

User Analysis FRAMEWORK

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Thoughts on User's Cognitive Factors for Information Design on Web-based Media

Websites have passed through several developmental progressions, from simple textual information to more sophisticated interactive communication that engages a larger and more diverse audience. As an alternative channel to communicate, access information, perform a task or fulfill personal interest, more usability problems become apparent. Studying and solving these problems is increasingly essential. This study attempts to analyze and understand search problems based on user search behavior. To understand this behavior more profoundly, focus shifts to the user's cognitive factors

that underlie and regulate behavior while searching through a website. These cognitive factors include generic goals, user modes of searching, user search strategies and methods, as well as different types of models to identify user characteristics. The study discusses classification of these cognitive factors and provides an analytic framework that helps systematically analyze and synthesize these factors in order to better anticipate user search behavior with the goal to eventually be able to determine the kinds of information and functions needed to include in different types of website design.

BACKGROUND

As web-based media has already begun to dominate our everyday life, it has passed through several progressions—the earlier simple model refashioned only textual communication available to those in academia or research to the far more sophisticated visual-animated interactive medium which now engages much larger and diverse audiences. The development in communication and information technology enables content to evolve from the electronic version of a simple letter or textual report to the interactive version of newspaper, magazine, graphic advertising and merchandising catalog, consequently web-based media has become more prevalent than ever. It has transformed the ways we live by presenting us with alternative channels to communicate, access information, perform tasks or fulfill personal interest. These opportunities extend to the general technically literate population. However, as more audiences engage, more usability problems are uncovered. These problems can't be solved by the development of technically sophisticated systems alone. User behaviors need to be deeply understood in order to design systems that allow users to perform their tasks easily, without struggle and frustration.

A previous research paper “User Purposes and Information-seeking Behaviors in Web-based Media: A User-centered Approach to Information Design on Websites” (Sawasdichai, 2002) provides a new perspective on design considerations for a website by incorporating requirements from both website (client) intentions and user purposes. In this study, user purposes and their modes of searching were investigated simultaneously with website goals to reveal common search patterns associated with each case and to identify the primary problems that occur in each pattern. The results show that the patterns of user search behaviors are uniquely different depending on their purposes and current modes of searching. Even though each user (subject) performed his/her task in isolation and in her/his own way, similar search patterns appeared based on a shared purpose and/or the same mode of searching. Different search patterns were associated with different user purposes and website intentions. Ten cases were investigated ranging from very specific to open-ended purposes and searches.

PREVIOUS RESEARCH FINDINGS

The research findings also show that user purposes and modes of searching are the main mechanisms that play an important role in determining user behavior and the resulting search pattern (see figure 1). User purpose is the main factor regulating their task description, while user mode of searching provides the major impact on their search strategies and search methods. User purposes determine different lists of task they need to perform to achieve their goal. Their modes of searching influence their search strategies, how hard or easy the search can be and how much time is spent on their search. Users who begin with the same purpose will perform their search similarly in terms of what tasks are necessary to reach the goal. However, if they use different modes of searching—depending on their personal knowledge and experience and how precisely they know what they want, they will have different search strategies and consequently choose different kinds of search methods even though they begin their search with the same purpose. Since user purposes and user modes of searching are the main mechanisms determining user search patterns, more understanding in this area will help web developers anticipate search behaviors, needs and the expectations of their intended audiences. Consequently, they will be able to lay out web structures suitable for both the web contents and the user purposes, and consciously include various search methods or search tools suitable for different user modes of searching.

**USER PURPOSES,
USER GOALS
AND USER
INTENTIONS**

Each user has a specific purpose when visiting a website. Different purposes suggest different task descriptions as stated earlier. To further investigate “user purpose” in this research paper, user purpose is elaborated into different levels as “user goal” which indicates something the user wants to achieve or attain and “user intention” which demonstrates a determination to act in a certain way to accomplish the goal. User goal originates from user needs; it is subjective and sometimes vaguely defined. User intention is then translated from user goal into an objective plan that the user can carry out to reach his/her goal. The relationship between user goal and user intention is further demonstrated in the Research Analytic Framework, discussed in the next section.

**SEARCH
STRATEGIES
AND SEARCH
METHODS**

When performing their search, users need a search plan—how to perform their search and which kinds of search tools to use in order to easily achieve their original goal. This plan is different from person to person based on user search strategy. However, as stated earlier in the previous research findings, user search strategy is influenced by

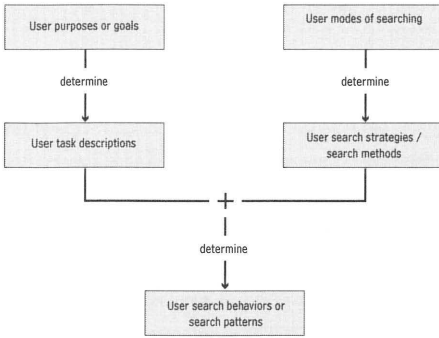


FIGURE 1
User Purposes and
User Modes of
Searching, the Main
Factors Regulating
User Search Behavior

user mode of searching. Search strategy can range from general or less objective search (browse) to more specific or purposeful search. These are directly proportional to user modes of searching which range from open-ended to specific search. Users may also plan a fast or slow search based on time available and the urgency of their need. Users who plan a slow search usually want to record their search results by using the bookmark function or simply print out the retrieval result pages for later use. User search strategy may change from time-to-time in accordance with user modes of searching, which are based on the current context or situation that unfolds while they are searching as well as the search results that they retrieve.

While search strategy is the scheme that generally characterizes users' search, search method is the procedure of how users actually perform their search. It is concerned with the types of search tools users choose to use in their search. These search tools include menu bar, table of contents, index, site map, shortcut, search field (box), search agent, etc. Users select a combination of these search tools to perform their search based on their strategy. For example, users who are in the mode of exploratory searching (open-ended search) will likely plan a slow and general search (search strategy), and mostly explore their search by browsing the menu bar and table of contents (search method). On the other hand, users who are in the mode of known-item searching (specific search) will usually plan a fast and purposeful search (search strategy), and comfortably use the index or shortcut to pursue their search (search method).

**THE PURPOSE
OF THIS
RESEARCH**

To gain more understanding within this area, user cognitive factors, user goals, intentions and modes of searching need to be further investigated in order to uncover how these cognitive factors have substantial impact on user iterative behavior when using the media. Furthermore, proper user models need to be established that take into consideration demographic, psychographic and technographic profiles. This paper serves as a post-analysis of the research on User Purposes and Information-seeking Behaviors in Web-based Media referred to earlier. It elucidates a classification of cognitive factors and illustrates how these factors can be considered simultaneously as an User Analysis Framework to anticipate various cases of user behavior and identify the main characteristics and potential problems associated with each case. Moreover, the framework identifies important functions to include in each case to support user tasks. Greater understanding in this area will help complement existing analysis and design methods such as task analysis or task mapping and scenario-based design.

**THE RESEARCH
ANALYTIC
FRAMEWORK:
MODEL OF
USERS' GOALS/
INTENTIONS/
ACTIONS**

Based on Donald A. Norman's model "Seven Stages of Action" (Norman, 1988), when people want to get something done, they have to start with a goal or some notion of what is to be achieved. However, despite its importance, it is often ill-formed and vaguely stated. To lead to action, a goal must be translated into an intention that indicates the appropriate action or method to take to achieve the goal. Consequently, the intention has to be transformed into a specific action sequence that can be performed or executed to satisfy the intention (see figure 2). Moreover, one could satisfy one's goal through different intentions and action sequences depending on the state of the world.

Likewise, in web-based media, users visit a website with unique goals. These goals are often subtle and vaguely stated. As a result, in some practices this important stage is sometimes intentionally or mistakenly excluded when performing the task analysis, but instead starts with users' intentions that are more obvious and precisely specified. This process may work successfully in interface design with a task-oriented approach such as used in software development. However, in web-based media,

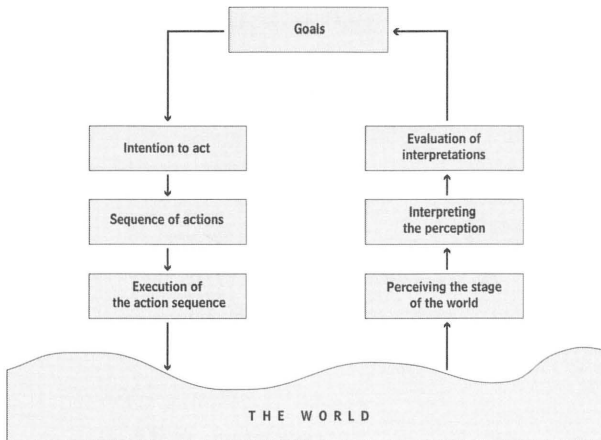


FIGURE 2
Seven Stages of Action
(Redrawn from the
original in *The Design of*
***Everyday Things*, 1988)**

users are usually goal-oriented, and they will be satisfied only if their goals are met successfully. As a result, this process may mislead design development, and result in user frustration when original goals can not be fulfilled. Since one particular goal may be transformed into various intentions based on several factors such as users' knowledge, experience, time available, context or situation, it is important, in the early stage of a design process, to recognize these goals as well as the connections between the goals and the intentions translated from these goals. Otherwise, it is difficult to understand and predict users' behaviors, needs and expectations, and as a result fail to design the system that enables user success.

