An Analysis and Evaluation of the Design Space for Online Job Hunting and Recruitment Software*

Bowen Hui[1], Eileen Wood[2], and Carlos Khalil[2]

[1] University of British Columbia, Kelowna BC, Canada bowen.hui@ubc.ca
[2] Wilfrid Laurier University, Waterloo ON, Canada
ewood@wlu.ca,khal4170@mylaurier.ca

Abstract. Despite heavy usage of social networking sites during the job hunting and recruitment process, little academic research has examined how these sites are used, the value they provide to the end-users, or how they should ideally be designed. The present study describes the use of a participatory design methodology to actively include end-users as part of the design process in creating an online job website. Participants who acted as job seekers and job providers both identified unique and overlapping requirements for an ideal prototype. The results enabled the production of a minimal viable product called EdgeMap. This prototype was evaluated in a usability study where participants endorsed EdgeMap as one they would use for recruitment and job hunting. The process and outcomes are discussed in terms of implementing participatory design methodology, design implications, and future directions for software design and adoption.

Keywords: Participatory design · design requirements · recruitment software · social networking sites · employment selection.

1 Introduction

Online job boards, such as monster.com and Workopolis.com, are common tools used by recruiters and job seekers. While online job boards are useful, their functionality is limited and the usability is often poor. Job boards usually feature search functions that let job seekers find and browse postings and let job providers find and browse résumés. The typical structure of a job posting includes the job title, location, salary, general description about the position, more specific responsibilities, required/preferred qualifications, and how to apply. Typical job boards provide no opportunity for applicants to interact with potential employers beyond submitting a résumé. This online experience is thus restricted to the process of viewing content-heavy job postings. Moreover, there is not much opportunity for individual companies to personalize their job ads. In some cases,

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a hyperlink to a company website may be provided, however, corporate websites can be perceived as overly complicated for job hunting purposes [1]. Ease of use is an important design requirement as 25% of job seekers reject potential work opportunities simply due to poor website usability [13]. Initial website impressions, therefore, are important during the recruitment process [3,16,2].

Meanwhile, many large organizations have adopted the use of social networking sites (SNSs) for recruitment. Existing SNSs are populated with a multitude of features to support many user groups, including job seekers, recruiters, and community learners across different expertise levels. While SNSs have been widely used for recruitment purposes since the mid 2000's, there is a lack of design and empirical research on how these sites should ideally be designed and used in the job search process. The goal of this research is to explore the design space of software that is used for online recruitment and job hunting purposes.

In this work, we adopt a participatory design methodology by involving the end-users in co-design sessions to gather design requirements of an online system that would be used in today's job hunting and recruitment process. Section 3 describes a participatory design study involving 9 youth job seekers and 5 business owners as job providers. This study involved activities for brainstorming, card sorting, and paper prototyping. Based on the session outcomes, Section 4 identifies five categories of software requirements to illustrate what the software should ideally do for the two user groups. Among these, our participants highlighted novel software features that would improve the user experience and confidence in the job search and hiring process. These elicited results led to our working prototype called EdgeMap, which is also presented in Section 4.

To evaluate our prototype, we conducted a preliminary usability study summarized in Section 5 involving 45 youths and 7 business representatives. The results indicated that most users found EdgeMap easy to use and liked the value that it provided. Moreover, the business participants identified specific criteria for software adoption, which we discuss in the context of future work in Section 6. Ultimately, our research goal is to deepen our understanding about the role of new technologies in the pre-employment process.

2 Literature Review

Although networking through social networking sites (SNS) has become one of the most widely used job search methods [15], there is limited research on how SNSs impact the job hunting and recruitment process [12]. Research examining how SNSs are used by potential employers indicates that recruiters regularly use these sites to make person-organization fit judgments [14]. Davidson et al. [4] report that recruiters used SNSs to identify counter productive work behaviors such as negative expressions of one's job, co-workers, or employer. Another study compared the degree of deception between paper résumés and LinkedIn profiles [6]. The researchers found that public LinkedIn profiles were less deceptive with an individual's work experience, but more deceptive regarding interests and hobbies. The authors hypothesized that the observed level of deception was due to

the public nature of online profiles that allows others, including past employers and co-workers, to view and (in)validate another individual's listed expertise. Research has also identified the types of information recruiters look for when viewing LinkedIn profiles [17]. Through interviews with recruiters for positions in sales/marketing, human resources, and finance, this work indicated that recruiters unanimously look for presence of spelling or grammar mistakes, hobbies or interests similar to the recruiter, a college degree, number of years of work experience, sufficient content provided, the professionalism of email used, and the presence of a professional photograph in the profile. To summarize, previous research provides some guidelines on how user profiles should be designed in order to facilitate access to the desired content that recruiters want to see.

