ABSTRACT

JOBS, DISABILITIES, AND YOU: AN ACCESSIBLE JOB INTERVIEW COMMUNICATION TRAINING TOOL FOR PERSONS WITH DISABILITIES

By

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I have designed and implemented a new online communication training tool (XHTML, CSS, PHP, Javascript, MySQL) that potentially maximizes a job candidate's ability to obtain job offers. All demographic statistics show people with disabilities as the largest minority group currently unemployed in the United States. Those who seek work have a higher chance of being unemployed, find a low-level job, or find part-time employment. With communication training, job candidates gain the ability to market their skills to potential employers and increase the likelihood of obtaining a job offer. I researched into ADA law that provided guidelines when developing the system and discuss a job candidate's rights in each step of the interview process. Using a Model-View-Controller (MVC) based framework, I have built a system that adapts to a user's disability, and presents them with a tailored list of interview questions and answers. For this paper, mobility and visual disabilities were focused on. The database contains legal interview questions, illegal questions under ADA law, and gray area questions (questions

that may seem illegal but really not). This allows us to challenge the communication skills and knowledge of the user and encourage them to learn how to improve. PHP modules were built to be flexible and independent from each other. Different modules can be loaded and unloaded in the Controllers thereby allowing flexibility in the system. Having independent modules also reduces the time to debug code. Participants are given multiple choice answers to each interview question in a 10-question training session and rated based on their performance. Answers are assigned points (from 1 to 4) and are calculated at the end of a training session. A group of California State University, Long Beach (CSULB) students were given a 2-part survey before and after communication training and provided promising results on the effectiveness of the system. Overall, attitudes of participants showed the entire group agreed that communication is a key aspect in a job interview and that communication training would help them obtain more job offers. Participants that completed part-2 of the survey indicated that communication training through the system has overall helped their abilities. Long-term usage of the system could potentially show an increase in job interview performance (i.e., job interviews vs. job offers) and therefore, increasing the employment rate for people with disabilities.

JOBS, DISABILITIES, AND YOU: AN ACCESSIBLE JOB INTERVIEW COMMUNICATION TRAINING TOOL FOR PERSONS WITH DISABILITIES

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LIST OF ABBREVIATIONS

ACS	American Community Survey
CPS	Current Population Survey
IT	Information Technology
CSULB	California State University, Long Beach
BLS	Bureau of Labor Statistics
ODEP	Office of Disability Employment Policy
(X)HTML	Extensible HyperText Markup Language
CSS	Cascading Style Sheets
PHP	Hypertext Preprocessor
WCAG	Web Content Accessibility Guidelines
ADA	Americans with Disability Act
EEOC	Equal Employment Opportunity Commission
EEO	Equal Employment Opportunity
STAR	Situation-Task-Action-Results
PAR	Problem-Action-Results
MVC	Model-View-Controller
IE	Internet Explorer
SP1	Service Pack 1
API	Application Programming Interface

ID	Identification
FTP	File Transfer Protocol
CS4	Creative Suite 4

CHAPTER 1

INTRODUCTION

One of the most prevalent issues of people with disabilities has always been about employment. As the largest minority group with the highest unemployment rate, it has been an uphill battle to integrate this group into the workforce. Although enormous strides have been made in providing this group with employment opportunities, statistics still show a high unemployment rate for people with disabilities.

Based on data from the American Community Survey (ACS), in 2009, there were 301,472,074 individuals living in the community, 36,150,710 of which were individuals with disabilities—a prevalence rate of 12.0 percent [1]. The state with the largest number of individuals with disabilities was California, with 3,637,196 individuals with disabilities, while the state with the smallest number of individuals with disabilities was Wyoming, with 68,889 individuals with disabilities [1]. West Virginia had the highest prevalence rate, 18.8 percent, while Utah had the lowest prevalence rate, 8.9 percent [1].

For this topic, we focus on the group of working-age individuals looking at ages 18-64 and in some cases 16-84. According to the ACS, in 2009, there were 189,181,224 people ages 18 to 64 years living in the community, 19,054,587 of which were individuals with disabilities—a prevalence rate of 10.1 percent [1]. For this age range, West Virginia had the highest prevalence rate, 17.2 percent, while Hawaii had the lowest prevalence rate, 7.7 percent [1]. The employment rate for individuals with disabilities

ages 18 to 64 living in the community was 35.5 percent compared to individuals without disabilities which was 74.3 percent [1]. The types of disabilities seen within this age group are as follows. In 2009, of the 189,181,224 individuals, ages 18 to 64 years living in the community:

3,914,029 individuals had a hearing disability with an employment rate of 51.5 percent [1].

3,269,773 individuals had a vision disability with an employment rate of 38.3 percent [1].

7,865,243 individuals had a cognitive disability with an employment rate of 24.4 percent [1].

9,800,216 individuals had an ambulatory disability with an employment rate of 26.2 percent [1].

3,368,117 individuals had a self-care disability with an employment rate of 17.4 percent [1].

6,555,826 individuals had an independent living disability with an employment rate of 16.9 percent [1].

The U.S. Department of Labor also produces employment statistics of people with disabilities. The Bureau of Labor Statistics provides data from the Current Population Survey (CPS), which is a monthly sample survey of about 60,000 households that provides statistics on employment and unemployment in the United States [2]. According to the survey, the data shows:

Across all age groups, persons with a disability were much less likely to be employed than those with no disability [2].

At all levels of education, persons with a disability were less than half as likely to be employed than were their counterparts with no disability [2].

Workers with a disability were more likely than those with no disability to work part time [2].

Workers with a disability were slightly more likely than those with no disability to work in service occupations and in production, transportation, and material moving occupations, rather than work in management, professional, and related occupations [2].

For all age groups, persons with a disability were more likely than those with no disability to be out of the labor force [2].

For persons with and without a disability, the vast majority of those not in the labor force reported that they do not want a job, representing the group that do not actively seek employment [2].

It is apparent that groups with cognitive, ambulatory, self-care and independent-living disabilities have the lowest employment rates of the groups. Across the board we do see people with disabilities are less likely to be employed, less likely to obtain professional and managerial jobs, less likely to work full-time and more likely to not participate into the labor force (for example, not actively seeking a job).

It is also important to note the education levels and employment statistics for this population. According to the CPS we see about 31 percent of people with disabilities who have a bachelor's degree or higher are employed, with a large majority not participating in the labor force [2]. For their counterpart, people with no disabilities, we have about a 77 percent employment rate with a smaller group of people not in the labor force [2].

What is the Cause?

In 2010, a study was done by Allsup, a nationwide provider of Social Security disability, Medicare and Medicare Secondary Payer compliance services for individuals, employers and insurance carriers [4]. The number of people applying for disability benefits has risen to a record 2.9 million applicants in 2010 [4]. This means more people are not participating in seeking a job during that year and it is currently on the rise. With a rich pool of educated job candidates being untapped, one may wonder why this is the case, and what can we do to mitigate this, at the very least.

There are a number of factors when speculating why people with disabilities are not participating in the labor force, and/or why are they not being hired. In this section I attempt to make some conjectures, on why this is the case, based on numerous articles and government websites:

Government provides financial benefits for the disabled. This can cause a disincentive for those who are otherwise capable of work [3].

Social/employer discrimination in the work sector can affect people with disabilities [3].

Transportation issues which make it difficult to commute to jobs; information technology (IT) jobs are less affected since there is the opportunity to telecommute.

Employers lack of knowledge on accommodating people with disabilities or knowing the cost to accommodate the person (which could range from nothing to a few hundred dollars).

There can be a lack of preparation, knowledge and job duty compatibility of interviewees from people with disabilities.

To further understand the cause, I have surveyed a group of California State University, Long Beach (CSULB) students, on their thoughts and experiences in interviews and the job market. Each survey has around 6 or 7 questions related to job interview perspectives and experience. I provide questions and discuss possible outcomes along with the actual results in chapter 6, "Empirical Data and Results."

The Job Market Outlook and the Importance of Soft-Skills.

Based on the Bureau of Labor Statistics (BLS) employment projections for 2008-2018, jobs for people with disabilities are projected to grow by 9 percent, about 1 percent lower for people with no disabilities (10.1 percent) [5]; taking into consideration the population growth for people with disabilities, employment for this group may even decline in the up-coming years. However, there are a number of potential indicators that show significant job growth for people with disabilities.

For occupations with substantial growth, it has been shown that standard cognitive abilities needed for these occupations have little to no importance in the effectiveness of the work [5].

In addition, there is substantial projected growth in jobs for which psychomotor and physical ability have little to no importance [5].

Part-time and home-base jobs are projected to increase and allow people with disabilities to fulfill [5].

Most of new jobs projected to be created in 2008-2018 will be in occupations where computer skills are important. With new technology, computers can overcome many disadvantages for people with disabilities [5].

Although the job growth rate for people with disabilities is slower, data on abilities requirements show promising potential for the increase in employment for this group [5]. With such a large potential for employment, it becomes important to increase skills in job interviewing, maximizing the chances to land a fulfilling job.

In addition, a survey in 2008 was performed by the Office of Disability Employment Policy (ODEP), about employer perspectives on the employment of people with disabilities. This survey consisted of a 15-minute telephone survey of a senior executive from various industries and business sizes (from small to large corporations) [6]. Based on this survey, they have found some interesting results:

Large companies (53.1 percent) reported employing people with disabilities, more than small or medium-sized businesses [6].

Percentage-wise, the majority of large companies are recruiting people with disabilities for jobs, but in terms of absolute numbers, more mid-size companies are recruiting this group than large and small companies put together [6].

Public administration organizations are more likely to actively recruit people with disabilities than their private sector counterparts [6].

It is also important to know what employers felt was the most concerning aspect when hiring a person with a disability. The results were as follows:

When asked about the type of information that would persuade them to recruit people with a disability, companies that do not actively recruit cited information about performance, productivity, and how hiring people with disabilities can benefit a company's bottom line as the most persuasive information, while information about cost is the least persuasive [6].

Information on satisfactory job performance and how hiring people with disabilities can increase a company's productivity are cited by small and medium-sized companies as the most persuasive [6].

Large companies are more likely to be persuaded by information that is supported by statistics and research [6].

The nature of the work being such that it cannot be effectively performed by a person with a disability is cited as a hiring challenge by 72.6 percent of all companies. Attitudes of co-workers or supervisors are the least frequently cited challenges. Health care costs, workers compensation costs and fear of litigation are more challenging for small and medium companies than for large companies [6].

The cost of employing people with disabilities and the belief that workers with disabilities lack the skills and experience necessary are the most often cited concerns for small and mid-sized companies, while supervisor uncertainty about how to take disciplinary action is cited most often for large companies [6].

These results show a good view into the minds of employers. Note how companies cited performance, and skills necessary to perform work as a concern. Furthermore, information about performance, productivity and benefits from hiring a person with a disability are factors on what would persuade companies into recruiting people with disabilities. Based on these results, it becomes even more important for job seekers to communicate essential skill sets and convince employers how they will benefit the company's bottom line. It is this very skill that can persuade employers into hiring a qualified person with a disability.

Employers seek someone with skills and experience to fulfill the needs of the company. However, how can one gain experience if no employers hire them? It can definitely be a challenge to get one's foot in the door in any industry to gain work experience. This is compounded by the issue that everyone is competing for the same job and may have attained similar education levels. Where does one get a competitive edge? A Department of Labor 2006 report on employers' perspectives on new entrants, discuss the importance of soft-skills: Professionalism or work ethic; oral and written communication; teamwork and collaboration skills; critical thinking or problem-solving skills [7].

In this paper we focus on communication skills for a job interview. Effective communication is the ability to communicate one's thoughts and ideas enabling the recipient to conceive them as clearly as you do [8]. On any top ten soft skills list for job interviews, you will find communication being at or near the top of the list. It is very important for a job candidate to be able to communicate their ideas effectively and be able to sell their skill set to their potential employer. This issue may be more difficult for those who have communication disabilities and/or generally have a negative outlook on the job market. The good news is, effective communication is a skill and can be learned.

Online Communication Training System.

The goal of this system is to enhance the knowledge and communication skills of participants seeking employment. As a result, they will be able to maximize their ability to land a fulfilling job in a tough job market. The system will conduct job interview simulation sessions which will execute the following steps:

1. Understand the type of disability of the user and tailor the program and training sessions accordingly to their disability.

2. Conduct training sessions comprised of numerous interview-related and ADA-related (Americans with Disabilities Act) style questions.

3. Process user results based on answers to the questions, type of disabilities, and results from any previously conducted sessions and provide feedback/suggestions on further enhancing their knowledge and communication skills.