Based on the original goals, users form intentions for what they need to obtain the goals. These intentions guide specific actions. Users' intentions are varied based on their modes of searching, which can be differentiated by the three substantial factors as follows (*see figure 3*).

- > Levels of specification or determination of user needs
(how exactly they know what they want)
- > Levels of urgency of user needs
(how urgently they need to meet their goal)
- > Levels of user contribution to the search tasks
(how much time and effort they are willing to spend to complete the task)

These user modes of searching may change from time to time or from one search to another after users gain more experience or collect more information from their search task. As a result, the users' intentions may change accordingly, especially when users are struggling with search problems and feel overwhelmingly frustrated.

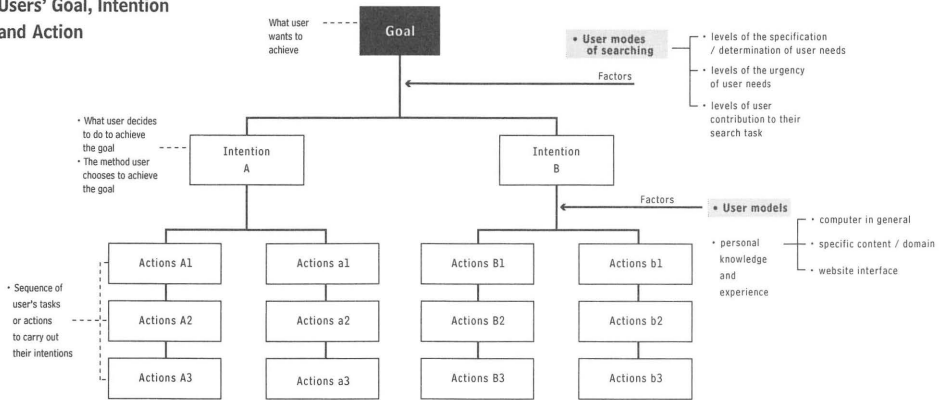
After intentions are formed, users transform their intentions into specific actions or descriptions of what they need to perform. Similar to the connection between the users' goals and intentions, a particular intention can be translated into various action sequences based on models that describe user characteristics, substantially based on users' demographic and technographic profiles as follows (*see figure 3*).

- > Levels of users' knowledge and skill in the specific content or domain in which they are searching
- > Levels of users' skill and experience in the particular task they are performing
- > Levels of users' experience or familiarity with the particular website interface
- > Levels of users' computer and internet literacy— users' knowledge, experience and ability to operate a personal computer, as well as connect and use internet

Due to differences among characteristics, each model of user will choose to perform the tasks differently for the very same intention. For example, users who are sophisticated and literate in computer operation will certainly feel confident when facing any technical problem and will be able to solve the problem successfully on their own. Similarly, users who have expertise in the particular domain they are searching will face less struggle since they have a familiarity with the structure and contents under exploration. These users will probably be able to take an easier, shorter action sequence since they have flexible category and content knowledge and feel confident when they come to make decisions. First-time users or users who lack any knowledge or experience in the domain they are searching will probably take a longer sequence of actions because they need to perform and learn from their mistakes simultaneous with their search.

In summary, one particular goal can be transformed into various intentions based on different user modes of searching, and further translated into various sequences of actions based on different user models. Therefore, it is important to recognize these connections among users' goals, intentions and action sequences, and understand the

FIGURE 3
Analytic Model of
Users' Goal, Intention
and Action



substantial factors that enable these transformations, so that users' behaviors, needs and expectations will be predicted more correctly or closely to how users really behave in actual cases.

Each user may access the same website with different goals at different times or they may change their goals from time-to-time in accordance with the context or situation that unfolds while they are performing their tasks. Furthermore, they often link several goals and explore them sequentially. These factors complicate the attempt to anticipate users' needs, expectations and search behaviors. However, generic user goals may be generalized and categorized based on website usage as follows.

**GENERIC
USER
GOALS**

1. Use a website as an alternative channel to access and search for information they need. In this category, the website is used as an alternative channel to other traditional channels such as books, magazines, newspapers, television, radio, consultants, etc. Some users may need information only to stay updated; others may need information to fulfill their specific inquiry or for additional decision making.
2. Use a website as an alternative communication channel to communicate and connect with other people or the world. The website is an alternative communication channel to other traditional ones, such as telephones, letters, conferences, etc.
3. Use a website as an alternative medium to perform specific tasks.
The website is an alternative medium for shopping, organizing and paying bills, subscribing, etc.
4. Use a website as an alternative medium to fulfill personal interests.
The website is an alternative medium to play games, download music, watch video clips, etc.

These generic goals are often subtle and vaguely stated by users; however, they play a substantial role in determining user tasks. Using a website as an alternative channel to access and search for information is a very different task from using the same website as an alternative medium to shop or pay bills. Moreover, these generic goals are not mutually exclusive since users tend to have several goals when visiting a website and pursue them sequentially. Users will feel more satisfied and successful if their goals

correspond to website goals, content and structure. As a result, web developers need to recognize these goals, so that they will be able to anticipate user tasks, and provide a web structure that is agreeable with those tasks.

**GENERIC
USER GOALS
IN DIFFERENT
KINDS OF
WEBSITES**

When exploring a website, users often pursue several different goals as primary and secondary ones. Secondary goals are often concerned with tasks that support primary goals. In a commercial website, users' primary goal is to perform a specific task—to purchase merchandise or service offered through the website. However, before purchasing, users need to know specific information about the merchandise or services in order to compare and make a decision. This becomes the users' secondary goal, which is to access and search for the information they need (*see figure 4.1*). In this case, users will be able to achieve their primary goal only if their secondary goal is satisfactorily fulfilled. If users are unable to find the information they need, they may leave the website without purchasing anything. Even though, in most scenarios, users are able to find some information, it is still not sufficient to make a final decision. In this case, users will postpone their decision and purchase until they have information that makes them feel confident. However, these purchasing behaviors are not exclusively based on user goals, but are also influenced by user modes of searching and types of user models, which are further discussed in the following sections.

In an information website, the users' primary goal is obvious—to use the website as an alternative channel to access and search for information. Some users may need information to stay updated or to learn about particular topics or subjects. Others may need information to fulfil their specific inquiries or to use for comparing and making decisions. These sub-goals become the users' secondary goals, which considerably influence their task descriptions (*see figure 4.1*). Users who need information to help with their decision processes or those who need information to fulfill their specific inquiries usually perform their search task more intensely than those who need information only to stay updated.

In an education website, some users may have only one primary goal to access and search for information they need for learning—to seek information or knowledge in a specific domain. However, other users may have two different primary goals that they need to pursue sequentially. One is to use the website as a channel to access informa-

