JUS
JOURNAL OF USABILITY STUDIES

Vol. 7, Issue 2, February 2012, pp. 68-87

Investigating the Accessibility and Usability of Job Application Web Sites for Blind Users

Jonathan Lazar
Professor
Towson University
8000 York Rd
Towson, MD
USA
jlazar@towson.edu

Abiodun Olalere
Doctoral Candidate
Towson University
8000 York Rd
Towson, MD
USA
aolale1@students.towson.edu

Brian Wentz
Assistant Professor
Frostburg State University
101 Braddock Rd
Frostburg, MD
USA
bjwentz@frostburg.edu

Abstract

Most companies today place their job advertisements online and frequently require that applications for jobs be submitted online. Unfortunately, many online employment Web sites are inaccessible to users with disabilities, preventing these individuals from even applying for jobs online. Previous studies have used automated tools or expert reviews to evaluate the accessibility of online employment applications. This study involved 16 blind, screen-reader users, attempting to apply for jobs online. Two applications were submitted to each of 16 companies in the southeastern United States, for a total of 32 applications submitted. Many of the online employment application processes were inaccessible to blind users, and users repeatedly asked for assistance from the researchers when they faced accessibility problems. Only 9/32 (28.1%) of application attempts could be completed independently without any assistance. This report details the problems discovered during the usability testing and discusses the most common problems for blind users, as well as problems related to general usability. It also provides suggestions for improvement, including providing accessible feedback, unique and clear hyperlink text, properly structured layout, logical grouping of questions, clearly identified data format and required form fields, and conducting regular accessibility evaluations. It is essential that companies ensure that their online employment applications are accessible and usable for all individuals, including individuals with disabilities.

Keywords

Accessibility, usability, human-computer interaction, employment, unemployment, job application, discrimination, Section 508, WCAG

Introduction

Employers today commonly place job advertisements and applications online (Braddy, Meade, & Kroustalis, 2008; Bruyere, Erickson, & VanLooy, 2005; Nakamura, A., Shaw, Freeman, Nakamura, E., & Pyman, 2009), and job recruiters consider online job applications to be fast, efficient, and cost-effective. Many job seekers view online applications as both convenient and enhancing their prospects of securing jobs (Breen, 2000; Capellli, 2001; Meskauskas, 2003; Younger, 2008). Individual companies advertise jobs on their Web sites or outsource the task to recruiting companies or job boards, which also place the jobs online (Williams & Verhoeven, 2008). Both sighted and non-sighted (blind) job seekers go to the same sources online to search and compete for jobs, but many Web sites that post these jobs are not accessible to blind people who depend on assistive technologies to access Web sites (Bruyere, Erickson, & VanLooy, 2005; Lazar et al., 2011). The purpose of this project was to evaluate the level of difficulty that blind users have when attempting to submit job applications online, and to determine what specific components of the application (e.g., finding an open position, previous education, references, account creation) cause the greatest problems. Previous usability evaluations of employment Web site aggregators, such as hotjobs.com and careerbuilder.com, focused on using assistive technologies and expert reviews (Bruyere, Erickson, & VanLooy, 2005; Lazar et al., 2011), but no usability testing involving individuals with disabilities attempting to apply for jobs online has previously been conducted. The goal of this project was to evaluate the accessibility and usability of online employment Web sites, by having blind users attempt to apply for jobs online.

Background

Employment is a core ingredient in self-esteem, independence, and happiness (Frey & Stutzer, 2002). In a recent study in the UK to measure the nation's wellbeing, having a job was linked to happiness and self-esteem (Ross, 2011), and unemployment has been shown to have a negative effect on happiness (Frey, 2008). Historically, the unemployment rate for people with disabilities, especially blind individuals, is high (Wang, Barron, & Hebl, 2010), despite the fact that blind people want to work and be productive, pay taxes, and be financially independent (National Federation of the Blind [NFB], 2010). As an example of how accessibility challenges hinder blind people who want to work, a study has shown that computer frustrations (such as inaccessibility of Web sites) can negatively impact the mood of blind individuals, but only when it impacts their work (Lazar, Feng, & Allen, 2006). In the US, about 70% of working-age blind people are unemployed (NFB, 2011), and the estimates in other countries also reflect high unemployment—about 66% in the UK (Royal National Institute of Blind People [RNIB], 2011a) and about 75% in Canada (Canadian Federation of the Blind [CFB], 2011). This figure is high compared to the general unemployment rate of approximately 8.6% in the US (Bureau of Labor Statistics [BLS], 2011), 8.3% in UK (Office for National Statistics [ONS], 2011), and 7.4% in Canada (Statistics Canada [SC], 2011). It is obvious that the goal of equal employment for the blind is still far from being realized.

Today, the recruitment world has moved from the traditional method of job advertisement (handbills, job boards, newspapers, etc.) to online advertisement (news, social networking, blogs, job boards, recruiting Web sites, employer Web sites, etc.). There is a proliferation of general online job application Web sites (often known as "job aggregator Web sites"), and most companies also advertise job openings on their own Web sites. Convenience, scope, efficiency, and cost-effectiveness among other factors, have endeared many job seekers, employers, and recruiting companies to prefer the online approach (Capellli, 2001; Mehkauskas, 2003; Younger, 2008). For blind people who use assistive technologies to access the Web, the opportunity to apply for jobs online could, theoretically, be good news, however, inaccessible job application Web sites actually lead to discrimination and an inability to even apply for a job (Hastings, 2010; Everett, 2011).

Legal Status of Employment Web Sites

Currently, there have not been any known court cases in the US relating to the legality of inaccessible online employment applications. Online employment applications are likely covered under Section 503 of the Rehabilitation Act of the US, which requires that all employers that have federal contracts or subcontracts of at least $10,000 "must take affirmative action to hire, retain, and promote qualified individuals with disabilities" (60-741.1).In July 2010, the Office of

Federal Contract Compliance Programs at the U.S. Department of Labor issued an advance notice of proposed rulemaking (ANPRM) to strengthen the regulations relating to Section 503 of the Rehabilitation Act, and the ANPRM included a question (#13) relating to accessible online hiring processes, with comments due on September 21, 2010 (Department of Labor [DOL], 2011). Specifically, the text of the ANPRM was "What impact would result from requiring that Federal contractors and subcontractors make information and communication technology used by job applicants in the job application process, and by employees in connection with their employment fully accessible and usable by individuals with disabilities?[1] What are the specific costs and/or benefits that might result from this requirement?" No further action has been taken yet by the Department of Labor related to this advanced notice of proposed rulemaking.