As an online tool, we have the capabilities to create a website highlighting communication training benefits and providing accessible tools to the widest possible audience. We will be using standardized Extensible HyperText Markup Language (XHTML), Cascading Style Sheets (CSS) and Javascript coding, with a backend of Hypertext Preprocessor (PHP) and MySQL databases producing and processing the training sessions. Section 508 guidelines and Web Content Accessibility Guidelines (WCAG) 2.0 will be applied to ensure accessibility across mainstream web browsers.

Each chapter will consist of a discussion and analysis of each step in the system. In addition, we will then discuss the empirical results/data and future work that delves into the flexibility of the system to add more questions to the pool, modules specific to other disabilities, and any other future work that would have been great to add but not enough time to implement.

CHAPTER 2

UNDERSTANDING THE TYPE OF DISABILITY

Before job interview training can be conducted, it is necessary for the system to understand the type of disability of the current user. By understanding the type of disability we can customize the system to the specific needs of the user and ask or avoid specific job questions in relation to that disability. For instance, in an interview, a person with a mobility disability may or may not be asked questions for a job that indirectly requires extensive physical abilities. This allows our system to give a different experience for each user based on their specific needs and disabilities. With a better understanding of the user, we can evaluate, give suggestions and improve their area of communication more accurately.

What do we mean when we say, to understand the type of disability? While the system's goal is not to become a self-diagnostic tool for what kind of disability one may have, its ultimate purpose is to maximize the individual's ability to land a job, given the existence of their disabilities. This is achieved and includes, but is not limited to, communication training, understanding the type of job that may interest them, and further providing suggestions on how they can improve, based on latest interviewing techniques. Providing information in what area(s) their disability affects, we even have the ability to suggest a broad range of jobs that would be recommended, given a disability. It is apparent we must first understand what area(s) does their disability affect, and to do this, we first look into the definition of a disability.

ADA Definition of Disabilities

Title I of the Americans with Disabilities Act 1990 (ADA) prohibits employment discrimination on the basis of disability [9]. However, to be protected under the Act, one must meet the requirements for a "qualified individual with a disability." Determination of a disability requires extensive analysis on the type and severity level. In this section, I attempt to summarize various key aspects of ADA definition law, and ultimately, will give an understanding on how this will affect the training system. According to ADA law, the term *disability* means:

A. A physical or mental impairment that substantially limits one or more of the major life activities of such individual [9].

B. A record of such an impairment [9].

C. Being regarded as having such an impairment [9].

A person must meet at least one of the three criteria to be an individual with a disability under the Act [9]. To fall under the first definition (A.), a person must establish three elements [9].

1. That (s)he has a physical or mental impairment [9].
2. The impairment substantially limits them [9].
3. It substantially limits in one or more major life activities [9].

People that have a record of a disability (B.) that substantially limits a major life activity whether classified correctly or not, are covered under the ADA [9]. This includes people who have recovered, in whole or in part, from a substantially limiting disability [9]. The rationale behind this requirement is that people who have a history of a substantially limiting impairment are subjected to discrimination [9].

People who are regarded as having a disability (C.), whether perceived or having an actual disability are covered under the ADA. Congress recognizes that perceived impairment can be just as disabling as the limitations caused by an actual impairment [9]. The third requirement is aimed at an employer's perception of an individual. However, since we assume both parties in a job interview have a willingness to conduct a fair interview, we focus more on the previous two criteria.

Impairments, Major Life Activities and Substantial Limitations

Impairment is a physiological disorder affecting one or more of a number of body systems or a mental or psychological disorder [10]. The person claiming to have a disability must have an actual impairment in order to fulfill the first part of the definition. The impairment must be the cause of his/her limitations in life, and therefore be a disability [9]. For example, someone who has difficulty coping with stress due to a bi-polar disorder is considered to have an impairment [9]. However, not everything that restricts a major life activity is considered an impairment [9]. Some examples of conditions that are not impairments: restricted financial spending, prison records, sexual orientation, old age, and lack of education.

It becomes very important to distinguish impairments from non-impairments. One way of determining disability is the existence of medical documentation that describes the condition [9]. Other information from family, coworkers, and/or friends may also be relevant in determining whether or not the person has an impairment [9].

Major life activities, in general, "are those basic activities that the average person, in the general population, can perform with little or no difficulty [9]." Examples of major life activities listed in the Title I regulations include caring for oneself, performing

manual tasks, walking, seeing, hearing, speaking, breathing, learning, and working [9]. In addition, thinking, concentrating, and interacting with others also are considered major life activities [9].

In order for an impairment to be considered a disability, it must substantially limit one or more major life activities [9]. It is substantially limiting if it prohibits or significantly restricts an individual's ability to perform a major life activity as compared to the ability of the average person in the general population to perform the same activity [10].

It must be determined how substantial the limitation is, based on the severity of the impairment [10].

It must also be determined how substantial does the impairment limit the person's ability to work, within a broad range of jobs [10].

Temporary impairments are generally not considered substantially limiting; however, temporary impairments that take a significantly long time to heal may be a disability depending on the severity [10].

Chronic or episodic disorders may be a disability when active or have a high likelihood of reoccurring in substantially limited forms [10].

An individual with two or more impairments which are not substantially limiting by themselves, but are substantially limiting together are considered disabilities [10].

These definitions allow us to set up the training system's framework, in terms of the types of disabilities that should be recognized, and how these disabilities will affect the training system.

ADA Amendments Act of 2008

In September of 2008, the President of the United States signed the Americans with Disabilities Act Amendments Act of 2008, which made a number of changes, making it easier for individuals to establish that they have a disability under ADA law [11]. The ADA Amendments Act is effective as of January 1, 2009 [11]. Here are a few highlights of the changes in relation to impairments, major life activities and substantial limitations:

Revise definition of "substantially limits" in its regulations [11].

It expands the definition of "major life activities" with two more non-exhaustive lists [11].

Clarifies an impairment that is episodic or in remission is considered a disability if it substantially limits a major life activity [11].

Visual and Mobile Disabilities

With numerous types of disabilities and severity levels, it becomes too grand of a task to include them all for this paper. However, we focus on two disabilities for interview training: visual and mobile. Both visual and mobile disabilities are perceived to be important in daily life. ADA's definition of disability considers motor and visual skills such as walking, standing, sitting, seeing, reaching, etc. as major life activities. However, with the advent of technologies in the digital age, both visual and mobile disabilities have become less important in the workplace. Computers with screen readers can allow a blind individual to read e-mails; wheelchairs, and prosthetic legs/arms can give back some types of motor abilities. Text-to-speech software can allow a person, who cannot speak, the ability to communicate with others. The ability to be as

productive as the average worker in a work environment is available for those with a disability.

Unfortunately, for certain types of disabilities, it becomes very difficult to mitigate issues where, for example, self-care is an issue. These situations require more extensive and creative thought to resolve, if possible. Fortunately, both visual and most mobile disabilities provide a good starting point because technology is available to mitigate issues caused by these disabilities; as a result, it then becomes an issue in other aspects: education, communication, professionalism, organization, marketing skill-set, and so forth. In this section, we will delve a bit deeper into some types of visual and mobile disabilities, and ultimately, have a better understanding of how we can provide a more rewarding job interview simulation experience.

Types of Visual and Mobile Disabilities

There are three prominent visual disabilities: blindness, low-vision, and color-blindness. People who are legally blind may have some vision. Similarly, people with low-vision, have difficulty visually perceiving their environment. Different types of low-vision conditions include:

Macular degeneration–where the person's central area of sight is affected the most, making it difficult to see objects that the person is looking at directly [12].

Glaucoma–produces the opposite effect of Macular degeneration, a loss of peripheral vision and a blurry central area of vision [12].

Diabetic retinopathy–a condition that causes dark patches in the field of vision [12].

Cataracts–have areas of opacity in the lens of their eyes which results in a blurred or hazy effect, especially in bright light [12].

Motor disabilities bring an interesting problem. In everyday life, we use our hands and feet to interact with our world. For those with a motor disability, simple things such as reaching for an item can be very difficult to execute. While the scope of this paper is to not describe every type of assistive technology available for mobility users, it should be noted that computer devices, such as adaptive keyboards for those with limited mobility or even eye-tracking software, allow the opportunity to be productive in a work environment, thus, improving independence. Here are a few examples of motor disabilities:

Spinal-cord injury–may vary depending which parts of the limbs are paralyzed. Paralysis of the legs is called paraplegia, while paralysis of the legs and arms is considered quadriplegia [13].

Loss or damage of limb(s)–this is self-explanatory.

Cerebral palsy–is an injury to the brain (hence the term *cerebral*), resulting in decreased muscle control (palsy) [13].

Muscular dystrophy–a genetic disorder in which the genes for muscle proteins are damaged. It is characterized by the progressive degeneration of the muscles [13].

Note these are not exhaustive lists, but by understanding disabilities, we lay the foundation of how the training system should utilize this information and maximize each individual's communication ability based on their unique needs.

Data/Variables for Understanding Disabilities

Before an interview simulation can be conducted, the user is required to create an online account with the system. With an online account, this allows the system to measure various statistics, track multiple interview sessions from a user, and note any user preferences. When creating an account, the system requires the following information before presenting a questionnaire to gather some knowledge of their disabilities: first/last name and e-mail address.

Although for statistical purposes it may be beneficial to track other information, such as the user's age and gender, ultimately, we are simulating a job interview; employers are prohibited to discriminate based on age, sex, and so forth. therefore, we do not ask a user for that type of information as well. We simply ask for their name and e-mail address to send any results and/or use as a contact method. If may be beneficial to later ask for age and other information for our own statistical reports.

User Questionnaire for Categories

Because this system is aimed to help those with a disability, we do ask questions regarding their impairment. So how do we determine this information and what do we ask of the user when evaluating their type of disability? Understanding their type of disability is based on the user perception of their own disability, whether if it is actually correct or not. We first ask for the type of disability they consider themselves to have. We present them with a drop-down menu of the options: Visual and/or Mobile. They may select more than one disability in future iterations of the system. We ask questions to further understand their disability in the following areas:

We want to understand the general severity of their disability (whether it is serious or not).

Figure out if their disability is over any legal thresholds (if applicable).

Find out the duration of their disability and if it exceeds 12 months.

Ask the user if whether or not any type of equipment is used as an aid for their disability.

Each question in regards to a disability is only allowed a yes or no response unless otherwise indicated, and will be used by the system to personalize possible interview responses and questions during the simulated session. Once account creation is done, we will have the user's contact information and yes or no responses to questions respective to their disability. The user is able to modify any of their information at any time before starting an interviewing session; this includes answers to the questionnaire and therefore changing how the system will react to them, in regards to generating questions and answers for the user. Table 1 (see Appendix A) provides the actual questions that will be used during the account creation process.

System Representation of Questionnaire Answers

In order to use the responses given by the user, the system represents the input as bits depending on how many questions there are for an assigned category. For example, for the visual category we currently have four questions to ask the user. In the system, this will be represented as a 4-bit string, where each bit represents a yes or no response to each question. The order of the questions and therefore, the bits, are currently not utilized in any way by the system; all we need to do is keep track of which question is

assigned to which bit. This bit string is used to personalize both questions and answers for the user, which we will discuss more below.

System Customization by Disability Type

By understanding the specific need of a user, we can determine what type of interview questions and answers which would suit the user. For example, we can analyze users with severe mobility issues, how they respond when asked job questions directly or indirectly relating to extensive mobility, similarly, ask a visually impaired user, job questions relating to high visual importance. With interview answers, giving nothing but generic answers that fit all users across the board would not help build communication habits to better market skills. Therefore, we tailor answers as close as we can for a user's specific situation. With their account profile available to the system, we may determine the type of interview questions and answers appropriate for the user. There is a vast array of customizations we can implement (perhaps for future work), however, we focus on questions and answers as the main personalization feature. The following are overviews of the types of personalization the system will implement. More details will be discussed in chapter 3, "Pool of Interview Questions."

Type of Interview Questions

Interview questions are categorized based on what area they are relating to. We assign three categories for this project: General, Visual and Mobile. Each interview question may have more than one category assigned to them. General questions are interview questions which do not imply any disability whatsoever. These are considered legal questions under ADA. Questions labeled visual and/or mobile relate directly or indirectly to that category. The system will choose questions based on the user's profile,

where we can avoid certain questions, or even focus on certain questions. This will not only help communication ability but also provide "curve ball" questions designed to enhance their knowledge of what is an appropriate question or what is not, under ADA definition and how to deal with difficult questions through communication skill.

