

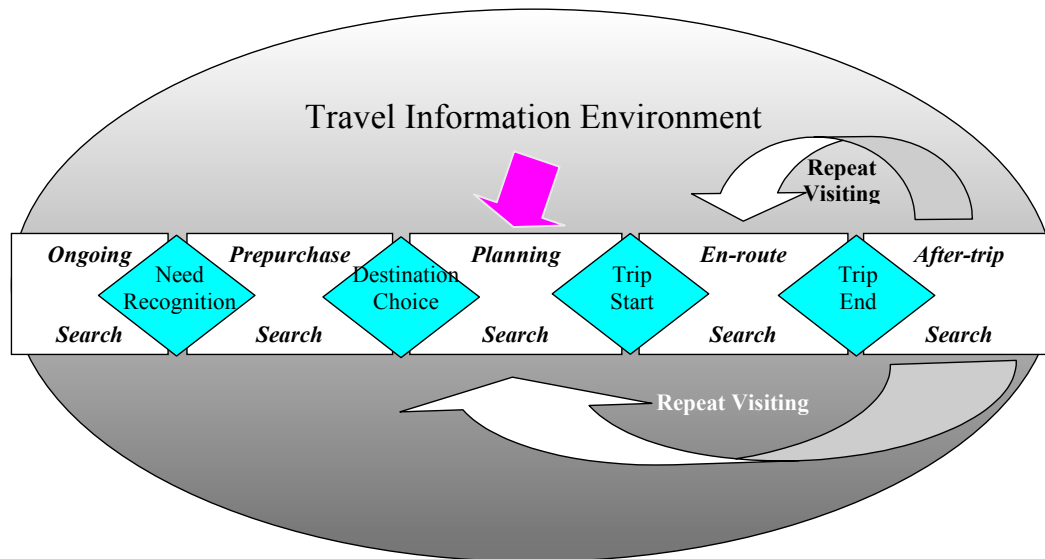
## CHAPTER II. CONCEPTUAL DEVELOPMENT

This chapter begins with a review of relevant literature on travel information search. Additionally, the nature, characteristics, and the implications of the Internet as a hypertext-based travel information source are discussed. Furthermore, general models of human-computer interaction, cognitive information search and information retrieval are reviewed in order to understand the usability problems of the Internet as a travel information source. Finally, a conceptual framework of travel information search on the Internet in the context of trip planning is proposed.

### 2.1 Travel Information Search as Information Processing

According to Jeng (1999) the traditional view of travel information search is closely related to travel decision making and can be viewed as information processing (Engel, Blackwell & Miniard, 1990; Bettman, 1979). In the purchase process, a consumer will go through a series of stages including need recognition, information search, alternative evaluation, decision making and post-purchase evaluation (Engel, Blackwell & Miniard, 1990). Consumer behavior research focuses mainly on the types and amounts of information search in relation to situational and environmental factors, the nature of the products, and individual characteristics (Vogt, 1993). In tourism, Vogt and Fesenmaier (1998) identified five information needs when travelers search for information: besides functional information needs, which is mainly used for decision making, travelers also seek travel information for sign (symbolic expression and social interaction), hedonic (emotional, sensory, phenomenology, and experiential), innovation (novelty, variety, and creativity) and aesthetic (fantasy and image) needs. In general, the travel

information search can be classified into five stages (Pan, 2001). Starting from ongoing search, travelers may undergo prepurchase search (or destination choice search), planning search, en-route search, and after-trip search. In repeat visitations, travelers may skip certain steps in the process. This study focuses on the use of the Internet in the planning search stage (Figure 2-1).



