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Introduction and Problem Space

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 paper is to conduct a design analysis of the website for the Human Factors and Ergonomics Society (HFES). 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. Given the professional makeup of the Society's members, surely this design goal should be readily achieved. However, as demonstrated by the present analysis, the interactive design of hfes.org has several shortcomings that may be hindering the organization from accomplishing these goals. The remainder of this paper will serve to diagnose and describe some of the most problematic design features, as well as make suggestions for improving upon the website.

Diagnosing and Describing

Task Analysis

A hierarchical task analysis (HTA) is a process by which the method of completing a task is broken down into sub-parts and sub-tasks. For this project, we followed an outline for HTA proposed in Sharp, Rogers and Preece (2007)—section 10.7.1. This section described 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 idea 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. As such, an HTA was conducted with a naive undergraduate student from the University of Central Florida. Common tasks that were chosen for the HTA 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 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 the Human Factors and Ergonomics Society. Below is a visual representation of the HTA for becoming a student member of HFES (see Figure 1).

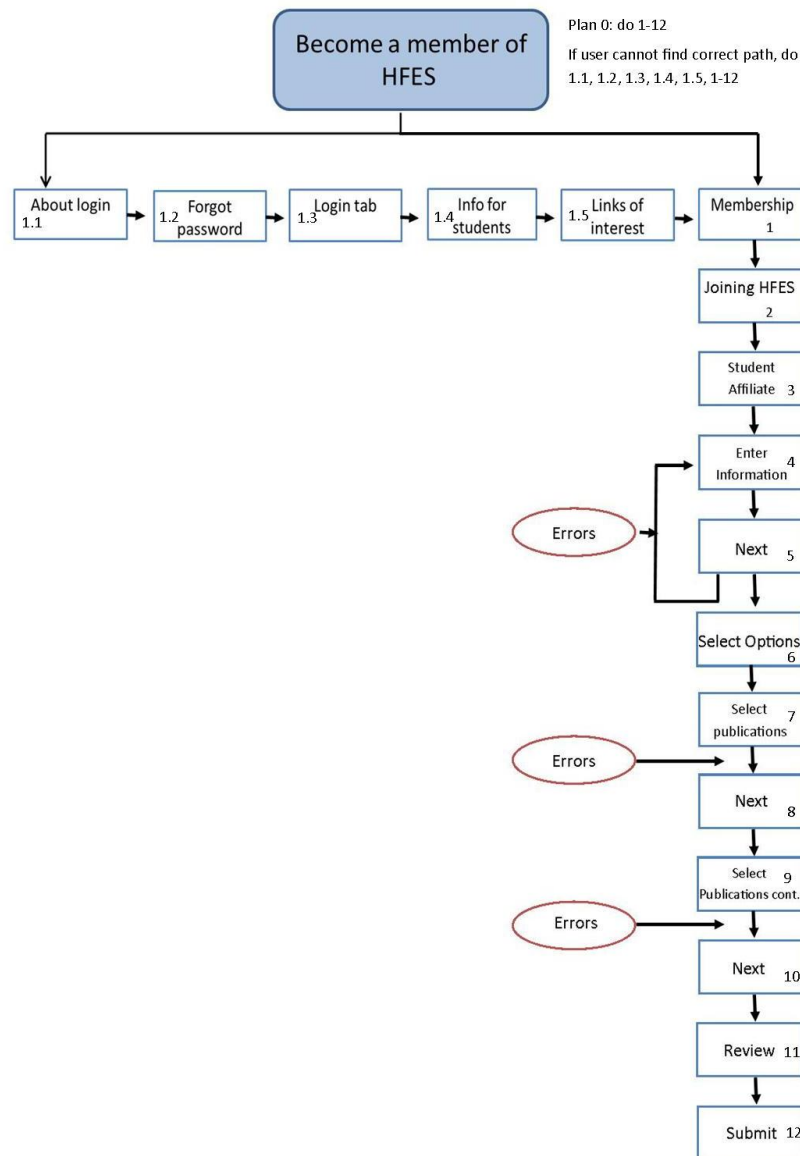


Figure 1. HTA for registering as a student member of hfes.org.

Describing the Problems

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, of various website design elements that are holding HFES back from maintaining a professional web presence. The following sections will describe some elements that the authors feel are most problematic including efficiency, confusing menu structure, needless text, and consistency.