Websites	User primary goals	User secondary goals	Possible user intentions (what to do to achieve the goals, varied by user modes of searching)
Commercial website	<ul style="list-style-type: none"> • Buying merchandise / service (use website as an alternative means to perform specific tasks) 	<ul style="list-style-type: none"> • Seeking specific information about the merchandise / service • Comparing and / or making decisions (use website as an alternative channel to access information) 	<ul style="list-style-type: none"> • Purchasing the merchandise / service only • Seeking information about the merchandise / service to compare and make decision, then purchase on-line • Seeking information about the merchandise / service to compare and/or make decision, but purchase somewhere else • Seeking information about the merchandise / service, then record or save to compare and make decision later
Information website	<ul style="list-style-type: none"> • Seeking information (use website as an alternative channel to access information) 	<ul style="list-style-type: none"> • To stay updated • To fulfill specific inquiry • To compare and/or make decision • To learn about a specific topic or subject 	<ul style="list-style-type: none"> • Seeking only specific information • Seeking specific information and all other relevant information • Seeking information (either only specific information, or all relevant information), record, then compare and make decision • Seeking information (either only specific information, or all relevant information) and record or save for later use
Education website	<ul style="list-style-type: none"> • Learning (use website as an alternative channel to access information) • Learning and practicing (use website as an alternative channel to access information and use an alternative means to perform specific tasks) 		<ul style="list-style-type: none"> • Seeking specific lesson / topic, and learn step-by-step on-line until finished • Seeking specific lesson / topic, then record for learning later (off-line), or save for later use • Seeking specific lesson / topic, learn step-by-step on-line, then save to continue the lesson or re-visit later • Coming back or re-visiting the lesson for practising or reviewing
Identity website	<ul style="list-style-type: none"> • Seeking information (use website as an alternative channel to access information) 	<ul style="list-style-type: none"> • To stay updated • To fulfill specific inquiry • To compare and/or make decision 	<ul style="list-style-type: none"> • Seeking only specific information • Seeking specific information and all other relevant information • Seeking information (either only specific information, or all relevant information), record, then compare and make decision • Seeking information (either only specific information, or all relevant information) and record or save for later use
	<ul style="list-style-type: none"> • Performing specific tasks (use website as an alternative means to perform specific tasks) 	<ul style="list-style-type: none"> • Make transactions on-line (such as paying bills) 	<ul style="list-style-type: none"> • Making transaction only (may be first time or routinely done) • Seeking information about the transaction or account, then make transaction
		<ul style="list-style-type: none"> • Get involved or make contact with the company, institution or person (such as applying or subscribing) 	<ul style="list-style-type: none"> • Making contact with the company, institution or person • Seeking contact, apply or subscribe to information, then make contact with the company, institution or person

FIGURE 4.1
Generic User Goals in
Different Kinds of
Website

tion and another is to use the same website as a medium to perform specific tasks—to practice and further develop skills they have learned (*see figure 4.1*). These behaviors may be found in some websites such as the “DIY—Do It Yourself” website or the academic websites that provide long-distance learning programs.

In an identity website provided by an individual, company, or organization, there are two different primary goals that are not mutually exclusive. Some users may entertain both goals and explore them simultaneously or sequentially. One goal is to use the website to search for information regarding the individual, company, or organization who owns the website, or to examine the merchandise or service provided by them. The information may be needed to stay updated, fulfill a specific inquiry, or compare and make a decision. Another goal is to use the website to perform specific tasks (*see figure 4.1*). These tasks are different from one website to another; however, they usually include making an on-line transaction (such as organizing and paying bills), or getting involved or making contact with whoever owns the website (such as applying or subscribing to a commercial, academic or government website).

In an entertainment website, users’ primary goal is to fulfill personal interests—to engage in particular activities for their enjoyment (*see figure 4.2*). They may play games, download music or video clips. However, some users may also have a secondary goal to use the website to access and search for information they need to support a primary goal or intended activity.

For a community website, based on Digital Knowledge Assets’s (dka) research on communities, there are three main types: community of interest focusing primarily on ideas and information, community of practice following a process or making something together and community of transaction (markets) engaging in buying and selling. In a community of interest website, some users may have a primary goal to communicate with other people—to socialize, make connections or get in touch with others who share the same or similar interests. Other users may use the website to access information they need—to seek advice from people in the community in order to answer a specific inquiry or compare and make a decision about something. However, to achieve the main goal, they need to contact and communicate with people in the community who share the topic of interest. This becomes the users’ secondary or

supporting goal. This scenario also applies to the community of practice website (*see figure 4.2*). In the community of transaction website, users' primary goal is to perform a specific task—to engage in buying and selling activities (*see figure 4.2*). However, similar to the commercial website, some users need to know specific information about the items for sale in order to compare and make decisions before making a transaction. As a result, users also need to access and search for the information they need from the website. This becomes the users' secondary or supporting goal.

Since users may employ several goals at the same time either simultaneously or sequentially, it is important for the websites to be aware of the differences in these user goals. Each website needs to position and demonstrate its characteristics clearly as an information-driven website, service-driven website, task or activity-driven website or a combination of these attributes. However, to be able to anticipate users' search behaviors properly, user goals need to be considered together with user modes of searching and different types of user models. These are discussed in the following sections.

Similar to user goal, users approach a website with different timeframe, context and situation. They also have different levels of determination or specification of what they need. Some users may know precisely what they need, while others may only have a vague idea. Since these different search modes help transform a particular user goal into various intentions, as well as influence user search strategies and search behaviors, it is necessary to recognize and distinguish their characteristics. A current study (Rosenfeld and Morville, 1998) has categorized users' different modes of searching as exploratory searching, existence searching, known-item searching and comprehensive searching. In the previous research paper (Sawasdichai, 2002), user modes of searching has been extended to include topical searching which falls between existence and know-item searching (*see figure 5*).

Based on Rosenfeld and Morville's model, user modes of searching are further investigated in this study in order to establish the classification of these searching modes. By considering the differences in users' needs and their characteristics, user modes of searching can be primarily differentiated by three substantial factors: 1) specification or determination of user needs, 2) urgency, 3) user contribution to the search task (*see figure 6*).

USER MODES OF SEARCHING

Websites	User primary goals	User secondary goals	Possible user intentions (what to do to achieve the goals, varied by user modes of searching)
Entertainment website	<ul style="list-style-type: none"> Engaging in an activity for personal enjoyment (use website as an alternative means to fulfill personal interest) 		<ul style="list-style-type: none"> Seeking an interesting topic or activity, engage in the activity on-line Seeking an interesting topic or activity, record or download for later use Seeking an interesting topic or activity, engage in the activity on-line, and save to continue or re-visit later Coming back or re-visit the interesting topic or the saved activity to continue playing or reviewing
Community website: Community of interest	<ul style="list-style-type: none"> Socializing, making connection or getting in touch with others who share the same or similar interests (use website as an alternative communication channel) 		<ul style="list-style-type: none"> Seeking an interesting topic, and engage in chatting or sharing information
	<ul style="list-style-type: none"> Seeking advice, information (use website as an alternative channel to access information) <ul style="list-style-type: none"> to fulfill specific inquiry to compare and / or make decision 	<ul style="list-style-type: none"> Socializing, making connection or getting in touch with others who share the same or similar interests (use website as an alternative communication channel) 	<ul style="list-style-type: none"> Seeking a specific topic or group of people who might be able to offer an advice, and engage in chatting or sharing information Seeking needed information in the community database
Community website: Community of practice	<ul style="list-style-type: none"> Socializing, making connection, getting in touch or making something together with others who are in the same practice (may be following a process or event). (use website as an alternative communication channel) Seeking advice, information (use website as an alternative channel to access information) <ul style="list-style-type: none"> to fulfill specific inquiry to compare and / or make decision 	<ul style="list-style-type: none"> Socializing, making connection or getting in touch with others who share the same or similar interests (use website as an alternative communication channel) 	<ul style="list-style-type: none"> Seeking for the interested topic, and engage in chatting or sharing information Seeking a specific topic or group of people who might be able to offer advice and engage in chatting or sharing information Seeking needed information in the community database
Community website: Community of transaction (market)	<ul style="list-style-type: none"> Engaging in a buying / selling activities (use website as an alternative mean to perform specific tasks) 	<ul style="list-style-type: none"> Seeking specific information about the merchandise / service Comparing and/or making decision (use website as an alternative channel to access information) 	<ul style="list-style-type: none"> Making transaction or engaging in buying / selling activity only (may be first time or routinely done) Seeking information about an interesting item, then engaging in buying / selling activity Seeking information about an interesting item, compare and make decision, then engage in buying / selling activity Seeking information about an interesting item to compare and/or make decision, but engage in buying / selling activity somewhere else Seeking information about an interesting item, record or save to compare and make decision later or for later use

FIGURE 4.2
Generic User Goals in
Different Kinds of
Website (continued)

Known-item searching	Comprehensive searching	Topical searching	Existence searching	Exploratory searching
Users know exactly or specifically what they want. The answer is definite. There is only one answer.	Users know exactly or specifically what they want. However, they want to know all relevant or related answers that stay within the intended boundary.	Users certainly know what they want quite specifically, but don't know the name or term to identify it correctly, or where it is likely to be found. The answers will be very limited to a certain boundary.	Users know what they want in general, but not specifically. They may have an abstract idea of what they want, but don't know if it exists. The answer can be varied and flexible, but limited or restrained within a certain boundary.	Users don't know exactly or specifically what they want. They have a vague idea of their needs. The answer will be varied and open-ended.

FIGURE 5
User Modes of Searching (Modified from the original classification by Rosenfeld and Morville, 1998)

The specification or determination of user needs may be distinguished as five sequential levels as follows:

Definitely conclusive

User needs are certainly determined. They know exactly or specifically what they want and look for a definite answer.

