12-2014

Examining the Relationship between IQ, DQ, Usefulness, EoU, and Task Performance

Anne B. Matheus
Marist College, anne.matheus@marist.edu

Carolyn C. Matheus
Department of Computing Technology. Marist College

M. Pamela Neely
School of Business Administration and Economics, SUNY Brockport

Examining the Relationship between IQ, DQ, Usefulness, EoU, and Task Performance

Anne B. Matheus

Department of Computing Technology. Marist College

Anne.matheus@marist.edu

Carolyn C. Matheus

Department of Computing Technology. Marist College

M. Pamela Neely

School of Business Administration and Economics, SUNY Brockport

Abstract:

The World Wide Web (WWW) has become a premier source for locating information. However, much of Web's content has not been verified for accuracy, relevance, or completeness. Using the IS success model, the technology acceptance model, and the unified theory of acceptance and use of technology models as a foundation, we empirically examined the impact of four constructs (perceived information quality, perceived design quality, perceived usefulness, and perceived ease of use) on task performance. We used Structural equation modeling to evaluate a new model for establishing a predictive relationship between the four constructs and task performance. Results indicate that there is a path relationship leading to accurate, relevant, and complete answers on the WWW. In the conclusion, we discuss the practical and theoretical implications of our research.

Keywords: Information Quality, Design Quality, Usefulness, Ease of Use, Information System Success, Task Performance, World Wide Web, WWW, Structural Equation Modeling, SEM.

I. INTRODUCTION

The World Wide Web (WWW) is increasingly used as a ubiquitous resource for locating information. Whereas people used to rely on using physical objects to locate information—such as telephone books and encyclopedias—information can now be readily acquired by many people through Web-based portals to online resources. With a few clicks, people can use the WWW to find restaurants, plan vacations, answer health questions, and communicate and collaborate with friends and colleagues. However, much of the information found on the WWW is not regulated and has not been verified with respect to of its quality, such as whether it's accurate, relevant, complete (Wand and Wang, 1996), applicable (Eppler & Muenzenmayer, 2002), and/or useful (Kahn, Strong, & Wang, 2002; Leung, 2001). In previous research on Internet usage, Thompson (2003) found that people do not see a difference between websites' reliability based on the presence or absence of advertising. This is an important issue. It is logical to assume that websites funded by a partisan sponsor may contain biased information. More research is needed on how people use the WWW, and is needed to assess the quality of people's search skills and ability to select appropriate resources (Thompson, 2003).

One challenge associated with conducting research on the WWW is the magnitude of the amount of information that can be found using the Internet. The WWW is a colossal system of documents, interrelated through hypertext links, that grows exponentially each day. In order to study the WWW and how it is used, the focus must be narrowed. With this study, we investigated how people evaluate information found on web sites. Specifically, we examined the relationship between four constructs (perceived information quality, perceived design quality, perceived usefulness, and perceived ease of use) and performance in completing an assigned task using resources on the WWW. We obtained the four constructs from multiple information system (IS) models. This study contributes to IS research in several ways: it proposes and examines a model for studying the WWW, including successful task performance and an examination of how people evaluate information on the WWW. In addition, our study used real websites versus websites created solely for research purposes, which increases its ecological validity (i.e., the extent to which research can be generalized to common behaviors and natural situations (Heiman, 2000)) and the generalizability of its findings.

Background

Many people—including students and professionals—seem especially interested in finding information that meets their needs quickly, regardless of whether it is entirely accurate. Although definitions have varied, at its core, "accuracy" means to be correct or right (Fisher, Lauria, & Matheus, 2009). One problem identified in the library science literature is that people, without assessing its accuracy and/or completeness, use information from the WWW if it appears useful (Borzo, 2009). For example, Grimes and Boening (2001) found that students reported they would use a piece of information as long as it fit their needs, regardless of whether it was accurate or not. In addition, 40 percent of students agreed that information on the Web is just as good as printed books and journals (Grimes & Boening, 2001). This is especially problematic considering how many students use the WWW for a variety of tasks, including finding information. Mokhtari, Reichard, and Gardner's (2009) research indicates that 95 percent of students reported using the Internet every day or almost every day, including e-mail use (90%), instant messaging (64%), surfing the Web (56%), listening to music (53%), and conducting research (48%). The model for acquiring information in academic settings appears to have shifted from professor and textbook to "Googling" for information, and many students are willing to settle for a source that is "good enough" (Duke & Asher, 2011, p. 73). This problem also extends beyond the classroom. In business, the model of information flow through the organization has been impacted by the WWW. Increasingly, the WWW serves as the primary source for collecting data (Segev, 1996).

Prior research examining the relationship of Web experience and trust in the Web found that perceived website quality is highly correlated with trusting vendor's intentions. Users who had no experience with a particular vendor made their decision to use that vendor based on their perception of the quality of the website (McKnight, Choudhury, & Kacmar, 2002). Content and navigation are both associated with perceived success by users (Palmer, 1997, 2002). Similarly, other studies have found that user perception of site quality is a significant predictor of their intention to purchase from it (Everard & Galletta, 2006; Lowry, Vance, Moody, Becman, & Read, 2008). Whether or not perceptions are accurately based on factual criteria, they do appear to be related to selection and trust of websites.

Design quality also appears to be highly related to user perceptions of the quality of information obtained from a website. Design quality refers to a website's appearance and function (i.e., links work, graphics and fonts are appropriate, is easy to read and navigate, displays information in easy-to-find locations). Indicators for this construct in the current study are taken from previous research and include the amount of information displayed on the screen, website organization, the usability of links, the layout of the pages, and the rate at which information is displayed (Agarwal & Venkatesh, 2002; Alexander & Tate, 1999; Everard & Galletta, 2006; Grassian, 1998; Palmer, 2002, 1997; Tractinsky, Cokhavi, & Kirschenbaum, 2004). Overall impressions of Web pages are made quickly (Tractinsky et al., 2004), and attractive websites result in positive interactions and a feeling of success (Etcoff, 1999; Jones & Hill, 1993). People tend to look at website design elements that they are concerned about, which will vary significantly from person to person (Nielsen & Pernice, 2010). One benchmark of Web usability is the ability to address the needs of all users, regardless of gender, age, culture, or even right-handed versus left-handed users (Lazar, Meiselwitz, & Feng, 2007; Schneiderman & Plaisant, 2010). However, many users tend to look in specific places for certain design functions. For example, 58 percent of users tend to look for a shopping cart in the upper-right quadrant of the web page, and 56 percent of users tend to look in the upper-right quadrant for search fields (Nielsen & Pernice, 2010). The expected placement of certain features may contribute to users' interest in a website and subsequent judgments about the quality of the information obtained on it.

There is a fundamental difference between a website's design and its information. Design quality is a different construct than information quality. An important aspect of design quality is navigation, which is associated with user satisfaction. Users who have difficulty locating and obtaining content from a website report significantly less satisfaction with it, and inexperienced users demonstrate the most frustration (Lazar, Bessiere, Ceaparu, Robinson, & Schneiderman, 2003). Likewise, users assessing the quality of information on a website may vary depending on whether their tasks are specific or general, or on their level of expertise and training (Klein, 2001, 2002, 2003). It is possible to have a well-designed website with poor information or information based on bad data. In addition, most user interface design decisions are made based on the designer's personal taste, which may or may not actually meet users' needs (Nielsen, 2005). Given the above information, we investigated how people judge information on websites. Information quality has been defined as having sufficient and appropriate information to answer users' questions (Klein, 2001, 2002, 2003; Pipino, Lee, & Wang, 2002; Strong, Lee, & Wang, 1997; Wand & Wang, 1996; Wang & Strong, 1996) and includes dimensions such as accuracy, reliability, completeness, and relevance (Wang & Strong, 1996). However, users often pay more attention to websites' design quality, such as their structure, text, graphics, style, and navigation (Kendall & Kendal, 2004). Users appear to care more about how easy the site is to use (e.g., whether the navigation links work and whether text is easy to read) than the information.

