Chapter XII

Impact of Individual Differences on Web Searching Performance: Issues for Design and the Digital Divide

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Abstract

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an introduction to and explore the phenomena of online Web searching and the potential role of individual differences in investigating this situation. An overview of the literature will be detailed as well as issues regarding how individual differences can be incorporated into this type of research. This chapter will support the notion that individual usage and performance with Web search engines is influenced by a collection of factors, more specifically, individual differences.

Introduction

The Internet is a revolutionary technology that is changing the way that people create and search for information, as well as communicate within the global society. The importance of this technology has been widely documented in terms of access to information, resources, organizations, virtual communities, and networks of people.

Currently, Internet search engines provide users with their primary source for locating content on the Web. They also assist in the information searching process and navigation of the Internet using keywords and search terms.

The majority of Internet search engines are straightforward technologies that do not include a great deal of capabilities for personal customization. The developers of Web search engines make an effort to add advanced searching features such as Boolean operators and character strings to make searching more specific to the desired subject. In addition, a combination of skills with the technology, knowledge of the subject matter, and knowledge of online search processes can be beneficial in searching for information on the Internet.

However, the experiences of users of search engines may differ in their level of success in searching for information. There are two ways in which the performance of individuals may vary with regard to search engines. Primarily, there is a difference in being able to find what one is searching for. In addition, there are differences in strategies that are used to search or the way in which people go about finding the information they seek.

So the question remains as to why some users are more effective searchers than others. Another question is whether the experience that a user may have with a Web search engine impacts his/her attitude toward Internet technology as a whole? The characteristics that can be attributed to one searcher performing
more successfully than another are presently not well defined. It may possibly be that the design of these systems provides advantage to certain types of users rather than others. There may also be other factors. However, individual differences may play a role in the Web searching skills of users and their performance with Web search engines.

Individual differences could include a range of characteristics including gender, race, age, socioeconomic status, education, income, cognitive style, personality, self-efficacy, and so forth. So an individual user’s skill and performance with a Web search engine can be motivated or influenced by a number of these factors. Our goal is to investigate how these individual differences play out in the performance of users of search engines, and what, if any, impact they have on the successful use of that technology. Although it is important to study the range of individual differences, our focus will be mainly on demographic differences.

In addition, we would like to frame the evaluation of this research in terms of social exclusion and the digital divide. Greater numbers of people are exposed to the Internet on a daily basis, but more research is needed to address the motivations and barriers to effective use of the Internet. So the study of the impact of individual differences in Web searching performance may also provide additional information as to why a disparity exists among users and nonusers of Internet technology.

Studying the role of individual differences with Web searching behavior is important on many levels for many different populations. On the societal level, Internet technology is increasingly becoming a part of everyday life as well as a requirement for many jobs. Access to the Internet has been studied in various dimensions to determine its effect on people’s use of the technology (Katz & Rice, 2002). Access in this situation can be defined as a function of resources. Research has shown that physical access can be a barrier to use of the technology, but placing the Internet in publicly accessible places such as schools, libraries, and community centers, has not yet worked to close the digital divide. Therefore, it is important to continue to research the types of barriers that may be deterring users from participating in Internet technology. This should be carried out in an effort to determine what measures can be implemented to address the problem. If the Internet or its components can be improved to be a more inclusive and usable technology, then the resources and benefits of the Internet could have a more far-reaching effect. Ideally, the Web is a technology that serves all people, not just the privileged in society (Introna & Nissenbaum, 2000).
The purpose of this chapter is to encourage the consideration of the role of individual differences in determining Web behavior and performance, which could inform and improve the design of search engines. This chapter will serve as an introduction to the literature and basis for understanding the importance of individual differences in relation to human information behavior. The chapter will review current explanations of the digital divide to evaluate the facilitators and inhibitors of Internet use. Next, we will explore the user behavior literature to search for explanations of user behavior with search engines and information retrieval. Then we will explore the role of individual differences in information systems. We will then investigate what current research into individual differences explains, and introduce the individual differences theory by Trauth (Morgan, Quesenberry, & Trauth, 2004; Quesenberry, Morgan, & Trauth, 2004; Trauth, Quesenberry, & Morgan, 2004; Trauth, Quesenberry, & Yeo, 2005). Last, we will outline an agenda for researching individual differences in Web search engines and develop implications for design that integrate the concept of individual differences.