Expansively conclusive

User needs are conclusive. They know exactly or specifically what they want. However, they look for extensive answers. They want to know all relevant or related answers that stay within the intended boundary.

Specifically confined

User needs are well defined. They certainly know what they want quite specifically, but don't know the name or term to identify it correctly, or where it likely to be found. The answers can be varied, but will be very limited in a definite boundary.

Generally confined

User needs are generally defined. They know what they want in general, but not specifically. They may have an abstract idea of what they want, but don't know if it actually exists. The answer can be varied and flexible, but limited or restrained within a certain boundary.

Indistinct

User needs are vague and undetermined. They don't know exactly or specifically what they want. The answer will be varied and open-ended.

The urgency of user needs may be divided into three levels as follows:

Extreme

Urgency is extreme. They need to fulfill their goals immediately. They search for the expected answer and find the quickest way to complete their task.

Moderate

Urgency is moderate. They are working in a certain timeframe. In the beginning, they browse for various answers, experiment with methods or try other alternative ways to achieve their goals. Later, they search seriously in order to meet the expected timeframe.

None

There is no urgency. User goals can be fulfilled anytime, depending on their satisfaction. They explore for various answers, experiment with methods or try other ways to fulfill their goals. Their search ends when they feel satisfied with the results or answers they retrieve.

User contribution to search task can be constrained in terms of available time (both duration and frequency) and effort contributed (*see figure 6*). In terms of time, the user contribution may be divided into three levels as follows:

Long

Users are willing to spend a long period of time for searching.

Moderate

Users are willing to spend a reasonable period of time for searching.

Short

Users are willing to spend only a short period of time for searching.

In term of frequency, user contribution may be differentiated in three categories:

Several times

Users are willing to come back to search several times until their goals are completely met, or when they feel satisfied with the results.

Limited times

Users are willing to come back to search a limited number of times. They want their goals met as soon as possible.

Once

Users don't want to come back to search again.

Lastly, in term of user effort, user contribution falls into three levels:

Much

Users are willing to put much effort in their search. They persevere and don't give up easily, even when they experience trouble.

Moderate

Users are willing to put some effort in their search. They tend to persevere to find the expected answers, but only in a reasonable period of time.

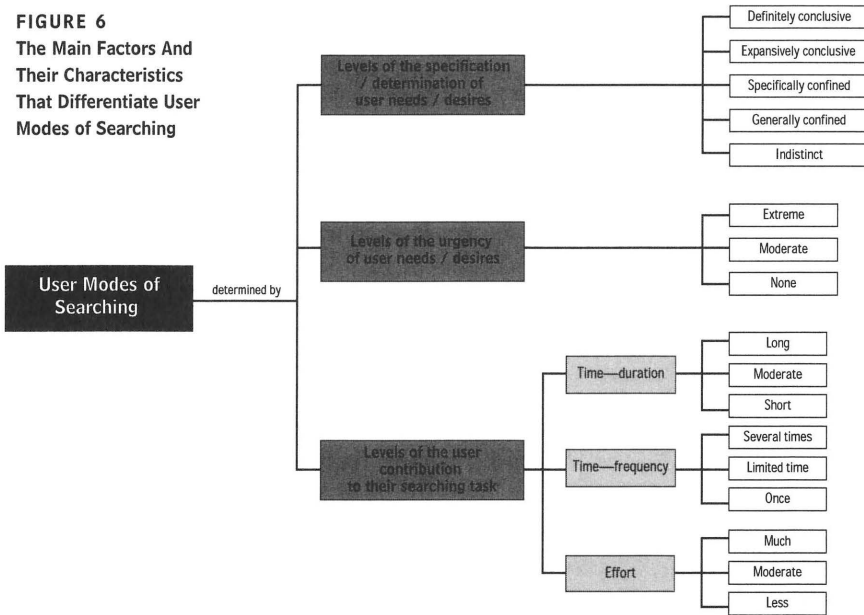
Less

Users are willing to put only a little effort in their search. They give up easily if they can't find what they want or feel unsatisfied or frustrated.

When considering all of these factors simultaneously, there are twelve categories of user searching modes identified from this cross-analysis. These categories include intensive, limited or extensive cases of known-item, comprehensive, topical, existence and exploratory searching respectively (*see figure 7*). Moreover from this cross-analysis, the levels of user contribution to their search (the third factor) generally illustrate the urgency of user needs. Users who arrive with urgency to fulfill their needs will spend only a short time for their search. Goals must be met within one search. If frustrated, they will leave the website, and instead try to find other ways to fulfill their goals.

Significantly, these modes of searching change from time-to-time depending on the situation that unfolds while users perform their search or upon the retrieval results they found. Generally, users move from general, open-ended modes to more specific and confined ones once they retrieve information that helps them to frame their search. Users who start from an open-ended mode need to find sufficient information to help them limit and refine their search; then they move up to a more confined mode before their goals can be completely reached. On the other hand, users who start from a confined mode can reach their goals more quickly since they already know what they are looking for; their search terrain is limited and well defined. As a result, users who arrive with an open-ended mode of searching usually spend more time for searching and collecting information than those who begin with a more confined mode.

FIGURE 6
The Main Factors And
Their Characteristics
That Differentiate User
Modes of Searching



Furthermore, since user modes of searching influence how users determine their search strategies and methods when they move from one mode to another, their search strategies and search methods change accordingly. For example, users with a confined mode of searching, who know exactly what they want, normally perform their search in a particular domain and find that a simple alphabetical index can be a powerful search tool. On the contrary, those who have only a vague idea of what they are looking for usually prefer browsing through various categories and find the alphabetical index completely useless. Instead, a simple table of contents, systematically categorized, is more accessible and useful. Consequently, web developers can help ease users' search tasks by recognizing these factors and offering various search tools that are suitable to user modes, strategies and methods in order to increase search success.

Besides user goals and their modes of searching, users also approach a website with varied profiles including knowledge, skills, experience, backgrounds, capabilities, limitations, resources, roles, environments, attitudes, values, interests and needs, which lead to extensive variations in user search behavior—how they actually perform their search with different actions. Since these characteristic differences of users significantly influence how a particular user intention alternatively transforms into various courses of action (patterns of user search behaviors), it is important to understand and categorize these differences into distinctive types of user models. This will clarify user search behaviors. User models can be established based on user analysis data, including demographic, psychographic and technographic data, and then categorized into particular groups of users.

User demographic data may include the following categories: **1** user ethnic background and origin such as culture, country of origin and native language, **2** general knowledge, skill and experience such as education, ability to read a certain language, reading grade level and occupation, **3** physical capability and limitation such as gender, age and disability, **4** resource and economic status, **5** social role, **6** contextual and environmental surrounding such as region or country of residence.

Psychographic data may concern the following categories: **1** user response to external stimuli, **2** problem-solving skill, **3** learning skill, **4** memory, **5** emotion, **6** judgment, **7** concentration, **8** attention span, **9** effort, **10** motivation, **11** expectation, **12** attitude, **13** value, **14** interest.

Technographic data may involve the following categories: **1** computer/internet sophistication such as type of computer or speed of internet connection, **2** computer/internet literacy such as amount of time spent or frequency of use, **3** website interface familiarity such as first-time, return, or regular user, **4** task-specific skill and experience such as amount of time, frequency and method of acquiring skill and experience, **5** content/domain-specific knowledge and depth and breadth of the specific knowledge/skill and method of acquiring knowledge and skill.