Within the Americans with Disabilities Act, Title I addresses discrimination in employment, and Title III addresses discrimination in the 12 categories of "public accommodations." The ADA was signed into law in 1990 before the advent of online employment Web sites. However, since the mid-1990s, U.S. Department of Justice statements and various court rulings (such as National Federation of the Blind vs. Target) have stated that the Americans with Disabilities Act does apply to Web sites of public accommodations. Furthermore, the Department of Justice began the rulemaking process in 2010 for creating specific guidance for Web accessibility within the ADA, with an advanced notice of proposed rulemaking, titled "Nondiscrimination on the Basis of Disability; Accessibility of Web Information and Services of State and Local Government Entities and Public Accommodations" (Department of Justice [DOJ], 2010). While the ANPRM does not specifically mention online employment applications, it is expected that online employment applications would be automatically covered as a part of the requirement for accessibility of the Web sites of public accommodations.

Many other nations have supported the call to make Web sites accessible to people with disabilities that use assistive technologies (Lazar et al., 2011). Laws have been enacted, such as the Equality Act 2010 in the UK (RNIB, 2011b), and the Financial Administration Act (containing Common Look and Feel standards) in Canada (Treasury Board of Canada Secretariat [TBCS], 2007). The World Wide Web Consortium has also developed standards and guidelines for designing accessible Web sites (W3C, 2011a). However, the goal of a fully accessible Web is far from being realized, as research has shown that many Web sites, including Web sites required to be accessible by law (such as government Web sites covered by Section 508) aren't accessible (Olalere & Lazar, 2011).

Previous Evaluations

A number of evaluations have previously been conducted on the accessibility of employment Web sites, but these evaluations used automated tools, expert inspection, or a combination of both. Previous research has not involved having blind users attempt to apply for jobs online. In addition to validating that the problems identified by automated tools or expert reviews are real, user-based testing may clarify what the problems are, and identify additional problems. While usability testing takes additional resources to conduct, it provides more depth about problems and solutions. Furthermore, while expert reviews can be most effective for evaluating compliance with regulations on one Web page, usability testing with people with disabilities is most effective in determining whether people with disabilities can successfully complete a task involving a series of interrelated subtasks, such as applying for a job online or completing an e-commerce transaction, or requesting government benefits (Lazar et al., 2011).

Many job application Web sites have been found to be inaccessible. Bruyere, Erickson, and VanLooy (2005) conducted an accessibility evaluation of 10 job boards and 31 e-recruiting Web sites for accessibility using an automated evaluation tool (Bobby v3.2) and an expert-simulation of the application process using a screen reader. From the results, none of the job boards evaluated were accessible; a majority of the e-recruiting Web sites were inaccessible and only

[1] For example, requiring that contractors ensure that application and testing kiosks are fully accessible and usable by individuals with disabilities, and that contractors strive to ensure that their Internet and Intranet Web sites satisfy the United States Access Board's accessibility standards for technology used by the Federal Government and subject to section 508 of the Rehabilitation Act.

three out of the 12 corporate Web sites were accessible enough for the expert-simulated process to go through. Lazar et al. (2011) also performed accessibility evaluations on eight job aggregator Web sites. Aggregator Web sites (such as careerbuilder.com and hotjobs.com) are those that provide job postings from multiple employers and allow users to submit applications directly through the site for many of those employers (Williams & Verhoeven, 2008). Lazar et al. (2011) used expert inspections to determine job aggregators' Web site compliance with Section 508 guidelines. The results showed that seven of the eight employment aggregator Web sites evaluated had accessibility violations.

Methods

This study focused on evaluating the accessibility and usability of online employment application Web sites in eight southeastern US states: Alabama, Florida, Georgia, Kentucky, North Carolina, South Carolina, Mississippi, and Tennessee. These states were chosen because they are the states served by the Southeastern ADA Center (http://adasoutheast.org/), which funded this project. Also, the Southeastern ADA Center has connections with businesses in these states, so the results of the usability evaluation can be communicated to companies in the southeastern US, and could result in the improved accessibility of online employment Web sites. The staff of the Southeastern ADA Center chose two companies that had online employment applications from each of the eight states, for a total of 16 Web sites evaluated. For each state, the largest 50 employers were selected. Then, in each state, the top 10 high growth fields were selected. Then, two companies were selected from the 10 top growth fields in each state, making sure that no field was represented twice in the sample. This way, not only would there be geographic diversity, but also diversity of different fields and industries. So as not to embarrass any of the companies, they will not be identified by name. Two attempts were made to apply for jobs on each Web site (for a total of 32 attempts at submitting a job application).

Participants

A total of 16 participants were involved in the usability evaluation. Most participants were recruited through a partnership with the Maryland Division of Rehabilitation Services, Office of Blindness and Vision Services. Participants were required to be blind, at least 18 years of age, must have been employed at some point within the last few years, and must be screen-reader users unable to use screen magnification (meaning that the participants did not have enough residual or partial vision to use their vision in the usability evaluation). It was also stated in the recruitment email that the testing would require an average of three to four hours per participant. Note that one participant showed up for data collection, but it was determined that the participant did not meet the screening qualifications. No data was collected from that user, and a replacement user was selected. All 16 participants were currently either unemployed or part-time employed, and were seeking full-time employment. None of the participants were fully employed; so, the participants were very representative of the typical blind persons who would be attempting to apply for jobs online. Of the 16 participants, 11 were female, and five were male, and the average age was 36.5 years (with a range of 21-65 years old). All of the 16 participants were blind users with a great deal of experience using screen reader technology (an average of 12.06 years of experience) and a great deal of experience using the Internet (an average of 10.94 years). Three of the participants had never applied for a job online before, but the other participants had previous experience applying for jobs online. Of the 16 participants, two had high school degrees, three had Associate's degrees, nine had Bachelor's degrees, and two had Master's degrees. Participants were paid $250 for their participation. While some participants took public transportation, others had friends or family members drop them off, however, the friends/family members were not allowed to stay in the computer room or assist the usability evaluation in any way. There was a 5-to-15 minute break in between the two attempts to apply for applications. Participants did not have any additional documented disabilities, aside from their vision loss. Note that while the university Institutional Review Board (IRB) requires signed paper copies of both the IRB form and the payment form, printed copies logically do not make sense for blind participants, so the participants received electronic copies of the documents in advance that they could read. When the participants arrived for the data collection, they were asked to sign the paper copies, with Braille stickers saying "sign above" to let them know where to place their signature.