This study will contribute to the research community as well as to society by helping to identify the factors influencing different users’ Web search skills and identifying behavior that could provide developers with recommendations to build better, more usable systems. In order to make technology valuable to the greater population of users it is necessary to understand the ways in which information technology can be beneficial to diverse users, and the underlying social judgments that people make when using technology.

**Literature Review**

In an effort to better understand this situation, this chapter will conceptually explore the role of Web search engines in relation to Internet use. By additionally evaluating the literature on human information behavior, the digital divide, and individual differences, we will show the need for the study of individual differences with Web searching behavior.

**Web Search Engines and the Internet**

If the Internet is an important technology in society today, Web search engines can be identified as the gatekeeper to them. According to Introna and
Nissenbaum (2000), "search engines constitute a powerful source of access and accessibility within the web." Although many companies, organizations, and individuals make a concerted effort to publicize their Web site URLs, search engines still provide the primary source of locating content on the Internet. The ability to search successfully has an impact on whether an individual will be able to locate a Web site that contains the information that he/she seeks. However, an individual user's skill and performance with a Web search engine can be motivated or influenced by a number of factors. These factors could include two types of individual differences. One level of individual differences takes into account demographic and social characteristics, including age, race, gender, socioeconomic status, and so forth. The other level of individual differences takes into account other characteristics, including education level, socioeconomic status, and geographic location.

Current Web search engines are built upon the principles of traditional information retrieval (IR) systems. Much of the functionality of these IR systems is based on a notion that users are able to represent their information need in the form of text. Web search engines follow this tradition. The argument is made that much of the current complexity in search engines is a result of the size of the Web. Methods that originate from private collection IR systems are not scalable enough to meet the needs of a collection with the magnitude of the Internet. So traditional techniques have had to be adjusted and enhanced to operate effectively with the Web. In addition, Jansen and Poole (2001) assert that information seeking in traditional information environments holds very important differences to Internet-based Web searching. Studies show that the advanced features of search engines are not as beneficial as they are described to be. Also, the indication of these advanced search operators is that they are useful only to those who are familiar with the structures and inner-workings of IR systems.

Introna and Nissenbaum (2000) discuss how the structure and politics of Web search engines affect users. The authors argue that Web search engines emphasize certain Web sites while making others virtually invisible. In addition, they state that many of the Web sites that receive visibility are popular and mainstream commercial Web sites that are maintained by large economic powers. These large organizations help to illuminate their own presence to the detriment of other small entities. Those neglected Web sites are then further alienated due to lack of traffic and eventually are completely taken down, which narrows the options and content availability on the Internet to Web users. The authors argue that access in its truest sense means a "comprehensive mecha-
nism for finding and being found" (p. 30). They conclude that search engines are politically influenced through technical means such as crawlers, indexers, and ranking algorithms.

Arasu, Cho, Garcia-Molina, Paepcke, and Raghavan (2001) provide a comprehensive overview of Web search engine design and its challenges. A large number of Web search engines utilize IR techniques and algorithms. The difference in the size of the audience for Web search engines versus private collection IR systems makes the design of these systems even more complex and important. The use of new techniques and methods to meet the challenge of scalability for Web search engines improves chances for improving relevance in the retrieval of information. Research suggests that the Web structure mimics that of a "bow tie" in which roughly 28% of the pages constitute the core of the bow tie and 22% make up the loop which connects also to the core but cannot be reached from it" (p. 3).

