

# **An empirical usability evaluation of the Human Factors website**

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## **ABSTRACT**

The purpose of the present study is to conduct an empirical design and user perception analysis of the website for the Human Factors and Ergonomics Society (HFES), and to use this information to make relevant design recommendations for improving the quality of the website. As the central hub for online interactions with the society, it is important that hfes.org effectively and efficiently communicate messages and highlight its activities concerning its membership, publications, and services. The goal of this paper is not to present a caustic review of the Society's shortcomings, but offer a critical analysis, supported by literature and data, of various website design elements that may be holding HFES back from maintaining a professional web presence, and to illustrate why maintaining a professional web presence is beneficial for the HFES community at large. The present paper outlines an empirical usability evaluation of the Human Factors and Ergonomics Society website, hfes.org. An initial proposal and method for data collection are outlined. Results of the study will be presented the Annual Meeting of the Human Factors and Ergonomics Society.

## **INTRODUCTION**

Websites that are accessible via the World Wide Web have become an increasingly salient reality. The increased access, availability, and ease of perusing the Internet has certainly made web browsing commonplace. Accordingly, a wide variety of industry sectors (e.g., government, private, non-profit) are utilizing websites to disseminate information, recruit potential employees, advertise to a customer-base, or connect family and friends via social networking. That said, not all websites are created equal. A plethora of factors will influence the success or failure of a website and whether the organization (or individual) sees a return on their investment (ROI) when establishing a domain. Central to achieving an ROI is the development of a sound, interactive website that is easy and effective to use. For example, Preece, Rogers, and Sharp (2002) noted that many web developers attempt to crowd as much information onto a single web-page as possible. While it may seem intuitive to maximize the real-estate of a web-page, such a practice can result in overwhelming the user—requiring them to search and scan for relevant information in the presence of daunting amounts of data. Similarly, creating a website that is too simple or generic may detract from the aesthetic appeal that draws in users.

Clearly, a host of factors play a role in optimal web design. The purpose of the present study is to conduct an empirical design and user perception analysis of the website for the Human Factors and Ergonomics Society (HFES), and to use this information to make relevant design recommendations for improving the quality of the website.

### **Return on Investment**

Briefly, the Society's mission is to "promote the discovery and exchange of knowledge concerning the characteristics of human beings that are applicable to the design of systems and devices of all kinds" (HFES, 2011). Founded in 1957, HFES is an international community of professionals, academicians, and students working in research and design fields related to human-machine and human-systems integration. The online presence of HFES is housed and managed at hfes.org. This site is the essential hub of online activities for members of the human factors and ergonomics community and parties interested in the activities and publications of HFES. As a central hub, it is important that the space effectively and efficiently communicate its messages, advertise and explain its services, and highlight its products.

The 2011-2012 member directory reports that the society was comprised of 3,899 members last

year, of which roughly 15% were student members (HFES 2011-2012). With average membership costs being \$195 and student membership costs \$35 (not including contributing membership categories), it is reasonable to forecast that the society generated somewhere around \$666,000 in funds in membership last year. Given that hfes.org is a primary means by which membership is registered and managed, it is important that the website be an effective and efficient means by which new visitors register for membership and returning visitors re-register for membership. As such, hfes.org has the potential to offer a large ROI to the society if the design of the website helps to attract new members to the society. Given the professional makeup of the Society, surely this design goal should be readily achieved. However, the interactive design of hfes.org has several shortcomings that may be hindering the organization from accomplishing this goal.

## PROPOSED METHOD

### Participants

60 participants will be recruited from the undergraduate psychology participant pool at the University of Central Florida. Participants will be compensated for their participation in the form class credit to be applied to any of their qualifying courses.

### Task

A preliminary Hierarchical Task Analysis was conducted with a naïve undergraduate student from a large southeastern university. For this project, we followed an outline for HTA proposed in Sharp, Rogers and Preece (2007)—section 10.7.1. This section describes that the purposes of an HTA are to specify how a task might be performed in a realistic setting. As such, we relied on this paradigm to get a better understanding of the way in which common tasks a first time visitor to hfes.org might take part in are conducted. We also wanted to gain a better understanding of frustrations, road blocks, errors, and time required to complete these tasks. For our preliminary HTA, a series of tasks that an individual might engage in when first visiting the site were chosen. These included, 1) becoming a student member of HFES, 2) advertising with HFES, 3) learning more about 3 technical groups within HFES, 4) contacting HFES, 5) finding information about

submitting a paper to an HFES affiliated publication (e.g., *Human Factors: The Journal of the Human Factors and Ergonomics Society*, *Ergonomics in Design*), and 6) finding information about the Annual Meeting of HFES. For this follow up empirical analysis, only one task was chosen for further investigation. That is, becoming a student member of HFES. This task was chosen for the follow up study as it would be most relevant to our intended population and represents one means of revenue generation for the society.

### Study Design

This study will be a one way between subjects design with two conditions. Half of the participants will be randomly assigned to complete the experimental task of becoming a member of HFES via hfes.org, and the other half will complete the task of becoming a student member of the American Psychological Association (APA) via apa.org. The APA website was chosen to provide an experimental comparison with requirements for student membership similar to those of HFES.