From the job seeker's perspective, Gerard [5] reported SNS usage data from business students in an undergraduate capstone strategy course. Survey data collected after the participants had completed assignments that involved in-depth usage of LinkedIn indicated that participants were very engaged when using features that related to the maintenance of their own profile and connections. However, they spent very little time on professional development activities such as asking for career or résumé advice, identifying themselves as a job-seeker, joining groups, looking up companies of interest, conducting advanced job searches, or promoting themselves. The authors suspected that the participants did not engage in professional development activities was due to a lack of incentive in the research study and a greater demand on the participants' effort and time. Other research on job seeker attitudes show that the ease, simplicity, and perceived usefulness of an online job site affect the job seeker's attitudes and the site features are used [8,9]. This body of research suggest the need to train job seekers to engage in professional development activities online.

We are unaware of any published design research on SNSs or empirical analyses of these sites to assess whether they meet user needs. However, from a general design perspective, Maurer and Liu [10] proposed that an online recruiting site should tailor its design to emphasize either "central processing" or "peripheral processing" of information depending on the software's target user. The authors define *central cues* as information pertaining to relevant content and *peripheral cues* as information that reflect relatively cursory content or reference to the medium used to present content. They suggest using central cues to target job seekers who are serious or have more work experience, while using peripheral cues to target new graduates or those who are just browsing for jobs. The authors also draw on marketing literature that suggests two key software features which are consistent with the findings of our studies below: a user's active control of a site (e.g., the ability to personalize and save search results) and the support for a two-way communication between a potential employer and candidate (e.g., online messaging). Site vividness, in terms of providing rich sensory information that evokes multiple perceptual channels, was also identified as a means for improving site receptiveness and usability when used appropriately. This model offers important design suggestions for two types of end-users. Unfortunately, the authors did not provide an application of the model to evaluate

existing software or a design of the software that is prescribed by the model. Such an extension is necessary to fully understand the relative contributions of their proposed research.

In order for designers to develop software that better fits the target user's conception of the process, Muller and Kuhn [11] propose employing participatory design methodology to bring the user and designer together through "co-design sessions". These types of sessions would enable potential users to act as designers, and work together to complete design tasks that lead to concrete artifacts used in building software prototypes. Example artifacts may include an organization of information into categories, sketches of screen mock-ups, preference evaluations of sample screenshots, and paper prototypes built using craft materials. This process allows designers to better understand the user's way of thinking and users can better appreciate the designer's constraints. For this reason, we adopt a participatory design approach to conduct our design study.

3 Design Research

Our first study uses a participatory design methodology by bringing the end-users into the design loop. Participatory design research is a well-established area within the field of human-computer interaction (HCI) in computer science. Traditionally, software design is mainly driven by business needs. In cases where gaps exist, design decisions are often made by programmers developing the software. Consequently, such software often ends up being unintuitive and fails to gain broad user acceptance. To solve this problem, the main premise of participatory design is to involve potential users throughout the design process to ensure that software is designed to meet real user needs and is implemented in a way that reflects how real users would actually want to use the software. This section describes the participatory design activities used to elicit user needs and preferences for an online job hunting and recruitment software.

3.1 Participatory Design with Job Seekers and Job Providers

The goal of this study was to explore the design space of job hunting and recruiting software. We elicited user needs from two groups of potential users – youth as job seekers and business owners as job providers. The results provided insights into the software needs of the two user populations and their general technology usage and preferences. This research was reviewed and approved by a university research ethics board and all participants were treated in accordance with APA ethical standards.

3.2 Participants

In total, we had 14 participants from community organizations and schools from two small Canadian communities. There were 9 youth participants for our first target user group: 3 male students in grades 10 to 12 from one community

and 4 females and 2 males in grades 9 and 10 in the other community. All the youth participants were comfortable with basic computer technologies, common social media applications, and mobile applications. In addition, none of them had knowledge of LinkedIn prior to this study.

For our second target user group, there were 5 business owners or organization leaders: 2 female and 1 male from the first community and 2 females from the second. Our business participants' ages spanned from mid-thirties to mid-fifties, and all of them were familiar with basic computer technology and recognized the need for a job hunting software in today's market.

3.3 Materials and Procedure

There were three design activities in this study: brainstorming, card sorting, and paper prototyping. Both participant groups conducted the brainstorming and card sorting activities. Due to limited time available, only the youth participants completed the paper prototyping activity.

In each community, we conducted two 90-minute sessions for each participant group. Sessions were held in a community high school. Each session was facilitated by one research assistant. For materials, the facilitator brought in sticky notes, blank paper, and colorful writing implements to each session. In order to keep the structure of these sessions consistent, the facilitator followed a process script and had a list of goals and questions to use in probing the participants during the sessions to encourage participation. At the beginning of the first session, participants were introduced to each other and the research facilitator who led the session. The remainder of the time was devoted to the design activities.

Brainstorming Participants were asked to generate as many ideas as possible to express how job hunting software could ideally help them search for jobs. (Alternatively, the context for business participants was recruitment software looking for qualified candidates.) At times when participants were stuck, the facilitator prompted them with questions related to functionality and usability (e.g., "How do you search for jobs?", "What would you like to do differently", "Which features do you like from other apps that you enjoy?"). Each idea was written on a sticky note. These ideas reflect user needs as either functional requirements that define what the software is supposed to do or non-functional requirements that specify how the software does it.