Efficiency. Efficiency for web usability evaluation refers to the ratio between the number of detected defects and the time spent in the inspection process (Conte, Massollar, Mendes, & Travassos, 2007). In terms of the HTA depicted above, defects refer to the (a) steps made by the user that do not progress the user to the end goal (i.e., lateral moves through the site) and/or (b) errors attributed to the site that do not progress the user to the end goal (e.g., broken links, inconsistent formatting). Overall, time to completion for becoming a member of HFES was approximately 15 minutes and contained 7 defects—representing roughly 2 defects encountered per minute of time on task. This is a situation in which the owners of hfes.org should seriously consider (a) what is a reasonable amount of time for someone to become a new member of HFES (b) how many clicks users will reasonably tolerate in the path to becoming a member and (c) what is the number of errors people will bear before giving up. If it is possible to increase the efficiency of this process, HFES may draw more users to either register as a new member or renew their membership more readily and could help the organization achieve a better ROI.

Deep versus Wide Websites. Krug (2000) described the concept of deep versus wide website hierarchies as a debate concerning the degree to which information is broken down into categories at each level of a website's menu hierarchy. Wide websites present more categories of information on each level, but have fewer levels. The result is that fewer clicks are needed to navigate to the information of interest within a site. On the other hand, deep websites have less information organized on each level, require more clicks to reach the information of interest, but require less consideration of the options on each level. Krug (2000) suggested that although deep sites are generally discouraged within the web development community, web users will generally deal with more clicks to get to their desired destination as long as the clicks correspond to mindless decisions. For instance, if a user is required to navigate through many hierarchical levels within a website, navigation to the next level should be limited to a few choices, not require much consideration before making a choice, and be readily able for a user to go back to the previous level if a mistake has been made. On the other hand, research has indicated that website usability is enhanced by broad, shallow menu hierarchies (Larson & Czerwinski, 1998; Shneiderman & Plaisant, 2005, as cited in Sharp, Rogers, & Preece, 2007).

While both sides of this debate have shown evidence for successfully employing either wide or deep web menu hierarchies, hfes.org does not fall neatly into either of these categories. That is, hfes.org is *neither wide nor deep*—it is a puzzling combination of both. For example, if a researcher were interested in submitting an article to the HFES sponsored technical magazine *Ergonomics in Design* (EID), a researcher might start by navigating from the homepage to the

publications page. On this page, there are 59 separate links on the first level of the publications menu. This organization would suggest that the site is designed to be wide and present many categories of information for each level. However, there is almost no other information on this page other than a very large list of links, which is more suggestive of a deep structure. If the user wants to continue, the next logical step in the process of trying to learn more about submitting an article to EID is to choose the first link: "Ergonomics in Design". In a wide hierarchy, this menu level would likely contain all or most of the information someone needed to submit an article to EID. However, choosing this link brings the user to a third menu level complete with an additional 14 links and accompanying text to be considered. In addition, there is no clear visual hierarchy or way to visually assess the relationships between all the links on this third level (see Figure 2).