The impact of query operators on Web search engines was researched by Eastman and Jansen (2003) to determine if they result in improved searching capabilities. Presently there are roughly 32,000 search engines in existence which 71% of Web users visit to locate information on the Web (p. 389). In Web search engines, advanced phrase search capabilities and Boolean operators are used rarely. However, there is a perception that the use of these conventions increases the effectiveness of Web searching by "increasing the total number of retrieved documents, increasing the number of relevant documents retrieved, or improving the ranking of relevant documents" (p. 384). A number of the major Web search engines even recommends use of advanced operators to improve search on their Web sites. Research suggests that Web users do not utilize advanced searching capabilities for reasons that include laziness and search engine design flaws. The results of Jansen's research show that, in fact, advanced operators in Web searching actually do not increase or decrease the precision of the search. Additionally, these types of advanced functions are useless without a working knowledge of IR systems because integration of these conventions is not intuitive to the user.

Belkin, Cool, Stein, and Theil (1995) discuss the design of interactive IR systems. Traditional IR systems have focused on "representation of texts and queries, and on comparison of these representations" (p. 379). The inclusion of interactivity into the IR systems has placed new focus on the activities of the user, including formulation of queries and retrieval response. The authors present a theoretical basis that supports these types of activities occurring within the context of information-seeking strategies. Their model characterizes
information retrieval distinctly as human-computer interaction impacted by information seeking strategies. This situation represents a dialogue between the user and the system, and should be designed and developed based on that notion. The structure of the resulting dialogue can be framed within different information-seeking strategies, and use of case-based reasoning can provide a model for patterns of interaction. Last, the integration of “information-seeking strategies, dialogue structures, scripts, and cases can be used in a system design that uses the advantages of each to ameliorate the disadvantages of each” (p. 394).

Searching is an important process to Internet use. People have different experiences of success and failure in regard to information that they seek on Web search engines. In addition, because it is possible that a person’s experience with a search engine may affect his/her overall level of interaction with the technology, it is important to identify if individual differences of users affect their performance with Web search engines. If so, implications for the design of Web search engines and the higher-order effect for the digital divide should also be identified.

User Behavior

Users of technology interact with it in a number of ways, especially in their search for information. When looking to solve a problem or answer a question, users find different methods of formulating that question in the context of their own knowledge. Based on their knowledge, users look for a way to find the information they need in the environment of the information system. However, the arrangement of information systems is not always based on the way that different individuals organize their search for information. This makes the task of information searching very complex. In addition, the experience that a user may have with a Web search engine may also have an impact on their attitude toward Internet technology as a whole.

Bates (1989) describes a way in which to model online and information systems searching called “berry picking.” Through this method, she challenges the conventional information retrieval model because she believes that it does not adequately represent the way in which users search for information. Bates argues that users begin with a piece of a larger topic and move iteratively through sources where the query continually evolves. More specifically, berry picking is characterized as the process that happens when users gather more
and more information at each stage of searching, thereby satisfying the query by a series of selections, not the single retrieval set. Using a model such as berry picking that involves the wide horizon of user behaviors may allow for better design of information retrieval systems. Last, the author notes that users with the widest range of search strategies will be the ones with the greatest information retrieval power.

Borgman (1996) discusses the difficulty that users encounter with online catalogs. She cites the main reason for that difficulty being the “design that does not incorporate sufficient understanding of searching behavior” (p. 493). Important to her argument is the notion that online catalogs are being designed with skilled workers in mind instead of an average end user. The process of searching is described as one that happens over time through a combination of information technologies and resources, where the user works iteratively to explore his/her inquiry. This process is very complex because searchers have to interpret their information need based on their own knowledge of the problem and understanding of the system. The perspective of this article supports the notion that “information retrieval is a difficult problem because it requires information that [one] does not yet have” (p. 494). Borgman illustrates that for online catalog searching, three levels of knowledge are necessary: conceptual knowledge of the information retrieval process, semantic knowledge of how to implement a query in a given system, and technical skills in executing the query.