No personal participant information was used, and each participant had a name, resume, and email account prepared for them for use in the study. All resumes submitted were marked "not a real application—submitted for training purposes only" so as not to confuse or waste the time of employers who received the application. There was no stated time limit for how long it took participants to attempt to submit an employment application.

Data Collection

For the data collection, participants were given the URL of the home page of the company/organization and were told to apply for a job of a certain category (e.g., help desk manager, or software engineer). We interacted with all of the job application Web sites beforehand to know which jobs were available on each Web site. Specific job categories were selected for our participants in advance, and resumes appropriate to each specific job were created for use by the participants (for instance, with appropriate professional experience, degrees, and certifications). All usability evaluations took place using the same computer in the computer lab at the Maryland Division of Rehabilitation Services, Office of Blindness and Vision Services. The computer was a Dell Optiplex 760, Intel Core 2 Duo CPU, running Microsoft Windows XP Professional Service Pack 3 and JAWS 11 (screen-reader software). Users were allowed to modify the speech output speed to their liking to make it similar to how they typically interact with a computer. The browser used for the study was Internet Explorer 8. All data collection took place in August and September 2011. JAWS was selected because it is the dominant screen reader currently in use (WebAIM, 2010). Typically, the participants were in the computer lab for 3-4 hours, including the introduction, signature of forms, description of procedures, the actual usability evaluation, breaks, and wrap-up.

We used a modified usability methodology to learn as much as possible about the barriers to online job applications. Ideally, people with disabilities need to apply for a job online without assistance from anyone. Because many of the sites had core features (such as the "search jobs" function) that were inaccessible, if a traditional usability methodology had been used, the researchers could not offer help or assistance in any way, and the participants would not have made it past initial inaccessible screens. That scenario would have provided no useful feedback about the accessibility of other steps in the hiring process. In the modified usability methodology, when participants could not move forward and specifically asked for help, we offered to assist them, and took careful notes of when we were asked to perform an intervention and the type of intervention performed. Specific data about the interventions are in the Results section of this paper. Aside from the user-requested interventions, we non-obtrusively took notes about what steps the users were taking, and we did not comment or assist the users in any other way. We encouraged the participants to think aloud and state what they were doing, and that also influenced our notes.

Applying for a job online is really one large task with a number of subtasks. These subtasks cannot be separated out as separate, discrete tasks, because the tasks all must be completed successfully to reach the ultimate user goal: submitting an application. The specific subtasks for each Web site application process vary; there is no consistency among sites in the different subtasks needed to reach the goal. In comparison, when attempting to use different email applications, all applications have identical, discrete tasks that can be compared across different applications, such as adding an email address to an address book, sending an email, responding to an email, and deleting an email (Wentz & Lazar, 2011). While some subtasks are common across job application sites (such as education, certifications, and previous work experience), they are asked in a different manner, with differing levels of detail required (e.g., one site asks you to name your university attended, but another site asks you to find your university attended from a list of thousands of universities). The same question is asked in different ways on different sites: some ask a question as one question, while some sites break that same question down into multiple subtasks. Furthermore, different job application Web sites have different subtasks, such as salary requirements, date availability for a job, availability for job travel, hobbies, languages spoken, and work preferences, which often are not asked on many of the Web sites. Some Web sites allow you to upload a resume, and the software on the Web site then takes the data directly from the resume, populates the form fields, and simply asks for confirmation that they are correct. Other sites, even with a resume uploaded, do not populate the form fields with any data. Therefore, it is impossible to compare the performance on each subtask across sites, even when those sites use a similar software package for the hiring

process, such as the recruitment software from Kenexa (http://www.kenexa.com/recruitment-technology).

Pilot Study

A pilot study was conducted with two blind participants to test the appropriateness of our data collection methods. Note that this did not take place at the location described for the 16 participants, but rather took place in the participants' homes. From the pilot studies, minor modifications were made to the data collection methods, such as a stronger encouragement to participants to think aloud, clearer pre-study instructions, methods to document the interventions, and increasing the amount of information available to participants on their resumes for use in the study.

Results

Each participant was asked to apply for two job openings online. One of the participants had to leave early, and therefore could only attempt to submit one job application online. One of the other participants, who had a more flexible schedule, was asked to attempt to apply for a third job. Out of the 32 attempts to submit applications online (two for each of the 16 companies), 24 of those attempts were successful, that is, participants completed the application process. However, many of those attempts involved interventions. Only nine of the 32 applications were submitted successfully and independently, without any type of intervention, for a task success rate of 28.1%. The types of interventions are discussed in the following paragraphs. For the nine participants where both of the applications were successfully submitted, for eight of those participants, the second application was completed and submitted in a faster time period than the first application, suggesting that over time, there could potentially be some learning effects if users are submitting, for example, 10-15 employment applications online.

The quickest successful submission took 23 minutes, with no interventions. The longest successful submissions were in 121 minutes, one with no intervention and the other with one intervention. The longest unsuccessful attempt lasted 229 minutes (nearly four hours), at which point the participant gave up and indicated that they would not continue applying for the job. It is important to note that, before the data collection began, it was clear to the researchers that many of the sites use the same software applications to power their job application processes. For instance, four of the companies selected for the study use the Taleo software (http://www.taleo.com/solutions/recruiting), and four of the companies selected for the study use the Kenexa software. It is important to note that each implementation of the Taleo and Kenexa software packages is different (and there are multiple versions of the software from those vendors), so while there are some similarities, each company using Taleo or Kenexa is in fact using a different, but similar interface.

Interventions

It is important to note that there were a total of 34 interventions required, where participants asked for assistance in moving forward. These interventions were in situations where a mouse click was required (16), or where participants asked for suggestions (18). For the 16 situations where a mouse click was required, 12 of them were situations on four sites. Often, a mouse click was required to access any information about jobs. The other four situations where a mouse click was required were for buttons that were inaccessible by keyboard use only. For instance, in Figure 1, participants were required to click on the item to search for jobs, but the object could not be selected using the keyboard. In Figure 2, the two individual buttons were both read by the screen reader as "previousnext," allowing no individual identification of the buttons, even though visually they appear as two clearly separate buttons.

Figure 1. Screenshot of an inaccessible link to search for jobs on a Web site that required a mouse-click

Figure 2. An example where two buttons were visually separate, but in the code they were marked with the same label of "previousnext"

The other 18 interventions occurred in situations where the participants asked for a suggestion to help them move forward. The causes of interventions were the following: (a) labels or markup were misleading or absent (5), (b) the instructions from the Web page were confusing (3), (c) there were pop-up boxes with inaccessible information (3), (d) there was an error message where the Web site had rejected the participant data input because it was not in the proper format (3), (e) lack of participant knowledge (participant was listening too fast or could not figure out how to attach a document; 2), and (f) JAWS problems (JAWS was not reading the current Web page, and JAWS was not reading the options in the combo box; 2).