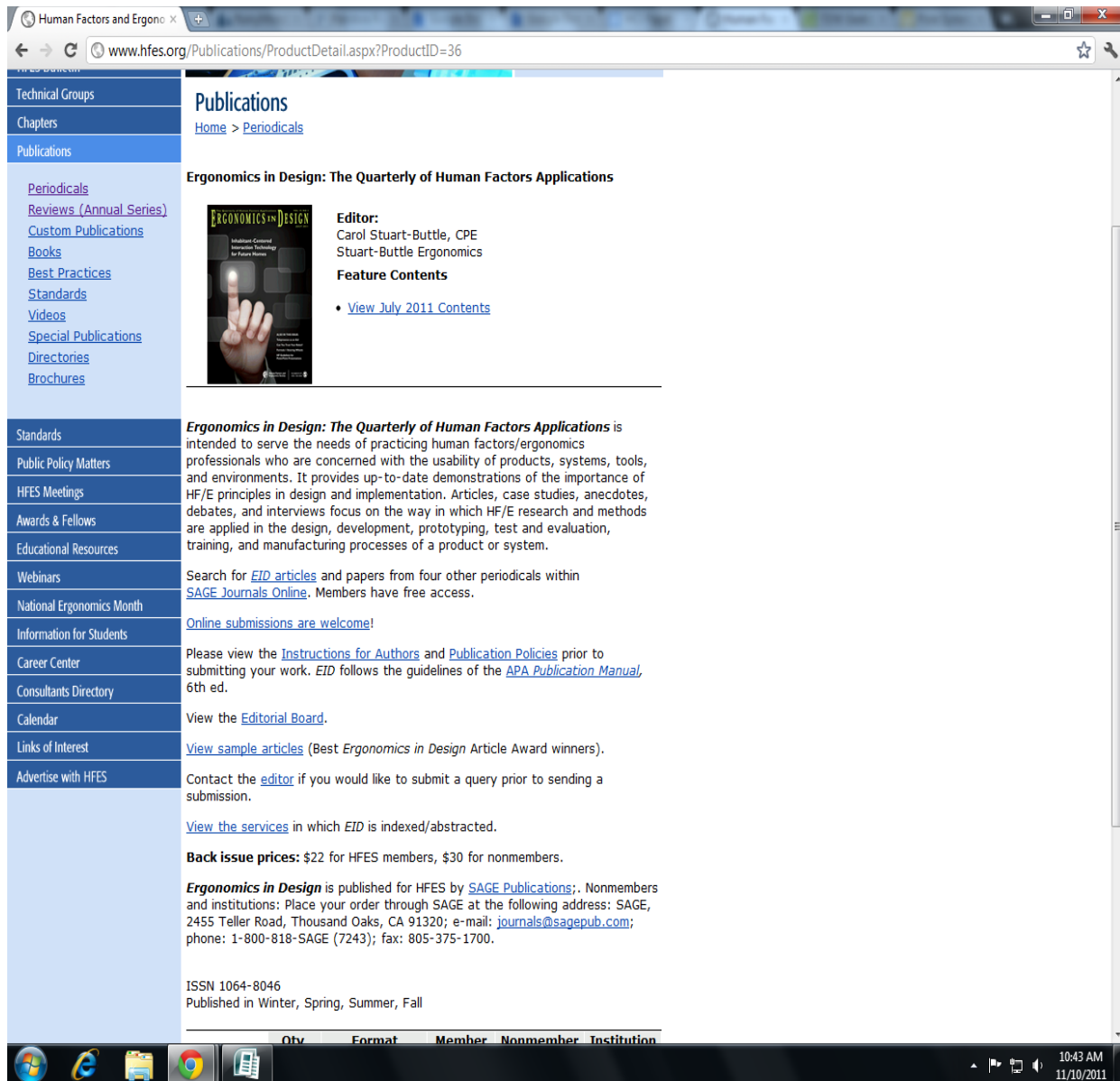


Figure 2. Third level of menu hierarchy for submitting a publication to Ergonomics in Design via hfes.org.

As depicted in figure 2, users are left to pore over the text accompanying these links in order to get a sense of how they relate to one another. Continuing in the process described above, an appropriate choice for a user questing to learn more about submitting an article to EID would be to follow the link “Instructions for Authors”. Choosing this link brings users to a fourth level of the menu hierarchy. Here users are presented with a wealth of information concerning submissions to EID, including: submission types, original works, and manuscript preparation. While this is essential information for interested authors, there are no clear visual relationships between categories of information in this page; users cannot chose to skip to relevant information and come back to less relevant information when they are ready. Instead, users are expected to carefully read through over 1900 words of text and headings, possibly reading through several levels of headings and accompanying paragraphs before reaching the information they are

seeking. This arduous process engenders an experience in which users are expected to hold a lot of information in memory, such as the difference in maximum word count between submission types. If they have forgotten the difference by the time they have reached the end of the document, they are required to scroll back up through several paragraphs to find it again. In addition, scrolling presents a cognitive burden and a usability challenge because it forces users to remember information that has moved out of the window and can disorient users (Weinreich, Herder, & Mayer, 2008). An appropriate means to address this problem might be to include all of the information in the form of a summary table that can be used to compare the different submission requirements across various publications.