**Figure 2-1. A Process Model of Travel Information Search**

Research has identified numerous determinants of information search, including the travel information searchers' value system, their product knowledge and/or self-assessed knowledge, product involvement, views of decision risks, attitude toward products and intentions (Jeng, 1999). Two basic types of information search strategies can be identified, holistic (alternative-based) and analytical (attribute-based), which are in accordance with inter-dimensional and intra-dimensional decision making strategies (Payne, 1976; Tversky, 1969). At a macro-level analysis, trip planning involves many sub-decisions and can be viewed as a hierarchical, dynamic, multi-stage and contingent process; in addition, these sub-decisions have different centrality and rigidity levels,

which, too, are inter-dependent. Core decisions are usually made at the beginning of trip planning process, usually hard to change (high rigidity), and set the context for subsequent sub-decisions (Jeng, 1999). The contingent trip planning process implies that travel information search is continually changing, responding to a travel information searcher's cognitive system and information environment. Thus, travelers may use different search strategies such as location-dominated, amenity-dominated or interest-dominated strategy (Pan & Fesenmaier, 2000). In location-dominated information search, travelers focus their search around few locations and change their interests and amenities once the location choice has been made; in amenity-dominated travel information search, on the other hand, amenity has high level of rigidity and information search will be centered on amenities; finally, in interest-dominated information search travelers have established interests and plan their trip accordingly. For example, a traveler may decide to go to a Disneyland first and then make a decision between the Disneyland in Florida and the Disneyland in California. This type of trip planning is the interest-dominated travel information search.

## 2.2 The Internet as a Travel Information Source

Travelers make decisions within an information environment, which includes various travel information sources. Information search can be divided into internal search, which is a scan of long-term memory for relevant product knowledge, and external search, which happens when internal search can not provide sufficient information (Bettman, 1979; Engel, Blackwell & Miniard, 1990). In terms of external information sources, travelers rely on both marketing-dominated and non-marketing dominated

information sources to search for travel related information and plan their trips. The former information sources include advertising and commercials on mass media, travel brochures, guidebooks from clubs and welcome centers; the latter includes friends, relatives and personal experience. Fodness and Murray (1999) explored travel information search strategies using clustering analysis, and distinguished seven search strategies: prepurchase mix, tourist bureau, personal experience, ongoing, on-site, automobile club and travel agency. These strategies can be arranged along three dimensions: temporal (ongoing search versus prepurchase search), spatial (internal search versus external search), and operational (contributory information source versus decisive source).

A recent study by NFO Plog Research showed that the Internet has become one of the most important information sources for travel information acquisition; about 95 percent of web users used the Internet to gather travel related information, and about 93 percent indicated that they visited tourism web sites when planning for vacations, and nearly one half said they used email to gather travel related information (Lake, 2001). The choice of different information sources has been studied by Ratchford, Talukdar, and Lee (2001); they argued that the choice of information sources is determined by the cost and benefit of accessing information through those sources. For example, while traveling, traveler may use welcome centers, sign posts, or mobile devices for *en-route* information search since they are convenient to use and demand relatively little cognitive effort. For detailed trip planning prior to the trip, the Internet is a better choice

since it is universally accessible and contains a large quantity of information (Wang, Yu & Fesenmaier, 2001; Pan & Fesenmaier, 2000).

## 2.3 Navigation on the Internet and the Usability of the Internet

The Internet is an enormous hypertext system which is composed of interconnected text and information nodes (Smith, 1996). The travel information searchers need to navigate through the travel information space on the Internet in order to obtain relevant information. Accordingly, the success or the value of the Internet is determined by the ease of access and navigation and is uniquely related with its hypertext nature and the information searcher's navigation behavior.

### 2.3.1 Navigation on the Internet

Research in hypertext showed that three methods can be used to carry out information search tasks in a hypertext system: (1) the user can traverse through a set of links to reach interested nodes; (2) the user can navigate through the documents using a representation interface (such as using a graphic bookshelf to represent the organization of online books); and, (3) the user can query all documents through keywords search to locate relevant documents (Conklin, 1987). The main advantage of hypertext is that large amounts of information can be accessed rather quickly and the organization of the information is flexible with links of semantic relevance. On the other hand, hypertext does not have a conventional structure that leads the user through documents and the user is completely unrestricted in terms of where to go and which hyperlink to click; therefore, the hypertext systems require the user to exert more cognitive effort.