Type of Interview Answers

Similar to the type of questions, we also categorize our multiple choice answers based on the nature of the answer. As with interview questions, there will be three categories: general, visual and mobile, used for each answer within the system. Each answer may have more than one category assigned to them. With the user's profile, the understanding of and the severity of their disability, we can tailor answers more closely to their experiences. Therefore, each answer will be more personalized for each user, along with general answers to interview questions.

Extensibility for Understanding Additional Disabilities

To extend more disabilities, we must add categories to the system. For example, we may add "auditory" to the list for those with a hearing disability. Next, we must add a questionnaire to understand the severity of their disability and therefore, provide a number of yes or no questions. Interview questions and answers can be categorized as "auditory" when appropriate and be used by the system when presented with an opportunity to do so. Current interview questions and answers may also be re-categorized if the initial choice does not fit the situation.

CHAPTER 3

POOL OF INTERVIEW QUESTIONS

Our pool of interview questions are focused on training key knowledge points in accordance to Americans with Disabilities Act law. However, for the purpose of training in real world scenarios, the system will present legal questions and other questions which are not so clear-cut in how they should be answered. Like many real-world situations, answering and handling difficult questions is very important in a job interview and as a communication skill.

We divide our interview questions and answers mainly into categories based on the type of disability they are relating to. For this paper, we have three categories: General, Visual, and Mobile. Questions and answers may also be assigned more than one category. With still such a vast amount of questions to ask, how do we determine which questions are most appropriate for a specific user? How do we determine which answers are best for a user? First, to understand what we can or cannot ask, we look into ADA law in regards to job applications and interviews. Then we will delve into the format of interviews and answers, and finally look into how the system generates them to be presented for an interview session.

ADA Law for Job Applicants

Title I of the Americans with Disabilities Act of 1990 (ADA) makes it unlawful for an employer to discriminate against a qualified applicant or employee with a

disability [14]. However, like all job candidates, they must be able to meet the employer's requirements such as: education, experience, skills, licenses, etc. [14]. Job candidates with a disability can request for "reasonable accommodations" – any adjustments to the job interview process – to enable the person for interview participation and be considered for the job [14]. It is important to note, employers are not required to provide such an accommodation if that accommodation will cause "undue hardship," in other words, it will be significantly time consuming and/or difficult to implement [14]. Based on the U.S Equal Employment Opportunity (EEO) Commission website, we take a step-by-step look into the job interview process and the rights for people with disabilities.

Being "Qualified" for a Job

The main focus is distinguishing the main responsibilities vs. the minor duties of the position. An employer is not required to hire anyone who cannot perform essential job duties, even with reasonable accommodations [14]. However, they cannot reject a candidate solely because a disability prevents any minor duties from being accomplished [14]. For example, a data entry position may have a minor duty of answering phone calls. Because answering phone calls is not an essential job requirement (i.e., other forms of communication available such as e-mail), an employer cannot refuse to hire the candidate based on this minor task.

During an interview, the ADA prohibits any interview questions that may reveal the existence of a disability before making a job offer [14]. Post job-offer, after a required medical examination for example, an employer cannot refuse to hire a candidate based on slightly increased risk, speculative risk, future risk, or any other generalizations about one's disabilities [14]. A candidate who has a mental disorder, but well-controlled

with medication and has past experience which show their disorder has no effect in their performance, cannot be refused employment based on that risk. If absolutely necessary, the employer must seek appropriate information to assess the level or nature of harm [14]. This includes requesting specific information from a person's doctor related to health and safety [14]. Furthermore, an employer must consider whether or not the risk can be eliminated or reduced to an acceptable level within a reasonable accommodation [14].

Accommodation for the Application/Interview Process

The application and/or interviewing process may entail aspects which may not be accessibly friendly. For example, interviewing people on the 2nd floor of a building where only stairs are available. When situations like this arise, it is up to the applicant to inform the potential employer of a needed change or adjustment to that process because of their medical condition, whatever that may be [14]. The request can be made orally, in writing, or someone, on the person's behalf, may make the request to the employer [14]. Likewise, employers are permitted to ask candidates if reasonable accommodation is needed strictly for the interviewing process [14].

Once a request is initiated, the employer may need additional clarification about the candidate's disability and the proposed accommodation. Candidates are recommended to respond to employer's inquiries as soon as possible and explain how the accommodation will enable them to fully participate in the application/interviewing process [14]. Employers may ask for reasonable documentation explaining the disability and the accommodation needed [14].

Employers may offer different accommodations so as long as it meets the candidate's needs [14]. If multiple accommodations meet the candidate's needs, then the employer may choose which to provide [14]. However, an employer does not have to provide a reasonable accommodation that will cause "undue hardship," which is significantly difficult or expensive [14]. Also, the candidate cannot insist on a specific accommodation only because it is a personal preference [14]. If the proposed accommodation does not meet the candidate's needs, then they will need to fully explain why.

Reasonable accommodations may take on many forms and employers are required to provide one, even if it entails some financial or administrative costs [14]. If accommodations proposed by the applicant are substantially expensive and/or difficult, the employer is required to provide an accommodation that is not [14].

Discussing Disabilities with a Potential Employer

Any interview question which may reveal a type of medical condition prior to making an offer is prohibited under ADA; this includes questionnaires, medical examinations, and any other type of inquiries during the pre-offer period [14]. However, post-offer, such inquiries and examinations are permitted [14]. Furthermore, although an employer is permitted to ask such inquiries and require such examinations, they must do so to other applicants who are also offered a similar position.

Post-offer, if it is found a candidate does have a medical condition/disability, the employer can withdraw their offer only if they can show the candidate is unable to perform essential job functions (with or without reasonable accommodation), or the candidate pose a significant risk of causing substantial harm to anyone [14]. In situations

where medical information is revealed under any circumstances, under ADA law, employers are under strict confidentiality requirements with certain exceptions [14]. Employers may share information with the following individuals:

Supervisors and managers may be told about necessary restrictions on the work or duties of an employee and about reasonable accommodations [14].

First aid and safety personnel may be notified if the disability might require emergency treatment [14].

Government officials investigating compliance with the ADA may be shared necessary information [14].

State workers' compensation offices, state second injury funds, or workers' compensation insurance carriers [14].

Employers may also use the information for insurance purposes [14].

Discussing Accommodations to Perform Job Tasks

Although employers are permitted to ask if reasonable accommodations are needed for the interviewing process, generally they may not ask if reasonable accommodations are need to perform essential job tasks, since it will likely reveal a disability [14]. However, if the employer already knows the candidate has a disability, because it is obvious or has been voluntarily revealed, then the employer may ask if accommodation is needed, and if so, what kind [14]. Moreover, if a disability is obvious, the employer may ask the candidate to demonstrate how she/he would perform the job, with or without reasonable accommodation [14].

Despite any inquires an employer may have about a disability, the applicant is not required to disclose and/or inform any type of accommodation needed to the employer at

any particular time [14]. However, some people decide to disclose their disability and accommodations when they have more information about the job, while others wait till after they have a job offer [14]. This is the decision an applicant makes completely up to their discretion. For situations where a disability is visibly obvious, it may even help to explain such a disability, and how it brings valuable experience when performing job tasks.

Filing a Charge of Discrimination

If a person believes the employer discriminated based on disability, refuse to provide a reasonable accommodation, or ask illegal questions during the interview process, they have the right to file a complaint with the EEO Commission, which must be filed within 180 days of the alleged discrimination [14]. More time can be obtained if unable to file within 180 days. If a person believed they have been discriminated by a federal employer, then they must initiate EEO counseling within 45 days of the alleged discrimination with the agency's EEO office [14].

Overall, ADA rules try to be fair for both the interviewer and the interviewee. Although some rules are somewhat subjective (i.e., "reasonable accommodation," distinguishing between essential and minor duties, etc.), it is imperative that the applicant defines their own disability, prepare and/or provide beforehand a list of reasonable accommodations (and ideally, their financial and/or administrative cost) to show an employer if necessary, and communicate effectively when dealing with both legitimate and illegal interviewing questions. Preparation is a key factor for a smooth and successful interview.

Interview Questions/Answers and the Training System

Based on ADA law for job applicants, we have a set of guidelines to following when developing the system. In this section we discuss question formats and how it will be integrated into the system. Questions and their associated variables (see below) are contained in a database, generated, and processed by the system to present to the user, conduct the training session and perform analysis.

Interview Question Format

There will be 10 questions during the interview simulation. Each question consists of a multiple choice answers (out of five possible answers) where each answer is given 1 to 4 points based on the correctness. The more points, the better the user performs in the session. Each question contains the following variables in the back-end:

Interview question ID number: unique ID that is generated automatically by the system.

Category(ies) in relation to the question: General, Visual and/or Mobile. Each question may have more than one category assigned to it. If the user has a mobility disability, for example, we may exclude those questions out of the question pool.

The interview question: our database will contain the actual question used in the interview simulation.

Appropriateness rating (from 1 through 3): determines how appropriate question is:

1. Rating level 1–interview question does not imply a disability (legal questions according to ADA).

2. Rating level 2–interview question borderline implies a disability (gray area).

3. Rating level 3–interview question obviously implies a disability (illegal questions according to ADA).

Multiple choice answer (out of 4 possible answers). Each answer is given points from 1 to 4 based on the correctness of the answer. There may be multiple answers with the same number of points for a given question, but only one answer for each point (1 through 4) will be selected and presented to the user, giving more diversity, deterring the user from just memorizing a few answers in future sessions.

Difficulty rating is based on how difficult the question is to answer:

1. Rating level 1–these types of questions should be relatively straight forward in their answers. For example, "Do you have experience using Microsoft Word?" This is usually a "yes" or "no" answer.

2. Rating level 2–these questions require a little bit more thought in their answers and usually requires some type of specific example to be given. For example, "Tell me about your experience with Microsoft Word."

3. Rating level 3–these questions require extensive knowledge and thought into what would be considered a great answer. For example, "Rate you experience level with Microsoft Word and explain the reasoning behind it."

Priority rating that determines when a question should be asked. A high priority question such as, "Tell me about yourself?" should be asked first compared to, "Why did you choose to apply to this job?" If questions are of same priority, the system will randomly select and present a question. The rating for this variable is as follows:

1. Priority level 1–high priority questions; these must be asked in the beginning of an interview session.

2. Priority level 2–standard priority questions, these can be asked at any time during the mid-interview;

3. Priority level 3–end priority questions; these must be asked at the end of an interview session.

Each category assigned to a question will have an X number of bits, where X represents the number of questions within the questionnaire assigned for a category (see Chapter 2). Each bit represents the questionnaire yes or no responses. For example, if a question applies to someone who is legally blind, the bit string represents this question as 0100, indicating a "yes" response for legally blind, and "no" responses to the other questions.

Each question is screened and entered manually by an administrator of the system. The administrator determines the appropriate values for each question such as appropriateness, difficulty, answers to the questions, and priority rating in accordance with communication and job interview experts. Therefore, this requires the human element of judgment. In chapter 4, "Assessing Performance," we see what a great interview answer should contain and calculate points based on the correctness of an answer (up to 4 points rewarded). Table 2 (see Appendix A) shows the ratios for each group of questions.

Ratios regarding difficulty levels will be chosen at random. Therefore, it is possible for the participant to have an "easy" interview, and likewise, to have an interview with all "difficult" questions.

Interview Answer Format

Each interview question may have multiple answers associated to it. When personalizing answers for a user, we must store information about that type of answer in our database. The following are the attributes each answer will contain:

Interview question ID: the question ID that the answer is associated with. This is generated automatically by the system.

Interview answer ID: unique ID for each answer. This is generated automatically by the system.

Category (ies) in relation to the answer: general, visual and/or mobile. Each answer may have more than one category assigned to it. Categories are determined by interview experts and the administrators for the answer.

Answer to the question: the answer to an interview question will be stored within the database.

Points: Each question is assigned a number of points from 1 to 4, based on the correctness.

Similar to interview questions, each answer will contain an X number of bits representing the questionnaire input from chapter 2.

Each answer will need to be screened by interview and disability experts, assigning categories, personalizing answers, and providing appropriate points. Careful consideration must be taken when assigning values to interview answers however we may modify these values at any time as we see fit.

Job Interview Scenarios

Job interview scenarios are created to give the user a more diverse feel when training their communication ability. The goal of these scenarios is to have the user think through and select a great interview answer using common sense without the need of any extensive specific knowledge in the field. Each scenario contains general interview questions that can be asked in any job, as well as questions geared towards that scenario. While any job position can theoretically be chosen, the scenarios are designed not to be too knowledgably specific. For instance, we do not want a scenario to be a "Database developer" since that requires knowledge in database software and programming, which not everyone has. Another example, we do not want a job scenario of "Medical Doctor" since it requires extensive knowledge in the medical field.