On the surface level, this seems like an arbitrary complaint because consumers of information readily read through and remember lots of information all the time, particularly when information is presented in print form. However, websites are not the same as print. Users have different expectations of information presented via the web versus via standard print. Web usability expert Jakob Nielsen described that web users just want to get in, get what they need, and get out as quickly as possible. They ignore efforts that involve lingering on a site (“Web users getting”, 2008). As such, they consume information on the web differently than in print. For instance, it is well documented that web users do not read websites—they scan (Nielsen, 2000; Morkes & Nielsen, 1997). In an eye-tracking study, Nielsen (2000) found that very few users actually read web-page content word for word. Instead, users tend to scan each page in a fairly consistent F-shaped pattern. They tend to scan text while trying to pick out keywords and sentences and skipping over the rest (Nielsen, 2000). Most likely, people do this because reading on a computer screen is slower than in print (Dillon, 1992). In addition, as modern technology is keeping people connected to their work at all times, people simply do not have the time to sit and concentrate on all of the information presented to them via websites. In fact, in a study of web use with 25 participants, researchers discovered that 50% of all new web-page visits were viewed for less than 12 seconds (Weinreich, Obendorf, Herder, & Mayer, 2008).

Needless Text. Because people read web-pages differently than print pages, web-page writing needs to be different as well. Neilson (2000) stated that web-pages should contain about 50% less text than in print, not only because computer screens with lower than 300 dpi resolution are harder to read than print, but also because web users generally find reading web-pages unpleasant. In addition, the strategy of not reading a page of text in its entirety has worked for users in the past. For example, Krug (2000) explained that people have been successfully garnering information by scanning newspapers, magazines, and books their whole lives.

The HFES website contains a plethora of valuable information for members and non-members alike. However, the amount of information is daunting. Of the pages surveyed for this project, the majority contain introductory text containing niceties and general welcome messages. These add between 30 and 100 extra words presented as a block of text at the top of each page. Krug (2000) argued that presenting these introductory statements not only takes up space, but serves no useful function as well. In addition, the mere presence of this text implies that it actually needs to be read, and this is not the case. The fact of the matter is that users will never appreciate these welcome gestures and they should be eliminated, as such. Therefore, keeping web text short serves several advantages, including: reducing the overall length of each

page which reduces the need to scroll, making useful information more salient, and reducing the overall visual clutter or noise on each page (Krug, 2000).

Consistency. Consistency in web design is something that users expect. Krug (2000) explained that websites make a social contract with its users about the nature of its links when it comes to naming conventions and page titles. Each time that a link violates user expectations with discrepancies between link names and page titles, users lose trust in the credibility of not only the site, but the people who publish it as well. Internally, there are many inconsistencies for link naming conventions within hfes.org. This is particularly apparent in the breadcrumbs used in the site. In website design, breadcrumbs refer to a list of links (usually presented at the top of a page) reminiscent of a trail of breadcrumbs that help to provide users with navigation support within the site's hierarchy. They generally show the path from the homepage to the page the in which the user is currently viewing (Krug, 2000). Generally, breadcrumbs are fairly consistent across web-pages that employ them. They start with the homepage and end at the current page, with each level represented as a simple text link and one character separator between links (e.g., <, or /; Nielsen, 2000). While hfes.org does a good job following two of these conventions, the one that is not followed is arguably the most important (see Figure 3).