Once everyone was finished, participants were asked to post their sticky notes onto the wall for sharing. They reviewed each other's ideas, made clarifications in the wording, and identified additional features to add to the wall. The activity ended when everyone was comfortable with the posted information.

Card Sorting The card sorting exercise is a well-established usability technique used in HCI research that helps designers identify how information is organized from the user's perspective [7]. With all the ideas generated from the brainstorming activity, participants were asked to sort all the labeled sticky notes

into meaningful categories with approximately the same number of items. After establishing all the groups, they were asked to provide an umbrella label that represents the ideas in each category with a word or a short phrase. The goal here was to understand the organization of the desired software features in terms of what was intuitive and natural from the user's perspective.

Paper Prototyping Focusing on the categories identified from the card sorting activity, participants were asked to pick a category and sketch an interface that works best that would incorporate all the features in it. For example, a participant who chose the category "User Profile" with three items (e.g., personal information, upload résumé, and calendar reminder) would need to sketch out various user information while considering where upload résumé and the calendar reminders would be located and how they would be visualized on that page. This activity is helpful for eliciting interface layout requirements because users typically do not have the design vocabulary to articulate how they want the interface to look and feel.

3.4 Results

Brainstorming Overall, the youth participants were highly engaged during the co-design sessions. The first group of youths generated 50 notes and the second group generated 76 notes. Considerable time was spent together clarifying the wording used, as the youths often found it hard to articulate their ideas. Redundant notes were removed. For example, "easy to use" and "app has to be basic" were considered as one requirement.

The business participants were also productive, where one group generated 36 notes while the other generated 45 notes. There were many instances where participants said, "If the app could have [such and such] feature, it would be very effective for me." At times, the business participants also considered functionality that would be useful for youth job seekers. Overall, the participants were very thoughtful and thorough in this activity.

Card Sorting The results of the card sorting activity from both participant groups produced the following categories of functional requirements: usability, user profile, job search, social media and networking, resources, and job consideration (alternatively, candidate evaluation for business participants).

In addition, usability was of high importance to all the youth participants, indicating that they did not want ads or making sure the app was simple and easy to use. Surprisingly, business participants were less concerned about usability although they do expect the software to be easy to use.

Notably, it was important to the youth participants to be able to directly communicate with potential employers or employees who had previously worked in a company of interest. On the other hand, business participants did not express in engaging with potential candidates until they reached an interview stage. One possible reason, as explained by one of the business participants, is that living

in a small community makes them know many people informally already so they did not feel the need for this feature. However, business participants indicated that they wanted the ability to maintain a network with other businesses and stay connected with the community.

Ideas generated by the business participants emphasized the importance of having a wide variety of functionality available in the software and access to external resources (e.g., government funding opportunities for hiring students, incentive programs, sample interview questions).

Paper Prototyping The youth participants were excited to develop sketches in this activity. We found that some participants struggled with developing the details for a mockup, as they did not reference external sources. Interestingly, we noted that all of the resulting mockups were designed for a mobile device rather than a desktop computer (although they were not instructed to do so one way or another). This suggests the importance of mobile friendly applications for our youth population.

Figure 1 presents three mockups that show how two participants visualized search results. On the left, the sketch shows a search about a business in a certain geography. Once the user selects a business, the details are displayed. In the middle and on the right in Figure 1, another participant illustrated the search results of potential jobs and the details of a job posting. In these cases, the mockups illustrated very well-organized content, arranged using images and whitespace appropriately so that the content is easy to process.

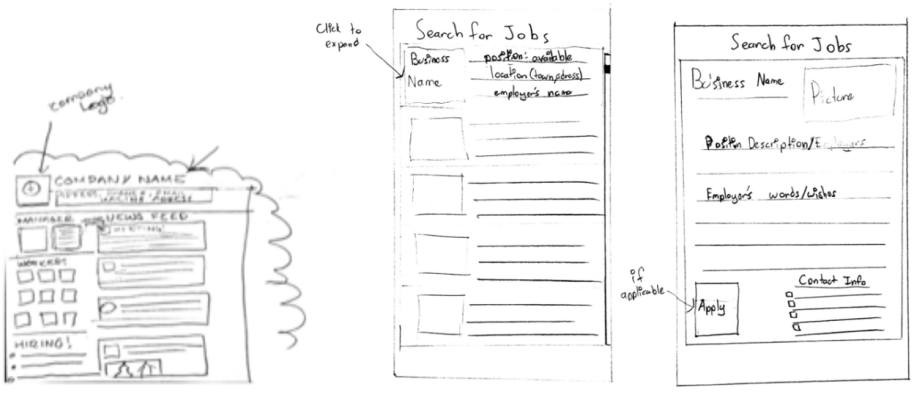

Fig. 1. Youth mockups showing the importance of content structure.