Each of these user characteristics alters the process of website design differently. Some may provide major impact on the design during the process of identifying,

Specification / determination of user needs

	Definitely conclusive	Expansively conclusive	Specifically confined	Generally confined	Indistinct	
Urgency of user needs	Extreme Intensive known-item searching Users know exactly or specifically what they want. The answer is definite. There is only one answer. Users need to fulfill their goals immediately. They tend to search for an answer seriously. They try to find the quickest way to complete their tasks and achieve their goals. Users are willing to spend only short period of time, and want their goal to be met in one search. They tend to give up easily.	Intensive comprehensive searching Users know exactly or specifically what they want. However, they want to know all relevant or related answers that stay within the intended boundary. Users need to fulfill their goals immediately. They tend to search for an answer seriously. They try to find the quickest way to complete their tasks and achieve their goals. Users are willing to spend only short period of time, and want their goal to be met in one search. They tend to give up easily.	Intensive topical searching Users certainly know what they want quite specifically, but don't know the name or term to identify it correctly, or where it likely to be found. The answers will be very limited in a certain boundary. Users need to fulfill their goals immediately. They tend to search for an answer seriously. They try to find the quickest way to complete their tasks and achieve their goals. Users are willing to spend only short period of time, and want their goal to be met in one search. They tend to give up easily.	Intensive existence searching Users know what they want in general, but not specifically. They may have an abstract idea of what they want, but don't know if it exists. The answer can be varied and flexible, but limited or restrained within a certain boundary. Users need to fulfill their goals immediately. They tend to search for an answer seriously. They try to find the quickest way to complete their tasks and achieve their goals. Users are willing to spend only short period of time, and want their goal to be met in one search. They tend to give up easily.	Intensive exploratory searching Users don't know exactly or specifically what they want. They have a vague idea of their needs. The answer will be varied and open-ended. Users need to fulfill their goals immediately. They tend to search for an answer seriously. They try to find the quickest way to complete their tasks and achieve their goals. Users are willing to spend only short period of time, and want their goal to be met in one search. They tend to give up easily.	Time : Short + Frequency : Once + Effort : Less
	Moderate Limited known-item searching Users know exactly or specifically what they want. The answer is definite. There is only one answer. Users need to fulfill their goals in a certain timeframe. In the beginning, they tend to browse for various answers, experiment with several methods, or may try other alternative ways to achieve their goals. Later, they will search more seriously in order to meet the timeframe. Users are willing to spend a reasonable period of time, or come back to search for a few times. They tend to persevere at reasonable level.	Limited comprehensive searching Users know exactly or specifically what they want. However, they want to know all relevant or related answers that stay within the intended boundary. Users need to fulfill their goals in a certain timeframe. In the beginning, they tend to browse for various answers, experiment with several methods, or may try other alternative ways to achieve their goals. Later, they will search more seriously in order to meet the timeframe. Users are willing to spend a reasonable period of time, or come back to search a few times. They tend to persevere at reasonable level.	Limited topical searching Users certainly know what they want quite specifically, but don't know the name or term to identify it correctly, or where it likely to be found. The answers will be very limited in a certain boundary. Users need to fulfill their goals in a certain timeframe. In the beginning, they tend to browse for various answers, experiment with several methods, or may try other alternative ways to achieve their goals. Later, they will search more seriously in order to meet the timeframe. Users are willing to spend a reasonable period of time, or come back to search for a few times. They tend to persevere at reasonable level.	Limited existence searching Users know what they want in general, but not specifically. They may have an abstract idea of what they want, but don't know if it exists. The answer can be varied and flexible, but limited or restrained within a certain boundary. Users need to fulfill their goals in a certain timeframe. In the beginning, they tend to browse for various answers, experiment with several methods, or may try other alternative ways to achieve their goals. Later, they will search more seriously in order to meet the timeframe. Users are willing to spend a reasonable period of time, or come back to search for a few times. They tend to persevere at reasonable level.	Limited exploratory searching Users don't know exactly or specifically what they want. They have a vague idea of their needs. The answer will be varied and open-ended. Users need to fulfill their goals in a certain timeframe. In the beginning, they tend to browse for various answers, experiment with several methods, or may try other alternative ways to achieve their goals. Later, they will search more seriously in order to meet the timeframe. Users are willing to spend a reasonable period of time, or come back to search for a few times. They tend to persevere at reasonable level.	Time : Moderate + Frequency : Limited + Effort : Moderate
	None Extensive known-item searching Users know exactly or specifically what they want. The answer is definite. There is only one answer. User goals can be fulfilled anytime, depend on their satisfaction. They tend to explore for various answers, experiment with several methods, or try other alternative ways to fulfill their goals. They will end their search when they feel satisfied. Users are willing to spend a long period of time, and may come back to search for several times. They tend to persevere and being persistent.	Extensive comprehensive searching Users know exactly or specifically what they want. However, they want to know all relevant or related answers that stay within the intended boundary. User goals can be fulfilled anytime, depend on their satisfaction. They tend to explore for various answers, experiment with several methods, or try other alternative ways to fulfill their goals. They will end their search when they feel satisfied. Users are willing to spend a long period of time, and may come back to search for several times. They tend to persevere and being persistent.	Extensive topical searching Users certainly know what they want quite specifically, but don't know the name or term to identify it correctly, or where it likely to be found. The answers will be very limited in a certain boundary. User goals can be fulfilled anytime, depend on their satisfaction. They tend to explore for various answers, experiment with several methods, or try other alternative ways to fulfill their goals. They will end their search when they feel satisfied. Users are willing to spend a long period of time, and may come back to search for several times. They tend to persevere and being persistent.	Extensive existence searching Users know what they want in general, but not specifically. They may have an abstract idea of what they want, but don't know if it exists. The answer can be varied and flexible, but limited or restrained within a certain boundary. User goals can be fulfilled anytime, depend on their satisfaction. They tend to explore for various answers, experiment with several methods, or try other alternative ways to fulfill their goals. They will end their search when they feel satisfied. Users are willing to spend a long period of time, and may come back to search for several times. They tend to persevere and being persistent.	Extensive exploratory searching Users don't know exactly or specifically what they want. They have a vague idea of their needs. The answer will be varied and open-ended. User goals can be fulfilled anytime, depend on their satisfaction. They tend to explore for various answers, experiment with several methods, or try other alternative ways to fulfill their goals. They will end their search when they feel satisfied. Users are willing to spend a long period of time, and may come back to search for several times. They tend to persevere and being persistent.	Time : Long + Frequency : Severeal + Effort : Much

Contribution of user to search task

collecting, organizing and structuring information, while others may influence the process of formatting information, as well as determining the appearance—look and feel of a particular website (see figure 8.1 and 8.2).

However, to establish the classification of user models, this study particularly focuses on users' personal and prior knowledge, their skill and experience in the specific content or domain they are searching or their performance of intended tasks, their familiarity with a particular website interface, as well as their ability to operate a personal computer and use the internet. These categories are relatively new compared to other typical demographic and psychographic data. However, these areas provide the most impact on users' search behaviors and their success in searching and/or performing a task in web-based media. Based on users' demographic and technographic profiles, these categories can be defined as follows:

1. Users' knowledge and skill in the specific content or domain they are searching—concerned with different levels of users' prior knowledge and skill with the particular contents as well as their ability to understand terminology and classification generally used in that domain.
2. Users' skill and experience in the particular task they are performing—concerned with different levels of users' prior skill and experience in performing the intended task, either in the particular environment such as performing task on internet, or in other environments. This includes users' ability to transfer prior skill and experience to perform the same or similar task in the new setting.
3. Users' experience or familiarity with the particular website interface—concerned with different levels of users' experience with the interface of a particular website, including accuracy and details of users' cognitive map of website structure, which is built from users' prior experience in that particular environment.
4. Users' computer and internet literacy—concerned with different levels of users' general knowledge, skill, experience about computer and internet use, including their ability to operate a personal computer,

	Classification approaches			Impact to design process			
	Demographic data	Psychographic data	Technographic data	Identifying and collecting information	Organizing and structuring information	Formating information	Appearance, look and feel
Response to external stimuli		●				●	●
Problem-solving skill		●			●		
Learning skill		●			●	●	
Memory		●			●	●	
Emotion		●					●
Judgement		●		●			●
Concentration		●			●	●	
Attention span		●			●	●	
Effort		●			●	●	
Motivation		●		●		●	●
Expectation		●		●	●	●	●
Interest		●		●			●
Attitude		●		●			●
Value		●		●			●
Computer sophistication							
• Type of computer used/owned			●		●	●	
• Type of internet connection			●		●	●	
Computer/internet literacy							
• Amount of time spent			●		●	●	
• Frequency of use			●		●	●	
• Method of acquiring knowledge			●		●	●	
Website interface familiarity							
• Amount of time spent at a time			●		●	●	
• Frequency of use			●		●	●	

FIGURE 8.1 (top)

Types of User

Characteristics and Their Different Impacts on Website Design

Process

FIGURE 8.2 (bottom)

Types of User

Characteristics and Their Different Impacts on Website Design Process

(continued)

	Classification approaches			Impact to design process			
	Demographic data	Psychographic data	Technographic data	Identifying and collecting information	Organizing and structuring information	Formating information	Appearance, look and feel
User characteristics							
Physical capabilities / limitation							
• Gender	●						●
• Age	●						●
• Disability	●						
General knowledge/skill							
• Education	●				●		
• Occupation	●				●		●
• Ability to read certain language	●				●		●
• Reading grade level	●				●	●	●
Background/origin							
• Culture	●	●			●		●
• Country of origin	●				●		●
• Native language	●				●		●
Resource/lifestyle/environment							
• Country of residence	●				●		●
• Region	●				●		●
• Economic status	●				●		●
• Social role	●	●			●		●
Task-specific skill/experience							
• Amount of time spent	●				●	●	●
• Frequency of performing task	●				●	●	●
• Method of acquiring knowledge	●				●	●	●
Content/domain-specific knowledge/skill							
• Depth and breadth	●				●	●	●
• Method of acquiring knowledge	●				●	●	●

connect and use internet, ability to perform their intended tasks via the internet, as well as ability to solve basic technical problems regarding computer or internet uses.