The study by Gauch and Smith (1993) demonstrates the use of an expert system that automatically reformulates queries to improve search results. The authors conducted this study based on the problem of user unfamiliarity with search tactics of online retrieval systems. The authors found that most users, even experienced ones, reformulate their queries incorrectly. Their expert system is a knowledge-based assistant that operates as a front end to information retrieval systems.

Belkin, Oddy, and Brooks (1982) discuss a different approach to developing IR systems based on anomalous states of knowledge (ASK). The authors’ premise is that the information needs of users cannot be easily specified because they are not facts in themselves, but rather a means by which to find the resolution to a problem. Traditional IR systems utilize a method known as “best match” through which a system responds to a query based on the text whose representation most closely matches it. However, this technique requires that users be able to coherently express their information need in a simple text form, which may or may not completely represent their understanding of the problem needs resu or situatio to underst request for Saracevic characteri stress tha significant informati systems a technolog tion” (p. 1)

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the problem. The authors’ hypothesis for the ASK system is that information needs result from anomalies in the “user’s state of knowledge regarding a topic or situation” (p. 62). Based on this notion, IR should use a process that helps to understand the users’ ASK rather than require them to specify their own request for information.

Saracevic and Kantor (1988a, 1988b) performed a study that aimed to characterize the components of information seeking and retrieving. The authors stress that human decisions and human-system interactions are the most significant factors in the processes involving searching for and retrieval of information. They also emphasize that the “key to the future of information systems and searching processes … lies not in increased sophistication of technology, but in increased understanding of human involvement with information” (p. 162).

The human search for information is a complex process which is further complicated by the inclusion of technology. Information systems in the form of online catalogs and information retrieval systems appear to require the user to search within the constraints of the system itself, rather than allowing the user to specify his/her own criteria. Bates’ (1989) method of berry picking provides a model for the iterative process of human information searching. However, this model also highlights the difficulty that is encountered by users in trying to specify their information needs as being able to search for information often involves having some knowledge of the very topic on which the inquiry is based.

Beyond differences in user behavior, there also exists literature that discusses the differences with individuals who utilize technology and those who do not. Research on the digital divide highlights reasons for the disparity among users of technology and addresses implications for its existence.

The Digital Divide

In 2000, the percentage of households in the United States that reported having Internet access was 41.5% according to the National Telecommunications and Information Administration’s report entitled Falling Through the Net. The disparity in the amount of people participating and not participating with the Internet has been labeled the “digital divide.” In addressing the digital divide, Kvasny and Truex (2000) state that as new technology is deployed, classes of users are empowered while others lose power. Explanations for the gap have been associated with the concept of unequal access.
Unequal access is largely correlated with technological access. Technological access is the traditional idea of access that corresponds to the physical availability of appropriate computing equipment or the ability to attain the hardware, software, and connectivity necessary to actually use Internet technology. An additionally important notion regarding the digital divide is that of social access. Social access is more concerned with the skills, knowledge, and perceived benefit to engage in using the Internet. Social access has been defined by Kling (1998) as the mix of professional knowledge and technical skills that augment professional practices and social life. A variety of external factors may cause individuals to use the Internet less, such as the need for technical support and a connection to a network of other online users. Kling asserts that the Internet is a medium that can be used socially by ordinary people to accomplish a variety of tasks.

The digital divide is a phenomenon that represents the gap between those who participate with technology and those who do not. Traditionally, the argument is framed in terms of the “haves” and the “have-nots” as it relates to physical access. Many different types of demographics are used to examine the use of technology and much of the early research points to access in order to solve the problem of the digital divide. However, access, though a first step in lessening the divide, is not the end all for eliminating the problem. The digital divide is largely a representative example of the inequality and the power struggle that exist in our society. The technology that is being developed in present times serves to further advantage those who already have privileged status and further exacerbates the inequalities that exist.

