December 2001

The Effectiveness of Site Map Representations on Different Navigation Structures in Retrieving Information

S. Jarupathirun  
*University of Wisconsin at Milwaukee*

Derek Nazareth  
*University of Wisconsin at Milwaukee*

Follow this and additional works at: [http://aisel.aisnet.org/amcis2001](http://aisel.aisnet.org/amcis2001)

Recommended Citation

[http://aisel.aisnet.org/amcis2001/259](http://aisel.aisnet.org/amcis2001/259)

This material is brought to you by the Americas Conference on Information Systems (AMCIS) at AIS Electronic Library (AISeL). It has been accepted for inclusion in AMCIS 2001 Proceedings by an authorized administrator of AIS Electronic Library (AISeL). For more information, please contact elibrary@aisnet.org.
THE EFFECTIVENESS OF SITE MAP REPRESENTATIONS ON DIFFERENT NAVIGATION STRUCTURES IN RETRIEVING INFORMATION

Suprasith Jarupathirun
University of Wisconsin at Milwaukee
jarupat2@uwm.edu

Derek Nazareth
University of Wisconsin at Milwaukee
derek@uwm.edu

Abstract

Navigation in complex web sites remains an open issue. The ability to easily locate relevant information in a site will determine the effectiveness and utility of the site to potential users. The growing popularity of hand held device as a means of accessing the Internet makes the design of web sites more challenging. The use of a site map to effectively retrieve information represents an important navigational aid for users. Several different representations are available for structuring the site map. This research posits that the fit between a web site structure and its site map, coupled with the user's spatial ability determine the effectiveness of information retrieval. This paper will reexamine the fit theory on web site representation and web site structure and find out which type of representations is the most appropriate to which type of web site structures. Users’ spatial ability is also examined whether it has an influence on the retrieval performance. The findings will help web developers to select an appropriate site map to a particular web site, particularly in cases where parsimonious representations are desirable.

Introduction

The power and efficiency of the Internet as a medium to communicate across geographical boundaries had let to its widespread adoption as a global information dissemination medium. As technologies to access the Internet continue to expand, web site designers need to be increasingly aware of the limitations posed by these technologies to effectively display and navigate through the site. Currently small wireless devices such as cell phones and palm pilots, being increasingly used as a new media to connect with the Internet (Mitchell and Railback 2001; Rockhold 2001). They have limited ways of presenting web material, and interacting with the active elements on a web page. As a result, design of web sites to improve accessibility becomes a greater challenge. In the case of retrieval of information from a site, navigational aids such as site maps or search engines can significantly improve the ability to efficiently locate relevant information. This paper focuses on site maps as a navigational aid.

Based on fit theory, we argue that not only users’ experiences on web navigation, web site structure, and users’ spatial ability, but also the type of web site representations will affect the performance of each user in the search and retrieval of information. Based on previous studies on the impact of representation on performance (Benbasat and Dexter 1986; Jarvenpaa 1989; Tan and Benbasat 1993; Vessey 1991), we posit that web site representation has a clear impact on performance if the representation has a good fit with the structure of that web site. This paper will examine the impact of the goodness fit of web site representation with web site structure, and spatial ability on information retrieval performance.

Web Site Structure and Spatial Ability

Despite the common belief that web sites should be and are frequently structured in a hierarchical manner, a recent study that surveyed 300 web sites, found that web sites often employ a quasi-hierarchical structure (Gillenson et al. 2000). In many cases, particularly in mid levels, web structures may employ linear, hierarchical or network structures. McDonald and Stevenson (1996) found the users’ disorientation is high in hierarchical and nonlinear structures. Other studies have found that, over time, users...
are able to adapt to different hypertext structures, and that their experience on navigation contributes to the performance of retrieving information in different environments (Batra et al. 1993).

With the increasing size and complexity of a web site, navigation aids can be of immense value to the user. Navigation aids can take many forms, including site maps, table of contents, search engines, among others. For complex web sites, it may be necessary to employ multidimensional site maps. It is theorized that spatial ability has an impact on individual navigation performance using site maps (Satanek 1998). To effectively navigate through an environment using maps, people should have at least three basic spatial factors: spatial orientation, spatial relations, and spatial visualization. Spatial orientation involves the ability to imagine how configurations of elements would appear from different perspectives; spatial relations involve the ability to recognize the spatial patterns, and spatial visualization involves the ability to mentally manipulate visual stimuli. Spatial ability factors were originally identified when the study of mechanical aptitude and practical ability were conducted during 1920s. Since then, a number of studies have confirmed the existence of spatial abilities which are necessary for each individual to effectively and efficiently solve everyday spatial tasks (Cooper 1980; Golledge and Stimon 1997).

