the exchange of information. Therefore, a typology should be based on the analysis of the nature of information and information exchange. According to Shannon [15] information is something that reduces uncertainty. Wiio [16] argued that this definition can be hardly applied to human interaction and human-computer interaction, since the meaning of uncertainty varies drastically across different individuals and contexts (for example, the information about a certain car model can only reduce uncertainty to a specific buyer in a specific context), and its use is mainly in electronic communication. Either in psychology or in information science, information is understood more as information per se. In psychology, information is "anything that produces changes in consciousness" of the human being [17]. In information science, Saracevic differentiates three levels of information: information as messages, information as cognitively processed and information as being in a context (situation, task, and the like) [18]. Using the third level of the concept of information, different web sites can be seen as different channels to facilitate the exchange of information among different users. In other words, web sites should be analyzed through the interaction between the user and the web; more specifically, between the information users and the information itself the site intends to provide. The proposed typology is based on the analysis of the information flows between information users and the information richness of tourism related web sites.

3.2 Analysis of the Typology

In order to define a typology of tourism related web sites, we need to first inspect both the information flow of these web sites and the attributes of information these travel related web sites contain.

3.2.1 Analysis of Information Flows

Information Flows in Tourism

The scope of the concept "tourism" has been greatly extended in the cyberspace. Since cyberspace includes every aspect of our life, it breaks the barriers between different disciplines when we use the term tourism. For example, in ordinary life, when we are trying to find the web site for a specific destination, we call it tourism
web site. When we try to find tourism statistics for a place (i.e., city, state etc.) in United States, we still refer it as tourism web site. All these web sites are also categorized as tourism web sites in most online portals. Therefore, the term "tourism" in cyberspace is more than an industry or a research area; it has been referred to every aspect related to tourism. Using this broad sense of tourism, all information users related to tourism area can be divided into three groups: travelers, tourism industry professionals and tourism researchers. Travelers are the central character of the whole arena; tourism professionals serve travelers at the frontline; tourism researchers study the relationship, activities of travelers and tourism professionals. A basic typology of the information flow between these groups of travel-related information in computer-mediated environment can be illustrated as follows (Fig. 1).

![Diagram showing information flow between travelers, tourism industry professionals, and tourism researchers](image)

**Fig. 1. Information Flow of Tourism in computer-mediated environment**

In the tourism system in the computer-mediated environment, information flows occur: (1) between the three parts in tourism system; and, (2) between one of these three parts and the outside of the tourism system. Tourism related web sites can be seen as those sites designed for facilitating the information flow inside the tourism system, since the information flows link outside parts with inside parts are too general to define as tourism web sites (for example, those industry web sites which provide hotel equipment can hardly be defined as tourism related web sites).

An analysis of information users combined with a common sense of the words travel and tourism web sites can be categorized into travel web sites and tourism web sites.
Travel Web Sites

Travel web sites focus on travelers as their target audience, and their main objective is to satisfy the information needs of travelers. Corporations, non-profit organizations, and personal web sites that provide information and electronic transactions or facilitate communication and information exchange among travelers can be categorized into travel web sites.

Tourism Web Sites

Tourism web sites have the tourism professionals or tourism researchers as their target audience. These web sites include tourism organizations that aim at facilitating communication and information exchange between or within tourism professionals and tourism researchers (Table 4).

<table>
<thead>
<tr>
<th>Information Flow</th>
<th>Explanation</th>
<th>Web Site Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Travel Web Sites</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traveler -- traveler</td>
<td>Facilitate information exchange between travelers</td>
<td>Online traveler communities: <a href="http://www.lonelyplanet.com">www.lonelyplanet.com</a></td>
</tr>
<tr>
<td>Traveler -- professional</td>
<td>Facilitate information exchange between travelers and different tourism professionals</td>
<td>Provide online information to travelers: <a href="http://www.enjoyillinois.com">www.enjoyillinois.com</a></td>
</tr>
<tr>
<td>Tourism Web Sites</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Professional -- professional</td>
<td>Business to business communication, web sites of tourism professional associations</td>
<td>International Association of Convention &amp; Visitor Bureaus: <a href="http://www.iacb.org">www.iacb.org</a></td>
</tr>
<tr>
<td>Professional -- researcher</td>
<td>Web sites to enhance communication between professionals and researchers (e.g., online consulting and knowledge base)</td>
<td>National Laboratory for Tourism and eComerce: <a href="http://www.tourism.uiuc.edu">www.tourism.uiuc.edu</a></td>
</tr>
<tr>
<td>Researcher -- researcher</td>
<td>Communication between researchers</td>
<td>Tourism Research Webring: <a href="http://www.walsberg.com/webring/">www.walsberg.com/webring/</a></td>
</tr>
<tr>
<td>Traveler -- researcher</td>
<td>Online traveler survey to gather information from travelers</td>
<td>NYC 20000 Traveler Survey: nyetourist.com/survey_recent4.htm</td>
</tr>
</tbody>
</table>
Different Information Flows