The National Telecommunications and Information Administration (NTIA) released a report in 1995 entitled *Falling Through the Net*. This report was one of the seminal works to introduce the notion of the information “haves” and “have-nots.” This survey contrasted the goal of “universal service” that corresponds with the idea that all Americans should have the ability to access the telephone service, with the levels of penetration of the Internet across the nation.

Hoffman and Novak (1998) give a comprehensive look at the digital divide and the importance of race as it relates to computer usage. This article examines the differences between African American and White computer and Internet users at different demographic levels to determine how to better address the divide. Many key findings were addressed in this research based on a quantitative analysis of the Nielsen Internet Demographic Study. The authors state that household income is directly related to computer ownership in the home.
regardless of race. Also, the level of education that a person has correlates to access to computers at work regardless of race. However, race did become a factor in other areas of the study. African Americans are less likely to own a home computer than Whites at every level of education, and are more likely than Whites to have access to a computer at work when income is taken into account. Additionally, the authors say that both income and education affect computer access and subsequent Web use. This article concludes that African American students require multiple points of access to participate in computer technology. Education is also determined to be the most important factor in computer usage. This notion leads the authors to conclude that better educational opportunities for African Americans will result in better participation of all Americans with technology. The article concludes with the notion that if access to computer technology is ensured, then computer usage will follow. Katz and Aspden (1997) report on the motivations and barriers to Internet usage based on a national telephone survey administered in 1995. The results of the survey showed evidence of a digital divide due to the wealthy and highly educated status of Internet users as opposed to large numbers of ethnic minorities who were largely unaware of Internet technology. The authors report that Internet interest is stimulated greatly by social and professional networks and that these also provide a means of support for users. Internet users are motivated to participate for social-personal development, but nonusers believe the value of the Internet to be in business/commercial use. The survey also determined barriers that people overall felt it difficult to get over when starting with the Internet, even those with technical experience. In addition, other barriers to use include the cost of Internet service and the complexity of use.

In an article that explores the digital divide as a phenomenon regarding more than demographics, Adams (2001) discusses the divide as a “complex web of interconnected issues, with its base in structural and social inequalities that have long been present in this country and world” (p. 6). The author’s argument is that by allowing quantitative representations of the digital divide to explain their existence, the actual questions of “who” and “why” the divide is affecting is going unanswered. The presence of discrimination against minorities and the underprivileged has increased the level of difficulty in obtaining both the social and economic means by which to access and benefit from the Internet. According to Adams (2001), the benefits of using computers and the Internet are “access to job training and openings, the ability to strengthen social networks through email, productivity benefits, participation in democratic and political life, and access to an increasing pool of raw information and knowl-
edge” (p. 6). Also as awareness about the digital divide grows, we should not assume that all individuals interact with technology on the same level. In order to function within the digital community, there is an underlying knowledge that who the user is, where he/she comes from, and his/her exposure to technology will affect the way he/she will interact with different technologies.

Kraut, Lundmark, Patterson, Kiesler, Mukopahayay, and Scherlis (1998) studied the effect of the Internet on social and psychological behavior. This longitudinal research looked at whether the Internet increased or decreased social involvement. Decreased social involvement is thought to lead to disenfranchisement by citizens, thus allowing crime and political unrest to enter in to the community. The results of the conducted research support the notion that the Internet adversely affects “social involvement and psychological well-being” (p. 11). The study affirms that an increase in the use of the Internet is connected to a minor decline in social involvement and a more prevalent feeling of loneliness. The measure of social involvement came from observations of family communication and the size of the person’s social network.

DiMaggio and Hargattai (2001) discuss different types of prevalent inequality present in the information age. The authors argue that the digital divide represents more than a binary argument regarding those with and without the ability to access technology. The dimension in which digital inequality exists consists of five areas. Inequality of technical apparatus relates to availability of adequate computing equipment, software, and means of connectivity to the Internet. Inequality in the autonomy of use regards the location of Internet access and its affect on the users’ ability to use the Internet for their desired activities. Inequality in skill refers to the ability of users to utilize the Internet in an effective way and for the desired outcome. Inequality of available social support includes the other people that the users may interact with to help and encourage them in the use of the medium. Inequality in variety of use encompasses the influencing factors such as education and income on the understanding of the opportunities for use of the Internet.