All of these categories should be taken into design consideration since they provide major impact on the processes of organizing, structuring and formatting information for a website (*see figure 8.1 and 8.2*). Especially the first two categories: users' knowledge/skill in specific content/domain and users' skill/experience in specific task performance, show considerable impact upon the processes of identifying and collecting information as well (*see figure 8.1*).

Users' knowledge and skill in specific content or domain divides into four levels:

Novice

Users have no prior knowledge about the particular content or domain they are searching. They are not familiar with terminology and classification generally used in the content.

Learner

Users have some prior knowledge about the content or domain they are searching. They may gain their knowledge and skill from previous reading or second-hand experience. They are at a basic level familiar with terminology and classification used in the content.

Advanced learner

Users have good prior knowledge of content or domain from first-hand experience and previous reading. They are familiar with terminology and classification used in the content.

Professional

Users have very good prior knowledge of content or domain from their education, occupation or practice, where they are properly educated or trained. They are very skilled in using the terminology and classification.

Users' skill and experience in performing a particular task, is usually related and in direct proportion to users' knowledge and skill in specific content or domain.

This divides into four levels as follows:

Novice

Users have no skill and experience with the task they need to perform. They don't know how to begin and are unable to perform the task efficiently.

Trainee

Users have some skill and experience with the task they need to perform. They may do it occasionally and can complete the task nicely.

Experienced trainee

Users have good skill and experience with the task they need to perform. They may often do it and can complete the task efficiently.

Professional

Users have very good prior skill and experience with the intended task they need to perform. They may perform regularly and are able to complete the task very efficiently.

Users' experience or familiarity with a particular website interface may be divided into three levels as follows:

First-time user

Users are unfamiliar with the system and website interface, which prevents them from navigating effectively. They don't know where to begin or what information resides in each menu or category.

Return user

Users are somewhat familiar with the system and website interface. They are able to navigate effectively. They are certain where to begin and generally know what information resides in different menus or categories.

Regular user

Users are well familiar with the system and website interface, which makes them navigate very effectively. They are certain where to begin and know very well what information resides in different menus or categories.

Users' computer and internet literacy may be divided into four levels as follows:

Novice

Users are unable to use computer and internet in any way. They know nothing regarding computer operation and internet use.

Beginner

Users are able to use the computer and internet at a basic level. They know how to operate a personal computer and use the internet in general. They may use the computer and internet occasionally.

Advanced user

Users are able to use computer and internet well. They know how to operate a personal computer and use the internet efficiently, or have much experience. They may use computer and internet quite often.

Expert

Users are able to use computer and internet very well. They are well informed about computer operation and internet use, or have extensive experience from proper training in their education, occupation or practice. They use the computer and internet regularly.

The first two categories: users' knowledge in specific content or domain and users' skill and experience in particular task, are both concerned with users' prior knowledge, skill and experience acquired over time, either through self development or proper training. They are usually related and demonstrate a direct proportion to one another. As a result, in this study, these two categories are considered together and are combined as one category when performing cross-analysis. Simultaneously considering all four selected categories of user characteristics, to their fullest extent, provides thirty different user models. These user models include first-time, return and regular users with different levels of knowledge, skill and experience in a particular domain, as well as different levels in computer and internet use (see figure 9.1, 9.2 and 9.3). However, novice users, those without computer and internet literacy, are not included in this study.

In a particular website design, only some of these models, considered by the website (client) as the intended audience, should be covered and thoughtfully investigated with regard to user goals and possible modes of searching. Some websites may implement a system that serves only one particular group of users, while others may want to include as many groups as possible. To determine which models of users should be included, the web developer needs to examine the website (client) intentions and the possible extent of the website. Significantly, the variations of user models covered in a website may change over time, when the website (client) decides to limit or expand its extent. If so, the user models need to be reconsidered as well.

**APPLIED
ANALYTIC
FRAMEWORK:
ANALYSIS AND
SYNTHESIS**

The analytic framework demonstrated earlier in this study (*see figure 3*) can be used to help systematically analyze several factors essential to website design, including users' generic goals, user modes of searching and user models. By using the proposed framework, these essential factors can be analyzed step-by-step to assist user intentions, user search strategies, user search methods, as well as user courses of actions. This analysis helps web developers to foresee problems that may occur in different cases. The framework can be further used to help synthesize the results from analysis in order to understand and summarize user needs and user search behaviors. This synthesis helps determine and present the appropriate kinds, formats and amount of information and functions needed to be included in a particular website based on different types of user models and cognitive factors.

To apply the proposed framework, the extent of a website needs to be defined clearly. This includes website (client) goals, expected or intended users (selected user models), user goals and user modes of searching. When analyzing these factors systematically, the analytic framework will help predict possible user intentions, search strategies, search methods, courses of action, as well as foreseeing different kinds of problems that may occur with various groups of users. Initially, user generic goals need to be clarified. Next, based on user goals, user intentions are drawn out in accordance with potential modes of searching. These illustrate what tasks users decide to do, based on their current modes of searching in order to achieve or come closer to their original goals. Additionally, user search strategies

User Models	with beginning level of computer and internet literacy	with advanced level in computer and internet literacy	with professional level in computer and internet literacy
Novice (knowledge/skill in the content and intended task)	First-time user, totally unfamiliar with the interface Knows nothing about the content Has no skill or experience in the intended task	First-time user, totally unfamiliar with the interface Knows nothing about the content Has no skill or experience in the intended task	First-time user, totally unfamiliar with the interface Knows nothing about the content Has no skill or experience in the intended task
First-time user (familiarity in the particular website interface)	Knows something and has some experience with computer or internet—occasional use	Knows a lot of things and has good experience with computer or internet—often use	Knows very well and has extensive experience from training in education or occupation—regular use
Learner (knowledge/skill in the content and intended task)	First-time user, totally unfamiliar with the interface Knows the content from reading, story telling or second-hand experience	First-time user, totally unfamiliar with the interface Knows the content from reading, story telling or second-hand experience	First-time user, totally unfamiliar with the interface Knows the content from reading, story telling or second-hand experience
First-time user (familiarity in the particular website interface)	Has some skill or experience in the intended task—occasional performing Knows something and has some experience with computer or internet—occasional use	Has some skill or experience in the intended task—occasional performing Knows a lot of things and has good experience with computer or internet—often use	Has some skill or experience in the intended task—occasional performing Knows very well and has extensive experience from training in education or occupation—regular use
Advanced learner (knowledge/skill in the content and intended task)	First-time user, totally unfamiliar with the interface Knows the content well from reading and first-hand experience	First-time user, totally unfamiliar with the interface Knows the content well from reading and first-hand experience	First-time user, totally unfamiliar with the interface Knows the content well from reading and first-hand experience
First-time user (familiarity in the particular website interface)	Has good skill or experience in the same task—often performing Knows something and has some experience with computer or internet—occasional use	Has good skill or experience in the same task—often performing Knows a lot of things and has good experience with computer or internet—often use	Has good skill or experience in the same task—often performing Knows very well and has extensive experience from training in education or occupation—regular use
Professional (knowledge/skill in the content and intended task)	First-time user, totally unfamiliar with the interface Knows the content very well from education or occupation	First-time user, totally unfamiliar with the interface Knows the content very well from education or occupation	First-time user, totally unfamiliar with the interface Knows the content very well from education or occupation
First-time user (familiarity in the particular website interface)	Has very good skill or experience in the intended task from training in education or occupation—regular performing Knows something and has some experience with computer or internet—occasional use	Has very good skill or experience in the intended task from training in education or occupation—regular performing Knows a lot of things and has good experience with computer or internet—often use	Has very good skill or experience in the intended task from training in education or occupation—regular performing Knows very well and has extensive experience from training in education or occupation—regular use

FIGURE 9.1
 Thirty Categories of User Models Emerged from Cross-Analysis of Users' Characteristic Differences