Design quality is usually under the purview of web developers or programmers, while domain experts in the field of study determine the information quality (Miletsky, 2002). Evidence from the literature suggests that design quality will impact how users perceive a website's information quality (e.g., if it looks good it must have good information). In addition, a well-designed website (e.g., visually well-designed and easy to navigate) may positively affect a person's perception that the site is easy to use and that users may subsequently be more successful in their tasks. Based on the literature, we propose the following hypotheses:

> *Hypothesis 1: Perceptions of design quality are positively related to the perception of information quality of a website.*
>
> *Hypothesis 2: Perceived design quality is positively related to ease of use of a website.*
>
> *Hypothesis 3: Perceived design quality of a website is positively related to the successful use of the website.*

Models for Studying Web Success

Some fields of study focus on how users interact with computers (Schneiderman & Plaisant, 2010) and factors that influence success in using different systems. For example, research on Web use includes factors such as design quality (Agarwal & Venkatesh, 2002; Everard & Galletta, 2006; Palmer, 2002), ease of use and usefulness (Bhattacherjee, 2001; Davis, 1989; Koufaris, 2002; Venkatesh & Davis, 2000; Venkatesh & Morris, 2000), and information quality (Klein, 2001, 2002, 2003). However, research on successful use of the WWW is limited (Zhang & Li, 2003). Theoretical models developed in information systems (DeLone & McLean, 1992; Seddon, 1997) and information science (Wathen & Burkell, 2002) research posits a theoretical relationship between the aforementioned factors and net benefits, which is usually measured as a behavioral intention to use a system. However, these models are untested in the context of the WWW and are not related to objective measures of successful use. Furthermore, the above models suggest that the user satisfaction approach is distinctly different than the technology acceptance approach. As such, we empirically examined the relationship between perceived information quality, perceived design quality, perceived usefulness, and perceived ease of use and task performance using the WWW. These four constructs were derived from three established models that provided the foundation for the selection of

these variables: the technology acceptance model (Davis, 1989), the information systems success model (DeLone & McLean, 1992, 2003), and the unified theory of acceptance and use of technology (Venkatesh, Morris, Davis, & Davis, 2003).

Technology acceptance model.

The technology acceptance model (TAM) was developed to help explain how users accept using new technology. The TAM is used to study the actual or intended use of a system, and suggests that employees will not use a system until they are ready to (Davis, 1989; Pearlson & Saunders, 2013). Moreover, employees are more inclined to use a new system that is easy to use (e.g., little effort is required to use the system) and that they perceive as being useful (e.g., allows them to be more productive). Constructs of the TAM framework (Davis, 1989) include perceived ease of use (e.g., convenient, controllable, easy, and not burdensome), perceived usefulness (e.g., how much time and effort is involved in learning to use a new system), and components of information quality (e.g., importance, relevance, and value).

The TAM has also been used to study the WWW in terms of online consumer behavior. Findings have indicated that both enjoyment of the shopping experience and perceived usefulness of websites are important factors for a customer's intention to return, which suggests that perceived usefulness is an important predictor of intended system usage (Koufaris, 2002). In addition, when a consumer's personal taste conflicts with products sold on a website, a website that is well-designed can negate some of the negative effects. Thus, information quality may not predict intention to use and return to a website because perceptions may be partially based on design factors.

Research often focuses on objective measures to define ease of use. However, "although objective ease of use is clearly relevant to user performance given the system is used, subjective ease of use is more relevant to the users decision whether or not to use the system and may not agree with the objective measures" (Davis, 1989, pg. 323). A good direction for research is objectively measuring whether perceived ease of use and perceived usefulness predict actual use (Davis, 1989). Multiple variants of the TAM have been explored, which has led to revisions and modifications of the model. For example, the TAM3 integrates the plethora of findings from research using the TAM. Figure 1 demonstrates a basic form of the TAM3 model (Venkatesh & Bala, 2008).
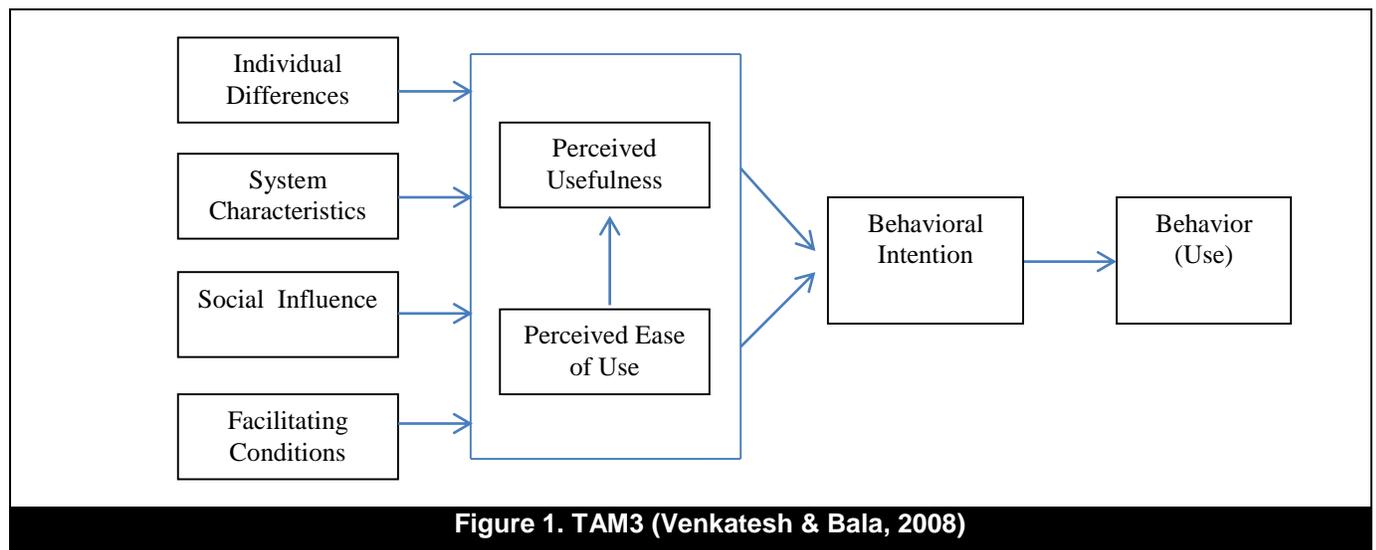

Figure 1. TAM3 (Venkatesh & Bala, 2008)

The TAM3 considers different factors that may influence how people perceive the ease of use and usefulness of technology, which likely influences user intentions and ultimately use. The left side of the figure includes determinants of perceived usefulness and perceived ease of use, including individual differences (e.g., gender and age), characteristics of the system (e.g., output quality and job relevance, which help individuals develop favorable or unfavorable attitudes about the system), social influence (e.g., subjective norms), and other facilitating conditions (e.g., managerial support) (Pearlson & Saunders, 2013; Taylor & Todd, 1995; Venkatesh & Davis, 2000). The primary difference between the TAM and the TAM3 is that the TAM model is easier for practitioners trying to understand the issues involved with user acceptance, whereas the more complex TAM3 model is useful for experts who are trying to figure out how to best implement a system (Pearlson & Saunders, 2013). The current study used two constructs from the TAM model (i.e., perceived usefulness and perceived ease of use) to examine performance in tasks using the WWW.

Lee, Kozar, and Larsen (2003) reviewed the use of the TAM since its inception, and they recommend that future TAM studies should: 1) "specify tasks more granularly", 2) investigate "actual usage and the relationships between actual usage and objective outcome measures", and 3) attempt to "determine whether the assumption that the relationship between IS usage, satisfaction, productivity and quality is positive (Lee et al., 2003, pp. 767-768) Based on the TAM research, we propose the following hypothesis:

Hypothesis 4: Perceived ease of use of a website is positively related to perceived usefulness of the website.

Unified theory of acceptance and use of technology.

Another variation of the TAM is the unified theory of acceptance and use of technology (UTAUT) (Venkatesh et al., 2003). The UTAUT proposes that user intentions to use a system—and subsequent usage behavior—are based on four key factors known as latent variables: performance expectancy, effort expectancy, social influence, and facilitating conditions. The UTAUT integrates eight theories and models of user acceptance of technology, including the theory of reasoned action (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975), the technology acceptance model (Davis, 1989), the motivational model (Davis, Bagozzi, & Warshaw, 1992), the theory of planned behavior (Ajzen & Madden, 1986; Schifter & Ajzen, 1985), a model combining the theory of planned behavior and technology acceptance models (Taylor & Todd, 1995), the model of PC utilization (Thompson, Higgins, & Howell, 1991), the innovation diffusion theory (Rogers, 1983), and social cognitive theory (Bandura, 1986). The four latent factors (i.e., performance expectancy, effort expectancy, social influence, and facilitating conditions) were developed through structural equation modeling by identifying indicators (i.e., statements that operationalize the constructs) of all eight constructs.

Venkatesh et al. (2003) conducted a longitudinal study of technology acceptance in two firms. Users completed surveys describing their satisfaction and intended use of a new mandated software system being introduced in their respective firms. The authors drew survey scales from the eight models of use acceptance that form the UTAUT. They analyzed the results with partial least squares to determine the factor loadings of the indicators (i.e., statement scores) that would best define the constructs, and to determine the path of interactions. They identified four constructs: performance expectancy, effort expectancy, attitude, and social influence.

The first construct, performance expectancy, is identical to usefulness. Factor analysis resulted in four item indicators of usefulness, which are semantically identical to the indicators used in prior research (Davis, 1989) for perceived usefulness. The second construct, effort expectancy (also known as perceived ease of use), includes the same indicators (i.e., items) used in previous research regarding the ease of operating a website, the ease of reading the pages, overall ease of use, and clarity of website labels (Davis, 1989). The third construct, attitudinal, refers to the user's affect of enjoyment or lack thereof. The fourth construct, social influence (also known as social norm), refers to whether the user is influenced by others.