Two different theories have emerged to provide explanations of hypertext navigation: (1) information foraging theory and, (2) a cognitive model of web design and navigation (Bollen, 2001). In an analogy with food foraging behavior of living organisms, information foraging theory is a general model describing how people use different strategies and technologies to search for information in response to the changing environment. Information searchers use proximal cues to identify important information for further exploration or consumption. The concept of information scent is a construct that describes how information searchers identify valuable information from “snippets” of proximal cues (represented by link anchors on the Web). In an empirical study, the value of information scent was measured by vectors of words in the documents in relation with the information searcher’s intention. On a web page the decision of which link to click depends on the comparison of the values of information scent of all the links (Chi, Pirolli, Chen & Pitkow, 2001). Alternatively, Bollen (2001) proposed the cognitive model of web design and navigation whereby he argued that shared knowledge is necessary for hypertext navigation. He argued that user expertise, hypertext network structure, navigation strategies, domain knowledge and mental models all contribute to the efficiency of hypertext navigation. The mental models of the users are represented by their navigational path and the model of the system is represented by the hyperlink structure of the web sites. In explaining the navigation process, Kim and Hirtle (1995) argued that the users of hypertext system need to perform several tasks at the same time. Informational tasks, which is reading and understanding the contents presented in the linked nodes; navigational tasks, which is

planning and searching through links; and also management and negotiation of the previous two tasks. Failing the first task may lead to disorientation in hypertext system. According to Nakayama, Kato and Yamane (2000), web pages can be categorized into index page and content page, representing indexical information and content information: indexical information is used for navigation purposes and content information is used by the user to process information in depth; therefore, a dichotomy of information processing can be proposed to explain the navigation process in the hypertext system: (1) Navigation, an information searcher browses through certain web pages in order to find more relevant web pages, (2) Reading: the information searcher stay on certain web pages for a longer period of time to process information.

According to Nielsen (1995) hypertext usability includes five aspects: easy to learn, efficient to use, easy to remember, few errors, and pleasant to use. However, Smith (2001) argued that since hypertext is designed to encourage exploration and browsing, traditional measures of computer system usability, such as the time it takes to complete a task and number of mistakes made in the process, are not appropriate in measuring usability of hypertext system. Instead, he proposed a measurement of “lostness” as the number of information items inspected compared with the number of items which nominally needed to make a decision. To explore the nature of usability problems, Wang and Pouchard (1997) showed that users had problems understanding the syntax and semantics of search engines. More than 30 percent of the subjects did not click any links of the results returned from the search engine on the university homepage. They suggested that providing context-sensitive help and automation of query terms would

reduce this type of errors. Another study conducted by Bilal (2000) with middle-school students showed that the students always used natural language to do information search which is not supported on the search engine. Many times they were searching information on the concepts which were either too broad or too narrow. These results suggest that the semantic meanings of concepts are a major factor contributing to usability problems when users are searching information on the Internet.

### **2.3.2 Human-Computer Interaction Models and Usability**

As described previously, the Internet is a huge hypertext system which contains heterogeneous information sources. When travelers search for information and plan their trips online, the interaction between the travel information searcher and the Internet is: (1) the interaction between a user and a computer; (2) the interaction between an information searcher and an information system; (3) the interaction between a browser (or navigator) and a hypertext system. The understanding of these interaction processes is essential to the understanding of the usability problems of the Internet as a travel information source and satisfaction of travel information search on the Internet.

Human-computer interaction research (HCI) is defined as “the interdisciplinary study of the design and use of information technology which aims to support the development and implementation of more humanly acceptable technology” (Dillon, 1997, p. 965). According to Preece, et al. (1994), one major psychological basis of HCI is largely based upon information processing theory which views human beings as information processor (Card, Moran & Newell, 1983). The model of human processor is composed of the perceptual system, the motor system, and the cognitive system, along with their

own memories and processors. The perceptual system includes every sense of human being and their relevant buffer memories. The cognitive system consists of a mechanism which receives information from perceptual system and memory to generate appropriate responses whereas the motor system is responsible for carrying out actions according to responses from the cognitive system. Based on the results of empirical research Card, Moran and Newell (1983) proposed the GOMS model, the current standard for analyzing and predicting the time required to perform interactive computerized tasks (GOMS stands for Goals, Operators, Methods, and Selection rules). It is assumed in this model that a user of a computer system sets up goals to determine what s/he wants to achieve. The operators are the elementary efforts needed to achieve the goal, such as keystrokes. The user determines the procedures for achieving the goal, which consists of operators and other relevant goals. The user then follows selection rules to determine which method to apply if several methods exist.