Hargattai (2003) advances digital divide research by placing a focus on the differences in the online skill of users. By doing so, the author expands the scope of the digital divide past the “haves” and “have-nots.” By exploring the differences among users in ability to perform online tasks, there will be a better understanding of an additional potential barrier to equity in the use of technology. The results of the study show that variation exists among the users of the Internet in their ability to find content. Age showed to be an important factor in the research as younger users navigated online content with a much greater
use than older users. The amount of time a user spends on the Web is also connected to better navigation of content. This study supports the notion that physical access alone cannot ensure participation in Internet technology.

The digital divide is a situation that is very complex and requires an in-depth analysis of the many ways in which it is perceived. Not only are there constraints in obtaining the necessary physical elements online, but there are also constraints in social elements. Users’ skills and ability with the Internet also play a role in their level of participation. It is then important to understand the factors that influence the individual user’s skill level and behavior with technology. The theory of individual differences can provide a useful lens in investigating this situation.

**Individual Differences**

The role of individual differences in information systems research is a growing but very important area. Individual differences have been applied in several disciplines and have been characterized in a variety of categories. Research in individual differences has been largely carried out to better understand the behavior of people in organizations or with technical applications. These types of studies are carried out at the individual level of analysis as opposed to the group or organizational levels. By studying the individual and his/her behavior or interaction with different types of technology, researchers can make recommendations for the improvement of systems based on different user characteristics. Many measures of individual differences have been utilized in research, such as personality, cognitive style, cognitive complexity, need for cognition, problem-solving ability, demographic differences, self-esteem, anxiety, and perceived usefulness.

Two very important measures of individual differences that will be used in the evaluation of users in the study are cognitive complexity and perceived usefulness. Cognitive complexity relates to the degree of differentiation with which an individual views the world (Ford, Miller, & Moss, 2001). Perceived usefulness is the degree to which a person believes that using a particular system would enhance the task he/she is trying to complete. These measures are important characteristics of users especially in relation to searching behavior. This is due to cognitive complexity being a measure of a user’s perceptual difference or frame of reference to activity. Users approach the task of searching for information with a worldview that influences their search behav-
ior. Perceived usefulness takes into account the value of systems in accomplishing their goals.

A recent study conducted in the area of individual differences and Internet searching was completed by Ford, Miller, and Moss in 2001. The authors recognize that increased access to the Internet is placing an emphasis on information-seeking skills to a more diverse body of users. This study utilized a positivist approach and gathered mainly quantitative statistical data. In addition, the authors chose not to use hypothesis testing but instead to aim for data exploration by way of factor and regression analyses to identify relationships between factors of individual differences and retrieval effectiveness. The dimensions of individual differences being researched are age, gender, cognitive style, levels of prior experience, Internet perceptions, and study approaches. The authors found that effectiveness of retrieval was linked to males, low cognitive complexity, an imager cognitive style, and several Internet perceptions and study approaches that correlated to low self-esteem of users.

In addition, the theory of individual differences has been largely applied in the context of gender and cognitive/information processing and personality. Trauth is presently working toward a theory of individual differences with respect to gender in the information technology (IT) workforce (Morgan et al., 2004; Quesenberry et al., 2004; Trauth et al., 2004, 2005). This theory seeks to address underlying reasons for the underrepresentation of women in the IT industry. This emergent theory focuses on the differences within instead of between genders and acknowledges that women respond in a variety of ways to external and internal influences. This theory also supports the notion that “both gender and IT are socially constructed at the individual level...[and that] ...women as individuals, experience a range of different socio-cultural influences which shape their inclinations to participate in the IT profession in a variety of individual ways” (Trauth et al., 2004, p. 115).