Other sketches included a mockup of two people messaging with each other, a mockup of two people engaged in a video or audio chat, a homepage with vivid

imagery to attract the user's attention, a layout with search and filter options. These mockups resemble the interfaces of well-known mobile applications (e.g., iMessage layout for text messaging on an iPhone). In one mockup, the search bar was placed at the top of the screen, suggesting the importance of the search functionality for the participant. One of the mockups showed a page of news feeds, which suggests the importance of staying up-to-date on various events relevant to the app.

3.5 Discussion

The software envisioned by both participant groups resembles an SNS with job hunting and recruitment features. In contrast to a professional SNS such as LinkedIn, the focus of our software design is not networking, but rather job placement success. As such, requirements that participants identified that were not central to LinkedIn include: job management capabilities (e.g., résumé tool and calendar), job review operations (e.g., comments on job experience), online communication features (e.g., online messaging or calls with potential employers), relevant resources for funding and advancement (e.g., training, career planning, business incentive programs), and mass résumé application.

4 EdgeMap: A Minimal Viable Prototype

Based on the design outcomes from Section 3, we identified features for a minimal viable prototype of a software that supports youth and business users in their job search and recruitment process. This section presents our prototype called EdgeMap, which was developed using Ruby on Rails and is made available at `http://edgemap.ok.ubc.ca/`.

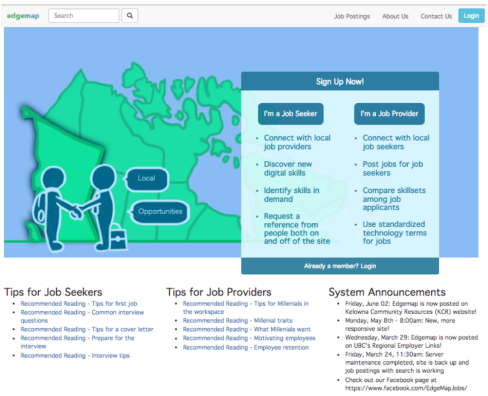

Fig. 2. Homepage of the EdgeMap system showing various functionalities at the top menu bar, the sign-up options, and tips and announcements at the bottom.

4.1 System Overview

EdgeMap is an online platform designed with two target user groups in mind: job seekers — youth looking for employment, and job providers — companies posting vacancies and recruiting qualified candidates. The site combines features from traditional online job boards, e-portfolio, social networking sites, and additional requirements identified from our design research study. Figure 2 shows the landing page for this site.

4.2 Job Seeker Features

As a job seeker, the user can create a profile with an online portfolio to showcase projects, browse the online community, and apply for jobs. Modeled after the testimonial feature in LinkedIn, EdgeMap also enables users to electronically reach out to referees and obtain a reference to include in their own profiles. The profile enables users to highlight their skills in an e-portfolio format. The profile allows users to record personal information and select whether to keep that information private or to display it to the public (e.g., name).

One novel feature that differentiates EdgeMap from other job hunting and recruitment tools is the skills survey. The skills survey is an online survey that lets the user self-report their expertise levels across many predefined categories. We devised this skills survey as a way to standardize the types of skills that the software recognizes, as well as to facilitate the search and comparison of skills.

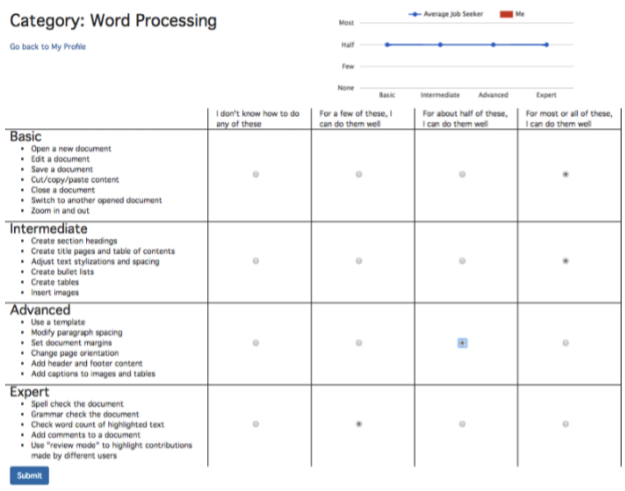

Fig. 3. The mini-questionnaire for the word processing category. The line graph at the top shows the average user in the system can do half of the functions in each of the basic, immediate, advanced, and expert levels. Once the user submits a completed mini-questionnaire, the system will automatically overlay the user's skills in the graph.

Each skill category operates as a mini-questionnaire which can be completed independently. Currently, each skill category has 3 or 4 related questions. For example, in the word processing category, we elicit the expertise level of the user in those related tasks, including: opening a new document, creating a new section heading, setting document margins, and checking the word count in a document. In our design, we enumerated a long list of tasks for each skill category, and grouped them into one of four levels: basic, intermediate, advanced, and expert. Thus, each level would have 5-10 associated tasks. The user completes the mini-questionnaire by indicating how well s/he can accomplish the tasks in each level (ranging from "I don't know how to do any of these tasks" to "I can do all the tasks well"). Figure 3 shows the mini-questionnaire for word processing.

