# Web Navigation Systems for Information Seeking

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## INTRODUCTION

Web browser is used as the major tool for information seeking on the Internet today. However, because of the vast information space on the Web, people often feel entangled and disoriented when overloaded with massive amount of information, a problem often referred to as "getting lost" (Lazar, Bessiere, Ceaparu, Robinson, & Shneiderman, 2003; Levene, 2010; Nah & Davis, 2002). They tend to lose sense of location, direction, and context (Head, Archer, & Yuan, 2000), especially when there is minimum assistance provided. Common causes of getting lost include unfamiliarity of the website design, difficulty to locate information due to deeply buried information, and isolated information (i.e. Information Island) without any linkage to related information. Users often reported frustration when "getting lost" (Lazar et al., 2003).

Web navigation systems provide assistance to guide users in the web information space. A good navigation system can ease the problem of getting lost and improve information seeking effectiveness. Common navigation tools include menu, sitemap, navigation trail, etc. Navigation is also a key factor of web usability (Palmer, 2002) which studies the ease-of-use of web applications and interfaces. Web usability guidelines are usually used by web developers then they design web navigation systems.

This article will present an evaluation framework to examine major web navigation systems from a human information behavior and user interface perspective. The framework focuses on content structure and ease-of-access, two of the most important features of web navigation systems. The advantages and weaknesses of each type of web navigation system will be discussed. The framework is expected to provide a more complete picture and a more structured analysis of web navigation user interface designs from a web information seeking perspective. Last we will discuss some future directions of web navigation designs influenced by the mobile computing trend.

## BACKGROUND

Information seeking is a human activity with a goal of obtaining information. Being a subset of the human information behavior field, it is particularly concerned with methods people employ to discover and gain access to information resources (Wilson, 1999). Web information seeking is information seeking in the World Wide Web environment using a browser as the major user interface. Compared to other software environments, web is a much larger and more complex environment with massive information and complex interlinking structures. This poses even more problems for users to find the information they want.

There are basically two generic tactics to seek information on the web: querying and navigation. Querying, or searching, is the process of "submitting a description of the object (for instance, keywords) to a search engine which will return relevant content or information" (Jul & Furnas, 1997). Navigation, or browsing, is the action of moving oneself around an environment in an order, "deciding at each step where to go next based on the task and the parts of the environment seen so far" (Jul & Furnas, 1997). Users use these two tactics together to obtain information on the web. The choice of searching or browsing depends on factors like task type, web site design, user preference, and skill (Nielsen, 2013). While searching has drawn more attention for the past a few years, navigation is still a fundamental way, and even the "last mile," of getting useful information. For example, users still need to navigate through searching results to evaluate the relevance and usefulness of them.

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The Web has become very large and complex. It is getting more difficult if people just rely on their intuition and follow embedded hyperlinks to locate information resources. Web navigation systems are commonly provided to guide users through the web information space. The major goal of a web navigation system is to present an effective content index or guide and support various web navigation behaviors. It allows users to approach an abstract information space in a similar way as they travel in a physical space (Juvina, 2006). Good navigation systems not only make information easier to find and allow users to acquire more useful information, but also contribute to the overall website success.

Traditional web navigation system designs focus on web usability, as navigation is considered to be one of the important factors to measure web usability (Palmer, 2002). A major consideration in web usability and web navigation design is to avoid getting lost. Getting lost is a common problem in an abstract and complex information space like the Web. The theory of human information processing (Miller, 1956) suggests that when navigating, a user tries to construct a structure map of the information space and a navigation path in mind. The structure and contents of information spaces are mentally represented and manipulated during Web navigation sessions (Juvina, 2006). This information is stored in short term memory which has limited capacity. As the user is browsing and reading content, he/she will have difficulty in memorizing that structure. When the structure of information vanishes from the short term memory, he/she tends to get lost. To relieve memory overload and avoid getting lost, web usability studies suggest several guidelines (Danielson, 2002; Fang & Holsapple, 2011; Nielsen & Loranger, 2006; Palmer, 2002; H. Zhang & Salvendy, 2001): 1) visualizing the structure of information space; 2) providing easy and flexible access to the navigational information; 3) providing context cues and navigation trace or history; 4) behaving consistently; 5) keeping the navigation system itself simple but meaningful. These usability studies and guidelines indeed have a positive impact on designing web navigation systems.

## WEB NAVIGATION SYSTEMS

### Content Structure and Ease-of-Access

#### Evaluation Framework

Human information behavior studies show that the most important features of a navigation system are visualizing website and content structures to users and providing easy access (Danielson, 2002; Nielsen, 2002; H. Zhang & Salvendy, 2001). Based on these two features, a 2 dimensional mapping framework is developed to categorize and assess major navigation systems. Figure 1 shows the framework diagram with some typical web navigation systems.

The framework is arranged as a two-dimensional positioning map with two axes representing the two features mentioned above. The first dimension (horizontal axis) is how much structure information a navigation system provides to a user when he/she is visiting a particular site or page. On one end, the complete structure can be presented. A typical example is a sitemap (Pilgrim, 2007), which is like a detailed table of contents of a book. On the other end, only partial information is presented or no structure is presented at all, such as quick links or browsing history. The second dimension (vertical axis) is how easy a user accesses or views the navigation tool and information. On one end, it can stay in-sight all the time without extra computer operations to interact with. On the other end, it can be visually separated and stay out-of-sight, and needs additional actions to be presented. For example, a site map is usually designed in a separate webpage and linked from the homepage. So an HTML site map presents a complete structure but offers completely separate access.

We use this framework to evaluate and discuss major navigation tools and systems used today. The discussion is further organized into two sub sections which represent two basic types of navigation systems (Levene, 2010): 1) website-provided navigations: these are designed and provided by individual websites or applications which are usually part of the website and are rendered together with other HTML page content by browsers; 2) browser-integrated navigation systems: these are either built-in components or add-ons of browsers. In practice, more than one navigation systems can be used at the same time to achieve the best result.