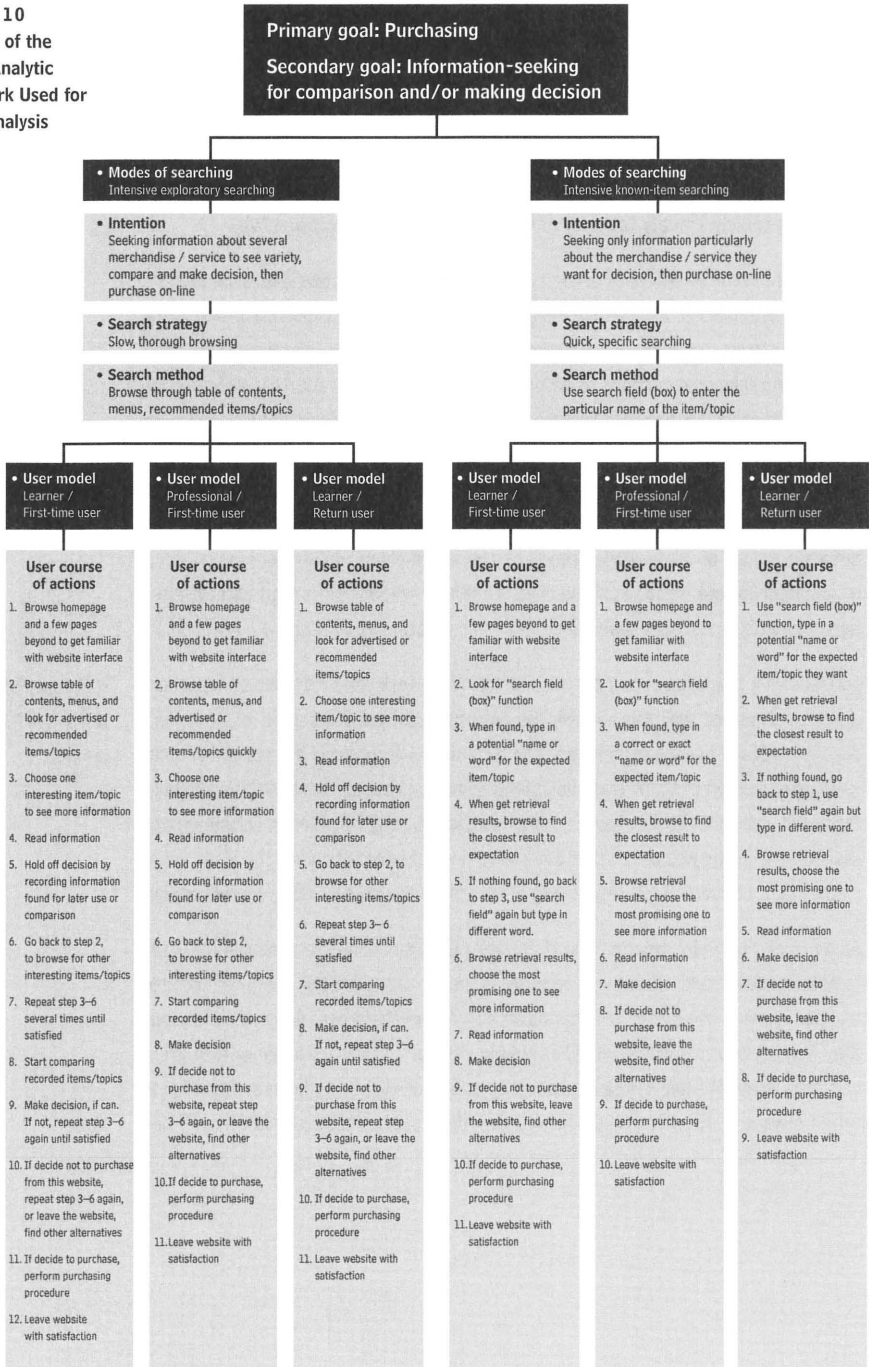
User Models	with beginning level of computer and internet literacy	with advanced level in computer and internet literacy	with professional level in computer and internet literacy
<p>Learner (knowledge/skill in the content and intended task)</p> <p>Return user (familiarity in the particular website interface)</p>	<p>Return user, somewhat familiar with the interface</p> <p>Knows the content from reading, story telling or second-hand experience</p> <p>Has some skill or experience in the intended task—occasional performing</p> <p>Knows something and has some experience with computer or internet—occasional use</p>	<p>Return user, somewhat familiar with the interface</p> <p>Knows the content from reading, story telling or second-hand experience</p> <p>Has some skill or experience in the intended task—occasional performing</p> <p>Knows a lot of things and has good experience with computer or internet—often use</p>	<p>Return user, somewhat familiar with the interface</p> <p>Knows the content from reading, story telling or second-hand experience</p> <p>Has some skill or experience in the intended task—occasional performing</p> <p>Knows very well and has extensive experience from training in education or occupation—regular use</p>
<p>Advanced learner (knowledge/skill in the content and intended task)</p> <p>Return user (familiarity in the particular website interface)</p>	<p>Return user, somewhat familiar with the interface</p> <p>Knows the content well from reading and first-hand experience</p> <p>Has good skill or experience in the same task—often performing</p> <p>Knows something and has some experience with computer or internet—occasional use</p>	<p>Return user, somewhat familiar with the interface</p> <p>Knows the content well from reading and first-hand experience</p> <p>Has good skill or experience in the same task—often performing</p> <p>Knows a lot of things and has good experience with computer or internet—often use</p>	<p>Return user, somewhat familiar with the interface</p> <p>Knows the content well from reading and first-hand experience</p> <p>Has good skill or experience in the same task—often performing</p> <p>Knows very well and has extensive experience from training in education or occupation—regular use</p>
<p>Professional (knowledge/skill in the content and intended task)</p> <p>Return user (familiarity in the particular website interface)</p>	<p>Return user, somewhat familiar with the interface</p> <p>Knows the content very well from education or occupation</p> <p>Has very good skill or experience in the intended task from training in education or occupation—regular performing</p> <p>Knows something and has some experience with computer or internet—occasional use</p>	<p>Return user, somewhat familiar with the interface</p> <p>Knows the content very well from education or occupation</p> <p>Has very good skill or experience in the intended task from training in education or occupation—regular performing</p> <p>Knows a lot of things and has good experience with computer or internet—often use</p>	<p>Return user, somewhat familiar with the interface</p> <p>Knows the content very well from education or occupation</p> <p>Has very good skill or experience in the intended task from training in education or occupation—regular performing</p> <p>Knows very well and has extensive experience from training in education or occupation—regular use</p>

FIGURE 9.2
Thirty Categories of User Models Emerged from Cross-Analysis of Users' Characteristic Differences (continued)

User Models	with beginning level of computer and internet literacy	with advanced level in computer and internet literacy	with professional level in computer and internet literacy
<p>Learner (knowledge/skill in the content and intended task)</p> <p>Regular user (familiarity in the particular website interface)</p>	<p>Regular user, well familiar with the interface</p> <p>Knows the content from reading, story telling or second-hand experience</p> <p>Has some skill or experience in the intended task—occasional performing</p> <p>Knows something and has some experience with computer or internet—occasional use</p>	<p>Regular user, well familiar with the interface</p> <p>Knows the content from reading, story telling or second-hand experience</p> <p>Has some skill or experience in the intended task—occasional performing</p> <p>Knows a lot of things and has good experience with computer or internet—often use</p>	<p>Regular user, well familiar with the interface</p> <p>Knows the content from reading, story telling or second-hand experience</p> <p>Has some skill or experience in the intended task—occasional performing</p> <p>Knows very well and has extensive experience from training in education or occupation—regular use</p>
<p>Advanced learner (knowledge/skill in the content and intended task)</p> <p>Regular user (familiarity in the particular website interface)</p>	<p>Regular user, well familiar with the interface</p> <p>Knows the content well from reading and first-hand experience</p> <p>Has good skill or experience in the same task—often performing</p> <p>Knows something and has some experience with computer or internet—occasional use</p>	<p>Regular user, well familiar with the interface</p> <p>Knows the content well from reading and first-hand experience</p> <p>Has good skill or experience in the same task—often performing</p> <p>Knows a lot of things and has good experience with computer or internet—often use</p>	<p>Regular user, well familiar with the interface</p> <p>Knows the content well from reading and first-hand experience</p> <p>Has good skill or experience in the same task—often performing</p> <p>Knows very well and has extensive experience from training in education or occupation—regular use</p>
<p>Professional (knowledge/skill in the content and intended task)</p> <p>Regular user (familiarity in the particular website interface)</p>	<p>Regular user, well familiar with the interface</p> <p>Knows the content very well from education or occupation</p> <p>Has very good skill or experience in the intended task from training in education or occupation—regular performing</p> <p>Knows something and has some experience with computer or internet—occasional use</p>	<p>Regular user, well familiar with the interface</p> <p>Knows the content very well from education or occupation</p> <p>Has very good skill or experience in the intended task from training in education or occupation—regular performing</p> <p>Knows a lot of things and has good experience with computer or internet—often use</p>	<p>Regular user, well familiar with the interface</p> <p>Knows the content very well from education or occupation</p> <p>Has very good skill or experience in the intended task from training in education or occupation—regular performing</p> <p>Knows very well and has extensive experience from training in education or occupation—regular use</p>

FIGURE 9.3
Thirty Categories of User Models Emerged from Cross-Analysis of Users' Characteristic Differences (continued)

FIGURE 10
Examples of the
Applied Analytic
Framework Used for
Design Analysis



and methods can be defined based on their search mode. After user intentions, search strategies and methods are identified, user course of action (detailed task descriptions) is described according to various kinds of user model. Besides the differences in search mode, users also arrive with different levels in knowledge, skill and experience. As a result, each group of users will refine their search and perform tasks differently. The traditional task analysis method can be applied at this stage to help identify tasks by different user groups (*see figure 10*).