A user completing the survey can choose the relevant skill categories to complete and view survey results immediately without having to wait until the other skill categories are finished. A sample screenshot of a user profile and her partial skill surveys is shown in Figure 4.

Fig. 4. A sample job seeker profile with partial skill graphs shown (image and name blurred for privacy reasons). Each red bar indicates the skill level of the job seeker and the blue line represents the skill level of the average user in EdgeMap.

Once a particular skill category is completed, a graph is used to visualize a user's skills alongside the skills of the average user in the system. Currently, the system includes the following skills categories: general computing; Internet and networks; programming; word processing; spreadsheet; online communication and collaboration; time, project, people; money; presentation; multimedia; social media; and 21st century skills. More skill categories can be added in the future.

Similar to a paper résumé, a user may add a list of skills and project accomplishments. Since our mini-questionnaires are worded in generic terms, users may want to add more detailed skills which can also be associated to the predefined skill categories. For example, a user can add "MS Word" and "Vim" as skills under "word processing". Furthermore, these skills can be linked to

specific projects where they were applied. An example screenshot showcasing a user's projects is shown in Figure 5.

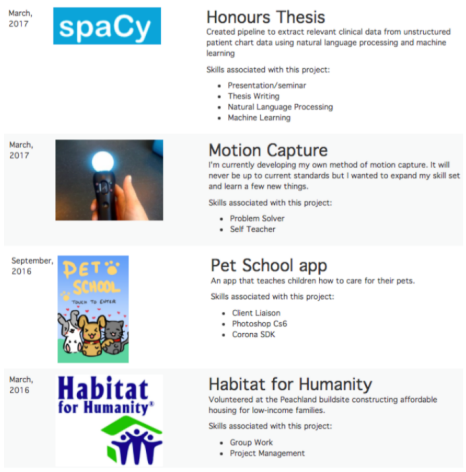

Fig. 5. Sample projects page in a job seeker's profile. Each project has a month/year, representative image, title, description, and associated skills.

EdgeMap is designed to combine features of a job hunting app with online social networking abilities. As such, our system serves as a virtual community platform with several key search functionalities. A job seeker can search for companies and read their profiles to learn about a company's culture and job postings. In addition, a job seeker can search for people in the online community to learn about their work and the kind of skills and expertise they have. This is especially useful for students who are thinking about their future careers and want to explore specific options in depth. If a user has certain skills in mind (e.g., python programming), the user can search directly for the skills to see who has those skills or search for projects involving those skills how those skills were applied. To take advantage of the skills survey in EdgeMap, users can compare their skills to another user to get a sense of the areas of improvement needed. This is helpful for young job seekers who are less familiar with the job market and wish to learn more about the skills they need to obtain their ideal job.

Lastly, a user can browse job postings, filter them by various criteria such as location and company, and apply to jobs. In the case where a job seeker is unsure whether she has the qualifications for a particular job of interest, she can compare her own skills to those of an "ideal candidate" as defined by the job posting. The result is a graph similar to that shown in Figure 7 below that compares the two skill sets. This feature helps job seekers conduct an initial self-assessment of qualifications which can help them build confidence and decide whether to take the time to apply to the interested job.

4.3 Job Provider Features

Job providers can create a company profile and manage job postings. To create a new job posting, the user enters information about the job, such as title, location, start and end date, salary, job description, required skills, and preferred skills. Optionally, the user can complete a skills survey (same format as the one for a job seeker) to express what skills an "ideal candidate" for the job should have. Once a job posting has been created, other users on EdgeMap can apply to it. Employers can view submitted applications on demand. Clicking an applicant's name directs the user to the applicant's profile, and a visual summary of which required and preferred skills are met. The user can decide to consider (i.e., shortlist), reject, or accept the applicant (see Figure 6). These decisions will propagate to the applicant's account and appear as a notification.

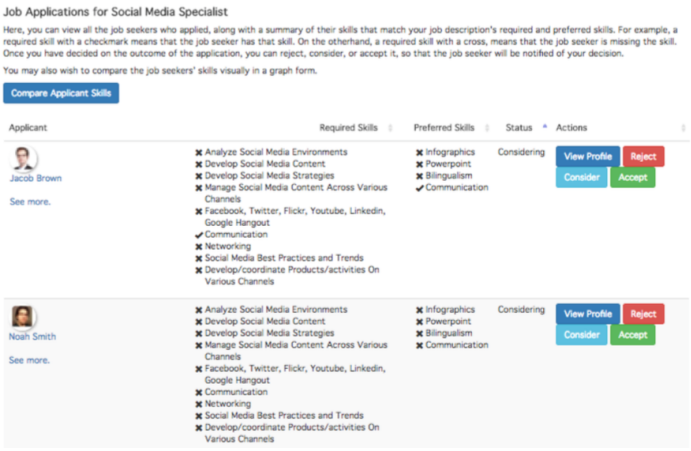

Fig. 6. A partial list of applicants for a particular job posting (profile images are blurred and fake names are used for privacy reasons).