Venkatesh et al. (2003) moderated the constructs with four variables: gender, age, experience, and voluntariness. Each construct was affected in a different manner. For example, the authors found facilitating condition to be significant only in conjunction with age and experience; that is, it only mattered to older workers. Overall, results indicate that 70 percent of the variance was explained by the four constructs and the four moderating variables (Venkatesh et al., 2003). Prior research suggests that, if a website is perceived as easy to use (e.g., because it is well organized and relevant to a given topic), then users will perceive it to be useful for their specific needs. In addition, if a website is perceived as useful, then users will be able to find the necessary information to be successful in their task(s). The UTAUT research reinforces the constructs developed in prior research (Davis, 1989). In addition, it reinforces the validity of our use of these constructs to develop a model for predicting task performance. Based on previous research, we propose the following hypothesis:

Hypothesis 5: Perceived usefulness of a website is positively related to the successful use of the website.

Information system success model.

Another model that examines user intentions is the IS success model (DeLone & McLean, 2003, 1992). Intended to measure user satisfaction, the IS success model identifies dependent variables that measure success of information systems, including system quality, information quality, use, user satisfaction, and individual and organizational impact. Figure 2 shows the multi-dimensional nature of the six distinct categories of the IS success model. They are not simply discrete outcome measures, but rather are part of a greater process. That is, there are dependencies between these relationships similar to the dependency found in the TAM. In addition, this model is not linear. For example, user satisfaction is thought to be dependent on system use, and system use is dependent on the information quality delivered by the system. Similarly, organizational impact—which is historically the most difficult to

measure and least studied variable—is complex, and it is challenging to isolate from other factors such as external economic indicators.

The IS success model (DeLone & McLean, 2003, 1992) has been tested with minor modifications, such as changing "use" to "usefulness" and adding an additional variable called "user involvement" (Seddon, 1997). Researchers found highly significant path coefficients. The original IS model measured each category, and had a great deal of overlap, which made the categories unusable as constructs. Currently, the categories are considered global categories from which constructs can be derived. In an effort to use the model without first specifying and validating the constructs, the IS success model has been described as both a process model and a variance model (Seddon, 1997).
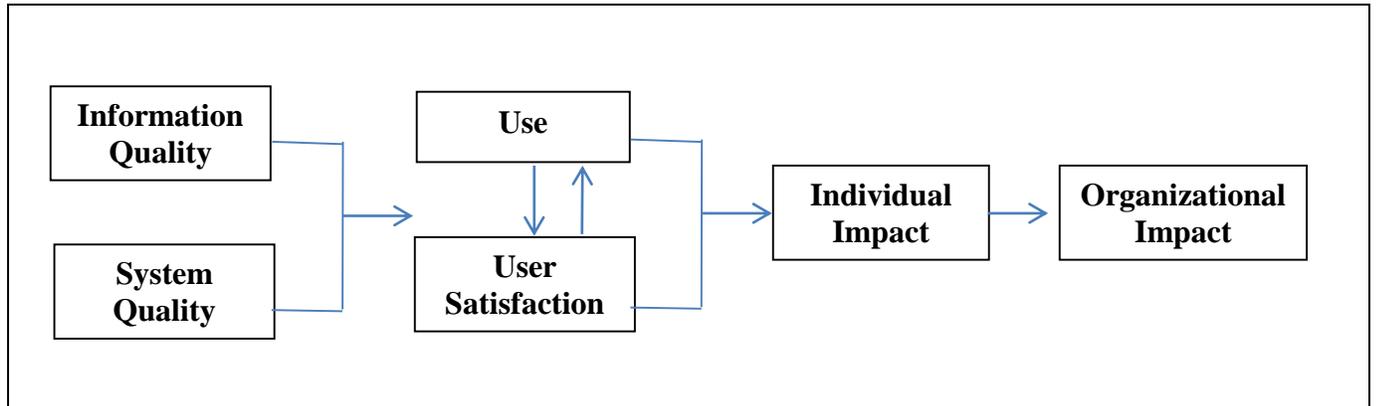

Figure 2. IS Success Model (DeLone & McLean,1992)

Instead of using system quality and information quality as dependent variables, the model uses both as independent variables. The quality of the system and the information quality should have a direct impact on perceived usefulness and user satisfaction (Seddon, 1997). This model includes two of the TAM (Davis, 1989) variables: perceived ease of use and perceived usefulness. Although performance success was not directly measured as a dependent variable, the IS success model assumes success based on the perceptual benefits derived from the independent variables perceived usefulness and user satisfaction. Seddon (1997) drew several conclusions:

- Perceived usefulness is a predictor of future use
- IS use does not directly measure successful use of a system
- As users have positive experiences with a system, they will have more success, which will lead to increased use and revised expectations.

The IS success model has been applied to software systems not based on the Web. In fact, in response to the emergence of end user computing, DeLone & McLean (2003) have added specific extensions to the model for use in e-commerce applications. The context—which determines the constructs that will make up the system components—is an important caveat for testing the IS success model (DeLone & McLean, 2003), which considers "system quality" and "information quality" as dimensions of IS success. The model considers system and information quality as antecedents to the remaining constructs including use, user satisfaction, and individual impact (Seddon, 1997). This updated model also includes system quality (defined as usability, availability, reliability, adaptability, and response time), which combines information quality (e.g., completeness, ease of understanding, personalization, relevance, and security) and service quality (e.g., assurance and responsiveness) (DeLone & McLean, 2003).

Prior research suggests that highly complex and very specific search tasks may result in the perception that a website is not useful, supporting the idea that information quality may not predict task success because the complexity and specificity of a task may preclude approval of a website's information quality (Ingwersen, Lioma, Larsen, & Wang, 2012). On the other hand, when users find information that they perceive as high quality (e.g., it is perceived as relevant to a specific task and adequate to meet their needs), they are more likely to believe that the website is useful to them and have more success in accomplishing tasks. As such, we propose the following hypotheses:

Hypothesis 6: Perceived information quality is positively related to perceived usefulness of a website.

Hypothesis 7: Perceived information quality of a website is positively related to successful use of the website.

The Current Study's Proposed Model and Construct Definition

Prior research has proposed the need for more empirical testing of the links between usability and behavior (Agarwal & Venkatesh, 2002). However, many studies attempting to replicate Web experiences fail the ecological validity test because participants can often identify the study's purpose (Agarwal & Venkatesh, 2002; Alexander & Tate, 1999; Everard & Galletta, 2006; Grassian, 1998; Palmer, 2002, 1997; Palmer & Griffith, 1998). Such studies often use artificial websites that do not follow the suggested guidelines for good web interface design. However, the trade-off is that extraneous variables are easier to account for due to the controlled setting of the research environment. Ideally, researchers could integrate experimental research with the design sciences (Lyytinen, 2010).

Based on previous literature, we propose a Web performance success model. The model consists of four independent constructs, a dependent outcome variable (i.e., task performance), and a hypothesized path structure of the interrelationships between the variables shown in Figure 3. We objectively measured the net benefits in this study by the subjects' performance in an assigned task, as opposed to a perceived or implied measure (Seddon, 1997). The UTAUT model had two dependent variables: behavior intention, measured with survey questions, and usage behavior, measured by adding the log time for each user in the system. We used an objective measure of task performance (i.e., the number of correct answers for the assigned task) as opposed to behavior intention or amount of time in the system. Several moderating variables used in the UTAUT analysis were not relevant in our study. For example, age was not a moderating factor because most subjects were 18 to 25 years old. Thus, the variation among subjects' age would not be significant enough to influence the variation in the model. Venkatesh et al. (2003) found that experience with the systems under study changed over time: that is, more use made more-satisfied users, and therefore influenced the constructs in the UTAUT model. In our study, we operationalized experience by timing subjects as they tried to find the answers to five general use questions:

1) Find the phone number for a local restaurant.
2) Find the stock price of Dell from the previous day.
3) Find the current temperature.
4) Find the author of this quote: "Do all men kill the things they do not love?"
5) In what year did Warren and Brandeis write "The Right to Privacy"?

We found neither a theoretical basis nor a statistical finding (Venkatesh et al., 2003) for including experience as a latent variable predicting task performance; therefore, we did not include a hypothesis to examine that relationship.

We also did not measure voluntariness because we directed the subjects to use the WWW to complete the performance task. The conditions to perform the task limited subjects to selecting one website in order to then evaluate that site on the four constructs. Subjects were allowed to use the Internet browser of their choice and the search engine of their choice while using the campus network.