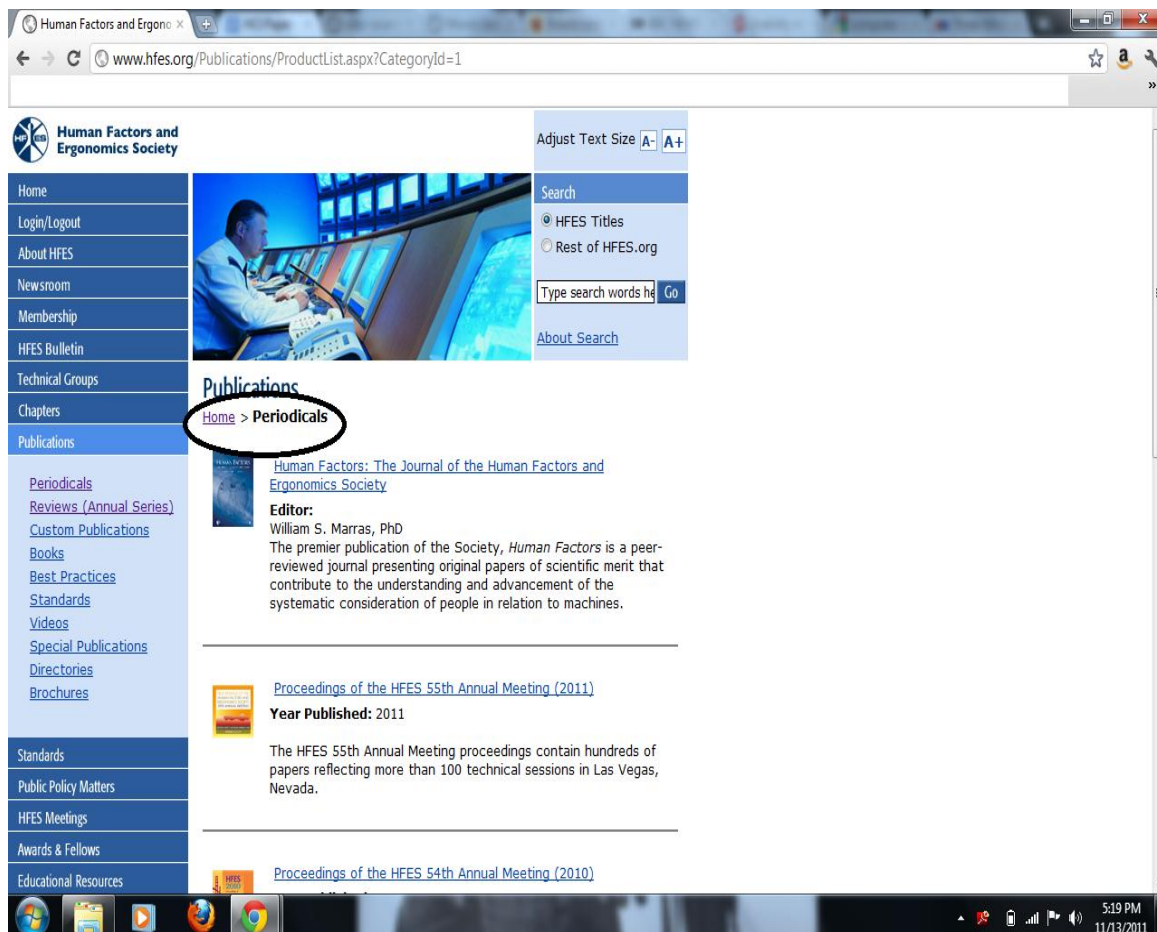


Figure 3. Publications menu hierarchy depicting the breadcrumb link trail for the periodical page of hfes.org.

The depiction shown above displays the breadcrumb trail that is presented to users when they reach the periodicals page within the publications menu. The problem with this breadcrumb trail is that it does not depict the correct path from the home page to the periodicals page. In fact, it skips a link in the path. The path depicted shows home to periodicals. In fact, the *actual* path employed goes from home to publications to periodicals. The reason the path is depicted in this way is because “home” does not represent the homepage of the website. Rather, it corresponds to the publications page. Perhaps this reality is in line with the thought that the publications page is the “home” of all the pages related to the various types of publications. While this representation is not overly difficult to interpret, it does break away from common convention and requires thought on the part of the user. As such, it does not provide the user with the navigational support originally intended and creates the illusion that the name of the link chosen (Periodicals) does not match the title of the page.

In addition, breadcrumbs themselves are not employed consistently within the site (see Figure 4).

