



Understanding of website usability: Specifying and measuring constructs and their relationships

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ABSTRACT

Developing a usable website is pivotal for e-business success. Researchers have devoted effort to develop metrics, guidelines and theories of website usability, yet there still is a lack of consensus on the multifaceted dimensions of website usability and lack of investigation of the nomological networks among website usability constructs. This study first investigated the common dimensions of website usability by integrating the findings of previous studies and a focus group study with website usability experts. Instruments to measure the constructs were developed and empirically validated. Then nomological networks between website usability constructs and between those constructs and online purchase intention and purchase were examined. Three field studies including two questionnaire surveys and a causal mapping analysis were conducted. The research identified ten website usability constructs with strong psychometric properties. A number of nomological networks between usability constructs were discovered, contributing to identification of sources of variances of purchase intention and purchase behavior. Findings of this study are expected to provide useful insights for practitioners to develop more usable websites and for researchers to better assess the effect of website usability on online customer behavior.

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1. Introduction

Within the e-commerce environment, the impact of a web site design on customer purchases cannot be fully understood without an evaluation of the usability of the web site

– DeLone and McLean [19, p. 25]

Developing usable websites is pivotal for e-business success since online consumers touch, feel, search, and experience products (or services) mainly through websites [18,68]. A usable website has been known to provide a positive attitude toward online stores, increases stickiness and revisit rates, and eventually stimulates online purchase [13,32,50,70]. To make comparisons with competitors' websites, benchmark performance, and plan improvements for designing a more usable website, HCI researchers have devoted effort to define website usability constructs, develop instruments to measure the multifaceted website usability constructs, assess their influences on online customers' attitude or behaviors including satisfaction, loyalty, purchase or revisit intention, and actual purchases [23,30,46]. This has led to a number of metrics, guidelines, and even theories of website usability.

However, even with this knowledge and contrary to our expectation, current websites still contain a number of usability problems [9,14,67,68]. Difficult-to-understand content, inconsistent formats, difficulty in navigation, disorientation, lack of interaction and reliability, inefficient search capabilities, and ill-defined help functions are usability problems frequently identified with commercial websites. Regarding the poor usability, Becker and Mottay [9] mentioned that "online business failures are increasing as consumers are turning away from unusable sites. The 'build it and they will come' attitude has led to the demise of several e-commerce sites which are too slow, too buggy, or too complex for ease of use" (p. 54).

There are numerous reasons for poor website usability, but this study focuses on the lack of consensus on the multifaceted dimensions of website usability and lack of investigation of the nomological networks among website usability constructs. Precise articulation of all dimensions of website usability facilitating particular design assumptions enables the design process to become more tractable for developers by focusing their attention and restricting their options, thereby improving design outcomes. In addition, designing standardized instruments to measure those constructs can facilitate direct comparisons across time, culture and geographical regions [30]. However, there is a lack of consensus on the constructs of website usability and how to measure them. Thus, previous studies were conducted based on different sets of constructs measuring website usability. Using different instruments to measure the same usability construct is another problem with previous studies, making direct comparisons of research

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findings difficult. Researchers have lamented on the absence of general measures and instruments of web usability and called for research regarding this matter [46,68].

HCI researchers and practitioners have speculated about potential causal relationships among multi-dimensional usability constructs [e.g., 50,52] and found high correlations between some of those constructs [e.g., 46]. Previous usability studies assumed independent relationships among usability constructs and thus only examined their direct influence on online customers' perceptions and behaviors. Scientific investigation is needed to reveal the relationships among those constructs to precisely assess overall influence on website usability, but few attempts have been made to examine the relationships.

Given this background, this study has two primary goals: (1) to identify common dimensions of website usability by integrating the findings of previous studies and through a focus group study with website usability experts. The instruments to measure the constructs are developed and empirically validated. (2) to investigate the nomological networks among website usability constructs by use of a causal mapping approach and structural modeling analysis. Through empirically testing and validating the networks, the effect of each website usability construct on online customers' purchase intention (and purchases) can be more precisely captured.

2. Literature review

2.1. Usability and website usability

Usability has been an important theme extensively studied in the human–computer interaction (HCI) field [64]. Researchers in this field have emphasized the successful interaction between a human and a computer as a key factor in designing and implementing a variety of computing systems. Using their definition, usability refers to “the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use”[33].