Common Problems for Blind Participants

From the usability evaluation by the 16 blind participants, patterns emerged of common problems in the online employment applications. Some of these problems were specific to blind participants who were accessing the employment applications using screen readers, but other problems that challenged blind participants were more general usability problems that blind users, as well as users with other disabilities or users with no disabilities would face. Table 1 lists the most common participant problems with the number of participant-requested interventions, the number of Web sites impacted (out of 16), the number of job applications impacted (out of 32), and the total number of instances that a particular usability challenge occurred. The problems described were either problems that were mentioned by the participants as challenging during the attempts to apply for jobs, or identified and defined by the researchers based on participants seeming to have problems but not saying anything. Because we took a hands-off approach to testing, just using instances in which participants specifically asked for help would have greatly underestimated the number of problems. Therefore, we also included instances based on observations where users were clearly having problems but were not complaining.

Only problems that impacted 10 or more applications are listed. For example, one cause of intervention mentioned earlier, lack of participant knowledge (with two interventions), did not appear in Table 1 because it did not occur frequently enough to meet the described threshold of impacting 10 or more applications. Typically, when usability problems are summarized after a series of usability evaluations, these problems are summarized and prioritized, and therefore, because we could not list every single problem in the article, we only focused on including those that appeared most often. To provide context information for the problems that required an intervention, the interventions are also listed in the first data column.

Table 1. Common Participant Problems with the Online Employment Applications, Sorted by Number of Applications Impacted

Problem Description	**# of participant requested interventions**	**# of Web sites impacted (out of 16)**	**# of applications impacted (out of 32)**	**Total # of instances (no limit)**
Design problem/confusing layout/links: This includes general design issues that often result in participant confusion, such as the location of navigational items, save/continue buttons, and instructions for data entry format.	1	15	24	51
JAWS issues: These are problems observed from the way JAWS read form content. These include JAWS not reading page content, reading out of sync with cursor position, reading form controls but not form labels, no confirmation of actions performed (e.g., file attached, new page ready, radio button checked, etc.), JAWS reading out password entered by participant.	2	15	23	46
Instructional/labeling problem: This includes no instruction or title on certain pages or sections of a job application, confusing instruction, confusing/misleading labels, unclear label or instructions, generic error message, confusing positioning of instructions or guidelines for completing a task (e.g., password entry guideline placed at the bottom of username and password fields instead of before those fields).	3	14	22	36
Form control issues: An example would be no binding between labels and form control, improperly coded form control (e.g., date), unlabeled form controls.	0	12	16	19
Required fields unclear or unspecified: This would include unspecified required fields, an asterisk placed after the form control or label, a required field visually specified but not read by the screen reader, or required fields read as strange characters that participants cannot understand.	2	10	16	18
Finding jobs link: This refers to the inability to find jobs links quickly or inability to access jobs links from the homepage of the company.	0	9	15	17

Problem Description	# of participant requested interventions	# of Web sites impacted (out of 16)	# of applications impacted (out of 32)	Total # of instances (no limit)
Mouse only/Flash/Javascript issues: This includes mouse-overs for accessing error messages, situations where JAWS cannot access certain form controls, cascading windows, inaccessible mouse-only flash content, etc.	19	9	15	21
Skip navigation issue: Either skip navigation is not present, or it is present but not placed at the very top of the page (or present in some pages on the site but not in others).	0	9	13	13
Specific participant preferences: This included participants wanting multiple options (e.g., attach, copy and paste, or direct entry) for importing a resume and cover letter. Participants also tended to prefer the job application automatically populating the form fields with attached resume data. Participants did not like an application form that was only one long page.	0	10	13	20
Tab order/cursor control: This would be illogical tab order, cursor control jumping to the bottom of page or browser address bar after page refresh, etc.	0	10	13	16
Data input format: Examples of this would include unspecified or confusing data input format (e.g., SSN, date, telephone, and currency).	3	11	13	14
Table headers poorly coded: Table headers were not properly labeled, making it difficult for participants to know what each cell in a row stands for.	2	7	10	11

"Specific participant preferences" is a category that needs further explanation. For instance, participants noted that they had preferences about how to enter the data, such as having multiple Web pages to enter data, instead of one long page. This method allows a participant to focus on one section at a time, and data is then saved from one page to another (so that data is not lost if the session times out). Also, participants preferred having an option for text entry, for instance, either to upload a cover letter in word format or to copy and paste it into a text box. If a resume was already uploaded, participants preferred to have the resume automatically populate many of the data fields (which was an option offered by a number of sites).

Action Items to Improve the Usability of Application Web Sites for Blind Participants

From the usability evaluation by the 16 blind participants, patterns emerged of common problems in the online employment applications. Based on the usability testing, the feedback by participants, and the categories of problems that participants faced, we created a list of five

suggested action items to improve usability specifically for blind users on employment Web sites. In the following sections, we provide five action items that would both improve usability for blind users as well as other user populations. All of these items are actionable, with minor technical changes that would lead to great improvement for blind users.

Design introduction pages that are accessible

A number of sites had introduction pages as the entrance to the job application process that were inaccessible to screen-reader users and had no textual equivalents. For instance, a few Web sites had a flash-based job search page, without any textual equivalents. There was no way to search for a job unless you could see the screen and could use a mouse pointer. For example, a Web site required users to click on a map to choose which region/country you wanted to apply for a job on, and then if you chose the US, you were then required to choose a state (see Figure 3). There were no textual equivalents for choosing the job region or state, although this would be easy to design accessibly, using a drop-down menu list. These features may seem visually appealing, and they could stay on the Web site, however, textual equivalents need to be added so that users who cannot use pointing devices could also access the information. The key problem with these features is that they are at the entry point of the entire employment process, so that if you cannot utilize these features, you cannot go any further in the application process. These entry points essentially prevent blind users from applying for jobs at these companies.