Currently, there are three job scenarios: College Career Counselor, Data Entry, and File Clerk. These jobs tackle topics such as working with others (i.e., college students), the negotiation of the physical layout of file cabinets, and experience working with standard software applications. Each scenario requires the user to choose an answer that best communicates the needed abilities for each job. By providing a diverse set of job positions and questions, we can better prepare the user for a vast range of situations.

Building the Pool of Questions/Answers for an Interview Session

At the beginning of the interview training session, we start off with a brief introductory summary presented to the user of what the system does and the format of the interview questions. Once the introduction is complete, their interview session will begin by pressing a start button. The pool of questions is screened based on various attributes in relation to the user before being presented:

1. The system will first determine which category of questions is most appropriate for the user. This is determined by their profile when creating an account on the type of disability (see Chapter 2) they have inputted. For example, a person that has indicated a mobility issue may have questions that are categorized as mobility excluded from the pool of interview questions available to the user, or even specifically included to work on communication in this aspect.

2. Based on the available pool of these categorized questions, we then select questions based on the appropriateness level, priority rating, and difficulty.

3. Since there may be multiple correct answers, the system will choose an answer for each given point (i.e., a 4-point answer; a 3-point answer; a 2-point answer, etc.). We first select all answers associated with an interview question.

A. Query off the database and find all interview answer bit strings that match the user's profile bit string, matching category and/or general answers.

B. Then we randomly select a 4-point answer, a 3-point answer, a 2-point answer, and a 1-point answer. These answers will be presented with the interview question to the user.

C. Randomly shuffle selected answers.

D. Iterate executing the steps again through the database, for each question.

4. Finally, questions are sorted based on their priority rating. If questions have the same priority rating, the system will randomly choose the order. Once this is complete, the system produces the list of questions to present the user for communication training.

We store this pool of questions and answers in a temporary database before the user is in session. With this database we can modify necessary variables associated with their current session. While the user is currently undergoing a session, we mark which questions have already been asked for user progress and consideration in future interview training. More details will be discussed in chapter 5, "Design and Implementation."

Extensibility of Interview Questions and Answers

Unfortunately, there are numerous types of disabilities in the world; it is impossible to cater to them all within this paper. However, this section discusses the extensibility of the system for future work. We can create "packages" for specific types of disabilities in its simplest form, a text file. Each file contains the necessary values and interview questions and answers that relate to a particular disability.

These packages or files will need to contain the same data as described in the previous sections, "Interview Question Format," and, "Interview Answer Format." While values entered are done by the administrator, we can automate the process of inserting questions and values into the database, using a script with database interactive capabilities. An example of a hypothetical text file "package" would contain the following:

Category (ies)

The interview question

Appropriateness rating

Difficulty rating

Priority rating

Bit string relating to questionnaire answers.

Answers, points assigned (may allow multiple rows with multiple answers). Each answer also contains its own category and bit string representing the relationship with its respective categorical questionnaire.

As an example, I present a simple text data file for the auditory type disability. Note each value corresponds to the type of variable listed above. This hypothetical text file called, "auditory.dat" will contain the following data for example purposes in Figure 1 (see Appendix B).

The interview question relates to hearing, but not necessarily, since there are other forms of communication where you can listen to someone. Because of this, we also categorize it as "General." This is an example of one question; we can continue to create questions and assign values to each variable with the assistance of communication and job interview experts.

Similarly with the interview answers, we see those with an "auditory" category also contains a bit string. In this example, a 4-bit string represents hypothetical yes or no answers to 4 questions from the account creation process. We also see that one answer is considered "general" and does not have a bit string since it is not associated with any disabilities. If we only wanted to add answers to a particular question, only the interview question ID will need to be obtained. Then we can proceed to provide answer data and process it using a scripting tool. Once we have created this file, scripting tools are used to process and insert the data automatically into the database. Likewise, we can export data from the database and create packages for types of disabilities to distribute.

CHAPTER 4

ASSESSING PERFORMANCE

In this chapter we discuss evaluating user performance based on set criteria in the communication system. In order to determine a performance level we must define what it means for an answer to be considered a great interview answer versus a bad one. I then quantify the answers using a 4-point multiple choice system and provide the summary of results as well as an in-depth analysis for participants. When using common communication guidelines along with various informational resources, the user will be able to create their own answers based on their own abilities and situations.

The Art of Communication

So what is a considered a great interview answer? How do we quantify an answer as being good or bad? Communication has always been the major component in a job interview. Although each answer can be unique, we can provide certain guidelines as a foundation, when coming up with great interview answers. These are the main lessons when training users in job interview communication:

Be specific and give concrete details [15].

Keep the conversation short and to the point; make sure to not go off topic from the question [15].

Be sure to give concrete examples about your abilities when appropriate [15].

Assess your skill set and how it relates to the job position [16].

Keep your answers positive as well as have a positive attitude [16].

There are certain exceptions to this rule however. For example, when discussing about salary range in the initial stages of an interview; usually putting out a concrete number is not the best way to answer that type of question. In those situations, it is best to communicate in a way that leaves open for negotiation while not downplaying your abilities. For most questions however, following the guidelines ensures a worthy answer any employer will accept.

Other general tips include the Situation-Task-Action-Results (STAR) method [16], the 3 C's: be clear, concise, and considerate and the Problem-Action-Results (PAR) method [17]. All of these techniques serve to help the interviewee to construct personalized answers for many of today's interview questions.

Note that the current techniques used in this system are not an exhaustive list. We can apply more communication techniques when extending the functions of the system. This is discussed a bit further in chapter 7, "Future Work and Conclusions."

Defining the Criteria for Interview Answers

Since each interview question is unique, so we must define a different set of criteria when considering good and bad answers for each question. Each question is chosen based on a learning outcome. From there, we determine a set of criteria. The goal is to provide a wide variety of answers based on real-world situations. For this example, we look at the question, "What is your social security number?"

This is a difficult question because many people find it uncomfortable to answer such a question, especially during the initial phases of an interview. The learning outcome for this question is to provide the trainee ways on handling question such as this.

We define the criteria as several guidelines in order for an answer to be considered a good one:

The trainee must identify whether or not the question is an appropriate (illegal) question to ask.

If so, under what circumstances would you provide a social security number?

Based on the criteria we set for the question and the general communication guidelines, we come up with answers in collaboration with job interview experts. There are many ways we can handle a question. We can set up different criteria for different sets of answers to the same question. Furthermore, we can create standalone answers for the same question based on the same learning outcome. Creating answers requires the aspect of human judgment. With job interview experts, we must decide what lessons would be most valuable to potential job applicants, which places more emphasis on the art than a science. With this in mind though, we can tackle a variety of issues and provide a wide range of communication techniques for trainees to successfully navigate through the job interview.

Each interview answer is also accompanied by the analysis/tip portion for that specific answer. This tip provides a more in-depth look on why the answer is a great one, or why it is a poor choice. If the answer is poor, it will offer suggestions on what to look for in a great answer, so next time the user may apply that information in future sessions. Table 3 (see Appendix A) consists of the assigned points, interview answer and analysis/tip.

Job Interview Communication Training Session

The user is first presented with an introduction that consists of instructions on how to approach answering the interview questions. This is followed by a "Welcome Letter" that states the type of job they are applying for, and a list of job requirements. To begin the test, users must click a button to start.

Each question is presented on a separate web page; this allows the user to focus on one question at a time. In addition, it allows the system to analyze their performance up to that point and gives room for any extensibility enhancements such as interactive video for each question. At each question interval, the system will analyze and keep track of the following:

Which questions from the interviewing question pool are being used in the current session, and their variables associated with those questions such as difficulty, appropriateness, priority, etc.

The answer they have chosen.

An accumulation of points based on their answers.

The current number of questions they have answered.

The type of job position the system has selected for them.

The job qualifications of the position are presented.

Once an answer is selected, the interviewee will press the continue button until all questions are answered. After the interview session is complete, the system will process and present the results to the user. In Figure 2 (see Appendix B), a screenshot is taken of the interface when answering interview questions.

Evaluating the Participant

After completion of an interview communication session, we know which questions have been asked and what answers the user has chosen. Each answer is given a specified number of points from 1 to 4, where 4 points is considered to be the best given answer. We first calculate the total points achieved versus the total points possible. Since we ask 10 questions, the total possible points will always be 40. Performance levels are grouped by a standard academic grading scale (i.e., A, B, C, D and F).

90% or 36 points and above is considered to be a top performance level.

Between 80% and 90% or 32 and 35 points is considered an above-average performance.

Between 70% and 80% or 28 and 31 points is considered to be an average performance level.

70% and below or 27 points and below is considered to be a below-average performance level.

Each group will be presented a general summary appropriate to their general performance. This includes how well they did in the training session, general tips on how to answer interview questions and encouraging the user to improve their skills through additional training.

In addition to a general review, I provide the user a more in-depth analysis of their performance. Each of the ten questions that were used, are presented to the user, along with the answer they have chosen and analysis/tip of why the answer was good or bad, and how to improve. This allows the user to self-evaluate and further understand the

implications of their answer and how they can improve. An Example screenshot of the summary page is provided in Figure 3 (see Appendix B).

A major component of performance is the user's motivation to improve their abilities. The system allows the user to keep a history of their performance, recording the training type, job scenario, score, and date. This allows us to also look at how many times they have attempted the session and see a rise in scores, if any. This also allows us to improve the system if necessary in the case where we see multiple attempts at the training session but see no significant improve in scores. It must then be determined if that is a user issue, or the learning curve of the system.

The End-Goal

The goal for a user is to achieve a high score in the communication training. Through the in-depth analysis and self-evaluation, the user will start to understand what is considered a great interview answer from a bad one. Once they understand the foundations of what a great answer consists of, the end-goal is for them start applying what they have learned in their own situation and their accommodation needs. What they have learned through the system will potentially help them come up with answers effectively communicating their own strengths and potentially maximize their ability to obtain a job.

Further Assistance on Communication Training

A number of websites are linked within the system to provide additional resources in job searching. This includes various governmental websites, non-profit organizations, and other resources on disability and legality in job interviews. I also provide the

communication guidelines/tips to serve as reference when attempting to improve communication performance.

When a user has finally learned every aspect of the training system, their training is essentially complete, however they may further improve their skill set and/or apply what they have learned in mock interviews, and consultation/review with a career counselor. The system allows the user to print out their summary results and in-depth analysis so that a career counselor may review their results and give specific tips to that individual. The training session can be the first step to maximizing job offers.

CHAPTER 5

DESIGN AND IMPLEMENTATION

In this chapter, I provide an overview of functional modules and databases within the system. I also describe certain design approaches and decisions made to provide flexibility, easy maintenance, and extensibility to the system. It should be noted, the design of the system is purely from a technical standpoint. Regardless of the design, the main importance of the system is its ease of use for the user and the impact in helping people with disabilities land a fulfilling job. With this system, I show that enhancing communication skills has a significant impact in a job interview.

Overview of System

For this project, I use PHP, MySQL database, (X)HTML, CSS, and Javascript to create an online communication training system. Web pages will adhere to Section 508 and WCAG 2.0 for universal accessibility. Browsers tested on Internet Explorer (IE) 7, Firefox 5.0, Opera 11.5, Chrome 12, and Safari 5.1 in a Windows 7 Service Pack 1 (SP1) environment.

The design philosophy I have chosen is based on a Model-View-Controller (MVC) framework using a functional programming style rather than an Object-Oriented approach. A functional programming style allows a very rapid development of this application while still allowing the separation of code for extensibility and maintenance. This allows us a reduction in the error coding rate and reduced the time to debug. Based

on an MVC framework we separate naming our files into three different subsets. Table 4 (see Appendix A) shows the three different subsets.

Using this framework, we create three main code modules in PHP: the user module, interview module, and administrator module. There is an additional module used for application security, but we will discuss that later on. Before discussing these modules and their functions in-depth, we first look at the data and design of the underlying MySQL databases. In the final sections, we will discuss system maintenance, security, and extensibility. Figure 4 (see Appendix B) shows a diagram of the system architecture used. User input is passed through the entry point and through the user layer, allowing the controller to decide how to appropriately process the input using functionality from our model. Once processed the controller then decides the proper displays and passes them on to the view for it to be visible to the user.