The difference between the IS success model and our proposed model is that the IS success model is a process model without the flow defined by directional paths. Our model, illustrated in Figure 3, suggests a directional path for each relationship.
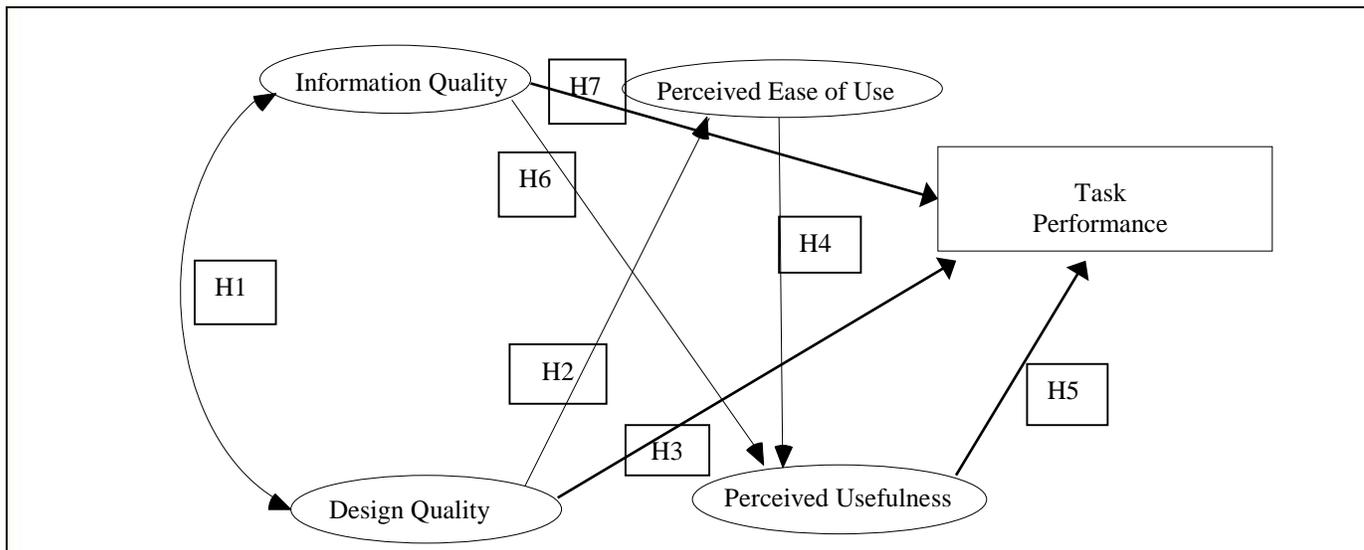

Figure 3. Theoretical Model

II. METHODOLOGY

We used a survey instrument to gather the data for analysis. We informed participants that the research study intended to examine factors related to use of the WWW and would involve finding answers to questions relating to criminal justice (specifically, fingerprinting). We provided participants with the following instructions: "Based on this topic, locate a source on the Web that you think will have college-level material that you might use for research purposes. Give yourself approximately 10 minutes to find the best website. You must use only the website you have selected to answer the questions. Even if you cannot answer all the questions, do not search for another webpage, but use the one you have already selected and do the best you can to answer the questions". We instructed participants to use their preferred searching method to locate a website to find the answers to the questions. We supervised participants during this process but they worked independently.

Instrument

The survey instrument contained the following items:

- Informed consent
- General directions
- Directions to complete the tasks along with each of the following tasks
    - Topic research for content questions of use test
    - Information quality perceptions
    - Design quality perceptions
    - Usefulness perceptions
    - Ease of use perceptions
    - Demographic data
    - Web expertise test

We measured all answers using a seven-point Likert scale with the range that makes sense for the statement and intent of the scale.

This study examined the relationship between four latent constructs—perceived ease of use, perceived usefulness, perceived information quality, and perceived design quality—and task performance using the World Wide Web (WWW). We asked participants to use the WWW to find answers to specific questions. We determined task performance success objectively by answering the questions correctly or incorrectly. We then asked participants to complete a subjective perception task, in which they rated their selected websites on measures of perceived design quality, perceived information quality, perceived ease of use, and perceived usefulness.

Construct Variables

Participants rated their level of satisfaction with their chosen website using a seven-point scale (1 = strongly disagree, 7 = strongly agree) to answer questions about the latent constructs (i.e., perceived ease of use, perceived usefulness, perceived information quality, and perceived design quality). We used the ratings in confirmatory factor analysis as part of the structural equation modeling to determine how well the indicators defined the constructs. Please see Appendix A for a list of all items used for each construct.

Construct 1: Perceived ease of use.

We define perceived ease of use as: "The user perceives that the website is easy to use and finds it not difficult to answer the questions" (Bhattacherjee, 2001; Corritore, Kracher, & Wiedenbeck, 2003; Davis, 1989; Koufaris, 2002; Venkatesh & Bala, 2008; Venkatesh & Morris, 2000). We used five items to measure perceived ease of use. Sample items include: "The display pages within the websites are easy to read" and "The website labels are easy to understand". The Cronbach alpha coefficient for this five-item scale was α = .87.

Construct 2: Perceived usefulness.

We define perceived usefulness as" "Users think that the website will benefit them by helping them to successfully answer the questions" (Bhattacherjee, 2001; Corritore, et al., 2003; Davis, 1989; Koufaris, 2002; Venkatesh & Bala, 2008; Venkatesh & Morris, 2000). We used five items to measure perceived usefulness. Sample items include: "The website adequately meets my information needs" and "The information on the website is effective". The Cronbach alpha coefficient for this five-item scale was α = .95.

Construct 3: Perceived information quality.

We define perceived information quality as: "Users find the information on the website is sufficient and appropriate to answer all the questions" (Klein, 2001, 2002, 2003; Pipino et al., 2002; Strong, Lee, & Wang, 1997; Wand & Wang,

1996). We used five items to measure perceived information quality. Sample items include: "I believe the information on the website is accurate" and "I believe the information on this website is believable". The Cronbach alpha coefficient for this five-item scale was α = .83.

Construct 4: Perceived design quality.

We define perceived design quality as: "Users think the website functions well, is easy to navigate, easy to read, looks nice, and information can be easily found" (Agarwal & Venkatesh, 2002; Alexander & Tate, 1999; Everard & Galletta, 2006; Grassian, 1998; Palmer, 2002, 1997; Palmer & Griffith, 1998, Tractinsky et al., 2004). We used five items to measure perceived design quality. Sample items include: "I find the website well organized" and "The links were useful and easy to locate". The Cronbach alpha coefficient for this five-item scale was α = .79.

Table 1 summarizes the construct variables.

Table 1: Operational Definitions of Construct Variables		
Variable	**Definition**	**Studies used in**
Ease of use	The user perceives that the website is easy to use and finds it not difficult to accomplish his task.	Koufaris (2002), Bhattacherjee (2001), Venkatesh (2000), Venkatesh & Morris (2000), Davis (1989), and Corritore et al. (2005)
Usefulness	Users think that the website will benefit them by helping them to successfully answer the questions.	Koufaris (2002), Bhattacherjee (2001), Venkatesh (2000), Venkatesh & Morris (2000), Davis (1989), and Corritore et al. (2005)
Information quality	Users find the information on the website is sufficient and appropriate to answer all the questions.	Wand & Wang (1996), Strong et al. (1997), Pipino et al. (2002), and Klein (2001, 2002, 2003)
Design quality	Users think the website functions well, is easy to navigate, easy to read, looks nice, and information can be easily found.	Alexander & Tate (1999), Grassian (1998), Palmer & Griffith (1998), Palmer (1997, 2002), Tractinsky, et al., (2004), Agarwal & Venkatesh (2002), and Everard & Galletta (2006)

Dependent Variable: Task Performance

The dependent variable in this study was task performance, which we define as the number of questions answered correctly. We asked participants to use the WWW to answer five questions related to criminal justice. Items included questions related to fingerprinting patterns and fingerprint classification systems (please see Appendix B).

III. ANALYSIS APPROACH

Structural equation modeling.

Structural equation modeling (SEM) is an efficient, advanced statistical method for simultaneously testing the model and the measurement model (Gefen, Straub, & Boudreau, 2000). It combines confirmatory factor analysis of the latent variables (constructs) with a test of the model's goodness of fit. Prior to SEM's development, researchers first had to conduct a confirmatory factor analysis (CFA) to measure the factor loading of the variables (constructs). Once they identified the variables through CFA that they hypothesized to predict the outcome, they tested several models to see if there was a causal relationship between the independent variables (constructs) and the dependent variable.

In SEM using AMOS, the confirmatory factor analysis (CFA) is part of the testing. The measurement of the variables as they load on each construct is measured and the factors that do not meet the criteria are dropped (See Table 3 for factor loadings and Constructs). Another advantage of this part of the SEM method is that the factors have unidimensionality; that is, they only load on one construct, which prevents cross loading and therefore supports the theoretical basis on which the constructs were hypothesized.