Norman's execution-evaluation cycle (1990) is another influential model which guides the design of information systems. The interaction between a user and a computer system is greatly influenced by the user's goals and application domain. According to this model, the stages of interaction include establishing the goal, forming the intention, specifying the action sequence, executing the action, perceiving the system state, interpreting the system state and evaluating system state respecting the goals and intentions. Norman argued that problems always arise when there is an evaluation gulf whenever the physical representation of the system cannot match the expectation of the user. Furthermore, the user and the system each describe the task in different

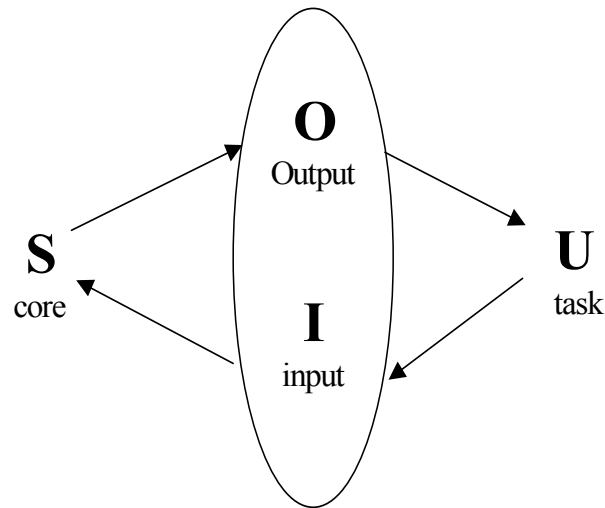
languages. That is, a user uses “task language” while a system uses “core language”, which describes the computerized information of the task (Dix, Finlay, Abowd & Beale, 1998, p.105). The two languages are not identical and discrepancies often cause communication problems between the user and the system.

Abowd and Beale (1991) argued that Norman’s model focuses excessively on the user’s side and ignores the complexity of the computer system. Instead, they proposed an interaction model which is comprised of four major parts (the user, the system, the input and the output) (Figure 2-2), and is more accurate if we consider different formats of input and output when a user interacts with the Internet. For example on the Internet, the input takes the formats of query terms and mouse-click while the output is web documents in different formats. In general, various models in HCI literature view the interaction between a user and a computer system as information processing. Different mental models, languages and understanding of tasks between a user and a computer system contribute to usability problems in the interaction process.

### **2.3.3 Cognitive Information Search and Retrieval Theories and Usability**

According to Jacob and Shaw (1998) there are two paradigms guiding most information retrieval research. The physical paradigm is based on an analogy to mechanical systems which does not take into account the user’s cognitive mode. On the other hand the cognitive perspective of information retrieval argues that “any processing of information, whether perceptual or symbolic, is mediated by a system of categories or concepts which, for the information-processing device, are a model of his world.” (de

Mey, 1977, pp. xvi-xvii). The cognitive perspective of information retrieval views information as subjective instead of objective. That is, information only makes sense when it is assimilated into the mental model and knowledge structure of the information receiver. Accordingly, effective information retrieval depends on the congruence between the cognitive structure of an individual user and the knowledge representation of the information system (Shera, 1965). Since each individual's idiosyncratic mental model is influenced by many socio-cognitive variables and is hard to capture and analyze, it is easier to explore the shared mental model and knowledge representation of a user group or knowledge domain (Allen, 1996). In addition, since representation of knowledge is language-based, it is essential to investigate the role of language played in the communication process (Blair, 1990).