Figure 3. Web site where the participants must click on a map, and there is no textual equivalent for screen-reader users or those unable to use a mouse pointer

Provide accessible feedback on data entry problems

All online employment application processes required users to fill out online forms, and this was expected. However, there were instances on multiple sites where the feedback on data entry forms was inaccessibly provided when data fields were filled out incorrectly, as recorded in Table 1. Inaccessible methods for providing feedback included highlighting the incorrectly filled-out field in red or providing feedback only in an inaccessible mouse-over. On one employment site (see Figure 4), the participants were prompted in a dialog box that they should hover over the problematic data entry fields with their mouse to learn what the problem is. A similar problem was noted on other Web sites, (e.g., see Figure 5) where the participants were given information about the data entry problem only through the use of a mouse-over on fields that were marked with a red exclamation point.

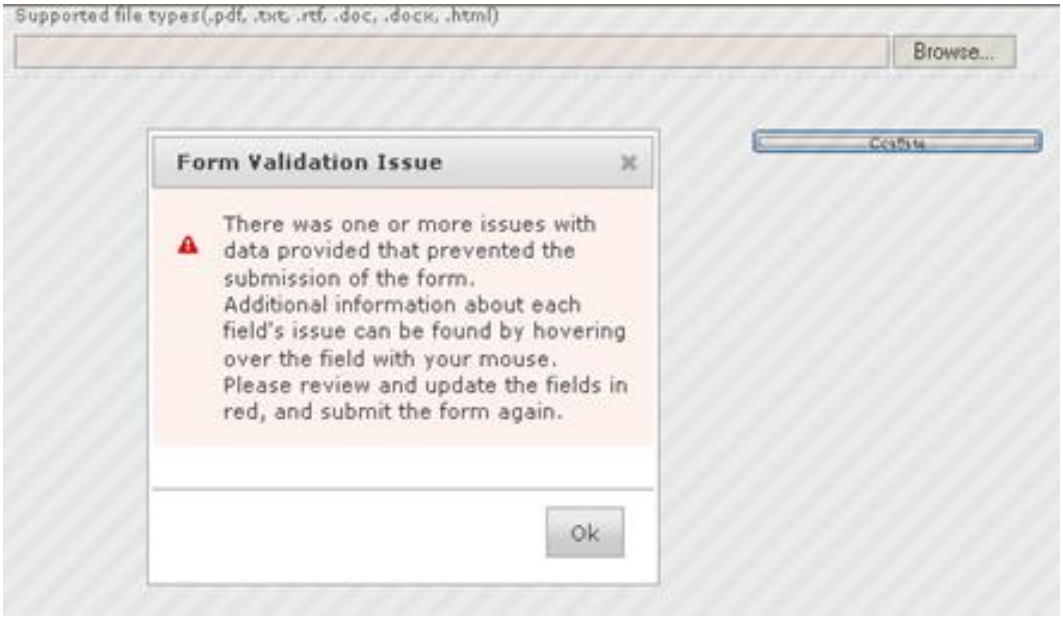

Figure 4. Feedback on a Web site about an incorrectly filled-out data entry form was provided in an inaccessible manner. The dialog box notes that, to find out what the error was, the participant should hover over the field with their mouse.

Figure 5. Feedback on the data entry from a Web site was provided only by doing a mouse-over where a red exclamation point was indicated as a field with incorrect data entry.

Provide accessible feedback regarding participant progress through the application

Typically, there are a number of steps that an applicant must complete before they can formally submit an application. Unlike e-commerce sites, where there is a standard and simple process (place items in the shopping cart, and then go to the checkout), submitting a job application is a much longer process, requiring as many as 10 different steps, and the actual steps vary widely from site to site. Unfortunately, the status feedback on participant progress through the sites we tested tended to be inaccessible, that is, the feedback was provided only graphically, through the use of shading, shapes, or colors, rather than a simple textual declaration saying "you have completed step 3 (previous employment) out of 9 steps" or something similar. Because the steps varied so widely from site to site, it was unrealistic to expect participants to know how many steps were involved or which steps were involved. Figure 6 displays progress indicators from three different sites, which show the various steps in the job application process, but show the data in an inaccessible manner.

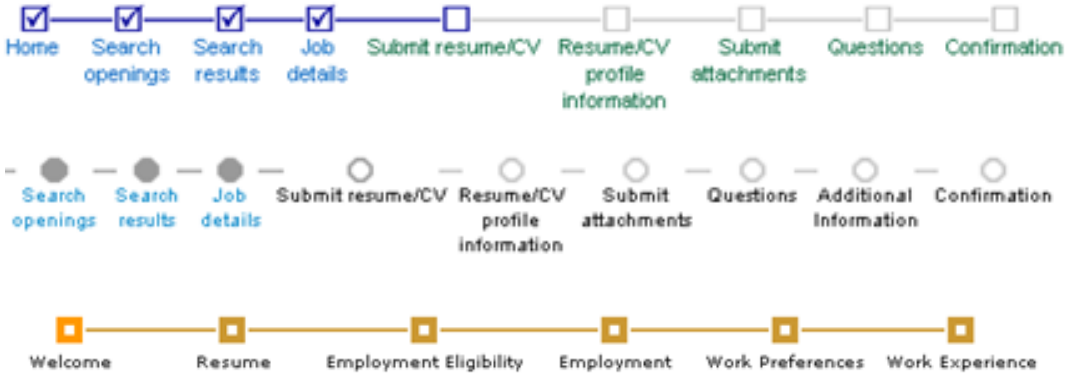

Figure 6. Progress indicators from different Web sites, which show the progress in an inaccessible manner that is unusable to screen-reader users

Use links that are unique and identifiable when listened to using a screen reader

A number of Web sites had link text that was listed as "click here" or "click here to read more." When a screen reader user listens to these links using the JAWS links list feature, all of the links sound exactly alike and are identical and not individually identifiable. This is easy to fix, instead of having all links read "click here," developers should designate the actual job titles as the links. On one of the Web sites, all of the job listings had links titled "more info," and on another Web site, all of the job listings had links titled "click here to read more" (see Figure 7). The outcome of that design decision is presented in Figure 8, where the JAWS links list displays a list of links, and the participant therefore hears a list of links titled "click here to read more."