Using the factors (Table 3) that meet the required loading standard of > .65, we adjusted the model then tested for goodness of fit. The independent variables are the constructs determined by the CFA and they are shown in Figure 1 as predictive of the success subjects will have in finding the answers to the questions. The path of best fit is shown in Figure 4, which illustrates the order in which the independent variables (constructs) relate to the dependent variable (success in answering the questions). The literature cited in Table 1 provides the theoretical basis for the hypotheses. It is an essential component in SEM that hypotheses be grounded in theory. SEM has been used successfully by Poels, Maes, Gailly, and Paemeleire (2005) to evaluate the perceived semantic quality of a conceptual model, who provide validation of a multi-item measure. Our study extends Poels et al.'s (2005) model and includes additional variables of Information quality and design quality.

Sample

The sample consisted of 226 undergraduate college students at a small American college in the Northeast. The sample included 140 females (62%) and 86 males (38%). Participants' level of college education included 104 (46%) freshman, 46 (20%) sophomores, 49 (22%) juniors, and 27 (12%) seniors. Eight participants were under 18 (3.5%), 215 (95%) were 18-25 years old, 2 (1%) were 26-35 years old, and 1 (<1%) was 36-45 years old. Participants' majors included accounting (5%), American studies (3%), biology (18%), business administration (23%), chemistry (> 1%), communication (13%), criminal justice (> 1%), environmental science (1%), educational psychology (1%), fashion (20%), history (1%), mathematics (1%), modern languages (> 1%), political science (3%), psychology (6%), and social work (1%). Seven (3%) participants did not report their major. Participants provided the URL of the website they used along with the answers to the questions. They selected a total of 33 different websites for use in this task. The most frequently used website, www.fingerprinting.com, was used by 76 participants.

IV. ANALYSIS

We examined and corrected violations of univariate normality before screening for multivariate normality. Criteria for univariate normality we utilized in this study were Skew between -2.0 and 2.0 and Kurtosis between -7.0 and 7.0 (Kline, 2005). All items were sufficiently normally distributed. All variables included in the CFA were also screened for multivariate outliers. Each of the four constructs started out with five indicators (i.e., items). Thus, we included a total of twenty variables in the regression analysis, with the critical χ^2 = 45.32 (Tabachnick & Fidell, 2007). We operationalized multivariate outliers as cases with Mahalanobis distance values greater than 45.32. Using this method, we detected and deleted four multivariate outliers from our analyses. The final sample size exceeded the recommended sample size for a CFA (Jackson, 2003; Kline, 2005).

We made revisions in an attempt to improve model fit. First, we deleted one item from the system quality construct (item 2: "The amount of information displayed on the screen was inadequate … adequate") because the loading was less than .60. Second, the Lagrange-Multiplier test provided post-hoc suggestions for parameters that should be added to the model (Bentler, 2004). As a result, we deleted items 4 and 5 from perceived usefulness ("The information on the website is effective" and "I find the website useful in completing assignments like this") from the perceived usefulness construct because these items cross-loaded with the information quality construct. Additionally, because item 3 from information quality construct cross-loaded with perceived usefulness construct, we deleted it as well. We used the root mean square error of approximation (RMSEA), the comparative fit index (CFI), and the Tucker-Lewis index (TLI) to evaluate the model fit. The second revision had an acceptable fit with the observed data.

V. RESULTS

Table 1 presents all fit indices of CFA analyses. The table shows that the hypothesized 4-factor model with five indicators did not fit the data well. As a result, we modified the hypothesized model. For the first modification, we removed all items with loadings lower than .60 from the model (Marsh & Hau, 1999). Using this criterion, we deleted a total of three items: item 5 from the information quality construct, item 3 from the perceived ease of use construct, and item 5 from the design quality construct. Based on the CFA, the model supported the data.

Table 2: Confirmatory Factor Analysis of 4-Factor Structure					
Model	**S-B χ2**	**Df**	**CFI**	**TLI**	**RMSEA**
Hypothesized model	556.79	164	.86	.83	.11 (.096 - .116)
Revision 1	317.34	98	.91	.88	.10 (.090 - .115)
Revision 2	148.84	59	.95	.93	.084 (.068 - .101)
Hypothesized model	556.79	164	.86	.83	.11 (.096 - .116)
Revision 1	317.34	98	.91	.88	.10 (.090 - .115)
Revision 2	148.84	59	.95	.93	.084 (.068 - .101)

Table 2 presents the standardized and unstandardized factor loadings. All factors in the final model contained at least three items, which is the recommended minimum number of items that should comprise a factor (Kline, 2005).

Table 3: Standardized and Unstandardized Loadings for the Modified 4-Factor									
		IQ		PEOU		DQ		PU	
Item	Description	Unstand.	Stand.	Unstand.	Stand.	Unstand.	Stand.	Unstand.	Stand.
IQ1	Accurate	1.24(.12)	.88						
IQ2	Believable	1.01(.10)	.90						
IQ4	Concise	1.00(--)	.65						
PEOU1	Operate			.88(.07)	.81				
PEOU2	Read			.85(.07)	.81				
PEOU4	Skill			1.00(--)	.82				
PEOU5	Understand			.80(.07)	.75				
DQ1	Organized					.90(.08)	.77		
DQ3	Find					.93(.10)	.67		
DQ4	Tasks					1.00(--0)	.83		
PU1	Answers							.94(.04)	.91
PU2	Needed							.98(.04)	.95
PU3	Adequate							1.00(--)	.93
Note: Robust standard errors are reported in parentheses									

Model specification.

We used multiple fit indices to evaluate model fit (Kline, 2005). We eliminated the chi-square statistic because it is heavily influenced by sample size (Hu & Bentler, 1999). Additional fit indices included: the goodness of fit index (GFI), the comparative fit index (CFI), the Tucker-Lewis index (TLI), and the root mean square error of approximation (RMSEA).

A GFI with a value of 1 is considered a perfect fit, with a value ≥.90 constituting a good fit. The CFI is derived from a comparison of the hypothesized model and the independent model, with a good fit having values ≥.95. Values greater than .90 and .95 for the CFI and TLI indicate acceptable and good fit, respectively. A value of the RMSEA of .05 or less would indicate a close fit of the model in relation to the degrees of freedom. In this model, the RMSEA was .08 ($CI_{90\%}$ = .64 - .095) (Hu & Bentler, 1999). This model accounted for 18.4 performance of the variance in task performance.

Correlations among the four subscales derived from the factor analysis were significant. According to Cohen's (1988) conventions, effect sizes of these correlations were in the medium range (i.e., between .3 and .5). Only the perceived usefulness construct correlated significantly with task performance, and the effect size of this correlation was also in the medium range.

Table 4: Zero-Order Correlations, Means, Standard Deviations, Internal Consistency, and Inter Correlations of Measures									
Variable	Range		M	SD	1	2	3	4	5
	Min	Max							
Information quality	8.00	21.00	16.96	3.19	1				
Ease of use	8.00	28.00	23.13	4.48	.42***	1			
Design quality	4.00	21.00	15.56	3.98	.42***	.57***	1		
Usefulness	3.00	21.00	10.20	4.87	.32***	.26***	.33***	1	
Performance success	0.00	4.00	1.33	1.07	.02	-.03	.02	.42***	1
*p < .05, **p < .01, ***p < .001									

Final path model.

We used the four factors identified in the CFA in a structural equation model (SEM), which measures the relationship between the constructs. The main outcome variable was task performance (i.e., the ability to successfully answer assigned task questions). We conducted all SEM analyses in AMOS 16.0.1. We used the same fit indices that were used in the CFA in our SEM analysis.

Figure 4 presents the final result of the path coefficients of the model that reach at least p< .01 significance. Links that we found to not contribute to the path relationship were: IQ → task performance and DQ → task performance. The final path model shows that Hypothesis 5 and Hypothesis 7 were not supported. The other five hypotheses were supported.