Internet users are a diverse group of individuals. No one type of user can be identified as the benchmark for developing universal systems. Many differences exist among types of users such as race, education level, socioeconomic status, cognitive style, nationality, and so forth. The theory of individual differences reflects and acknowledges this diversity.

The world is a diverse place, so as Internet use becomes increasingly integrated into daily life, the more emphasis will be placed on usability of the technology. Accordingly, it is important that the variety of people accessing the Web be able to effectively use search engines. Importantly, the research shows that models of human information behavior are not always implemented into systems that
are built to assist searchers in finding content. Therefore, it is possible that there is a mismatch in the system design of Web search engines with the user model of searching, or there could be other important factors that influence an individual’s ability to find information and search successfully. So what is currently not addressed in the literature is the effect of individual differences on use and performance with Internet technology. Additionally, the connection is not evident about the role of search engines in inhibiting or facilitating continued use of the Internet.

Issues

Studying user behavior and the Internet can be accomplished in many ways. The implication of doing so serves a number of purposes. First, by evaluating the way that users interact with Internet technology, we can understand its utility and how it is able to serve user needs. We can also observe the effect that human interaction with technology has on patterns of use, learning, and performance. Based on these ideas, the study of individual differences is critical to identifying influences of these different types of user responses and behavior.

The theory of individual differences takes into account that people make choices in their environment based upon personal experience and external influences. In the study of gender and IT, it has been used to illustrate that all people do not necessarily exhibit a single response in behavior or choice in the IT workforce (Morgan et al., 2004; Queseberry et al., 2004; Trauth et al., 2004, 2005). This theory is an appropriate basis for research on Web search skill and use, clearly because all users of this technology do not exhibit a single type of behavior nor do they perform at the same level. So investigation into individual differences can provide an explanation of the influences on user behavior and performance that could inform the design of improved systems. By extending and empirically testing the theory of individual differences, much can be learned about users in a way that could significantly affect performance issues by developing systems better suited to their behavior or learning style.

Current research into user behavior would benefit from the exploration of this theory because it would provide insight into how an individual’s collective experience affects his/her performance with technology. Instead of viewing users as one dimensional beings, the study of users from the perspective of
individual differences takes into account demographics and other personal attributes. By using individual differences as a guiding theory, the study of the user could provide a more complete view of individuals' embodied behavior, not just a slice from their observable actions.

The theoretical stance of individual differences supports the notion that people are unique individuals that will behave and interact with the environment based upon that fact. This theory rejects notions of behavior based upon static biological characteristics. For example, the thought that women and men, as groups, behave differently in respect to technology, would not hold with respect to this theory. Based upon prior research conducted by Trauth et al. (2004, 2005; Morgan et al., 2004; Quesenberry et al., 2004), it is documented that women display numerous types of behavior in respect to their positions in the IT workforce. Based upon this theory, generalizations about men and women do not adequately represent the diversity of the experiences that occur within or between each group.

The study of individual differences is important because the further development of technology and more specifically, the Internet should be based upon the actual study of user interactions. Using this theory as a basis for research into user behavior supports a notion of user diversity. It accounts for important characteristics that may influence how a user interacts with his/her environment. In addition, it highlights an important area of interest for those engaged in the development of systems. It illustrates that a number of attributes about a user may influence their interaction with IT, and therefore it is necessary to gather rich information about the users for whom the system is being developed. It may also argue that increased levels of user personalization in systems can have a positive impact on user behavior and interaction with technology.

**Solutions and Recommendations**

In an effort to encourage the incorporation of the theory of individual differences into the study of user behavior and Internet technology, the following research program outlines our approach to the study of the phenomenon. One goal of this research agenda is to add to digital divide research by investigating another possible facilitator or inhibitor of technology use. In addition, because there is evidence of a disconnect between current models of user searching behavior and actual search engines, we seek to inform design based on the
perspective of individual differences. Therefore, research into individual behavior with technology has the possibility to enlighten the development process of search engines. We also seek to support and extend individual differences research and theory by documenting its role in human information behavior.