Figure 6 also shows the option to compare applicant skills. This feature makes use of the skills surveys in EdgeMap to help job providers in evaluating the candidates. More often than not, a job provider has several seemingly good candidates who applied for a particular job and is unsure how to rank them. By clicking on this compare button, the system will aggregate the data in the skills survey and present them in a single graph with each candidate's skills stacked side-by-side. A sample comparison graph is shown in Figure 7 for the programming and social media categories. The line in the graph represents the skill levels of an average user on EdgeMap while the coloured bars in the graph represent the skill levels of the ideal candidate (if available) and all the applicants of this position. Figure 7 shows that the ideal candidate (red) has few basic programming skills but many social media skills across all expertise levels. The graphs show that all the

candidates have more than what is needed for programming skills, but only a few have the ideal set of social media skills. This visualization helps the decision maker tease out which applicants have the required skills quickly and provide a comparison of all the applicants in one place.

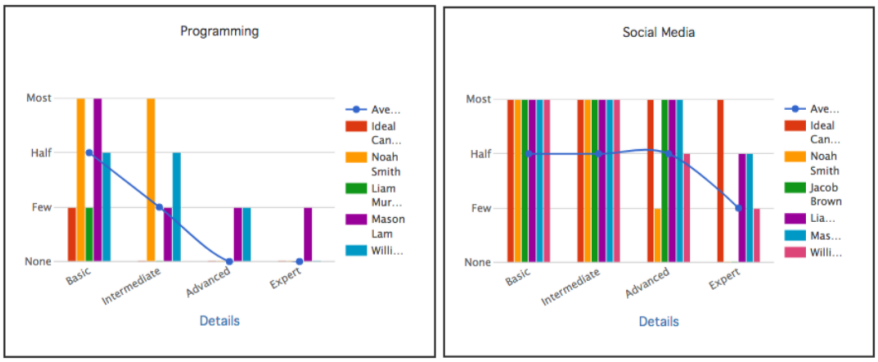

Fig. 7. Comparison graphs to support candidate evaluation for the Programming and Social Media skill categories.

5 Usability Study

The purpose of this study was to assess the utility of EdgeMap. We conducted a usability study with a new group of youth and business participants. The overall methodology in the two experiments were the same, although the detailed tasks and questionnaires differed due to the two user groups. This research was reviewed and approved by a university research ethics board and all participants were treated in accordance with APA ethical standards.

5.1 Study with Youth Participants

We first report our usability results with youth participants as job seekers.

Participants A total of 45 university students (21 females, 24 males) acted as youth job seekers in this study. Over 75% of the participants were born in 1996-1998, with the others born between 1987-1995. The majority of the participants were in their early years of a university program.

Materials and Procedure We used the current prototype of EdgeMap as described in Section 4 above. Participants were asked to use the software to complete a list of tasks we provided, and then complete a short post-questionnaire.

In particular, participants were tasked with creating an account on EdgeMap, completing the user profile with at least 5 projects to showcase. They also needed to upload a résumé to the account, browse for jobs, and determine if they are qualified for those jobs. Then, they were asked to search other people's profiles and compare their own skills against those in the profiles.

At the end of their session, participants were asked to summarize the tasks they completed and to complete the post-questionnaire. The questionnaire had four 5-point Likert scale questions and three open-ended questions assessing perceptions about the software.

Results Overall, the majority of participants found the site very easy to use (26.7%) or easy to use (51.1%). More than half of them reported they would be somewhat likely or very likely to use the site for self-promotion (53%) and for job hunting (51%). However, many participants did not realize the value of using an e-portfolio as fewer youth participants (42%) agreed or strongly agreed that showcasing their skills and experience using EdgeMap would be better than using a traditional paper résumé.

Qualitative open-coding methodology was used to code all open-ended responses. All responses were read and each new idea was coded and labelled. In cases where a single response included more than one benefit, multiple benefits were coded. With respect to perceived benefits that EdgeMap offered over traditional résumés, the most frequent responses identified by the participants include: the ability to showcase projects, display more content, emphasize skills, view information visually, and compare themselves with others. Figure 8 provides a histogram of all the elicited benefits.

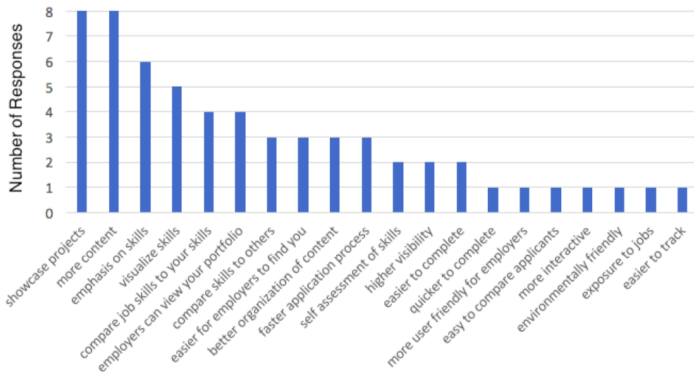

Fig. 8. Coded responses indicating benefits EdgeMap has over traditional résumés.