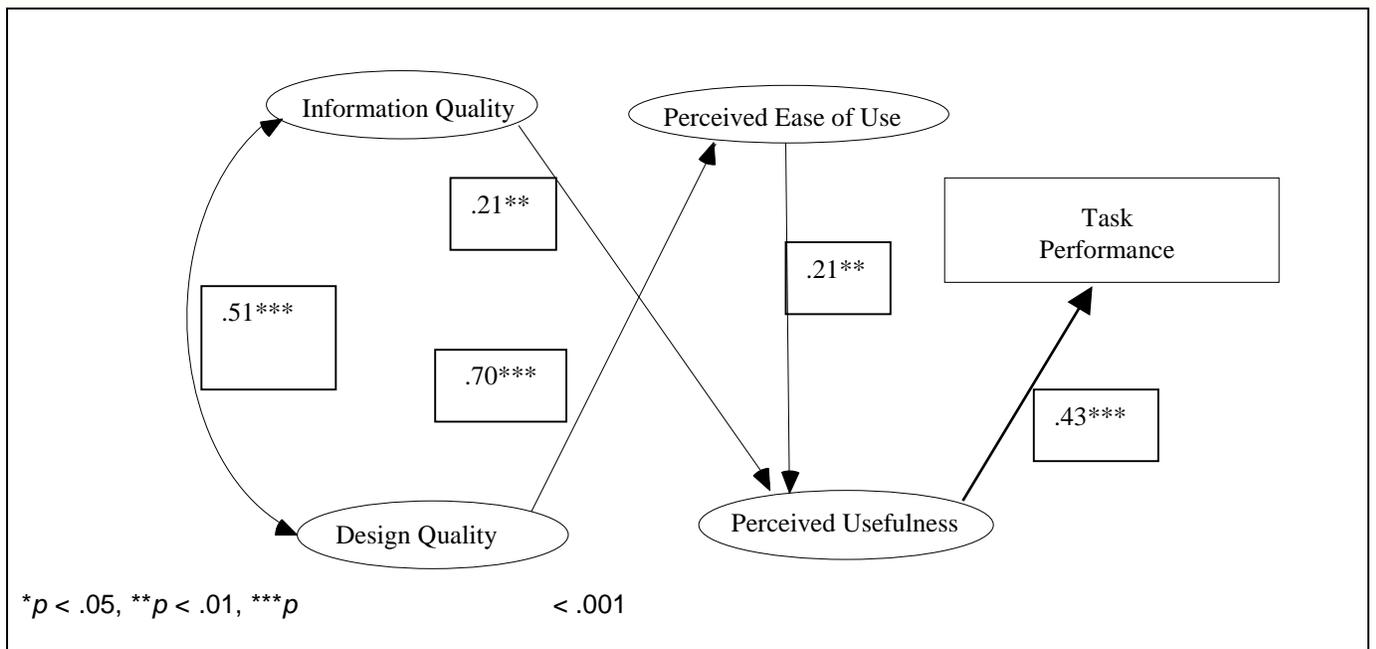**Figure 4. Final Path Model**

Hypotheses

Hypothesis 1

Hypothesis 1 proposed that a website's perceived design quality is positively related to its perceived information quality. Our model supported Hypothesis 1 ($r = .42$, $p < .001$). Both latent variables varied consistently, suggesting that, when users perceive a website to be designed well (e.g., well organized with links that are easy to find and use), they are more likely to believe the information on the website to be valuable and accurate. This is consistent with previous research of web design where study participants have viewed good design as adding credibility or trust to the website in question (Fogg et al., 2001; Fogg & Tseng, 1999).

Hypothesis 2

Hypothesis 2 proposed that a website's perceived design quality is positively related to its perceived ease of use, which was supported ($r = .57$, $p < .001$). These results suggest that users who perceive a website to have good design quality also find that website easy to use.

Hypothesis 3

Support was not found for Hypothesis 3, which proposed that a website's perceived design quality is positively related to task performance ($r = -.03$, *ns*). Unlike results found in e-commerce research (Agarwal & Venkatesh, 2002; Everard & Galletta, 2006; Lyytinen, 2010; Palmer, 2002), users perceived websites to be well designed; however, no relationship exists between that perception and task performance success. Thus, it appears a website can have a high-quality design but have inaccurate information, resulting in a user being unsuccessful in accomplishing a task.

Hypothesis 4

Hypothesis 4 proposed that a website's perceived ease of use is positively related to perceived usefulness of the site, which was supported ($r = .26$, $p < .001$). These results suggest that users who find websites easy to use (e.g., displays and labels are easy to read) perceive it to be more useful (e.g., perceive that the website is effective for completing tasks). This relationship is consistent with previous research (Davis, 1989; Venkatesh et al., 2003) that found that user intentions to use a system—and subsequent usage behavior—are based on effort expectancy, which was defined by the same indicators as ease of use.

Hypothesis 5

Hypothesis 5 proposed that a website's perceived usefulness is positively related to task performance, which was supported. The correlation between the perceived usefulness construct and the task performance measure is significant ($r = .42$, $p < .001$). These results are consistent with previous research (Davis, 1989; Venkatesh et al., 2003) that found a direct link between perceived usefulness, usage, and intention to use a system. These results suggest that users who perceive a website to be useful (e.g., able to adequately and effectively meet task needs)

are more successful overall in completing tasks. In addition, a simple point can be made: a website may be perceived as useful because the website is, in fact, useful. A "useful" website is one that has information that helps users successfully complete tasks.

Hypothesis 6

Hypothesis 6 proposed that a website's perceived information quality is positively related to its perceived usefulness, which was supported (r = .32, $p < .001$). These results suggest that users who perceive information on a website to be high quality are more likely to believe that the website can effectively meet their needs in completing a task. This finding is consistent with previous research (Bhattacherjee, 2001; Davis, 1989; Rai, Lang, & Welker, 2002) in that satisfaction with information systems is a strong predictor of users' intentions to continue using the system.

Hypothesis 7

Support was not found for Hypothesis 7, which proposed that a website's perceived information quality is positively related to its task performance (*r* = .02, *ns*). Although prior research makes a strong case for the important role information quality plays in impacting the actual use of a system (DeLone & McLean, 1992; Seddon, 1997; Fogg et al., 2001; Fogg & Tseng, 1999), our results do not support the expectation that the more successful the user is in achieving the outcome measure the higher will be their rating of the perception of information quality. The results suggest that users may have a difficult time judging a website's actual information quality. Unless there is corroborating evidence as to the quality of the website (e.g., data quality tags or other information related to quality), users appear to confuse information quality with other factors, such as the ability to navigate the site easily. Perceptions of information quality may also be skewed by other design factors.

Previous research has identified many dimensions of information quality, such as accuracy, relevance, and completeness (Wand & Wang, 1996). It is possible that users confuse the different dimensions of information quality, or are unable to distinguish between them. For example, in our study, users appeared to have a difficult time distinguishing between the appearance of information on a website and the accuracy of the information contained on it. However, "accuracy" definitions vary significantly across research studies (Fisher et al., 2009). Given that participants were unsuccessful in answering the questions from websites they perceived as having high information quality, it is clear that perceptions of information quality are not always factual and may be misunderstood.

V. DISCUSSION AND IMPLICATIONS

This study explored the complex relationship between perception of information found on the WWW and the successful use of WWW resources for effectively completing a task. In addition, we provide a better understanding of how people use the WWW and looked at different constructs related to the successful use of the WWW.

We contribute to the literature by demonstrating a successful model for studying the WWW as an information system. The model developed in this paper extends previous IS models used in non-Web application research (e.g., the TAM, the UTAUT, and the IS success model). The constructs in this model have been successfully used in prior information models. Another contribution is our study's design, which replicated real web-use experiences versus controlled websites created for research purposes. Although there are clear benefits to conducting research in a controlled laboratory setting, there are also benefits of conducting field studies. In practice, these different types of research can complement one another by showing similar results from different research designs. Using participants who were engaged in real tasks makes the results more generalizable as compared to studies using participants not engaged in real tasks. Finally, our research demonstrates the importance of the different ways people perceive information found on the WWW, which have significant meaning in the development of a success model of information system use (Davis, 1989; DeLone & McLean, 1992; Fogg et al., 2001; Fogg & Tseng, 1999; Seddon, 1997).

In a larger context, it is important to understand the criteria people use in assessing the validity and reliability of information found on the WWW. With the proliferation of Web access, people use the Web as a primary go-to source for gathering information. However, much information on the Web is user-generated (e.g., wikis and blogs) and not validated. There seems to be a perception that information that looks good is good (e.g., well-designed web sites contain high-quality information), but that assumption is not founded in truth. That is, there is no correlation between websites that look good and websites that contain high-quality information (e.g., information that is accurate, reliable, and relevant). Consequently, people may base their judgments of information quality on faulty assumptions.

Limitations and Future Research

Our study was limited in several ways. First, the sample population was limited in that participants were college students between the ages of 18 and 25. Thus, the results' generalizability are limited. Second, we asked participants to choose only one website. This control was necessary for participants to rate their perceptions of, and

experience with, one site; however, future research might include conditions that are more consistent with search techniques as they are commonly conducted by users. For example, many people probably view multiple sites before selecting information. In addition, an experimental design, using a control group that uses textbooks to find the answers, would contribute to the validity of the findings. Another limitation is that participants were limited to public websites. The use of additional sources, such as books and journals, often require membership. However, it is likely that the current method more accurately reflected how people conduct research on the WWW. Perhaps the most basic recommendation is for future research to develop and incorporate multiple measures of "success" using websites.

Finally, an important implication of the current research is for computer-literacy educators. If users were more aware (i.e., literate) of the constructs and definitions of data and information quality, and if they had valid direction and criteria to use when searching for information, then they might be better prepared to critically evaluate information derived from the WWW. In addition, they might be better able to understand the distinctions between design quality and information quality. Thus, perhaps at the simplest level the current research demonstrates a need for more education in the area of information literacy.

Conclusion

In this study, we examined how people evaluate Web content, and whether those factors lead to more successful acquisitions of information. Using structural equation modeling, we empirically examined the relationship between four constructs (perceived information quality, design quality, usefulness, and ease of use) and success on Web-based tasks. Results indicate that there is a path relationship leading to success in finding answers on the WWW. Our results highlight the importance of human perceptions as predictors of successful system use, and suggests a need for education in the area of information literacy.