Figure 7. A list of job links that all have the same text: "click here to read more" which would be meaningless to screen-reader users

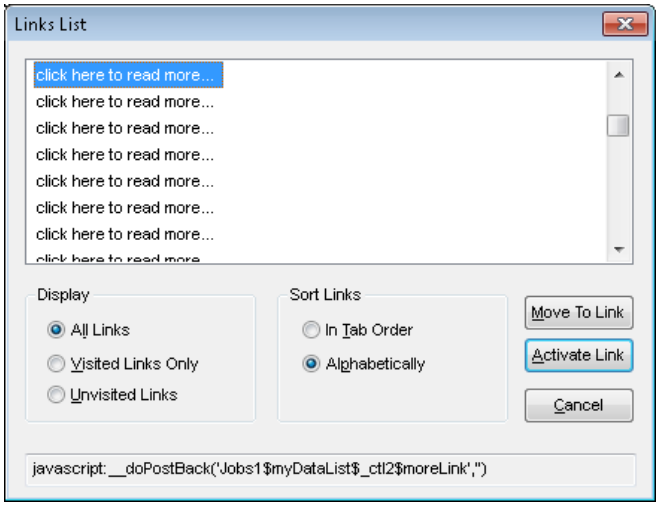

Figure 8. The JAWS links list on a Web site job listing, where all jobs have the same link title, which was confusing and meaningless to screen-reader participants

Use appropriate markup for lists and groups of questions

Users of screen readers rely on the Web design code (such as HTML) to provide appropriate information about the structure of information presented on the screen. For instance, headers (such as H1, H2, H3) provide information about the meaningful headings on the Web page, which allow users to navigate through those headings. Rather than presenting content with the goal of how it will appear visually, it is important to provide content with the goal of coding to indicate meaning and structure. Figure 9 provides an example of a problem where the participants are not hearing the questions and the answers together, but are hearing all of the seven questions listed together, and then the answers are read together. Developers sometimes use tables for visual layout, and this can confuse screen-reader users who count on structured Web design code to understand the meaning and relationship between items on the Web page.

Figure 9. Example where participants were not hearing the questions and the answers read together, but were hearing all of the questions first, and then all of the answers.

Common Problems Related to General Usability

Participants in this study faced a number of problems that were not specific to blind participants, but rather were general problems with usability that would apply to all users.

Data is required that does not make logical sense

There were a number of sites where the required data fields were noted by using red stars (which, itself, might be a problem for blind users if there are no non-visual equivalents for indicating a required field). However, in some cases, the required fields simply did not make sense. For instance, in Figure 10, the start date and end date of a job were required, which makes sense generally, even though there was an option to note that a job was the current job. Even if the check box for current job was selected, the participant still needed to provide an end date, even if there was no end date. This clearly could be confusing to users.

Figure 10. Participants were required to enter an end date for their current job, which makes no logical sense.

Data fields are required, but users are not informed that the fields are required

If a data field is required, that needs to be stated clearly. The lack of this type of information to the user was obvious, as shown Table 1. It is understandable that there are data fields that must be required, such as for name, contact information (such as email and phone), and educational degrees. However, if these fields are required, that fact needs to be clearly communicated to all users. Typically, the wording "Required field" should be used, or if a red star or something is used to indicate a required field, there should be equivalents (such as alt text) that indicate for color-blind, low-vision, or blind users that the field is required. In Figure 11, there are no indications that both email and phone numbers are required fields. Yet if the data is not entered in those fields, users will receive an error message.

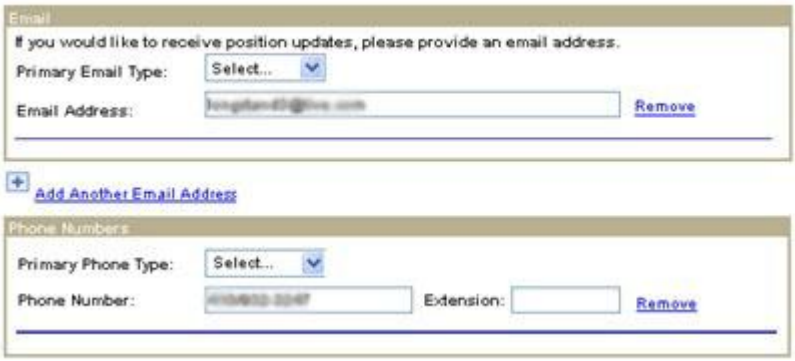

Figure 11. Required data entry fields with no indication (to blind participants or any users) that the fields are required

Participants are required to do a "lookup" when a data field is more suited to free text

When there are a limited number of potential choices in a data entry field, a drop-down list makes sense. However, when there are potentially thousands of possible choices, participants should simply be allowed to use free-text entry to indicate their data. Yet one of the online employment applications required that participants search for and select the colleges and universities that they attended. This is not standard on most online employment applications. Participants were required to enter the title of their school and then select from a list of potential matches to their search string. This approach was especially problematic when either a school was listed multiple times for the same school, or when there was a university system with multiple campuses with similar names. In the example in Figure 12, multiple campuses of a university were listed, and the same campus was listed more than once.

Figure 12. Multiple campuses of a university were listed, and the same campus was listed more than once, which was confusing to all users.

Participants in the study attempting to apply for jobs tended to find this approach problematic and confusing. It would be understandable if the choice from a list was required because it would note a specific code for a university, and then allow access for the employer to student records and transcripts from potential employees; however, at no point in the application process were participants asked to give permission to access transcripts, so this cannot be connected to providing the university name.

Data entry is required in a specific format, but the format desired is unclear

Earlier in this paper, the problem of inaccessible feedback on data entry was discussed. Another related problem is the problem of unclear guidance on what format data should be entered in, where, even though the feedback is accessible, it still is not meaningful for any users (refer to the data in Table 1). For instance, in Figure 13, the data entry field was supposed to be entered in a currency format ($XXX.XX), but the field itself did not clearly indicate that, and the error message in Figure 13 did not in any way specify how participants should enter the data, only that the data was entered improperly.

Figure 13. Unclear error message related to data field entry, which is confusing to all users

Users are not given the opportunity to indicate that more time is needed

In five of the participant attempts to submit a job application, the application automatically timed out because the participant had reached a certain time limit, without notifying the participant or giving the participant the opportunity to indicate that more time was needed. This impacts usability for users who may be busy (and may have their application task interrupted by other pressing tasks) and novice users of assistive technologies, who may need more time to complete an application task.

Recommendations

There were a number of usability problems on the employment application Web sites that were problematic for the blind participants in this usability study and kept the participants from independently submitting applications online. However, none of these usability problems were ones that were technically hard to solve or address. These were all commonly-known and understood problems, relating both to accessibility for blind users and general usability for all users. The solutions themselves are easy—such as creating textual equivalents for clickable image maps, accessible feedback for form errors, and clearly stating which fields are required and which data format should be used. For instance, if any of these employment application Web sites followed either Section 508 (Section508.gov, 1998) or the Web Content Accessibility Guidelines (W3C, 2011b), it is likely that most of the accessibility problems mentioned previously in the paper would have been addressed. Companies should ensure that their online employment processes are accessible and usable for users with disabilities.