Traveller - traveler: The web sites used among the travelers for the exchange of personalized, non-commercial information can be fit in this type.

Traveller - professionals: These web sites are created by tourism industries to facilitate the information flow between travelers and tourism industry professionals in order to satisfy the information needs of travelers.

Professional - professional: These web sites focus on communication and business information exchange between partners in tourism industry.

Professional - researcher: These web sites are used by researchers to provide tourism industry professionals with industrial knowledge and consulting services, and also by professionals to provide sufficient and real-life research topics for the tourism researchers.

Researcher - researcher: Web sites devoted to researchers’ based communities focus on the exchange of ideas and academic materials between researchers.

Researcher - travellers: This relationship is not so common and usually is unidirectional. Researchers may use online tools to investigate the traveler’s behavior. Using fill-out forms, the method of online survey has been relatively widely used.

3.2.2 Analysis of Information Richness

Information Richness

Evans and Wurth [19] used the concept of richness (this concept was firstly devised by Daft and Lengel [20]) and reach to describe the effects of information exchange in the cyberspace. Information richness refers to the “quality of information” in the view of the users: accuracy, bandwidth, currency, customization, interactivity, relevance, security and others. Reach means the number of the audience who can exchange information. Actually, the analysis of information users and different information flows discussed previously can be seen as a classification scheme of information reach. The concept of information richness can be used to describe the nature of information and taken as another decisive factor for the typology of tourism related web sites, since tourism web sites vary tremendously regarding their information richness, and accordingly the design and use of these web sites differ significantly.

Research done by Palmer and Griffith [18] supports this perspective concerning the information intensity-richness, even though their definition of information intensity is slightly different. Since the web site is used for the exchange of information, the concept of “information intensity” can be used to analyze and understand the difference between web sites and to guide the design of web sites. According to Porter and Millar [19], information intensity refers to "the proportion of an organization's market offering and/or value chain that is information-based". Different companies with different information intensity should use different marketing and communication strategies. For example, information intensified companies should
increase their competitiveness by providing product online or offering online product-
related information. Information intensity-richness theory has surpassed the view of
insignificant functional difference between web sites and provides an in-depth
perspective in viewing a variety of web sites. Thus, tourism related web sites can be
categorized into three levels of information richness: low richness, moderate richness
and high richness (Table 5).

Table 5. Levels of Information Richness in Tourism System

<table>
<thead>
<tr>
<th>Levels</th>
<th>Characteristics of Information</th>
<th>Web Site Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Richness</td>
<td>Customization, High bandwidth, Currency, Interactivity, Security transaction</td>
<td><a href="http://www.expedia.com">www.expedia.com</a></td>
</tr>
<tr>
<td>Moderate Richness</td>
<td>Moderate bandwidth, Interactivity, Updated periodically</td>
<td><a href="http://www.enjoyillinois.com">www.enjoyillinois.com</a></td>
</tr>
<tr>
<td>Low Richness</td>
<td>Static web pages with low bandwidth</td>
<td><a href="http://www.cupartnership.org/cvb/main.htm">www.cupartnership.org/cvb/main.htm</a></td>
</tr>
</tbody>
</table>

Different Information Richness

Low Richness: Provides static web pages, has a lot of links to other pages and may
have fill-out forms for suggestions and comments.
Moderate Richness: Provides some degree of interactivity like basic search engines
for this web site and the content of its web pages may be updated periodically.
High Richness: These web sites can provide web user with customized, up-to-date,
interactive information and real-time, secure electronic transactions.