**Figure 2-2. A Human-Computer Interaction Model (Abowd & Beale, 1991)**

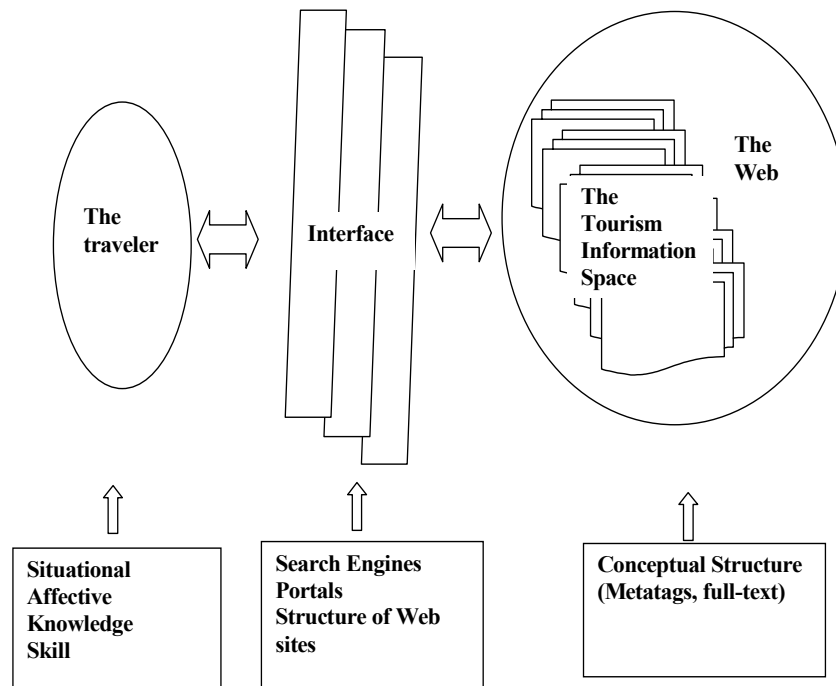
Ingwersen (1992) argued that in the information retrieval process, data in the information system has been transformed into information in relation to the mental model of the user and subsequently, the knowledge state of the user is changed. The concept of “polyrepresentation” of information can be applied to both the user’s mental

model and the system's information space. The linkage between different representations (differences and overlapping) of semantic models of the user's and the system's can reduce the uncertainty of information retrieval process by eliminating lexical ambiguity and providing contextual information. Furthermore, the interaction between user and information system is mediated by the user interface. Users always need to generate queries to match the system's language (Beaulieu, 2000), which represents compromises between his/her information needs and the need to adapt to the information system itself. In general, the cognitive information retrieval literature, similar to the constructivist view of learning, views the degree of congruence between the mental model of information users and the semantic model of the information systems as determining the usefulness and efficiency of the system.