Global Files

Along with our MVC files, I create a directory for files that are used throughout the system. These files are called global files. Files within this directory will contain global variables, validation functions, error handling, and security functions. Global variables provide any static values that make any system-wide effects. For example, instead of typing a file path for every file, we only refer to the variable that contains the file path throughout the system. This allows up to make a system-wide change by only modifying our global variables file. Security files generally authenticate the user, their privilege level and validate their user session before proceeding to process system data. Validation functions are used throughout the system to check system input for proper

formatting. Error handling files tell the system what error output should be shown and where the error should be sent.

Communication Training System Database

Our main priority is housing user data, interview questions, interviewee answers, and assessment/statistical data inside our database. Every user, interview question and answer, will have a unique Identification (ID) associated with their entry in the database. IDs are MediumInts unsigned to 8 bits. In the following sub-sections, I give a brief discussion of each table in the database and how they relate to the system.

User Database Tables

These tables house every user within our system. We currently have two types of users: Participants and Administrators. In this system, I have both users refer to a general user table therefore we have three database tables. Table 5 (see Appendix A) shows the list o variables and their descriptions in the database. Note this is a list of all variables and does not represent the design of the database. I leave the design generally open and only discuss the data needed.

Participants are those who are using the system for communication training purposes; mostly for people with disabilities. Administrators are those who maintain the system, and manage other users. Administrators are given a privilege level as needed. We may increase or decrease a privilege level as appropriate. Only a super user, one with the highest privileges may modify other administrator privilege levels.

The history/statistics database table will house the historical data containing previous interview sessions done by the participant. This table will allow the participant to view their previous session scores. This data also may allow the system to take into

account previous scorings when evaluating a participant in their latest interview session. Table 6 (see Appendix A) lists the statistics variables housed in the database.

Interview Questions/Answers Tables

The interview questions database table holds the information regarding interview questions for our system. Each row is a unique interview question containing the appropriate variables. Since there can be multiple categories assigned to each interview question, we create a sub-table that uses a foreign key from the main interview questions table. Each categorical row also contains the questionnaire binary code to match with the participant's binary code. In Table 7 (see Appendix A), we have the listing for the interview variables within the database.

Similarly for interview answers we have a main table housing every interview answer available and a sub-table contain categories and their questionnaire binary code for each interview answer. Each answer contains an analysis portion presented to the user as to why the answer chosen is correct or incorrect. Table 8 (see Appendix A) shows the answers listing similar to the interview database.

Security Table

For security purposes, there is a separate database table to hold administrator sessions. Similar to PHP sessions, we preserve data across each page an administrator visits. Table 9 (see Appendix A) shows the descriptions of each variable held within the database.

Each row will contain a current active administrator logged into the system. With this, we are able to monitor the active administrators and monitor any strange behaviors if any. More information will be discussed in the security session of this chapter.

Interview Training Session Tables

During an interview training session, the system will produce two temporary database tables for each participant. One table to produce the pool of appropriate questions designed specifically and displayed to the user, and a second table to hold the participant's answers progress through the session, until used to process their results. Once assessment is done, the temporary database tables will be deleted. The pool of questions used to display to the user will be the same as mentioned in the previous section, "Interview Questions/Answers Tables." The following are descriptions of the data held within the table for the participant's progress. In Table 10 (see Appendix) we have descriptions and variables of the temporary database.

With an understanding of the database layout and the purpose of the data, we then can discuss the PHP modules used to interact with our database.

PHP Programming Modules

The PHP modules contain functions and processes data in relation to that module. Using the MVC design philosophy, our model files will interact with the underlying database and produce the appropriate data. Our controller files will decide the appropriate way to use that data based on certain inputs. Finally, the view files will present the data to the user for display and user input. In addition, each file will be named based on which module they are associated with, for example, if we were to create a model file associated with the user module, we would name the file "user_Example.php." In another example, for the interview module, our file will be named "inter_Example.php." In this section, I give an overview of each module's functions of the system.

In Figure 5 (see Appendix B), we see an overview of the interaction between the user and PHP modules. User input is first filtered through the security module then process by the main and appropriate modules needed. The modules interact with the database then send the data back to the main files where it is then presented to the user as a view.

User Module

The User module provides an Application Programming Interface (API) for all functions relating to the processing of users and their data. Using an MVC design philosophy, we name our files based on the type of module they belong to and the function which they contain. The User module contains functions such as:

The retrieval of user data relating to administrators, participants and interview session history is contained in the module.

Data based on any settings option and/or preferences our system will allow the user to choose.

Allowing input for user adding, deleting, and modifying accounts for administrator accounts.

Displaying data to the user for input through a web interface (web browsers).

Interview Module

Similar to the User module, the Interview module contains functions regarding interviews and the interview session. This module is shown in Table 11 (see Appendix A) where it provides an API for the following functions.

Administrator Module

The Administration module provides functions for users who have high privileges within the system. As an administrator, they can manage participant accounts, by adding, modifying, deleting and reviewing sub-accounts. Administrators additionally have the ability to add, delete, and modify interview questions and answers in the system. Finally, they also have the ability to generate various statistics about participates and the usage of the system.

Administrators have certain abilities based on the type of privileges they have. In the following, I describe the different level of privileges and what abilities are associated with them. Each level contains certain privileges as well as all abilities associated with all levels below it. Table 12 (see Appendix A) shows the privilege levels and descriptions of what can be accessed.

Security/Authentication Module

When a user logs into the system, a unique session ID is created for that specific user. The session ID remains the same as long as they are logged into the system. Once logged out, the session deletes itself. For security purposes, we authenticate a user's session by matching the client's ID with the ID stored within the database. Once authenticated, the system then proceeds to process the page request.

In addition to unique sessions, we also store the current page the user is viewing, the previous page from where they came from, when their session was created, and when was the latest request made. If no request has been made within an hour, the clean up function will execute deleting any orphan session IDs stored within the database. Tracking which web pages a user is on allows us to monitor for any suspicious activities,

for example any unexpected jumps from one page to the next where no link is provided. Table 13 (see Appendix A) shows the authentication functions along with the descriptions.

Maintenance Tasks

Like any system, there are sections automated by computers and there are other sections that require manual maintenance. In this section, I discuss which parts need human intervention to keep the system well organized and running smoothly.

The first maintenance task is to review the log files from the system. Log files are files that contain any error codes produced by the system. They are in conjunction with the error handling functions within the system. The error handler sends error codes and descriptions about the error to these log files. It is important to review these files often to allow quick responses in dealing with any unforeseen occurrences. These files contain the following information.

The error message (usually a MySQL database error) caused by typical or unknown input entering the system.

A user-defined error message explaining what the error is, and where it originated from is contained within the file.

Our second maintenance task involves searching the database for any values which format does not comply with system rules. These values are mostly by a bug in the code, which may allow values to bypass or slip through our validation functions. The effect of invalid values could vary from very minor to unknown major consequences. This is highly important when managing the interview question and answers. We must make sure the data integrity stays intact as well as provide accurate data for the users.

Our third maintenance task involved browser compatibility. While we may not be able to test every web browser in today's market with the system, we can test browser that hold majority market share. This includes: Internet Explorer, Firefox, Chrome, Opera and Safari. To reduce the maintenance of this task, I use standardized code in (X)HTML, PHP, and MySQL. For example, proprietary functions in MySQL are not used unless deemed necessary. This allows for greater transferability between different platforms at the cost of less efficient code.

Additional Security

We provide additional security measures by modifying permissions of directories and files on the server. For directories we set permissions to 711, and file permissions to 644. This prevents any users who may also have File Transfer Protocol (FTP) access on a shared server from reading crucial directories through text programs. See other information regarding UNIX directory/file permissions, which is out of the scope for this paper. However, this does allow the execution of files if the absolute path is known. Fortunately, each file contains a PHP function that needs to me explicitly called in order for the function to execute. Executing the file that contains the function will simply bypass the function code.

Finally, our third security measure is in the form of ".htaccess" files within the most important directories. Our file contains the following code to deny all requests from the outside world. This prevents anyone outside of the program from executing and reading our files. These files will be placed in directories that contain our "model" files and our database connection values.

Technical Details about the System

The system was coded using the following web development languages: (X)HTML, CSS, Javascript, PHP and a MySQL database in the back-end, while Dreamweaver CS4 was used to develop the system. It uses an MVC based PHP framework in a functional programming style, rather than object-oriented. Functional programming was chosen based on an existing framework to accelerate development time. Default PHP sessions handling were overridden to provide more control and security. User input is filtered through various validation functions before being inserted into the database. Table 14 (see Appendix A) lists these functions and their descriptions.

The entire system not including the outer promotional website contains roughly 3200 lines of code and 38 application functions. The database contains roughly 250 lines of code. Although the initial development spanned around a 2-3 month period, maintenance and populating the database with meaningful interview questions and answers has been a continual process.

Application performance is not a concern at this point however we may anticipate certain bottlenecks within the system. For instance, during a training session, the system on the server side creates and keeps track of temporary tables while the user's goes through the training. If 1 million users were to take a training session at the same time, this point would be the most taxing on the server in terms of memory and processing power. We may reduce server load by containing user training progress within a Javascript array within the client system, rather than the server. Therefore, at the end of the session, the client system will send the array to the server in order for it to be processed into the server-side database. The only issue would be that we will need to

require Javascript to be turned on within the browser of their choice, since Javascript can be turned off by the user. Still, we could have that as an option while falling back to server-side processing in the event no Javascript is available.

Finally, the system was built in compliance with section 508 and the WCAG 2.0 accessibility guidelines to ensure wide accessibility between a wide a variety of persons with disabilities. Color contrast ratios at level 3 and above with relatively large Arial font to ensure proper presentation along with large clickable areas for proper input. Screen readers are compatible with the application and logically present the data to users. Headings are content appropriate to ensure easy understanding and navigation.

Extensibility of Modules

Using the MVC model for the system allows us to separate our program layers and eases the maintenance and extension of our code. To extend the user interface level, or our views, we simply create a view file, name it according to which controller file it is associated with, and modify the file through (X)HTML, CSS, and Javascript. Our controller files decided which data is passed to the view, and it is the view that presents/displays the data to the user. We manipulate the way the data looks through our web code. View files are actually executed within our controller files. As a side effect, our view files have access to the same variables the controller files access.

To extend our controller files, we must first create a new controller file and long with its corresponding view file. Within our controller file, we add code to first authenticate the user's session ID. We then include our necessary functions (our model files) needed depending on what data it controls. Once we create the logic, we finally add our view file to execute. Since the view file executes within the controller file, there

is no need to explicitly pass variables to the view, since the view will already have access to them.

Finally, each model file contains one function of the system. To extend the system, one just needs create a model file and define the function. Each function returns either an error message or the data that is being requested. Once this is completed, this model file can then be called by a controller file and its function and then be subsequently used.

CHAPTER 6

EMPIRICAL DATA AND RESULTS

In this chapter I present the criteria for gathering empirical data from initial participants of the training session. I provide various possible scenarios, followed by a review and interpretation of the actual results. A group of 4 CSULB students were given surveys relating to their job interview experience. They were asked to go through the initial communication training system and offered to continue training using the system for the next couple of weeks. After some weeks passed, these participants were told to complete an optional second survey.

The initial turnout for participants resulted in four CSULB volunteers. Most were students at CSULB seeking a job while others had part-time employment but looking for better opportunities. Although a small sample size, the data collected allows us to shed some light on the experiences of individuals with disabilities. We have only skimmed the surface when looking at the potential of the system and look forward to future work.

Job Interview Surveys

As discussed in chapter 1, I have supplied a group of CSULB students a 2-part survey, on their thoughts and experiences in interviews and the job market. This group was selected based on the following set criteria:

1. Must be actively searching for a job in the last 6 months.
2. Must have had at least one real-world job interview within the last 6 months.

3. Participant must have a disability relating to mobility and/or visual.

There are two parts to the survey each around 6 or 7 questions related to job interview perspectives and experience. The questions are provided below, along with a discussion of possible outcomes and actual results. Table 15 (see Appendix A) contains the questions for both part 1 and 2 of the survey.

Aside from questions 1 and 2 for both surveys, each question is scaled based on 5 points where 1 represents strongly disagree to 5, strongly agree. Survey part 2 is taken after multiple communication training sessions. Part 2 of the survey is more influenced by their performance using the communication training system.

Possible Survey Results & Outcomes

Ideally, in part 1 of the survey, we would obtain information from those who have real-world job interview experience, feel communication is a key aspect in a job interview, feel that their disability does play a role in job hiring, and would like to obtain more communication training. Each question is used to gauge a specific set of data from the user. The following discussion theorizes the ideal scenario that would significantly validate the purpose of the communication training program.