In addition, it is important to note that this study is not intended to measure participant performance. Rather, the goal is to obtain performance data as it pertains to the quality and functioning of either website (i.e., how well hfes.org helps users to meet their goals as compared to a professional society with a similar professional and student member base). As such, website performance will be measured both subjectively and objectively. Subjective measurements will be taken in the form of two questionnaires (e.g., Web Usability Questionnaire and the Questionnaire for User Interface Satisfaction) in which participants will rate their subjective reactions to either website. Objective measurements will be evaluated via participant click patterns (i.e, patterns of errors made because of site design) and overall task completion time.

Lastly, measurements will be taken of participant history interacting with both websites. This will help researchers to screen out data from participants who may already be active users of either hfes.org or apa.org. Also, measures of participants' computer understanding and experience, and participant readiness to use computer-based technologies will be used as statistical covariates as necessary. These measurements will be used to either

exclude data provided by participants who may already be experienced users of hfes.org or apa.org, and/or to statistically control for individual differences pertaining to computer use and technology acceptance.

## Measures

Participants will be asked to respond to the following questionnaires.

*Biographical data form.* This form contains a series of general biographical questions (e.g., age, sex, major area of study) as well as questions concerning previous experience registering for membership with HFES, APA, or other professional organizations. In addition, this measure contains items regarding general proficiency using the World Wide Web.

*Web usability questionnaire.* The web usability questionnaire (Rivera, Davis, Mouloua, and Alberti, 2010) is a subjective measure of the degree to which participants feel the website used to complete the experimental task is usable. Questionnaire subscales include simplicity, usefulness, functionality, consistency, proficiency, satisfaction, subjective behavior, needs for improvement, and user mental models. Items are rated on a 5-point Likert type scale and examples include, "This website did not fit my way of thinking when it came to performing this task" and "The website required only minimal computer knowledge to use". Several items were adapted from the original Web Usability Questionnaire to target our specific task.

*Questionnaire for user-interface satisfaction (QUIS).* The QUIS includes items pertaining to the degree to which users feel the organization of information on the website is confusing, difficult to learn, consistent, has required capabilities, and other overall reactions to the website (Chin, Diehl, & Norman, 1988).

*Camtasia 7 screen capture software.* Camtasia 7 will be used to record the cursor actions of participants as well as provide a measure of overall time to completion as participants work through the experimental task. The Camtasia 7 software captures video data of all screen actions and cursor movements, and creates a data timeline to accurately track cursor movements, clicks, and other interface interactions. The program will allow the experimenters to record participant-website

interactions for future analysis. The primary purpose for using Camtasia in this research study is to provide researchers with an objective performance measurement of the experimental task.

Participants' scores on the following measures will be used as statistical covariates as needed.

*Computer experience and understanding scale.* This scale is comprised of several statements pertaining to general computer knowledge and use (Potosky & Bobko, 1998). Participants will be asked to rate the degree to which they agree or disagree with each statement on a 5-point Likert type scale. Example items include, "I am computer literate" and "I know how to write computer programs".

*Technology readiness index.* As described in Parasuraman (2000), the technology readiness index is intended to measure people's readiness to use technology based systems. This is especially important as there has been an increasing transition to automated technology-based interactions that rely on self-service rather than interacting with human service personnel (Parasuraman, 2000). Similarly, the degree to which individuals are willing to embrace new technological systems may be related to their subjective evaluation of web usability. Meaning that, it is possible that subjective evaluations of site usability may be more related to willingness (or unwillingness) to engage with technology based systems than any particular aspects of site design itself. Survey example items include, "There is no such thing as a manual for a high-tech product or service that is written in plain English" and "I can usually figure out high-tech products or services without help from others".

## Procedure

Upon consent, participants will be asked to complete the intake measures including the biographical data form, computer experience and understanding scale, and the technology readiness index. Participants will then be randomly assigned to evaluate hfes.org or apa.org. Once assignment has been determined, participants will be given a brief familiarization training session. During this time, experimenters will explain to participants the nature of the task they will be asked to complete via either website as well as the fact that their cursor actions

will be recorded via Camtasia 7. Participants will then be asked to take all the necessary steps to register as a new student member of either HFES or APA via either organization's website. The task will be considered officially completed when the participant has reached the final phase of membership registration; typically at the dues payment step. Once they have reached this step, participants will be instructed to stop the task. From there, participants will be asked to rate their reactions to either website via the web usability questionnaire and the questionnaire for user interface satisfaction. Once complete, participants will be debriefed, thanked for their participation, and credited for their time.

### HYPOTHESES

H1: Researchers expect to find significantly longer completion times and number of errors encountered for users who complete the experimental task via hfes.org.

H2: In addition, the researchers expect that students evaluating hfes.org will show significantly lower scores on the measures of user interface satisfaction and overall web usability.

### PROPOSED ANALYSIS

A one-way between subjects MANCOVA will be used to compare group differences (hfes.org vs. apa.org) on the Web Usability Questionnaire, the Questionnaire for User-Interface Satisfaction as well as group differences in time needed to complete the task and number of errors encountered during this time. Items from the biographical data form, computer experience and understanding scale, and technology readiness index will be used as statistical covariates.

### DISCUSSION

Before continuing, it is worth noting that there are arguably as many elements of the HFES website that are designed well as there are elements that could use substantial revision. As such, the goal of this paper is not to present a caustic review of the Society's shortcomings, but offer a critical analysis, supported by literature and empirical data, of various website design elements that may be holding HFES

back from maintaining a professional web presence. The presentation of this paper will serve as a discussion of relevant study results and the resulting impact on design recommendations for the website. As applicable, results will be used to drive a discussion of design features, as well as make suggestions for improving upon the website.

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