#### 2.4 A Conceptual Model of Travel Information Search on the Internet

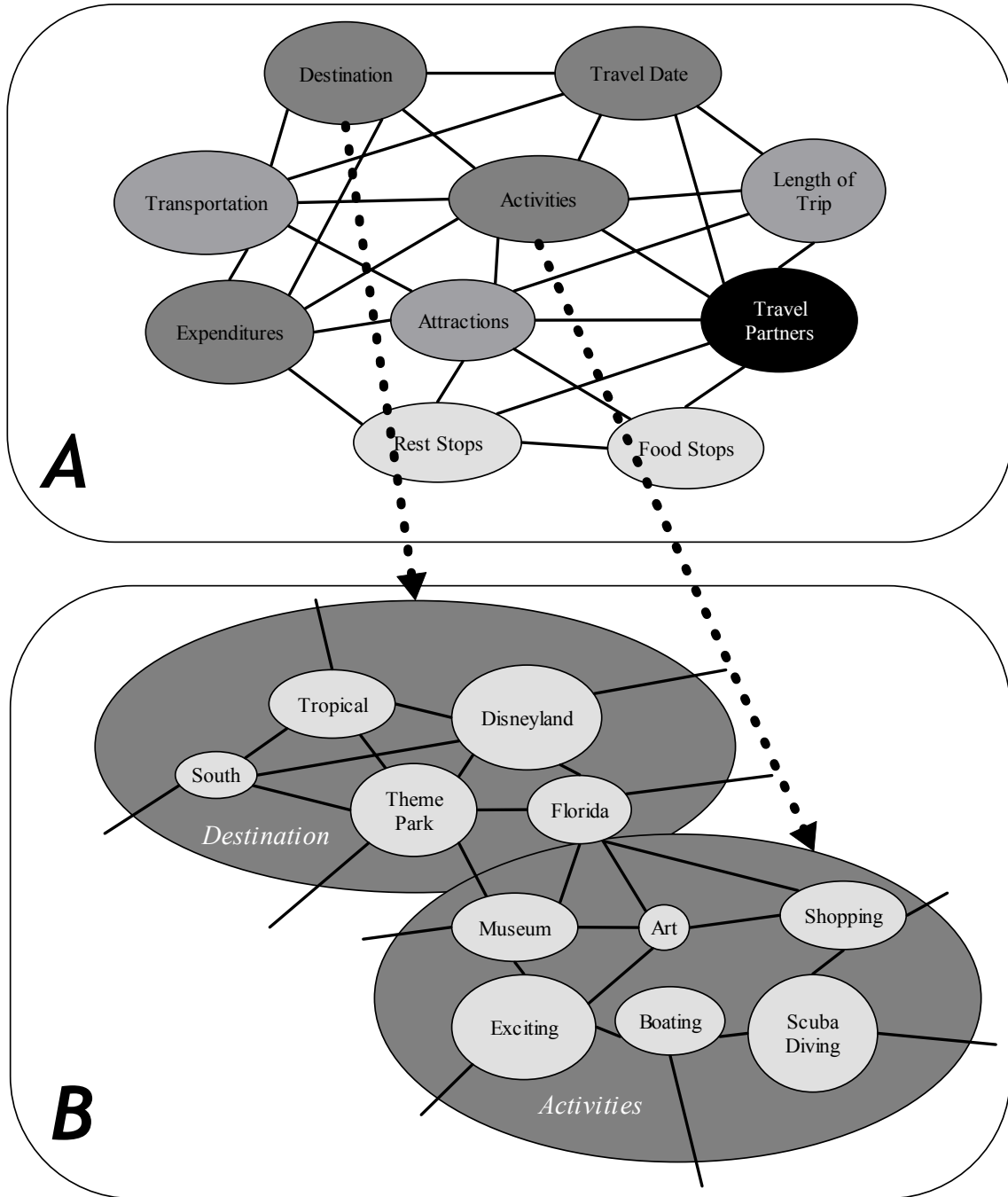
Following from the HCI literature, travel information search on the Internet can be seen as the interaction between information searchers and the information space (the part of the Internet related to tourism and travel destinations) in the context of trip planning and travel information search. The travel information space contains different types of information provided by different parties in tourism industry and other industries along with technology professionals in order to market their tourism products and communicate with travelers. Based on this framework, a model of travel information search on the Internet can be proposed (Figure 2-3). Three components constitute the interaction: a travel information searcher, the interface, and the travel information space. Traveler's situational factors, knowledge and skills regarding traveling and the

travel information space, contribute to effective travel information search; the travel information space refers to all the travel related web pages on the Internet which potential travelers can access; the interface consists of search engines, the information structure of web sites, and various metatags and link structures which are used to facilitate information search.