If online employment application software is being purchased (such as solutions from Kenexa or Taleo) employers should request documentation that the software complies with Section 508, similar laws in other countries, or international standards. This can be done by asking for documentation of what methods were used to check for accessibility, or asking for a Voluntary Product Accessibility Template® (VPAT®) that documents the accessibility features (http://www.itic.org/index.php?src=gendocs&ref=vpat&category=resources). While it is possible that users with disabilities would face challenges in using the interface that are not covered under Section 508, the most basic accessibility problems documented in this study would have indeed been covered under Section 508 or similar laws.

If online employment application software is being developed or modified in-house, good user-centered design techniques should be used to ensure accessibility. These techniques include usability testing involving people with disabilities, expert inspections using assistive technology, and automated accessibility testing (software such as HiSoftware Compliance Sheriff, Odellus ComplyFirst, and Deque Worldspace). In addition, if the online employment process Web pages are going to be modified in any way, accessibility needs to be considered in the modifications.

Even though there is additional expense and time involved with user testing, we believe that it is important to have real users with disabilities test Web sites. We uncovered the following usability problems that would likely not be detected by automated software tools:

- Many of the usability challenges we consider to be serious for the blind participants in our study, such as no clear identification of when fields are required fields, free-text being preferred to look-up, and unclear data format preference, would definitely not be detected.

- While it's likely that the inaccessible maps with no textual equivalent would be flagged, it's unlikely that the inaccessible feedback when users entered incorrect information would be detected.
- User actions, such as entering incorrect information, were required before the inaccessible feedback was triggered. Without the actions, the feedback would not be evaluated.
- Data fields that do not make logical sense, such as requiring an "end date" to a job those participants marked as their current job, would not be detected.

Automated accessibility testing tools are necessary for evaluating and monitoring any large Web site, as there may be thousands of sub-sites and pages; however, those tools are not a replacement for user testing, especially when users with disabilities must perform tasks that involve a series of sub-tasks across multiple screens. User-based testing provides a much deeper understanding of accessibility and usability.

It is important to note that these participant attempts to submit applications were only the first step in the process of applying for a job. The entire process, once the individual submits the application, must also be accessible. If these applications were real applications (and not marked with "for training purposes only"), and if these applicants were chosen for interviews and further review, those future steps would also need to be accessible. For instance, there are reports of many employers requiring potential employees to take online aptitude tests. Are these online tests accessible? Are follow-up communications electronic? If so, are they accessible? And furthermore (and non-technically), when potential employees go for an interview, are those face-to-face meetings in accessible locations? Do the offices and buildings have Braille signage? This usability evaluation has only examined the initial attempts to submit an employment application online. Future work needs to evaluate the accessibility of the entire process.

Conclusion

This study examined the accessibility and usability of 16 employer Web sites in the southeastern United States, and it revealed that the majority of attempts by blind individuals to apply for jobs using these Web sites were not successful. There were many unique problems identified (see Table 1). Accessibility and broader usability challenges can clearly prevent or discourage users with disabilities from even the earliest phases of the process of seeking and obtaining employment, as illustrated in this study. When a particular segment of the population (e.g., people with disabilities) is in this manner prevented from the right to apply for employment, it amounts to discrimination.

Accessible and usable online employment applications should be a priority for employers, and the negative impact that this has on people with disabilities must be understood. As illustrated in this research, most of the problems related to electronic accessibility and usability are easy for designers to correct. Following guidelines such as Section 508 and WCAG can allow businesses to make significant progress towards providing equal opportunities for all individuals to gain employment.

Practitioner's Take Away

The following are key points for practitioners from this study:

- Usability testing of Web interfaces should include individuals with disabilities in order to verify that an interface can be used by all individuals. It is not enough to simply assume such usability based on automated accessibility evaluations. This is especially true in transactions or applications where multiple subtasks must be successfully completed to reach the task goal.
- When conducting usability tests with blind participants, we suggest that the length of the session should be estimated in advance so that participants can be informed in advance of the usability testing session.
- When conducting usability evaluations of interfaces with individuals who are blind, it is sometimes necessary to consider a modified approach to usability testing, in order to

ensure that the usability of the entire interface is evaluated, rather than relying on a limited evaluation due to possible accessibility obstacles that are discovered during the usability testing.

- In addition to observing users during usability testing, encouraging users to think aloud may help to identify more issues during the testing exercise.
- Many of the core usability problems for people with disabilities are actually the same usability problems as for people without disabilities.

Acknowledgements

We would like to thank the DBTAC: Southeast ADA Center and the Burton Blatt Institute of Syracuse University Law School for funding this research under Grant #H133A060094 with the Department of Education, National Institute on Disability and Rehabilitation Research (NIDRR). Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the Burton Blatt Institute, Southeast ADA Center, or NIDRR. We also appreciate the assistance provided by the Maryland Division of Rehabilitation Services, Office for Blindness and Vision Services, and the National Federation of the Blind of Maryland, in recruitment of participants for the study.

References

Braddy, P., Meade, A., & Kroustalis, C. (2008). Online recruiting: The effects of organizational familiarity, website usability, and website attractiveness on viewers' impressions of organizations. *Computers in Human Behavior 24*(6): 2992, 2993.

Breen, B. (2000). Full house. *Fast Company*. Retrieved March 22, 2011 from http://www.fastcompany.com/magazine/42/pp_bellagio.html?page=0%2C0

Bruyere, S., Erickson, E., & VanLooy, S. (2005). Information technology and the workplace: Implications for persons with disabilities. *Disability Studies Quarterly 25*(2). Available at http://dsq-sds.org/article/view/548/725

Bureau of Labor Statistics (2011, November). The employment situation. Retrieved December 14, 2011 from http://www.bls.gov/news.release/archives/empsit_12022011.htm

Canadian Federation of the Blind (2011). Review: The politics of blindness: From charity to parity. Retrieved December 14, 2011 from http://www.cfb.ca/review-the-politics-of-blindness-from-charity-to-parity

Capellli, P. (2001). Making the most of online recruiting. *Harvard Business Review*, Harvard Business Publishing. 79(3), 139–146.