Ideal Survey Results

With these results we see a significant improvement in the number of job offers vs. job interviews. These results also suggest that participants value communications skills and continue to value them after completing training. We see a change in attitudes regarding their disability and an increase in confidence levels that they are able to communicate effectively. Finally, we see they have gone through numerous training

sessions and feel it has helped improved their communication skills. In Table 16 (see Appendix) we see the best-case results.

The results in Table 16 would indicate that we are succeeding in our goal to assist those with disabilities land a job offer. It would significantly validate the purpose of the system and encourage more users to begin communication training in order to become successful not just in job interviews but in their daily lives overall.

Worst-Case Results

In the worst case we see no improvement in job offers vs. job interviews. In fact, we see a decline of job offers after significant communication training sessions. Furthermore, we see initially participants felt communication is a key aspect in a job interview, but have a change of attitude after training. Participants continually feel their disability plays a significant role in job offers and still feels unable to communicate effectively after training. Finally, after numerous communication training sessions, participants feel they have gained nothing from using the system. Table 17 (see Appendix A) shows the worst-case results.

The results in Table 17 would indicate the system strongly has no effect and possibly hurt participants' chances of obtaining any job offers. Significant reworking of the communication system must be considered and reevaluation of possible solutions is needed.

Survey and Training Results

See Table 18 (Appendix A) for the actual survey results. The retention rate for the second part of the survey was extremely low. Only 1 out of the 4 participants volunteered to continue the survey and comeback for the second part. This is unfortunate

since it would have provided much more meaningful data. For example, participant 2 has indicated they feel they do not have the ability to communicate effectively to a potential employer. We see an initial training grade of *D*. It would be extremely interesting to see results for part 2.

Each participant took approximately 5 minutes for each part of the survey and 15 minutes for the initial online training session. In participant 1, we see they have a consistent attitude regarding their disability and communication abilities. The interesting part here is their initial assessment of the training session, which was a *B*, while additional attempts improved their performance to an *A*. We see no difference in the number of job offers vs. job interviews; however, this could be because of the small time-frame in between surveys due to scheduling. While it is not clear how this will translate into the real-world, it should be noted their attitudes after the training session remained unchanged.

We see the majority of participants strongly agree that their disability plays a significant role in obtaining a job, while participant 1 moderately agrees. It is interesting to see that those who strongly agree that their disability plays a role, were generally graded less on the initial training session, while the one participant that moderately agreed, had an above average performance. This could be an indication that the better the communication ability, the lesser the disability is of importance.

Additional Discussion and Difficulties

An interesting correlation is that those who generally scored lower on the initial training session and strongly agreed their disability plays a significant role in obtaining a job decided not to participate in part 2 of the survey, while the only participant that

performed above average decided to come back. While more data is needed for this correlation, it should be looked into further as more research is done.

It is difficult to figure out a precise reason the retention rate is so low. Prizes were given as an incentive to participate and complete both part 1 and 2 of the survey. Recruitment ads were sent through mass e-mailing of student databases on two occasions with different CSULB departments (both Disabled Student Services and Career Development Center). Even more unclear is why participants chose not to continue into the second part of the survey. Numerous attempts were done to set up a second meeting with participants, however all attempts resulted in either a response saying they were too busy or no response at all.

The source for participants should be considered. Definitely it is more difficult to obtain volunteers who have a hectic school schedule. Perhaps outside organizations would have had more success in gaining more research participants for this study. Furthermore, a different approach is needed to have participants come back for the second part of the survey, perhaps by creating a more clear incentive to continue the study.

Conclusions

Our initial research provided us with enough data that showed promising results. We can however, improve our research by increasing retention rates for participants to continue the training. As more studies are done, the effectiveness of the system will be clearer. Our current data proves more research must be done and warrants further investigation into the full effectiveness of the system. As we gain more information in

the long-term, our ability to refine the system increases, improves participant performance, and increases the employment rate for people with disabilities.

CHAPTER 7

FUTURE WORK AND CONCLUSIONS

There are numerous ways the system can be enhanced and designed. In this chapter, I discuss the future direction of this system and functions that could be an important part of communication development.

Academic Research

A more in-depth cause of low participation numbers and high unemployment rate for people with disabilities can be researched, and should be pursued. While the key to a job interview is communication, current government programs may cause a de-incentive to go back into the workforce. Therefore, future employment rates may depend on modifying government assistance, in addition to programs to promote tolerance in the workplace, may also alleviate poor job numbers.

An exhaustive list of communication techniques may also be pursued. This research will allow significant refinement in the system. We can code the system to help the user identify certain techniques that are being used during the session. For example, we can ask the user to identify the STAR (Situation-Task-Action-Results) method of answering interview questions. The user is then given points based on identifying each step of the method and to create their own answer using the same method.

Future System Enhancements

The system has the potential to provide an enormous benefit for job seekers. The system has the added bonus of not just being a general communication training tool, but a

tool to train people with disabilities as well, in the knowledge of ADA law, marketing skill set, and effectively communicate appropriate accommodation needs. While the basic concept here was developed, we can further enhance the system to achieve the overall goal, and extend it beyond our target audience, for instance, to employers. Here are just a few future enhancements that come to mind.

Administrator Interface

Not all administrators of the system will have the required knowledge to directly manipulate a database. Therefore, creating a user interface to interact with the necessary data will prove to be useful. An administrator will need to be able to work with interview questions and answers, adding, removing, and modifying them. Currently, the system is set up where there are two separate menus, one for the admin and the other for the participant. This means we can create different options for each group on the menu page, and only allow the administrator access to certain privileges.

Grouping Sets of Answers

Currently, each answer is technically independent from any other answers in the system. However, sometimes interview answers only make sense when grouped with other answers for a certain question and each group of answers take a different approach in how they answer a question. In other words, each group of answers has different criteria for what makes them good or bad answers. It may be beneficial to code the system so that it selects a set of related answers, where there can be numerous sets of answers to a question. In addition, we can still choose answers that are independent from any other answer. The system would choose whether to select a set of answers or independent answers from the pool at random, or choose based on some type of criteria.

Grouping them would make logical sense, since right now it is possible a 4-point answer and a 3-point to take a completely different route in answering the question.

Add Timer Function to Session

With a timer function during a communication training session, we would be able to analyze the time spent by the participant. For example, we can see how much they have spent on certain questions, or overall on average how much time a participant sent completing the session. This also allows us to set a time limit as well, so they do not use an indefinite amount of time. One type of accommodation is to request more time for certain tasks where more time is appropriate. This can even be used as a learning tool for the participant of when it is appropriate to request more time on the timer. Therefore, an option to extend the time could be implemented as well.

Statistics Module

With any research system, statistical reporting would be highly beneficial. It would be interesting to see statistics regarding the average number of sessions taken to reach a 90% or above performance rate. We can answer questions such as: what is the average score on a participant's first attempt? Which questions are most users scoring 4 points on? Likewise, which question are users mostly scoring 1 point on? Querying this data would give us a deep look into how our system shapes users and how users are reacting to the system. This information can also be beneficial for employers to know as well. With the system being highly extensive through separate programming modules, the statistics module essentially will be independent from others and simply interact with the database data extracting the needed information.

Business Venture

Along with academic research, there is also the opportunity to turn the system into a business venture. With proper business plans and models, we can pursue a possible commercial application for the system. During the development of this project, I have been in collaboration with both Disabled Student Services and the Career Development Center in CSULB. With great partners, we can possibly showcase to government job development centers and other organizations aiming to assist persons with disabilities find a job. It would be interesting to expand the user base to more real-world candidates and evaluate performance data.

Final Remarks

There are a number of improvements that can be made with this system. I believe I have set up a foundation for further research and refinement in this area. Communication training is highly beneficial in the workforce for anyone, but even more so for those who need to improve their abilities. People with disabilities have the added obstacle of communicating their specific accommodations to potential employers. While a challenge, talking is one of the key skills in determining whether or not a candidate is hired.

Data from the initial research study shows much promise in the direction this system is headed. Refinement is a continual process that needs constant research. The importance here is learning how to improve our research tools so that we can better understand the problems at hand and therefore produce a better system for those who seek to increase their skills.

Overall, it is exciting to integrate Computer Science with real-world problems. The key to this project was the partnerships between necessary entities. In this case, it is the partnership from Disabled Student Services and the Career Development Center that helped make this project a reality. As a computer scientist, we focus more on the technical aspects of the system making sure the user accomplishes the end-goal and develop a system that is flexible and manageable for future work. However, another part of Computer Science is integrating our knowledge with other disciplines to solve problems. This requires us to learn and adapt to other disciplines' methods and processes and translate that into a digital format. Therefore, the resources and knowledge that these partners provide is most invaluable. It is them that allows us to expand our ideas and give our applications a true purpose.

APPENDICES

APPENDIX A

TABLE INFORMATION

TABLE 1. Disability Questionnaire

Disability Type	Questions
Visual	1. Do you have serious difficulty seeing, even when wearing glasses and/or contact lenses? 2. Are you legally blind? 3. Are you expected to have serious difficulty seeing for the next 12 months or longer? 4. Do you use some sort of equipment for people with visual impairments other than glasses and/or contact lenses?
Mobile	1. Do you have serious difficulty with any type of movement (standing, reaching, sitting, etc.) that the majority of people find no problem doing? 2. Are you expected to have serious difficulty in mobility for the next 12 months or longer? 3. Do you use any type of mobile aid (crutches, wheelchair, cane, artificial limb, other) for this issue?

TABLE 2. Attribute Ratios of Questions

Question Attribute	Ratio of Questions
Appropriateness	7 questions, rated at appropriateness level 1, where interview questions do not imply a disability. These questions are legitimate interview questions which all candidates must answer. 2 questions, rated at appropriateness level 2, where these questions are gray areas, which may or may not be considered implying a disability. 1 question, rated at appropriateness level 3, where this question is downright illegal to ask, and definitely will reveal a disability.
Priority	1 question, with priority rating level 1. For example, "How are you?" 8 questions, priority rating level 2. 1 question, priority rating level 3. For example, "How do you feel you did in our interview today?"
Difficulty	Chosen Randomly.

TABLE 3. Points, Answers and Analysis

Points	Answer	Analysis
4	Can you explain more in-depth why you have a need for my social security number? I am glad to provide it, as part of the application process, if there is an offer of employment on the table.	Great answer, you asked the employer what the purpose was to have that information. Additionally, you let the employer know you will provide it once an offer has been made if it was necessary to complete the hiring process. It does give them the opportunity however, to give specifics such as the need for the SS number when the employer is completing a criminal background or credit check.
3	May I ask why do you need this information? I would be glad to supply it if it is necessary for the application process.	This answer is good, but it does not allow the employer to explain specifically why they want the social security number. It does give them the opportunity however, to give specifics such as the need for the SS number when the employer is completing a criminal background or credit check.
2	What do you need the social security number for? It is my understanding that you can't ask that question.	While the underlining concept of this answer does have some truth to it, in fact the employer can ask for your social security number when it is trying to complete a criminal background or credit check. It should be asked why the social security number is needed.
1	I will not give you my social security number, because I feel uncomfortable giving that type of information in a job interview.	While you may not give your social security number during an interview, it still may be requested and required for the employer to complete either or a criminal background or a credit check. It may be a good idea to ask the employer why they need this information.

TABLE 4. Overview Files

File Name	Description
md_Example.php	Files such as these represent the "model" of the system, interacting with the database. These files are used by the "Controller" to provide functionality and provide an interface to the database. "md" is replaced by the name of the module the file belongs to.
pc-Example.php	These files represent the "controller" aspect of the system controlling which "model" files are needed to execute which appropriate functions and how user input should be handled.
vw-Example.php	These files represent the "View" of the system. The view is the web interface that the user will see and interact with (also known as the user interface layer.
index.php	One file named "index.php" will be the main entry point for the application passing input to the correct controller for appropriate processing. Each controller then uses various model files to execute the appropriate functionality and send it to the view for display to the user.

TABLE 5. User Database Variables

User Database Variable	Description
User_dbid	Used as a primary key and unique ID for each entry within the database.
First_Name	First name of the user
Last_Name	Last name of the user.
Email	E-mail address of the user.
Username	Username used to log into the system; database encrypted for security.
Password	Password used to log into the system; database encrypted for security.
Privilege_Level	Used for administrators, the higher the privilege the more functions they can execute.
Prim_Phone	Phone number of the user.
Disability_Type	Disability type of the participant
QPBinary	Questionnaire in binary format, used to match participants questionnaire answers with interview questions/answers.