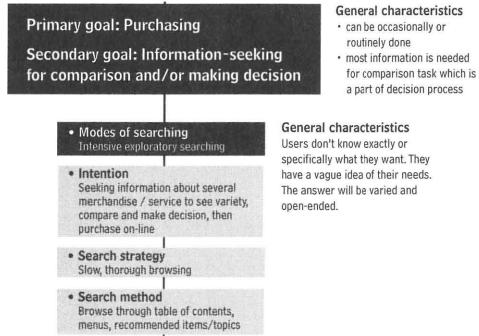
The results from the analysis can be synthesized to help understand user needs, the main characteristics of their search behavior, time spent, and problems they experience. Different patterns of user course of action are considered with user intentions, user search strategies and methods to uncover major differences in search characteristics and search problems among various groups of users. Accordingly, the synthesis can help determine the kinds, formats and amount of information, as well as the features or functions that should be present on a particular website to help users complete their tasks more successfully. Some information and functions may be shared among different groups of users, while others may be specifically helpful to only a particular group. Appropriate functions, as well as a suitable amount of formatted information compatible with user tasks and needs are identified (*see figure 11.1 and 11.2*).

The following examples show how the analytic framework can be applied as a part of a design analysis and synthesis process. The analysis helps web developers to understand different types of users and their cognitive factors, and accordingly assist them to anticipate user courses of action (task descriptions) more precisely since all the cognitive factors that regulate user behaviors have been deliberately considered. Consequently, the synthesis helps web developers determine kinds of information and function needed by the intended users. These results help in both planning and evaluating website design.

As more and more information and task-performing functions are available for users to access, search and use through web-based media, users become more comfortable and confident to use these websites as an alternative channel to access information they need, perform specific tasks, or simply use for personal enjoyment. Search capability in a website becomes increasingly essential. However, the search functions aren't always sufficient to help users realize their goals. These problems can't be

**CONCLUSION
AND FURTHER
STUDY**

FIGURE 11.1
Examples of the
Applied Analytic
Framework Used for
Design Synthesis



		User models		
		Learner (content) / First-time user	Professional (content) / First-time user	Learner (content) / Return user
Main characteristics	Users need to make 2 kinds of decisions <ul style="list-style-type: none"> • Selective-decision—to choose from variety of items or topics from available information or retrieval results in order to select the direction they want to pursue further. • Determined-decision—to make final decision about something based on the information they found to decide if they want to take further action or not. 			
Information needed	<ol style="list-style-type: none"> 1) variety of items or topics 2) detail descriptions of the selected item or topic 			
Main problems	<ol style="list-style-type: none"> 1) Location finding, Determining starting point —users are unable to identify starting point due to too much information on a page. 2) Understanding classification of the contents determined by website —users are unable to anticipate the contents in each category or menu on website, or don't know what is to expect beyond those categories, or unable to match their own classification of the contents to those of website. 3) Interpreting retrieval results and filtering out irrelevant information or items —users are unable to interpret retrieval results, and unable to anticipate the contents in each retrieval result, or don't know what to expect beyond those links. Accordingly they are unable to filter out the irrelevant topics or items. 			
Time-spending needed	<ol style="list-style-type: none"> 1) more time browsing categories 2) more time browsing variety and reading detail descriptions for making both selective and final decisions—slow decision cycles 	<ol style="list-style-type: none"> 1) less time browsing categories 2) less time browsing variety and reading detail descriptions for making both selective and final decisions—faster decision cycles 	<ol style="list-style-type: none"> 1) less time browsing categories 2) more time browsing variety and reading detail descriptions for making both selective and final decisions—slow decision cycles 	
Features / functions needed	<ul style="list-style-type: none"> • introduction • recommendation / advertising • glossary • rating / reviews 	<ul style="list-style-type: none"> • introduction • recommendation / advertising • glossary • rating / reviews 	<ul style="list-style-type: none"> • introduction • recommendation / advertising • glossary • rating / reviews 	
		<ul style="list-style-type: none"> • site map • comparison tool • preview • keyword search • bullet points / summary information • extensive table of contents / menu 		

These characteristics will be different in accordance with **User goals and user modes of searching**, but will be similar for all types of user models.

These problems may be different in accordance with **user models and user modes of searching**, but can be found similarly in all types of user goals.

These characteristics will be different in accordance with **User models and user modes of searching**, but will be similar for all types of user goals.

These general characteristics are mostly different with regard to the kinds and steps of decision-making users need to make.

Information needed by users is different, responding to the characteristics of each mode.

FIGURE 11.2
Examples of the
Applied Analytic
Framework Used for
Design Synthesis
(continued)

Primary goal : Purchasing
Secondary goal : Information-seeking
for comparison and/or making decision

General characteristics
 • can be occasionally or routinely done
 • most information is needed for comparison task which is a part of decision process

- **Modes of searching**
Intensive known-item searching
- **Intention**
Seeking only information about the merchandise / service they want to make decision, then purchase on-line
- **Search strategy**
Quick, specific searching
- **Search method**
Use search field (box) to enter the particular name of the item/topic

General characteristics
 Users know exactly or specifically what they want. The answer is definite. There is only one answer.

		User models		
		Learner (content) / First-time user	Professional (content) / First-time user	Learner (content) / Return user
Main characteristics	Users need to make only 1 kind of decision • Determined-decision —make final decision about something based on the information found, decide if they want to take further action or not.			
Information needed	1) detail descriptions of the selected item or topic			
Main problems	1) Location finding, Determining starting point —users are unable to identify starting point due to overwhelming information on page. 2) Understanding classification of the contents determined by website. —users are unable to anticipate the contents in each category or menu on website, or don't know what to expect beyond those categories, or unable to match their own classification of the contents to those of website. 3) Selecting from retrieval results (when they use search function) —users are unable to identify or select the right link that will lead them to the information or item they want because they are unable to interpret retrieval results, or unable to anticipate the contents in each retrieval result, or don't know what is to expect beyond those links.			
Time-spending needed		1) more time browsing categories 2) more time reading detail descriptions before making decision	1) less time browsing categories 2) less time reading detail descriptions before making decision	1) less time browsing categories 2) more time reading detail descriptions before making decision
Features / functions		• glossary	• site map • index • search field / search box • advanced search / limited search • short cut • filtering information / tailoring retrieval results	• glossary

These characteristics will be different in accordance with **User goals and user modes of searching**, but will be similar for all types of user models.

These problems may be different in accordance with **user models and user modes of searching**, but can be found similarly in all types of user goals.

These characteristics will be different in accordance with **User models and user modes of searching**, but will be similar for all types of user goals.

These general characteristics are mostly different with regard to the kinds and steps of decision-making users need to make.

Information needed by users is different, responding to the characteristics of each mode.

solved by the development of search engines alone. User search behavior needs to be understood at both the physical and cognitive level. User cognitive factors, especially, should receive more attention in the earliest stage of design since they are substantial factors that regulate how users behave physically. These cognitive factors can be systematically analyzed and synthesized by applying the analytic framework in order to understand the mechanisms that regulate or underlie user needs, user tasks and their search behaviors. By anticipating user action, both information delivery and appropriate functions can be better identified and planned for. However, to gain a more profound understanding of user search behaviors, certain cognitive factors including, user modes of searching, user search strategies and search methods need further investigation at a finer level of granularity in order to identify relationships, establish classification and create working systems.

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