**Figure 2-3. Travelers Interacting with the Internet When Searching Information**

Jeng (1999) argued that the goal of trip planning can be seen as a hierarchical structure of sub-goals. It can be represented as a network of sub-problems which need to be solved (Network A in Figure 2-4). This network of goals can be regarded as a mental model. In Network A, different nodes represent different sub-goals in which different darkness of the nodes represents different rigidity and centrality levels (the



**Figure 2-4. An Illustrative Semantic mental Model of Trip planning**

darker nodes represent more central and rigid sub-decisions). For example, “Travel Partners” is generally rigid and central to the overall travel plan, and is difficult to change. On the other hand, one’s choice of “Rest Stops” usually changes according to

other aspects of the trip. These sub-goals are interrelated and are constraints to each other. Thus, this is the most general level of a travel information searcher's semantic mental model prior to their information search and consists of various sub-goals in different domains. However, this level of semantic mental model is too general and not sufficient for exploring one's semantic structure which can be compared with the language and vocabularies in the travel information space. Therefore, if we "zoom in" to see the details of each node, one can see that each sub-goal has a cluster of related concepts and ideas and may include nouns, adjectives, and verbs. The Network B of Figure 2-4 is an illustration of two clusters, destinations and activities. When searching for travel information on the Internet, one's choices of links are determined by the value of relevance of the link anchors; in other words, the value of information scent, which is perceived cost and value of information source from proximal cues (Card, Pirolli, Van Der Wege et al., 2001). For example, "Theme Parks" is the most significant concept in this semantic network. If "Theme Parks", "Tropical", "South", and "Florida" appear on the same page and they are equally visually prominent, most likely the information searcher will click on the link of "Theme Parks". Thus, not every click is equally important. Some clicks are intended to reach certain destination web pages on which the travel information searcher stays for a longer period of time. According to Kim and Hirtle (1995), information seeking on the Web involves reading/understanding and navigating, and the two processes happen simultaneously. Since attribute information regarding alternatives are needed in the decision making process, the destination page is usually a content page describing attributes of different alternatives (Nakayama, Kato, & Yamane, 2000), whereas click-through web pages are index pages and the content is

limited. For example, a travel information searcher with a mental model as in Figure 2-4, will likely click through “South”, “Florida”, “Theme Parks” rather quickly in order to reach the “Disneyland” page and then spend a much longer time reading its content. In this example, the former pages constitute navigational pages and the latter are reading or navigational pages. Accordingly, it is proposed that the travel information search can be represented as “episodes” whereby each episode contains one destination or content page. The rest of pages in the “episode” are index pages in which the travel information searcher clicks through quickly in order to reach the destination or content page.

Importantly, during the navigation process the mental model of the travel information searcher and the representative semantic network is continuing changing. For example, after the destination choice has been made (e.g. the travel information searcher decides to go to Disneyland in Florida), her/his semantic network will change accordingly. Some destination concepts/ideas (Disneyland and Theme Parks) will disappear and some related concepts will emerge and become more central (for example hotels and motels). Thus, travelers’ mental models are dynamic and contingent upon traveler’s decision making process. After a certain period of searching and trip planning on the Internet, the information searcher will stop when all the goals are satisfied or the travel information searcher encounters obstacles (fatigue, no relevant information, or time constraint). The result of the planning effort is a “sub-space” of the overall travel information space, which represents the results of the interaction between the mental model of the travel information searcher and the travel information space. Clearly, the semantic model of the travel information searcher plays an essential role in this process.

If the traveler's mental model and the concepts/keywords in the travel information space do not match, the information searchers will not find the information s/he is looking for. Thus, a mental model, as a central construct, plays an essential role in this conceptual framework. The travel information searchers' mental models represent their background knowledge, information search tasks, and their understanding of the Internet as a travel information source. The travel information searchers search through the travel information space according to their idiosyncratic mental models. Their mental models continue changing during travel information search on the Internet based on upon the information they encounter and sub-decisions they make.