Department of Justice (2010). Nondiscrimination on the basis of disability; Accessibility of web information and services of state and local government entities and public accommodations. Retrieved December 15, 2011 from http://www.ada.gov/anprm2010/web%20anprm_2010.htm

Department of Labor (2011). Affirmative action and nondiscrimination obligations of contractors and subcontractors: Evaluation of recruitment and placement results under Section 503. Retrieved December 15, 2011 from http://www.dol.gov/ofccp/regs/unifiedagenda/Spring-2011/1250-AA02.htm

Everett, C. (2011). Online recruitment sites "not accessible." Retrieved March 13, 2011 from http://www.hrzone.co.uk/topic/recruitment/online-recruitment-sites-not-accessible/109886

Frey, B. (2008). Happiness research in economics—A revolution? *Journal of Happiness Studies*, *10*(4), 499-502.

Frey, B., & Stutzer, A. (2002). What can economists learn from happiness research? *Journal of Economic Literature 40*(2), 402–435.

Hastings, R. (2010). Making recruiting sites accessible for all. Retrieved May 5, 2011 from http://www.shrm.org/hrdisciplines/Diversity/Articles/Pages/RecruitingSitesAccessible.aspx

Lazar, J., Feng, J., & Allen, A. (2006). Determining the impact of computer frustration on the mood of blind users browsing the web. *Proceedings of ACM Conference on Assistive Technology* (ASSETS; pp. 149-156). Portland, OR, USA: ACM (New York, USA).

Lazar, J., Wentz, B., Biggers, D., Delair, J., Donnelly, M., Kashim, E., Henin, A., Markakis, J., Matos, A., McNicol, A., Nixon, J., Osborne, R., Postnova, T., Raja, J., Roberts, R., Serra, H., Sfakianoudis, V., Tyler, V., & Yun, J. (2011). Societal inclusion: Evaluating the accessibility of job placement and travel web sites. *Proceedings of the INCLUDE 2011 conference*, London, UK, Royal College of Art., Available at http://www.hhc.rca.ac.uk/3845/all/1/proceedings.aspx

Meskauskas, J. (2003). The potential of online job boards. iMedia Connections. Retrieved March 23, 2011 from http://www.imediaconnection.com/content/2013.imc

Nakamura, A., Shaw, K., Freeman, R., Nakamura, E., & Pyman, A. (2009). Jobs online. In: Autor, D.H. (Ed.) *Studies of Labor Market Intermediation* (National Bureau of Economic Research Conference, May 17-18, 2007; pp. 27 – 66). The University of Chicago Press.

National Federation of the Blind (2010). Senators Dodd and McCain introduce Blind Persons Return to Work Act: National Federation of the Blind applauds a common sense work incentive for blind social security beneficiaries. Retrieved March 9, 2011 from http://www.nfb.org/nfb/NewsBot.asp?MODE=VIEW&ID=547

National Federation of the Blind (2011). NFB executive Mark Riccobono honored by Wisconsin Alumni Association. Retrieved December 14, 2011 from http://www.nfb.org/NewsBot.asp?MODE=VIEW&ID=769

Office for National Statistics (2011, November). Labor market statistics. Retrieved December 14, 2011 from http://www.ons.gov.uk/ons/rel/lms/labour-market-statistics/december-2011/index.html

Olalere, A., & Lazar, J. (2011). Accessibility of U.S. Federal Government home pages: Section 508 compliance and site accessibility statements. *Government Information Quarterly 28*(3), 303-309.

Ross, T. (2011, January 10). Happiness is having a job, and the salary doesn't matter. *The Telegraph*, Retrieved March 23, 2011 from http://www.telegraph.co.uk/science/science-news/8249538/Happiness-is-having-a-job-and-the-salary-doesnt-matter.html

Royal National Institute of Blind People (2011a). Key information and statistics. Retrieved March 14, 2011 from http://www.rnib.org.uk/aboutus/Research/statistics/Pages/statistics.aspx

Royal National Institute of Blind People (2011b). UK law for websites. Does the law require me to make my site accessible? Retrieved March 14, 2011 from http://www.rnib.org.uk/professionals/webaccessibility/lawsandstandards/Pages/uk_law.aspx

Section508.gov (1998). Section 508 of the Rehabilitation Act. Available at http://section508.gov/index.cfm?fuseAction=1998Amend

Statistics Canada (2011, November). Labor force survey. Retrieved December 14, 2011 from http://www.statcan.gc.ca/subjects-sujets/labour-travail/lfs-epa/lfs-epa-eng.pdf

Treasury Board of Canada Secretariat (2007). Common look and feel standards for the Internet, part 3: Standard on common web page formats. Retrieved March 14, 2011 from http://www.tbs-sct.gc.ca/clf2-nsi2/clfs-nnsi/clfs-nnsi-3-eng.asp

W3C (2011a). Web Accessibility Initiative (WAI). Retrieved March 23, 2011 from http://www.w3.org/WAI/

W3C (2011b). Web Content Accessibility Guidelines (WCAG). Retrieved March 23, 2011 from http://www.w3.org/WAI/intro/wcag

Wang, K., Barron, L., & Hebl, M. (2010). Making those who cannot see look best: Effects of visual resume formatting on ratings of job applicants with blindness. *Rehabilitation Psychology, 55*(1), 68-73.

WebAIM (2010). Screen reader user survey #3 results. Retrieved February 2, 2012 from http://webaim.org/projects/screenreadersurvey3/

Wentz, B., & Lazar, J. (2011). Usability evaluation of email applications by blind users. *Journal of Usability Studies, 6(*2), 75-89.

Williams, S., & Verhoeven, H. (2008). "We-find-you" or "You-find-us"? - Internet recruitment and selection in the United Kingdom. *International Review of Business Research Papers, 4*(1), 374-384.

Younger, J. (2008). Online job recruitment: Trends, benefits, outcomes, and implications. *International Review of Business Research Papers*, *4*(1), 374-383.

About the Authors

Jonathan Lazar
Jonathan Lazar, Ph.D., is a Professor of Computer and Information Sciences, Director of the Undergraduate Program in Information Systems, and Director of the Universal Usability Laboratory. He is involved in teaching and research in Web usability and accessibility, user-centered design methods, assistive technology and public policy in human-computer interaction.

Brian Wentz
Brian Wentz, D.Sc., is an Assistant Professor in the Department of Computer Science and Information Technologies at Frostburg State University. His research interests include human-computer interaction, accessibility, user-centered design, policy implications of accessibility and usability, expanding employment opportunities for individuals with disabilities, and accessibility in higher education.

Abiodun Olalere
Abiodun Olalere is currently a doctoral student in Information Technology at Towson University. He has an MS in software engineering from Andrews University (Michigan). He has previous work experience as a computer analyst and a quality assurance analyst in the financial sector and as a Web developer in higher education.