In the IS area, there have been a few studies involving spatial ability. Swink and Speir (1999) examined the impact of the users’ spatial orientation and the characteristics of data, aggregation and dispersion, on the effectiveness of problem solving on spatial tasks using map representation. They found that spatial orientation has an effect on the decision quality but not on decision time. Smelcer and Carmel (1997) studied the effectiveness of tabular and map representations for problem solving. They also found that spatial visualization ability failed to predict problem-solving time, and speculated that visualization ability is a better predictor for navigational tasks, not problem-solving tasks. Satanek (1998) studied the effect of different navigation aids/site maps and individual differences on WWW hypertext navigation, and concluded that users with high spatial ability perform better and were less sensitive to different types of site representations than low spatial ability users.

**Web Site Structure and Site Map Representation Fit**

Frameworks involving congruence and/or fit between ends and means have been used in the managerial and organization fields to identify a strategy that best fit organizations with their environment (Venkatraman 1989). At the individual level, the theory has been used to evaluate and explain the decision performance by matching task with technology characteristics. Several researchers studied the impact of representation types, graphs versus tables, on individual decision-making and found a linkage between the task performances and data representation types (Benbasat, et al. 1986; Jarvenpaa 1989; Vessey 1991). The theory has since been extended into a different context and has been reexamined with new technology (Agawal et al. 1996; Vessey 1991). Other studies have examined the effect of task/technology fit in the context of IS utilization and individual performance (Goodhue and Thompson 1995), and the degree of fit between products and the e-commerce system used to market them (Jahng et. al. 1999). The use of the congruence concept between task and technology has formed a key theme in IS research (Huber 1983), with the prevalent notion that the technology should be designed or adapted to fit the task characteristics.

This paper posits that this notion is also applicable to navigation in complex web sites, and that a close fit between web site structure (not always visible to the user) and site map representation (visible to the user), will lead to improved performance in terms of information location/retrieval in the web site. First, we characterize the fit a priori by matching technology and task characteristics (Vessey 1991; Zigurs et al. 1998). We suggest that site map representation with a tree format is best to represent a hierarchical web site structure which has one way relationship, and that site map representation with a map format is best to represent a network web site structure which has multiple ways relationship. Based on the characterization of fit proposed in (Goodhue and Thompson 1995), fit represents the degree to which the web site’s representation assists the user in navigating through the site to perform specified tasks. Using this approach, fit is characterized as outcome characteristics of the congruence between representation and structure. We propose perceived ease of use, perceived locatability, perceived effort, and perceived performance to measure the fit between web site structure and site map representation.

We, in addition, propose spatial ability as a moderator that strength the relation between the matching fit and retrieval information performance. Users with high spatial ability will perform better than users with low spatial ability in retrieved information. As discussed earlier, different types of spatial ability have an impact on performance at the different retrieval information sub-tasks. Spatial scanning ability will affect the task during the process of capturing knowledge about relationship among web pages. Spatial visualization ability will affect the sub tasks that require the transformation of relationship pattern when the representation is not closely matched with the web site structure. Finally, spatial orientation ability is required to maintain users’ orientation during the navigation through the web site. The research model is presented in Figure 1.
Based on the arguments presented, the propositions in this research are:

**Proposition 1:** Congruence between web site structure and site map representations will lead to high user perceptions of fit.

**Proposition 2:** Greater fit will improve performance, with this relationship moderated by the individual's spatial abilities.

To test the proposed propositions, a controlled laboratory experiment will be conducted to measure the time spent and accuracy of searching and retrieving information tasks from two web sites that have the same content but have different structures; hierarchical and network. Subjects will be presented with two types of site map representations; hierarchical and map format. The target subjects are college students enrolled in the school of business and school of architecture. According to estimation of trait occupation requirements (McGee 1979 p. 33), we expect architecture students to have high spatial ability and business students to have low spatial ability. High variance in spatial ability or a heterogeneous sample is desired to observe the impact of spatial ability on the performance of retrieving information tasks in a web site. We expect to detect a small to medium effect on the fit of presentation and website structure, and spatial ability. Spatial ability of the subjects will be measured using the Spatial Ability Test kit (Ekstrom et al. 1976), and will include the map planning test, paper folding test, and the card rotation test. Perception on fit will be measured through an instrument that is currently under development.

**Implications**

We expect that our finding to contribute to improve a web design strategy. If the study does not find any significant effect of spatial ability and of fit on web site representation (site map) and web site structure, the result implies that web developers should simply provide a site map that is easy and low cost to develop. Web developers, otherwise, should consider the fit and spatial ability differences when they select and develop a site map that will ease users to search information in a particular web site on a different media. Theoretically, the study will confirm the validity of the fit theory and the important of spatial ability differences.

**References**

References are available upon request from the authors.