## 2.5 Satisfactory Travel Information Search on the Internet

Satisfaction is one major indicator of success of information technology and information systems and is determined by many elements (Mahmood, Burn, Gemets & Jacqez, 2000). A user's background knowledge and experience with computers, the Internet, and other information retrieval systems can influence their web search behavior (Hsieh-Yee, 2001). Since a mental model is an important construct in explaining information searcher's navigation behavior, it is argued that the congruence between the mental models of information searchers and the semantic model of information space contributes to the overall effectiveness of travel information search on the Internet. Research showed that product knowledge and information search experience can influence their information search efficiency (Hsieh-Yee, 2001). In travel information search, travel-related product knowledge is related to their travel experience regarding one destination, and information search experience refers the use

of the Internet as travel information source. In this research, it is proposed that the product knowledge, computer and Internet use experience, and travel information search experience will influence the information searcher's mental model, which in turn, will determine the congruence between a travel information searcher's mental model and the semantic model of travel information search. By measuring travel experience, computer and Internet use experience and travel information search experience on the Internet, one can examine the relationship between a travel information searcher's individual characteristics (including travel experience, computer and Internet use experience, and travel information search experience on the Internet) with satisfaction of travel information search. Because of the importance of mental models in the previous discussion, it is proposed that the congruence between the mental models of a travel information searcher and the semantic model of the travel information space will determine the levels of satisfaction in the trip planning and travel information search. If the travel information space contains the information which the travel information searchers are looking for and the interrelationships of those concepts are similar, their information search will be more efficient and satisfactory. According to Newman, product knowledge and information search experience can influence their information search efficiency (Newman, 1977). It is proposed that the degree of congruence between the mental model of an information searcher and the semantic model of the travel information space will be determined by previous travel experience and the experience of using the Internet as a travel information source; furthermore, the congruence of the two models will further influence satisfactory travel information search (See Figure 2-5 for a graphical representation of the model).

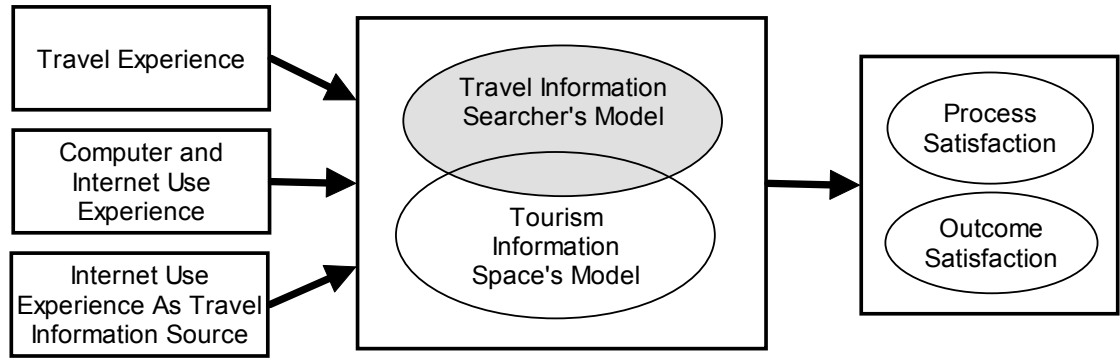


Figure 2-5. Overall Satisfaction Model

## 2.6 Summary

In this chapter, relevant research in tourism, information search, HCI, and information retrieval was reviewed and a conceptual framework was proposed. It is argued that travel information search is a dynamic, contingent, multi-fact and multi-stage process. Similar to other information sources, a information searcher's individual characteristics, information environment, and decision strategies influence traveler's information search behavior. The Internet is a heterogeneous and interactive hypertext system with huge amount of travel related information. Navigation and reading can be proposed as two different processes while searching the Internet. The information searchers click through the hypertext space according to their mental models and solve decision problems by reading certain web pages. More specifically, the travel information searchers have initial mental models regarding search tasks and domain knowledge based on their understanding of the travel information environment, and they carry out their search tasks through interacting with the Internet. The interaction process can be broken up into different episodes. Each episode includes reading, which is in-depth information processing, and navigation, which is quick browsing in order to locate more relevant web pages. Those web pages for reading purpose constitute a sub-space of the

whole travel information environment. There is no reached consensus regarding the measurement of satisfaction of travel information search on the Internet. Satisfaction can be measured through process satisfaction and product satisfaction. The mental models of travelers determine the satisfaction of travel information search.