REFERENCES

Editor's Note: The following reference list contains hyperlinks to World Wide Web pages. Readers who have the ability to access the Web directly from their word processor or are reading the paper on the Web, can gain direct access to these linked references. Readers are warned, however, that:
1. These links existed as of the date of publication but are not guaranteed to be working thereafter.
2. The contents of Web pages may change over time. Where version information is provided in the References, different versions may not contain the information or the conclusions referenced.
3. The author(s) of the Web pages, not AIS, is (are) responsible for the accuracy of their content.
4. The author(s) of this article, not AIS, is (are) responsible for the accuracy of the URL and version information.

Agarwal, R., & Venkatesh, V. (2002). Assessing a firm's web presence: A heuristic evaluation procedure for the measurement of usability. *Information Systems Research*, *13*(2), 168-186.

Ajzen, I., & Fishbein, M. (1980) *Understanding attitudes and predicting social behavior*. Englewood Cliffs, NJ: Prentice-Hall.

Ajzen, I., & Madden, T. J. (1986) Prediction of goal directed behavior: Attitudes, intentions, and perceived behavioral control. *Journal of Experimental Social Psychology, 22*, 453-474.

Alexander, J., & Tate, M. (1999). *Web wisdom: How to evaluate and create information quality on the web*. Mahwah, NJ: Lawrence Erlbaum Associates.

Bandura, A. (1986). Perceived self-efficacy in cognitive development and functioning. *Educational Psychologist*, *28*(2), 117-148.

Bentler, P. M. (2004). *EQS 6 structural equations program manual*. Encino, CA: Multivariate Software.

Bhattacherjee, A. (2001). Understanding information systems continuance: An expectation-confirmation model. *MIS Quarterly, 25*(3), 351 – 370.

Borzo, J. (2005). Teens don't know everything. *The Wall Street Journal.* Retrieved from http://online.wsj.com/article_print/0,,SB111401164267912052,00.html

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates.

Corritore, C. L., Kracher, B., & Wiedenbeck, S. (2003). On-line trust: Concepts, evolving themes, a model. *International Journal Human-Computer Studies*, *58*(6), 737-758.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, *13*(3), 319 – 340.

Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1992). Extrinsic and intrinsic motivation to use computers in the workplace. *Journal of Applied Social Psychology, 22*, 1111-1132.

DeLone, W. H., & McLean, E. R. (1992). Information systems success: The quest for the dependent variable. *Information Systems Research, 3*(1), 60-95.

DeLone, W. H., & McLean, E. R. (2003). The DeLone and McLean model of information systems success: A ten-year update. *Journal of Management Information Systems, 19*(4), 9-30.

Duke, L. M., & Asher, A. D. (2011). *College libraries and student culture: What we know.* Chicago, IL: ALA Editions.

Eppler, M., & Muenzenmayer, P. (2002). Measuring information quality in the web context: A survey of state-of-the art instruments and an application methodology. In C. Fisher & B. Davidson (Eds.), *Proceedings of the 7th international conference on information quality* (pp. 187-196). Cambridge, MA: MIT.

Etcoff, N. (1999) *Survival of the prettiest.* New York: Anchor Books.

Everard, A., & Galletta, D. F. (2006). How presentation flaws affect perceived site quality, trust, and intention to purchase form an online store. *Journal of Management Information Systems*, *22*(3), 55-95.

Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention and behavior: An introduction to theory and research.* Reading, MA: Addison-Wesley.

Fisher, C. W., Lauria, E. J. M., & Matheus, C. C. (2009). An accuracy metric: Percentages, randomness and probabilities. *Journal of Data and Information Quality*, *1*(3), 1-16.

Fogg, B. J., Marshall, J., Laraki, O., Osipovich, A., Varma, C., Fang, N., Paul, J., Rangnekar, A. Shon, J., Swani, P., & Treinen, M. (2001). What makes web sites credible? A report on a large quantitative study. In *CHI 2001 conference proceedings* (pp. 61-68). Seattle, WA: ACM.

Fogg, B. J., & Tseng, H. (1999). The elements of computer credibility. In *CHI 1999 conference proceedings* (pp. 80-87). Pittsburgh, PA: ACM.

Gefen, D., Straub, D. W., & Boudreau, M.-C. (2000). Structural equation modeling and regression: Guidelines for research practice. *Communications of the Association for Information Systems,* 4(7), 2-77.

Grassian, E. (1998). *Librarian-teachers and the virtual library*. New York: Neal-Schuman.

Grimes, D. J., & Boening, C. H. (2001). *Worries with the web: A look at student use of web resources.* Retrieved from http://www.ala.org/ala/acrl/acrlpubs/crljournal/backissues2001b/january01/grimes.pdf

Heiman, G. (2000) *Understanding research methods and statistics: An integrated introduction for psychology*. Wadsworth Publishing.

Hu, L., & Bentler, M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, *6*, 1-55.

Ingwersen, P., Lioma, C., Larsen, B., & Wang, P. (2012). An exploratory study into perceived task complexity, topic specificity and usefulness for integrated search. In *Proceedings of the fourth information interaction in context symposium* (pp. 302-305). Nijmegen, The Netherlands: ACM.

Jackson, D. L. (2003). Revisiting sample size and number of parameter estimates: Some support for the *N*:q hypothesis. *Structural Equation Modeling*, *10*, 128-141.

Jones, D., & Hill, K. (1993). Criteria of facial attractiveness in five populations. *Human Nature*, *4*(3), 271-296.

Kahn, B. K., Strong, D. M., & Wang, R. Y. (2002). Information quality benchmarks: Product and service performance. *Communications of the ACM, 45*(4), 184-192.

Kendall, K. E., & Kendall, J. E. (2004). *Systems analysis and design.* Upper Saddle River, NJ: Prentice Hall.

Klein, B.(2001). User perceptions of data quality: Internet and traditional text sources. *Journal of Computer Information Systems. 41*(4), 9-14.

Klein, B. (2002). Internet data quality: Perceptions of graduate and undergraduate business students. *Journal of Business and Management*, *8*(4), 425-432.

Klein, B. (2003). *Some determinants of user perceptions of information quality on the world wide web.* Proceedings of the Americas Conference on Information Systems.

Kline, R. B. (2005). *Principles and practice of structural equation modeling (*2nd ed.). New York, NY: Guilford Press.

Koufaris, M. (2002). Applying the technology acceptance model and flow theory to online consumer behavior. *Information Systems Research, 13*(2), 205-223.

Lazar, J., Meiselwitz, G, & Feng, J. (2007). Understanding Web credibility: A synthesis of the research literature. *Foundations and Trends in Human-Computer Interaction*, *1*(2), 139-202.

Lazar, J., Bessiere, K., Ceaparu, I., Robinson, J., & Schneiderman, B. (2003). Help! I'm lost: User frustration in web navigation. *IT and Society, 1*(3), 18-26.

Lee, Y., Kozar, K. A., & Larsen, K. R. T. (2003). The technology acceptance model: Past, present, and future. *Communications of the Association for Information Systems, 12*(50), 752-780.

Leung, H. K. N. (2001). Quality metrics for intranet applications. *Information & Management, 38*(3), 137-152

Lowry, P. B., Vance, A., Moody, G., Beckman, B., & Read, A. (2008). Explaining and predicting the impact of branding and web site quality on initial consumer trust of e-commerce web sites. *Journal of Management Information Systems*, *24*(4), 199-224.

Lyytinen, K. (2010). HCI research: Future directions that matter. *AIS Transactions on Human-Computer Interaction, 2*(2), 22-25.

Marsh, H. W., & Hau, K. T. (1999). Confirmatory factor analysis: Strategies for small sample sizes. In R. H. Hoyle (Ed.), *Statistical strategies for small sample research* (pp. 251-284). Thousand Oaks, CA: Sage.

McKnight, D. H., Choudhury, V., & Kacmar, C. (2002). Developing and validating trust measures for e-commerce: An integrative topology. *Information Systems Research, 13*(3), 334-359.

Miletsky, J. (2002). *Successful web sites.* Boston, MA: Course Technology.

Mokhtari, K., Reichard, C., & Gardner, A. (2009). The impact of Internet use and TV watching on the reading habits of college students. *Journal of Adolescent and Adult Literacy, 52*(7), 609-619.

Nielsen, J. (2005). Usability for the masses. *Journal of Usability Studies, 1*(1), 2-3.

Nielsen, J., & Pernice, K. (2010). Eyetracking web usability. Berkley, CA: New Riders.

Palmer, J. (1997). Retailing on the WWW: The use of electronic product catalogs. *Electronic Markets 7*(3), 6–9.

Palmer, J., & Griffith, D. (1998). An emerging web site design model for marketing. *Communications of the ACM, 41*(3), 44-51.

Palmer, J. W. (2002). Web site usability, design and performance metrics. *Information Systems Research*, *13*(2), 151-167.