Participants were also asked to identify any other sites they felt were similar to Edgemap. Only 3 software were identified: LinkedIn (16 responses), Indeed.ca

(15 responses), and social networking sites not designed for professional use such as Facebook (4 responses). Thirteen participants indicated that there was no other comparative site that they knew of.

The last question asked if participants had any other comments. Only two participants indicated concerns with EdgeMap. In particular, one participant did not know how to edit skills in the profile. Remaining comments identified strengths with the prototype with feedback such as: "This is a very useful site that I will strongly consider in the future. I loved the fact the user profile can be so informative and tell so much about an individual" and "This site has the profile and the bio as well as specific skills which is unlike any other site that I have come across. Very interesting."

5.2 Study with Business Participants

Here, we report our usability results with business participants as job providers. We note that it has been significantly more difficult in recruiting business participants due to their demanding workload as leaders of small businesses.

Participants We had a total of 7 business participants (2 females, 5 males). Following the North American industry classification system, the primary sector of business that these participants represent are: professional, scientific, and technical services (3), health care and social assistance (2), educational services (1), and information (1). The participants reported the average employee age at their company to be mostly between 26 and 35 years old (3), with some cases of 25 years and under (2), and between 36 and 49 years old (2).

Materials and Procedure Business participants were asked to complete an initial survey about their personal information, business, and attitude towards technology. They used the same EdgeMap prototype described in Section 4 to complete a list of tasks we provided.

The tasks that the business participants were asked to complete include creating an account on EdgeMap and posting two job advertisements that involve the use of technology (given printed content). In order to assess the utility of our system in the hiring decision process, we provided a generic business account with two technology job ads (social media specialist and web specialist). The idea is that the participant would log into this generic account as his/her own, then evaluate the applicants for the two positions. For one of the job postings, we created five fictitious applicants for it (all white males). The business participants were asked to familiarize themselves with the job ads, study and compare the applicants, and provide a final ranking of the applicants.

Lastly, we asked participants to complete a small usability questionnaire based on their experience using EdgeMap. The questionnaire had eighteen usability questions that used a combination of 5-point Likert scale questions, open-ended questions on strengths and weaknesses of the software, and open-ended questions that probed them to compare Edgemap with other systems.

Results From the initial technology survey, about 95% of the participants' responses indicated positive agreement (somewhat agree or strongly agree) towards technology's role in their businesses. Specifically, participants identified a range of technologies that their businesses use. These include: email, Word processing software, video conferencing software (e.g., Skype), presentation software, spreadsheets, accounting software, search engines, and social networks.

The main part of the study took participants on average approximately 50 minutes to complete. The accounts and content created showed care and thought, reflecting that the participants tried to use the system genuinely. When evaluating the fictitious job applicants, all the participants reviewed traditional résumés that were uploaded along with each applicant as well as the skills comparison graphs in EdgeMap. All but one participant ranked what we expected to be the top two candidates within their top three rankings. This suggests that the participants were able to use the information available in the system to help them make effective hiring decisions.

With respect to usability, the majority of participants found the system easy to use and would be inclined to use it in their company's recruitment process. In comparison to standard online job boards, the majority of participants found the added features of candidate portfolios and the visual skills graphs to be informative and helpful (see Figure 9). Importantly, participants found the traditional résumés less informative. This suggests that participants see value in the information provided by the portfolios and skills graphs that are not available in the résumés.

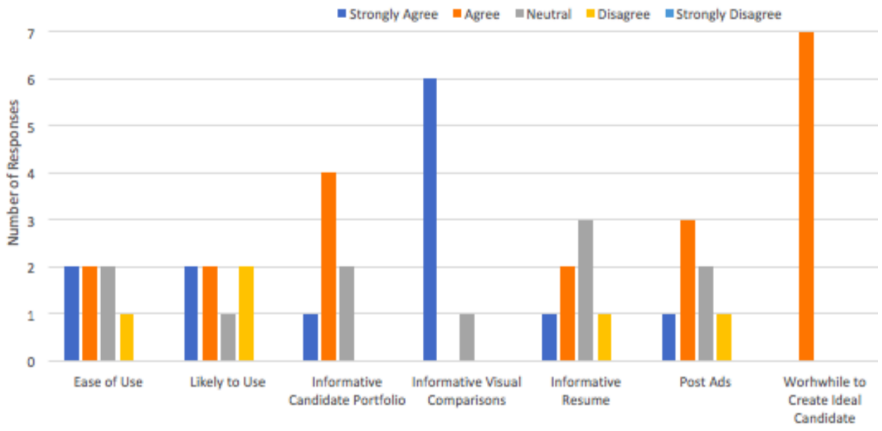

Fig. 9. Post-questionnaire responses on several usability aspects of EdgeMap.