Discussions on the Determinants of Information Richness

Different features of web sites may determine the information richness of a web site.
For tourism related web sites, two important attributes are prominent: the operation
scope and different types of information it may provide. For example, www.enjoyillinois.cn provide statewide traveler information (operation scope) and it can provide information on accommodations, attractions, and transportation (types of information). Naturally we can hypothesize that the scope of operation and types of information may determine the information richness of a web site, since the more types of information it can provide and the more broad the operational level (it lead to more users of information, in other word, wider reach), the more information it needs to provide and the more customization the information needs to be, since it will have large quantity and more diversified audience.
3.2.3 The Typology based on Information Flows and Information Richness

Based on the above analysis about information users and the essence of information itself, a basic typology can be proposed (Table 6). There are 18 types in which tourism related web sites can be categorized using the nature of information flows and levels of information richness. For example, www.expedia.com facilitates information flow between travelers and tourism industry professionals, and because of the customized, secure, current, and high bandwidth information it provides, it can be categorized into traveler-professional type with a high level of information richness. On the other hand, the web site of National Laboratory for Tourism and eCommerce in University of Illinois at Urbana-Champaign (www.tourism.uiuc.edu) intends to serve professionals with tourism information for the State of Illinois and other consulting service. This type of web page can be described as researcher-professional with a low level of information richness.

<table>
<thead>
<tr>
<th>Information Flows</th>
<th>Information Richness</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Low Richness</td>
</tr>
<tr>
<td>Traveler – traveler</td>
<td></td>
</tr>
<tr>
<td>Traveler – professional</td>
<td></td>
</tr>
<tr>
<td>Professional – professional</td>
<td></td>
</tr>
<tr>
<td>Professional – researcher</td>
<td></td>
</tr>
<tr>
<td>Researcher – researcher</td>
<td></td>
</tr>
<tr>
<td>Traveler – researcher</td>
<td></td>
</tr>
</tbody>
</table>

One phenomenon is that not all these 18 types of tourism related web sites do not have the same quantity of web sites. For example, most travel web sites tend to have middle or high level of information richness (like most online travel portals and online traveler communities like www.lonelyplanet.com), while tourism web sites tend to have low to middle level of information richness (most tourism professional organizations like www.ttra.com and most research institutions). One possible reason for that may be an implicit lack of awareness of the value of tourism related information for researchers and business-to-business information exchange.

3.2.4 Design Implications for the Typology

Different types of web sites should use different design strategies, since different types of web sites has different information user groups, who have different information needs and at the same time the contents of different web sites differ greatly in terms of information richness.
From the Perceptive of Information Flows

Traveler - traveler: Because of its commercial-free attribute, these web sites should focus on how to facilitate the sharing of experience among travelers. Accordingly, suitable tools for this purpose include bulletin board, e-mail list and other tools that are focusing on the sharing of personal experience.

Traveler – professional: The function of real-time transaction should be provided in order to let the tourists to book online. In order to attract more tourists, experiential aspect of web site should be emphasized. It means all kind of image and interactive tools can be used, such as, Java applet, Shockwave, and 3D imaging tools.

Professional-professional: Real-time and secure information exchange is needed. Accordingly, Electronic Data Interchange (EDI) is indispensable.

Professional - researcher: These sites should focus on the organization and representation of knowledge. Different tools should be provided to facilitate the knowledge search and representation, like search engine, text mining and others.

Researcher - researcher: Time issue is not so important as in professional-professional relation, nor is the experiential aspect compared with traveler-professional relationship. Instead, research tools include links to online references, libraries and search engines.

Traveler - researcher: Implicit methods of investigating web users' information search behavior, like Java applet and cookies, have started to be employed in those traveler-researcher web sites. Along with the demographic data and travel preference from traditional survey methods, valuable information about travelers' information search behavior can be obtained. However, since this is a new area for online research, many issues like privacy should be taken into account and need to be studied.

From the Perceptive of Information Richness

The design of the low information richness web sites should focus on its idiosyncratic style to attract more web visitors; the focus of the design of moderate information richness web sites should be on the concise, easy-to-navigate, and elegant layout and structure; for those high information richness web sites, the designing should focus on how to allow the visitor access and exchange the relevant information at the shortest time instead of confusing visitors with fancy Java applet and tools, and thorough knowledge about the target audience should be obtained and careful planning should be carried out before the real designing process.

4 Further Research

The proposed typology requires careful investigation along with the development of information technology, since the cyberspace is changing so rapidly that any predictions are problematic. Contractor and Wasserman stated that the development of technology will not only improve and facilitate traditional marketing and
transaction activities, but also "re-configure" the corporations and the industry [21]. In tourism the development of information technology may lead to the integration and re-configuration of online travel and tourism; consequently, in-depth and repeated investigations of the nature of web sites are necessary.

References