Pearlson, K., & Saunders, C. (2013). Managing and using information systems: A strategic approach. Hoboken, NJ: John Wiley.

Pipino, L. L., Lee, Y. W., & Wang, R. Y. (2002). Data quality assessment. *Communications of the ACM*, *45*(4), 211-218.

Poels, G., Maes, A., Gailly, F., & Paemeleire, R. (2005). Measuring user beliefs and attitudes towards conceptual schemas: Tentative factor and structural equation model. *SIGHCI 2005 Proceedings.* Retrieved from http://aisel.aisnet.org/sighci2005/11

Rai, A., Lang, S. S., & Welker, R. B. (2002). Assessing the validity of IS success models: An empirical test and theoretical analysis. *Information Systems Research*, *13*(1), 50 -69.

Rogers, E. M. (1983). *Diffusion of innovations.* New York: Free Press.

Schifter, D. E., & Ajzen, I. (1985). Intention, perceived control, and weight loss: An application of the theory of planned behavior. *Journal of Personality and Social Psychology*, *49*(3), 843-851.

Schneidermann, B., & Plaisant, C. (2010). *Designing the user interface: Strategies for effective human-computer interaction.* Boston: Addison-Wesley.

Seddon, P. B. (1997). A respecification and extension of the DeLone and McLean model of IS success. *Information Systems Research*, *8*(3), 240-253.

Segev, A. (1996). *On information quality and the WWW impact: A position paper.* Paper presented at the Conference of Information Quality.

Strong, D. M., Lee, Y. W., & Wang, R. Y. (1997). Data quality in context. *Communications of the ACM, 40*(5), 105-110.

Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics (5th ed.).* Boston: Allyn and Bacon.

Taylor, S., & Todd, P. (1995). Decomposition and crossover effects in the theory of planned behavior: A study of consumer adoption intentions. *International Journal of Research in Marketing*, *12*, 137-156.

Thompson, C. (2003). Information illiterate or lazy: How college students use the web for research. *Portal: Libraries and the Academy*, *3*(2), 259-268.

Thompson, R. L., Higgins, C. A., & Howell, J. M. (1991). Personal computing: Toward a conceptual model of utilization. *MIS Quarterly*, *15*(1), 125-143.

Tractinsky, N., Cokhavi, A., & Kirschenbaum, M. (2004). Using ratings and response latencies to evaluate the consistency of immediate aesthetic perceptions of web pages. In *Proceedings of the third annual workshop on HCI research in MIS* (pp. 40-44). Washington, DC.

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, *45*(2), 186-204.

Venkatesh, V., & Morris, M. G. (2000). Why don't men ever stop to ask for directions? Gender, social influence, and their role in technology acceptance and usage behavior. *MIS Quarterly, 24*(1), 115-139.

Venkatesh, V. (2000). Determinants of perceived ease of use: integrating control, intrinsic motivation, and emotion into the technology acceptance model. *Information Systems Research, 11*(94), pp. 342-365.

Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, *27*(3), 425-472.

Venkatesh, V., & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. *Decision Sciences*, *39*(2), 273-315.

Wand, Y., & Wang, R. Y. (1996). Anchoring data quality dimensions in ontological foundations. *Communications of the ACM*, *39*(11), 86-95.

Wang, R. Y., & Strong, D. M. (1996). Beyond accuracy: What data quality means to data consumers. *Journal of Management Information Systems*, *12*(4), 5-34.

Wathen, C. N., & Burkell, J. (2002). Believe it or not: Factors influencing credibility on the web. *Journal of the American Society for Information Science and Technology*, *53*(2), 134-144.

Zhang, P., & Li, N. (2003). The intellectual development of human-computer interaction research: A critical assessment of the MIS literature (1990-2002). *Journal of the Association of Information Systems*, *6*(11), 227-292.

APPENDIX A

Instructions: Using the scales provided, circle the rating that best reflects your agreement/disagreement with the following statements.

Perceived information quality

I believe the information on this web page is accurate Strongly Disagree   1 2 3 4 5 6 7   Strongly Agree
I believe the information on this web page is believable. Strongly Disagree   1 2 3 4 5 6 7   Strongly Agree
I believe that using the information on this web page increases the value of my work. Strongly Disagree   1 2 3 4 5 6 7   Strongly Agree
I believe the information on this web page is concise Strongly Disagree   1 2 3 4 5 6 7   Strongly Agree
I believe the information on this web page is relevant to the topic. Strongly Disagree   1 2 3 4 5 6 7   Strongly Agree

Perceived design quality

I find this website well organized. Strongly Disagree   1 2 3 4 5 6 7   Strongly Agree
The amount of information displayed on the screen was Inadequate   1 2 3 4 5 6 7   Adequate
The links were useful and easy to locate. Strongly Disagree   1 2 3 4 5 6 7   Strongly Agree
The layout of the pages made tasks easier Rarely   1 2 3 4 5 6 7   Often
The rate at which information was displayed was Too Slow   1 2 3 4 5 6 7   Fast Enough

Perceived usefulness

I was able to successfully answer the questions. Strongly Disagree   1 2 3 4 5 6 7   Strongly Agree
The information on the website is pretty much what I need to carry out the task. Strongly Disagree   1 2 3 4 5 6 7   Strongly Agree
The website adequately meets my information needs. Strongly Disagree   1 2 3 4 5 6 7   Strongly Agree
The information on the website is effective. Strongly Disagree   1 2 3 4 5 6 7   Strongly Agree
I find the web useful in completing assignments like this. Strongly Disagree   1 2 3 4 5 6 7   Strongly Agree

Perceived ease of use

Learning to operate this website was easy for me. Strongly Disagree   1 2 3 4 5 6 7   Strongly Agree
The display pages within the website are easy to read. Strongly Disagree   1 2 3 4 5 6 7   Strongly Agree
The web site was: Frustrating   1 2 3 4 5 6 7   Satisfying
I found it easy for me to become skillful at using the site. Strongly Disagree   1 2 3 4 5 6 7   Strongly Agree
The web site labels are easy to understand. Strongly Disagree   1 2 3 4 5 6 7   Strongly Agree

APPENDIX B

Instructions: Use the website you have found to answer the following questions. You cannot search for another website. Use only the one you have already located. Put the URL on the next line of the website you are using.

URL: _____

Answer these questions based on the webpage you used to answer the questions. MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

1. The fingerprint pattern accounting for only 5 percent of all known patterns is the:
    a. Whorl
    b. Radial loop
    c. Arch
    d. Ulnar loop
    e. None of the above

2. The AFIS _____ _____ determines the degree of _____ between the location and relationship of the minutiae between the questioned fingerprint and those in the database.
    a. software configurations, difference
    b. identification system, minutiae
    c. search algorithm, correlation
    d. relative position, orientation
    e. law enforcement community, cooperation

3. The first systematic system of individual classification and identification was introduced by:
    a. Richard Henry.
    b. William Herschel.
    c. Alphonse Bertillon.
    d. Francis Galton.
    e. None of the above

4. The pores of the sweat glands are located in the:
    a. friction grooves.
    b. skin ridges.
    c. dermis.
    d. knuckles.
    e. dermal papillae.

5. Fingerprints are formed:
    a. by the time a child is two years old.
    b. during first six months after birth.
    c. at birth.
    d. during fetal development.
    e. At conception

ABOUT THE AUTHORS

Anne Matheus currently is an Assistant Professor of Information Systems and Information Technology at Marist College, Poughkeepsie, New York, where she teaches in the undergraduate and graduate Department of Computing Technology. Prior to accepting this position, Anne was the Director of Management Information Systems at a facility operated by the New York State Office of Mental Health. In that capacity, and under her direction, that facility was one of the original recipients of a statewide award for Facility Information Center of the Year in 1999. She earned a bachelor's degree in Psychology, a master's degree in Community Psychology, and a master's degree in Computer Science from Marist College and a Ph.D. in Information Decision Systems at the State University of New York at Albany.

Carolyn C. Matheus is an Assistant Professor of Information Systems at Marist College in Poughkeepsie, NY. She earned a Ph.D. in Organizational Studies from the University at Albany with a focus on leadership, and a M.A. and B.A of Psychology from Marist College. She maintains close ties with leaders in the technology industry as an internship coordinator for computer science and information technology/systems students. Her primary academic and scholarly interests include the application of technology in the business environment, as well as using technology to aid researchers across different domains. In 2014 she helped establish the Palms Open Project, a collaborative service-learning program between Computer Science and Spanish college students to provide technology education and resources to students at underprivileged schools in the Dominican Republic.

Pamela Neely is an Assistant Professor of Accounting at SUNY Brockport, Rochester, NY. Formerly taught at Rochester Institute of Technology and Marist College. She received a PhD in 2002 with a Major in Information Systems and a Minor in Accounting Info. Systems from University at Albany, Albany, NY; and a MS in 1982 in Accounting from the University of Colorado, Boulder. Her research interests are in the areas of Data and information quality and Fraud and forensic accounting.