TABLE 6. Statistics Database Variables

Statistics Database Variable	Description
User_dbid	Uses the unique ID of the participant as a primary key. It is also the foreign key from the general user database.
Date_Captured	The date of the interview session which the results were calculated on.
Point_Score	Points of the pariticpant's interview session.
Training_Type	The type of training the user has completed.
Job_type	The type of job the user has completing communication training.

TABLE 7. Interview Questions Database

IQ Database Variables	Description
InterQ_dbid	Unique ID for each interview question within the database.
Question	The interview question to be used in the interview session.
Appro_Rating	The appropriateness rating of the question.
Difficulty	Difficulty level of the question.
Priority	Priority of when the question should be asked.
Q_Category	The category(ies) of the question based on the type of disability it relates to.
IQBinary	The questionnaire binary code used to match with the participant's binary code.

TABLE 8. Interview Answers Database

IA Database Variables	Description
InterQ_dbid	The interview question ID associated with the interview answer.
InterA_dbid	The interview answer's unique ID used as a primary key in conjunction with the interview ID.
Answer	The interview answer used for the question.
Points	Points assigned to the answer.
A_Category	The category(ies) of the answer to the disabilities it relates it.
AQBinary	The questionnaire binary code of the answer used to match a participants binary code.
Results_Tip	Feedback text given to the user based on the answer. Provides deeper analysis of why the answer is correct or incorrect.

TABLE 9. Security/Authentication Database

Security Database Variable	Description
CS_Username	The username associated with the session ID. Used as a foreign key.
CS_Session	Each time a user logs into the system, a new session ID will be generated and remain the same for the duration of the session (until logout).
CS_PageNext	Represents the current page the user is on.
CS_PagePrev	Represents the previous page the user was on.
CS_Created	The date and time when the session was created.
CS_LastUpdated	Time of the last request process. If no activity for an hour the session will delete itself upon the next execution of the cleanup function.

TABLE 10. Temporary Database

Temporary Database	Description
InterQ_dbid	Interview Question ID to identify the question being asked.
InterA_dbid	Interview Answer ID to identify the answer chosen.
Points	Number of points for that answer to be used to calculate performance.

TABLE 11. Interview Module Functions

Interview Function Name	Description
inter_AnalyzeResults	This function analyzes the results from the user's training session. It calculates the points, retrieves and displays feedback based on the answer chosen.
inter_APoolBuilder	Builds the answer pool based on the questions selected. Each question contains for multiple choice answers with assigned points 1 through 4.
inter_CleanupTempDB	Cleans up any lingering temporary DB from previous training sessions.
inter_DisplayQuestionAnswers	Displays the questions and answers in a presentable accessible format and sends it to be viewed by the user.
inter_DisplayScenario	Retrieves data based on scenario and sends it to be viewed by the user in a presentable format.
inter_KeepTrack	Keeps track of user progress during the communication training session.
inter_QPoolBuilder	Builds the question pool to be used by the training session based on which scenario is selected.
inter_SceneSelector	Randomly selects a scenario from the system.
inter_SetUpSession	Sets up a session with the necessary resources to process data in order to begin training.

TABLE 12. Privilege Levels

Privilege Levels	Description
Level 2	This is the super user. This administrator has the highest privilege within the system which includes: managing all users including other administrators, managing all interview questions and answers, generating any type of statistics either through the system interface, or connecting directly to the database.
Level 1	This is a common administrator. This type of user cannot manage other administrators but can manage regular users of the system, manage interview questions and answers, and generate statistics allowed through the system interface, but not connect directly to the database.
Level 0	This is a considered a participant. Participants register and sign-in to use the features of the system, training through interviews, answering questions and reviewing their results from their sessions. These users can only manage their own accounts and settings. If problems arise, they may request help from an administrator for any technical problems.

TABLE 13. Authentication Functions

Authentication Function Name	Description
auth_CommPageNext	Provides functions for tracking what web page the user is currently on and the page they were previously on.
auth_DeleteUser	Deletes user from the session database. This means the user has logged out.
auth_GarbageCollection	Cleans up any lingering resources made by managing session IDs
auth_InsertUser	Inserts user into the session database where they can be authenticated and tracked.
auth_SecurityCheckUser	Checks if the user session ID matches on both the client and server database.
auth_VerifyUser	Authenticates a username/password.

TABLE 14. Validation Functions

Validation Function Name	Description
validate_words	Checks if the current string complies with known acceptable characters and symbols. Prevents any scripting syntax from entering the database.
validate_name	Checks if a name is properly formatted (i.e. first letter is capitalized) and only contains the alphabet with minor exceptions
validate_phonenumber	Checks it the phone number is properly formatted (i.e. xxx-xxx-xxxx).
validate_number	Checks if the string only contains digits.
check_email_address	Checks if an email address is properly formatted.
validate_date	Dates must be formatted as yyyy-mm-dd
validate_time	Times must be formatted as hh-mm-ss from 00:00:00 to 23:00:00
checkallcaps	Checks if the string contains all capital letters.

TABLE 15. Survey Questions Part 1 and 2

Survey Part 1	Survey Part 2
1. How many job interviews have you had within the last 6 months?	1. How many job interviews have you had within the last 3 months?
2. Of those job interviews, how many job offers have you gotten in the past 6 months?	2. Of those job interviews, how many job offers have you gotten in the past 3 months?
3. I feel that communication is the key aspect to a successful job interview.	3. I feel that communication is the key aspect to a successful job interview.
4. I feel my disability plays a significant role in whether or not a job will be offered to me.	4. I feel my disability plays a significant role in whether or not a job will be offered to me.
5. I am able to communicate my disability, if needed, and market my skill set to potential employers.	5. I am able to communicate my disability, if needed, and market my skill set to potential employers.
6. I feel communication training would help me get more job offers.	6. How many training sessions have you done in the past 3 months?
	7. I feel the online communication training system overall has improved my communication ability.

TABLE 16. Ideal Survey Results

Survey Question	Part 1	Part 2
1. How many Job interviews have you had within the last 6 months?	6	6
2. Of those job interviews, how many offers have you've gotten within the last 6 months?	1	5
3. I feel that communication is the key aspect of a successful job interview.	Strongly Agree	Strongly Agree
4. I feel my disability plays a significant role in whether or not a job will be offered to me.	Strongly Agree	Strongly Disagree
5. I am able to communication my disability, if needed, and market my skill set to potential employers.	Strongly Disagree	Strongly Agree
6. I feel communication training will help me get more job offers.	Strongly Agree	N/A
7. How many training sessions have you done within the last 6 months?	N/A	10
8. I feel the online communication training system overall has improved my communication ability.	N/A	Strongly Agree

TABLE 17. Worst-Case Results

Survey Question	Part 1	Part 2
1. How many Job interviews have you had within the last 6 months?	6	6
2. Of those job interviews, how many offers have you've gotten within the last 6 months?	2	0
3. I feel that communication is the key aspect of a successful job interview.	Strongly Agree	Strongly Disagree
4. I feel my disability plays a significant role in whether or not a job will be offered to me.	Strongly Agree	Strongly Agree
5. I am able to communication my disability, if needed, and market my skill set to potential employers.	Strongly Disagree	Strongly Disagree
6. I feel communication training will help me get more job offers.	Strongly Disagree	N/A
7. How many training sessions have you done within the last 6 months?	N/A	10
8. I feel the online communication training system overall has improved my communication ability.	N/A	Strongly Disagree

TABLE 18. Actual Survey Results

	Participant 1		Participant 2		Participant 3		Participant 4	
Survey Question	Part 1	Part 2	Part 1	Part 2	Part 1	Part 2	Part 1	Part 2
1	2 or less	2 or less	3		4		2 or less	
2	2 or less	2 or less	2 or less		2 or less		2 or less	
3	5	5	4		5		5	
4	3	3	4		5		5	
5	5	5	1		5		4	
6	5	N/A	3	N/A	4	N/A	4	N/A
7	N/A	5	N/A		N/A		N/A	
8	N/A	5	N/A		N/A		N/A	
Training	B	A	D		B		C	

APPENDIX B

FIGURE IMAGES

```
--Sample text file: auditory.dat—

Auditory, General
What are the qualities of a good listener?
1
3
2
0101 // assuming four questions in the questionnaire and relates to two "yes" responses.
Answer:
Auditory
A good listener requires good hearing of course.,1
0100 // example
Answer:
Auditory, General
I usually do most of the talking so I don't listen much.,1
0001 // example
Answer:
General
I think a good listener requires someone who is attentive, patient, and open to new
ideas.  I definitely believe I have those qualities.,3
NULL // example
```

FIGURE 1. Extensibility sample file.

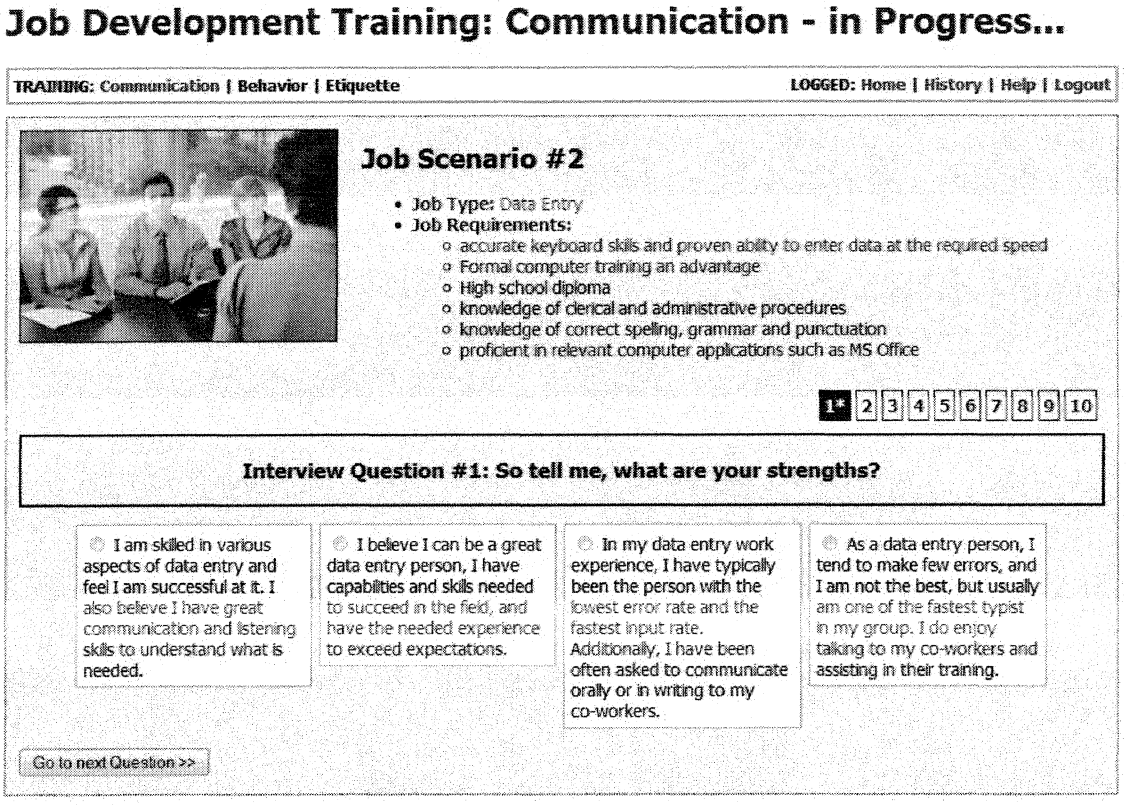

FIGURE 2. Interview questions and answers interface.