As e-business sites explosively have grown and the World Wide Web has become a dominant interface, usability researchers have applied the basic usability principles to the web environment and developed web-specific usability metrics, guidelines, tools, and techniques [38,46,70]. Web usability refers to the extent to which web sites can be used by specified users to achieve specified goals to visit with effectiveness, efficiency, and satisfaction in a specified context of website use [2, p.170].

Effectiveness represents the accuracy and completeness with which online users achieve goals (e.g., purchase, information gathering) while visiting a website [33]. It is directly related to the right functionality so that users can do what they need or want to do while visiting a website. For example, when a website has excellent navigation features, vivid and interactive images, and content with relevant depth and scope, people can achieve their goals with fewer errors. *Efficiency* represents the resources expended in relation to achieving goals while visiting a website. The users perceive efficiency when they can achieve goals with a quick visit without putting forth much cognitive effort. For example, they perceive more efficiency at a user-centered website which contains simple and consistent design features across web pages, making the pages easy to read and learn. Finally, *satisfaction* is defined as the comfort and acceptability of a website to its users. When a website provides a variety of options to support the users (e.g., FAQ, real-time chatting with customer support personnel) and reliable, secure, and privacy-guaranteed services, satisfaction can increase. Website usability is considered a multidimensional construct that encompasses effectiveness, efficiency and satisfaction due to website design.

2.2. Theoretical models of website usability

To identify the website usability factors and investigate their influences on online customer perceptions or behaviors, IS researchers

have developed theoretical models of website usability. First, based on the analogy of websites as buildings, Kim et al. [38] adopted Vitruvius' architectural quality model [58] to measure the architectural quality of a website. Kim et al. identified firmness (e.g., security, privacy), convenience (e.g., easy to navigate, search, order processing), and delight (e.g. visual esthetics) as usability factors and hypothesized and empirically validated the relationships between these three usability factors and online customer satisfaction and customer loyalty toward the site. Palmer [55] proposed a model to explore the relationships between website success and five website usability factors including download delay, navigability, site content, interactivity, and responsiveness. He found that all five website usability factors significantly affect website success measured by customer satisfaction, likelihood of return, and frequency of site use. Based on the Microsoft Usability Guideline (MUG), Venkatesh and Agarwal [70] proposed a usability model that examines the associations between five usability constructs including content, ease of use, promotion, made-for-the-medium, and emotion and web site use and purchases. They found significant effects of usability constructs on website use and purchases, even after controlling previous purchase and experience with similar sites. Finally, by adopting the landscape preference model from environmental psychology, Lee and Kozar [39] proposed a website usability model that explores the link between four usability factors including coherence, legibility, variety, and mystery and online customers' attitude and purchase intention. The significant relationships between usability factors and two endogenous variables were found although slightly different nomological networks were found depending upon site characteristics, gender and age.

In summary, previous theoretical models of website usability provided a rich understanding of the effects of website usability constructs on perceptions and behaviors of online consumers. However, there is room for further investigation because each theory uses different sets of website usability constructs, measures similar constructs using different measurement items, and does not examine the nomological networks between website usability constructs.

2.3. Identifying website usability constructs

To assess the influence of website usability on online consumer perceptions or behaviors, considerable effort has been expended to identify and measure website usability factors. First, researchers in the human–computer interaction field proposed multiple usability factors for an objective assessment of website design quality. They have in general taken an engineering approach in an attempt to identify a set of principles and common practices that ensure usability of website design. For example, Gehrke and Turban [27] specified page loading, navigation efficiency, download time, successful search rate, error rates, task completion time, and frequency of cursor movement as usability measurement factors. Schubert and Selz [63] suggested hypermedia presentation, time (availability and contact possibilities), ubiquity (availability and system performance), expert systems (e.g., personalization) and interactivity (e.g., consumer profile) as factors for a good web design. Second, website design experts [e.g., 50,66] also proposed several website usability factors. For example, Spool et al. [66] specified ease of use, readability, content quality, fun, productivity, completeness, and relevance. Nielsen [50] suggested navigation, response time, credibility and content. In the corporate world, companies like IBM and Microsoft as well as competitions such as the Webby awards specified website usability design guidelines. For example, Microsoft suggested a usability guideline (MUG) with five usability factors including content, ease-of-use, promotion, made-for-the-medium, and emotion. Finally, IS researchers [e.g., 2,46,68] developed perceptually-oriented website usability factors. They insisted that website usability is not intrinsically objective in nature, but rather is closely related with online consumers' subjective perception of a website through interaction with the site [2]. For instance, Loiacono et al. [46] have proposed perceptual measures

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