Given that creating job ads on EdgeMap was an important feature for job providers, we asked the participants whether the ad creation process was easy to complete. Four felt it was easy, two were neutral, and one thought that it

was slightly difficult to use. We also asked the participants to consider the time needed to prepare and post job ads in EdgeMap in comparison to other systems. When asked about the time needed to review job applicants for a given posting, six of the seven participants felt that EdgeMap was less time consuming than other systems, while one felt it was about the same. Recall that an optional feature in creating a job ad is to complete the skills survey of an ideal candidate for that position. Since this feature is unique to EdgeMap, it implies that carrying out this feature would require additional time and effort on the part of the job provider. However, all the participants indicated it was worthwhile to create an ideal candidate for a job posting, despite the added time needed.

In the open-ended section of the post-questionnaire, participants were first asked to indicate strengths and weaknesses of the system. Most participants identified the skills comparison of EdgeMap as the key strength, while others mentioned that the interface is easy to use, the content is well-organized, and the added value of the social networking aspect of the system. Some minor navigation issues were mentioned as weaknesses, with one participant indicating that they wanted a customizable skills survey and another requiring this feature to be available for future software adoption.

In another open-ended question, the participants mentioned the other sites they use for recruitment purposes include LinkedIn, indeed.ca, monster.com, Workopolis.com, university career sites, and some industry-specific systems.

Lastly, we were interested in knowing what would make businesses use a new recruitment software, despite the added overhead. Six of the participants indicated that if EdgeMap had a significant user base of job seekers, they would use it for recruitment.

6 Discussion and Future Work

The goal of this research was to explore the design space of software used for online recruitment and job hunting purposes. Understanding the design space of such systems enables us to analyze the value that existing software offers to the end-users and to improve upon the state-of-the-art business technology.

As SNSs become more prevalent in today's society, we also discovered that both our target user groups identified basic SNS features (such as connecting with others and online chat) as core functionality of job hunting and recruitment software. This finding suggests that traditional online job boards that only support job postings and résumé submissions will need to incorporate social media features in order to remain competitive.

Our participatory design studies identified several categories of features that job hunting and recruitment software should ideally have. For youths, they include: user profile, job search, social media and networking, training resources, and job consideration. For businesses, they include: user profile, job posting, social media and networking, funding resources, and candidate consideration. While the categories are strikingly similar for the two user groups, the detailed features within each category need to be tailored to each user group.

Given that LinkedIn is the most popular SNS designed for professional networking, we compared LinkedIn's design to this ideal conception of the software. In particular, we see that LinkedIn supports features for user profile, job search, job posting, and social media and networking. Also, there is some overlap in the set of job consideration features, such as the ability to view featured jobs and contact current or previous employees of a company of interest. However, our participants suggested the desire for the features in the resources category, which are largely absent from LinkedIn's design. Job providers, identified the need for resources that identified financial aid opportunities, business development links, connections to local entrepreneurial opportunities, and sample interview questions to support the hiring process. Although these resources could appear in the form of advertisements and discussion group posts in LinkedIn, the design of the software would be more coherent if it had a section dedicated to these resources which could then be personalized.

One of the resources that youth participants suggested they wanted in EdgeMap is resources to learn about possible career paths. At minimum, this information can be presented as articles on career development and links to educational programs. However, there is a very interesting opportunity to connect the skills graphs in EdgeMap with training resources and career paths suggested here. In EdgeMap, users can identify their skills and see how they fare in comparison to other users or an ideal candidate of a job posting. If these skills graphs were integrated within existing training programs and career options, then users could use EdgeMap to assist them in mapping out their learning goals. For example, given a user's profile, one could easily identify which training program to pursue in order to enhance a category of skills. Similarly, one could explore different career options, then backtrack to identify the necessary training programs and skills sets needed in order to pursue a career path. These are exciting ideas and they offer a very innovative design opportunity to explore in future work.

In the usability study, we saw that our business participants valued time savings offered by the skills graphs comparison feature during the candidate evaluation process. Since this feature is unique to EdgeMap, the business participants unanimously acknowledged the strength of this feature in comparison to other major competitors, such as LinkedIn and various online job boards.

Our usability results also indicated that having a rich community of job seekers is a key criterion to software adoption for businesses. Unfortunately, this is a circular dependency because job seekers will tend to use sites that have many job postings. Therefore, some mechanism needs to be in place to enter job postings onto EdgeMap to increase job seekers, which will hopefully in turn attract more job providers onto the site. In addition, the skills survey feature needs to be extended so that it can be customizable and job providers can select the categories of skills deemed most useful for their needs.

Design is an iterative process. As technology evolves, so do user expectations. Therefore, in order to ensure that software is relevant for the target users, regular technology reassessment is necessary. Our study indicates that participatory research between software designers and end-users is a particularly informative

mechanism for identifying key aspects of design needed. Given that design preferences differ from one user to another, it is theoretically impossible to arrive at a single optimal design that works equally well for everyone. However, design researchers need to sample representative users, and gather both qualitative and quantitative feedback. In some cases, these evaluations may involve a comparison of multiple software so that benchmark results can be obtained. Other methods such as longitudinal studies and field studies may also be employed, depending on the researcher's evaluation goals.

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