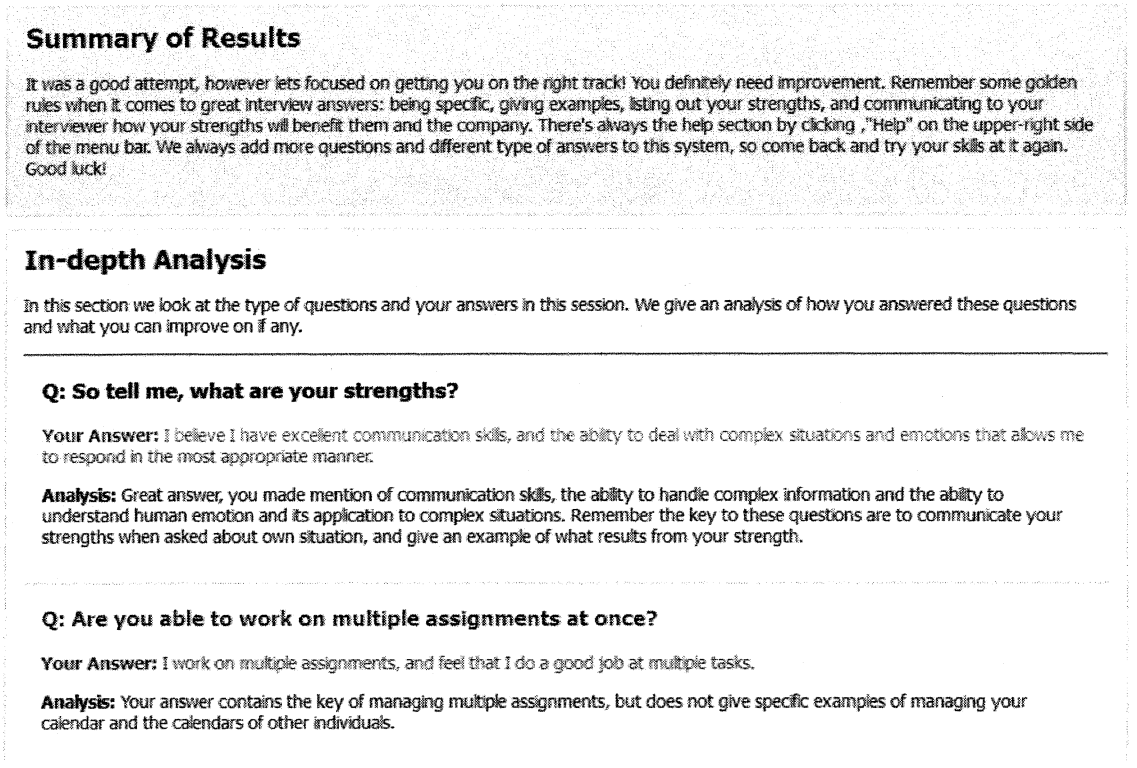

FIGURE 3. Summary of training session results.

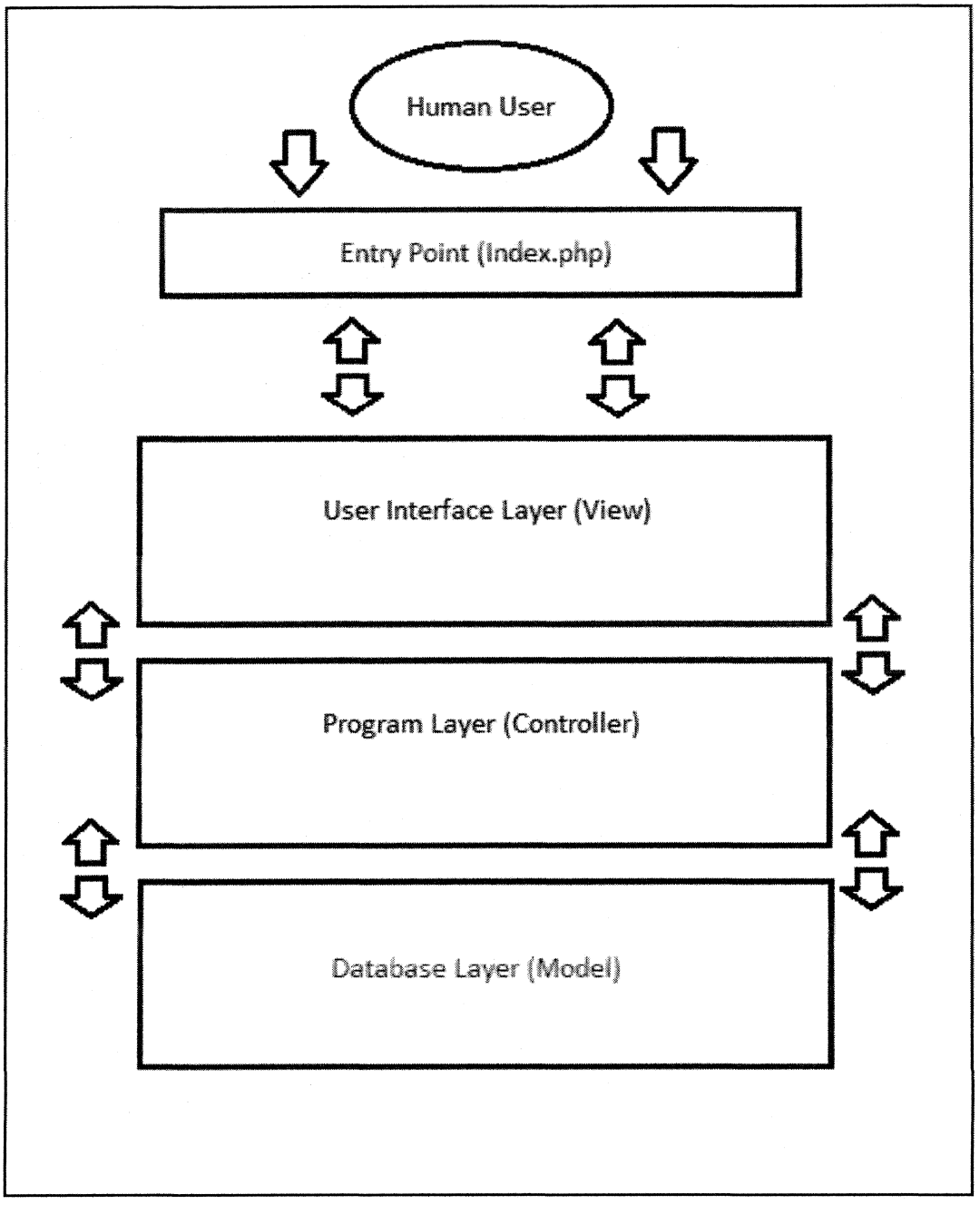

FIGURE 4. Overview of the MVC architecture.

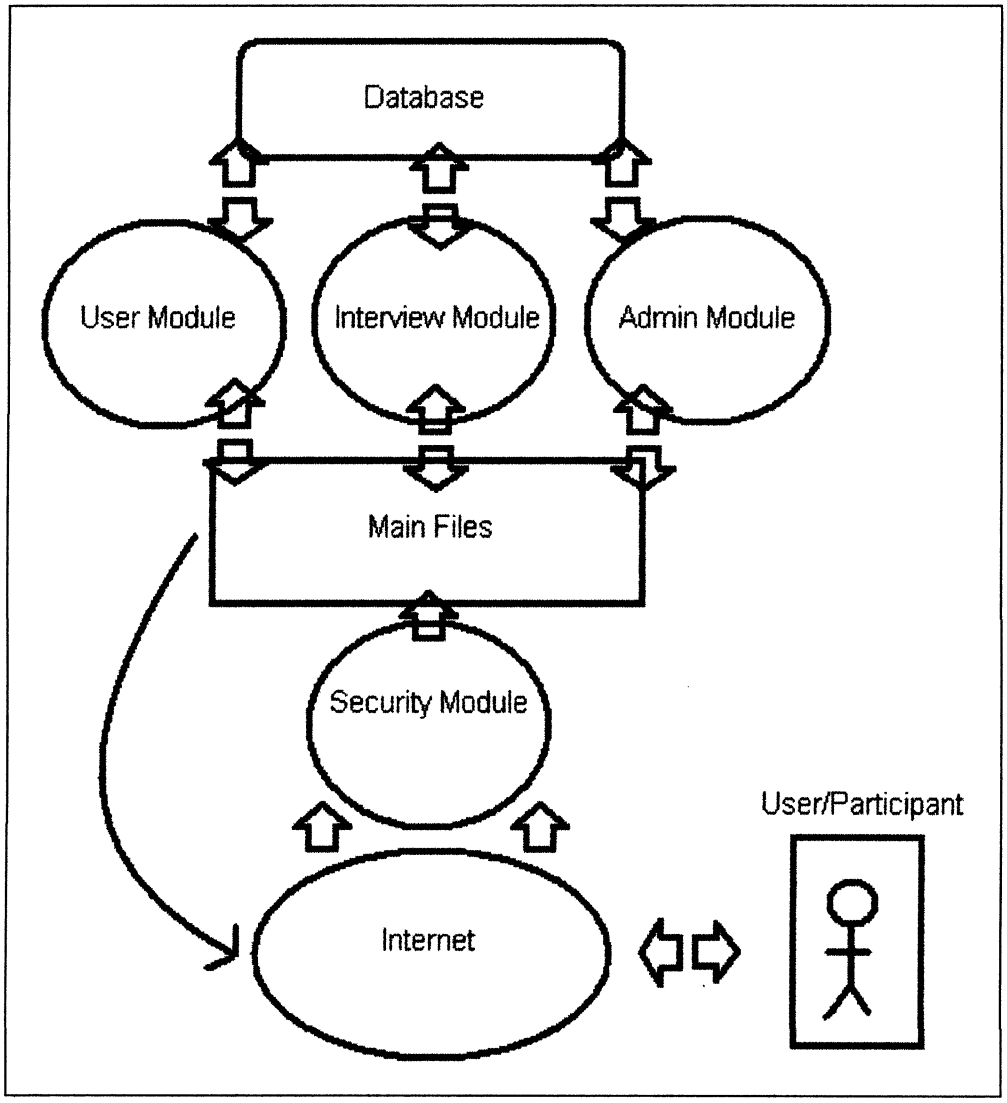

FIGURE 5. PHP module overview.

REFERENCES

REFERENCES

[1] Rehabilitation Research and Training Center on Disability Statistics and Demographics, *Annual Disability Statistics Compendium: 2010*, tech. report, 2010; http://disabilitycompendium.org/docs/default-source /previous-compendium-releases/2010-compendium-release.pdf

[2] Bureau of Labor Statistics, "Persons with a Disability: Labor Force Characteristics–2009," U.S. Department of Labor, Aug. 2010; http://www.bls.gov/news.release /archives/disabl_08252010.pdf

[3] P.D. Blanck, A.J. Houtenville, and T. Seekins, "Economics and People with Disabilities," http://www.accessiblesociety.org/topics/economics-employment/

[4] M. Jung, R. Ray, "**Income at Risk: Job Recovery Still Lagging for Those with Disabilities, Reports Allsup," Jan. 2011; http://www.allsup.com/about-us /news-room/current-news/income-at-risk-job-recovery-still-lagging.aspx**

[5] D. Kruse, L. Schur, M. Ali, "Disability and Occupational Projections," vol. 133, no. 10, Oct. 2010; http://www.bls.gov/opub/mlr/2010/10/art3exc.htm

[6] Office of Disability Employment Policy, *Survey of Employer Perspectives on the Employment of People with Disabilities*, tech. report, U.S. Department of Labor, Nov. 2008; http://www.dol.gov/odep/documents/survey_report_jan_09.doc

[7] Office of Disability Employment Policy, "Essential Skills to Getting a Job," http://promotions.usa.gov/odep/essential_job_skills.pdf

[8] G. Guwe, "The Importance of Communication – An Interview with NUS Students," http://garyguwe.wordpress.com/2008/10/11 /the-importance-of-communication-interview/

[9] US Code, Titles I and V of the Americans with Disabilities Act of 1990 (ADA), Public Law No. 101-336. sections 12101-12213, vol. 42; http:// www.eeoc.gov/laws/statutes/ada.cfm

[10] US Equal Employment Opportunity Commission, "Section 902 Definition of the Term Disability," http://www.lb7.uscourts.gov/documents/INND/208CV4.pdf

[11] US Equal Employment Opportunity Commission, "Notice Concerning The Americans With Disabilities Act (ADA) Amendments Act of 2008," http://www.eeoc.gov/laws/statutes/adaaa_notice.cfm

[12] Center for Persons with Disabilities, Utah State Univ., "Visual Disabilities – Low Vision," http://webaim.org/articles/visual/lowvision

[13] Center for Persons with Disabilities, Utah State Univ., "Motor Disabilities – Types of Motor Disabilities," http://webaim.org/articles/motor/motordisabilities

[14] The U.S. Equal Employment Opportunity Commission, "Job Applications and the Americans with Disabilities Act," http://www.eeoc.gov/facts/jobapplicant.html

[15] T. Peterson, "Job Interview Tips," last accessed on Jan. 2011; http://career-advice.monster.com/job-interview/Interview-Preparation /Job-Interview-Pointers-Fogarty/article.aspx

[16] Career Development Center, Cal State Univ., Long Beach, "Interviewing for the Job," http://www.careers.csulb.edu/job_search /interview_preparation.htm#Interview_Preparation

[17] T. Duval, "Tips on Communicating Effectively During a Job Interview," http://www.mariashriver.com/blog/2011/06 /tips-communicating-effectively-during-job-interview