Research Agenda

The individual differences theory will be the theoretical basis for this research. In addition, we will also work to expand the theory into the realm of Web searching and information retrieval. We believe that Web searching is largely influenced by individual differences. In addition, the theory is applicable to this study due to the possibility of sociocultural influences affecting people’s perception of Internet technology and their attitudes toward Web searching. The Internet has recently been described as being essential to society in a variety of ways (Hoffman, Novak, & Venkatesh, 2004). It is a vehicle for the creation and searching of information as well as being a mechanism for communication. So in the wake of this “Internet age,” it is important to understand how the technology can be more usable and beneficial to all people. Currently, due to the inequity of people with the ability to participate in Internet technology, a digital divide exists among users and nonusers. Although a great deal of research has been carried out to address causes for the problem, there has not been a definitive reason identified. In an effort to continue articulation into the problem of the digital divide, more research must delve into factors that influence the motivation or inhibition of Internet use.

We seek to address this need by researching the role of individual differences in online searching skill and performance. Research has identified that “knowledge of more fundamental and enduring factors that can help us improve people’s Internet retrieval in deep and lasting as opposed to relatively superficial and fleeting ways” is necessary (Ford et al., 2001, p. 1049). In addition, the investigation into user diversity with interactive systems has also been deemed important to the research community (Borgman, 1987).

The significance of this type of study would provide insight into how users actually search for information and the influences, experiences, and perceptions that shape their attitudes and behavior with Web search engines. This research seeks to further support and expand the theory of individual differences being developed by Trauth. This study would identify that the theory of individual differences...
differences is applicable to both genders and is relevant to explaining both the underrepresentation of women in IT and differences in Web search skills. In addition, the results of the study could provide critical design information for creators and administrators of Web search engines. In the event that the results do show a connection between individual differences and online Web searching skill, a case can be supported for more concentrated research effort into the personalization and customization of Web search engines. Also, this research may move the research community closer to finding a theory or framework that links the concept of individual differences to information retrieval. This would be an important contribution because without a guiding theory, the subject area will “continue to proceed as in the past using a shotgun approach” (Saracevic, 1991, p. 85). Another important contribution of this research would be the articulation of an additional obstacle to user participation with the Internet, which also supports further explanation of the problem of the digital divide.

Future Trends

This chapter supports the mission of this book by drawing attention to the importance of understanding individual characteristics with respect to technology. We support the notion that systems should be developed based on cognitive-, behavioral-, and performance-based user models. Due to the increased interactivity and sophistication of systems, understanding users at a superficial level will be insufficient to design effective usable systems. Research into individual differences emphasizes user-based design and development methodologies by stressing the uniqueness of individual users.

Future research into this area could explore a variety of areas. The study of individual differences could be expanded from a micro level look at Web search engine use and performance to overall use of technology. Also, this study could be replicated in different international locations to explore how individual differences may be affected by national culture or environment. The theory of individual differences could also be used to evaluate other user behavior in relation to Internet technology in order to develop a rich user model for the development of other Web-based systems.
Conclusion

Users of technology interact with it in a number of ways, especially in their search for information. When looking to solve a problem or answer a question, users find different methods of formulating that question in the context of their own knowledge. Based on their knowledge, users look for a way to find the information they need in the environment of the Internet. However, the arrangement of information systems is not always based on the way that different individuals organize their search for information. This makes the task of information searching very complex. However, we know that users identify a way to find information in their environment. To better understand the factors that influence different levels of performance with the Internet, the study of individual differences can provide critical insight into users. By incorporating the theory of individual differences into research of online searching skill and performance, we can see what impact that situation has on use of the Internet. This research program looks to extend research on individual differences and information retrieval. In addition, by exploring patterns of usage and performance, we can also address the impact of search engine use on overall technology participation. This may well help to address and provide an additional barrier or motivator to Internet use.

References


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