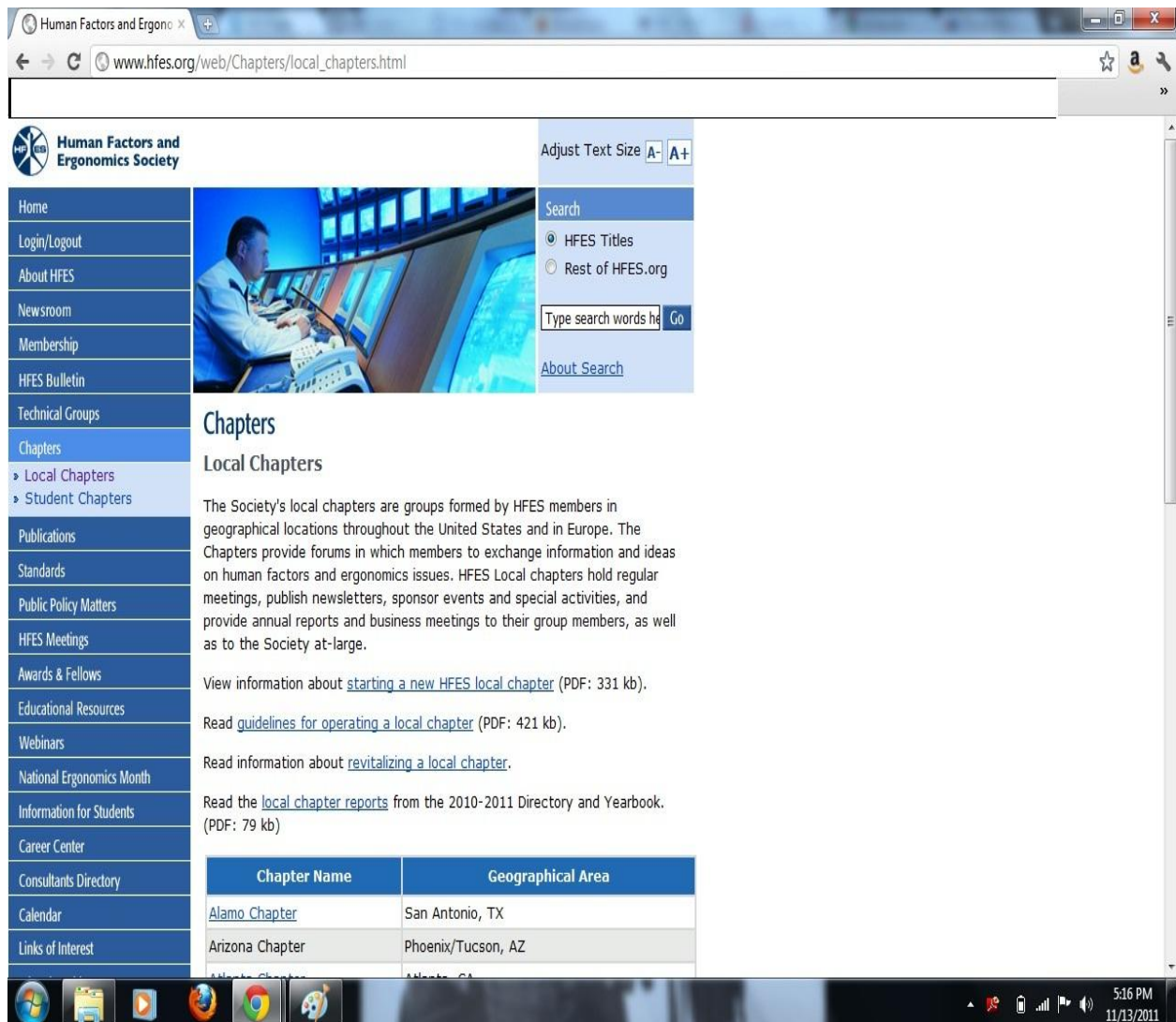


Figure 4. Image depicts the local chapters page within the chapters menu. No breadcrumb links are present.

As can be seen from figure 3, a breadcrumb trail is employed in the Publications menu hierarchy. Conversely, Figure 4 clearly shows that a breadcrumb trail is *not* used in the Chapters menu. While small, these inconsistencies diminish the credibility of the site and the organization associated with it.

Suggestions and Conclusions

The present paper has explored design deficiencies within the realm of hfes.org—the website for HFES. Because human factors represents the science and practice that “seeks to change the things people use and the environments in which they use these things to better match the capabilities, limitations, and needs of people,” it is paradoxical that such drawbacks exist within this particular website (Sanders & McCormick, 1993, p. 4). Although there are no explicit standards for web development techniques (Conte, Mossollar, Mendes, & Travassos, 2007), Neilson (2004, 2005) suggested several core usability guidelines which have endured decades. Therefore, based on the present analysis, the authors make the following recommendations to HFES to improve the usability of hfes.org:

- Reduce the time required to become a new member by reducing the number of steps required to complete this process. This may require a re-evaluation of what information is really crucial for the society to gather about users at this stage. Currently, this process prompts users for a wide variety of information. Is all of this necessary?
- Determine a design hierarchy (wide or deep)—stick with it.
- Design for billboards, not periodicals—help users find, scan, and interpret meaningful information presented in the text.
- Design for Hansel and Gretel—create breadcrumb trails that aid in navigational support.

While the present paper makes important observations to improve the experience of hfes.org users, it was limited in its scope and breadth (e.g., number of tasks conducted and number of participants utilized). Therefore, the authors invite future researchers to conduct a more comprehensive usability analysis (e.g., with 5-12 participants).

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