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#### Creation of an Evaluation System for Assistive Software for the

#### Danish Center for Technical Aids for Rehabilitation and Education (Hjæpemiddelinstituttet)

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### - Abstract -

This report explains the methods used to create a tool for software evaluation for use by the Danish Centre for Technical Aids for Rehabilitation and Education in Høje Taastrup, Denmark. The tool will allow software evaluators to standardize their methods of assessment and use their results to make unbiased comparisons. A copy of the final result, along with the justification for the inclusion of each of its components, can be found in the final chapters of this report.

### - Executive Summary -

With the advancements of modern science, it is becoming increasingly possible to compensate for both physical and mental disabilities with the use of technology. In the distant past, a person born with a disability or someone who incurred one at some point in his life was forced to compensate for that disadvantage on his own. Depending on the extent of that person's disability, their quality of life could suffer, sometimes severely. There used to be little that could be done other than hiring an assistant to help them in their daily activities, but in recent years a plethora of devices that can allow disabled people to assist themselves have been created. With the invention and recent increase in availability of computers, giant steps have been taken to offer a previously unimaginable level of independence to even some of the most severely disabled persons. This has been made possible through the use of various software packages that help the disabled communicate and carry out their daily activities more easily and effectively. It is these software-based assistive devices that were the focus of this project.

Many software programs have been made with the purpose of providing aid to the handicapped in some form. However, they vary so much in form and purpose that it can be difficult to discern which ones best satisfy a particular need. Thus arises the need for a standard method for evaluating these software products. The Danish Centre for Technical Aids for Rehabilitation and Education, the organization responsible for providing information on assistive technology to the public in Denmark, assigned us the task of creating such an evaluation method. During March and April of 2002, our project group worked at the Danish Centre in Høje Taastrup creating an evaluation tool that could be used to critique assistive software and provide a basis for comparison between such programs.

The challenge was not only to create a fair and accurate evaluation tool but also to keep the evaluations general enough to be applicable to all assistive software, while still being specific enough to thoroughly evaluate each particular product. The following sections outline the content of this report and give a summary of the results of this project and the way in which they were achieved.

In the Methodology chapter of this report the various methods that were used during the completion of this project can be found. This section also describes the different phases of creation and application of our evaluation tool.

In order to be able to create an effective tool, we gathered as much information as possible (see Background Information, Chapter Two) on both the current developments in the field of assistive technology and the needs of the disabled in today's world. It was also important that current software evaluation techniques and standards be analyzed. Through extensive research using the World Wide Web and the Copenhagen Library, it was possible to compile a list of the possible elements to be included in a software evaluation for a program designed to aid the disabled. Once this was done, we decided which elements of software to evaluate in our own evaluation tool. After having decided which elements needed to be included in an evaluation template, a first draft of the tool was created.

In order to accomplish the task of creating a tool that would be accepted by those who are currently working at the Danish Centre and other comparable organizations, it was necessary to gain their input at several points throughout our work on this project. The feedback from our liaison, Niels-Erik Mathiassen, as well as other Centre employees in Århus, Denmark gave us an insight into the future real-world applications of the evaluation tool we were creating. By conducting interviews with these professionals, we determined the needs of those who would be using the results of our project. The evaluation tool could then be customized to best suit their specifications.

To lend credence to our work, we referenced and drew on a number of well-known sources in the area of computer software and assistive technology. Some of the major sources are the Microsoft Windows Guidelines for Software Development, IBM's Assistive Technology Overview and the Macintosh Human Interface Guidelines. Also referenced, were the US Department of Education's Requirements for Accessible Software Design and the Nordic Guidelines for Computer Accessibility. By taking ideas from these sources, we could be sure to include any widely used criteria on software evaluations in our own evaluation tool.

After a suitable evaluation tool was created, it had to be tested. In order to identify its accuracy and effectiveness, we conducted a few evaluations of various types of assistive software. We also asked a panel of special education teachers to test the evaluation tool on some of the software products that they use in their work with the disabled. Once the reliability of the evaluation template was established, an electronic version was created using Microsoft Access. This database is identical in content to the hard-copy version of the software evaluation tool. However, it presents the evaluation material in a user-friendly interface and collects the information electronically for easy access in the future.

Chapter Four of this report contains a copy of the results of this project. This is our Software Evaluation Template in the form in which it will be distributed to a software evaluator.

The Analysis chapter, Chapter Five, of the report provides an explanation of the completed software evaluation template. The justification for the inclusion of each component of the software evaluation tool, as well as the reasoning behind the exclusion of certain other evaluation elements can also be found here.

4

The software evaluation tool we created to satisfy the need of the Danish Centre consists of three parts. The three parts are collectively referred to, throughout this document, as our Software Evaluation Template. Individually, the three parts are the Brief Overview, the Detailed Analysis, and the Scoring System.

The Brief Overview, as the name suggests, is a short summary of the software. When properly filled out by a software evaluator, at the Centre or elsewhere, this part of the evaluation tool will provide the reader of the evaluation with a general idea of the purpose of the software as well as its important pros and cons. The evaluator is also asked to provide the reader with a quick estimate of the usefulness and value of the product. This part of the evaluation appears first, but is filled out last by the evaluator after they have become familiar with the software by doing the other two more detailed parts first.

The Detailed Analysis is the main component of our software evaluation template, which asks the evaluator to describe the important aspects of the piece of software being reviewed. This section is for a reader, most likely a professional in the field of assistive technology, who wishes to see a more comprehensive description of a piece of software once he has read the Brief Overview and decided that the software could be of some use to him. The Detailed Analysis is accompanied by a set of instructions that will guide evaluators in providing similarly structured answers for each question.

The Scoring System, has a similar purpose as the Detailed Analysis, only it is meant to be more concerned with the overall quality of the software. This is where the evaluator is asked to assign scores to carefully phrased sentences describing the different features of the software. The scores from each phrase are used to calculate an overall score in the main categories of the Scoring System, as well as an overall score for the software. Chapter Six provides a description of the electronic version of our Software Evaluation Template and an explanation of how it was created. This electronic template asks the evaluator to provide the same information as he would on the hard-copy, but does so in a series of questions that pop-up on the computer screen accompanied by the appropriate instructions. This electronic copy is meant to be an alternative method of gathering information and organizing it in a manner that will be easily accessible and transmittable over the Internet.

Chapter Seven contains an explanation of the testing that we did to verify the content of our template. In addition a copy of a sample software evaluation that was done using our evaluation template is included as an appendix. This evaluation also gives an idea of how the results of a software evaluation will be presented to a reader once the evaluation is complete.

The aim of the Conclusions chapter is to provide the reader of this report with an idea of the significance of this project. Since, to our knowledge, there is currently no similar evaluation tool in use, the results of our project are unique. Many of the professionals we have been working with are excited about having a method for evaluating all forms of software, as it will provide them with a standard format to present the information about a software product to a potential disabled user.

Our liaison at the Danish Centre, Niels-Erik Mathiassen, is planning to set up a team of evaluators to begin preliminary usage of our evaluation tool. They will all be trained in a similar fashion in order to assure that they evaluate software products the same way. Our software evaluation template will assist them in making these evaluations as consistent as possible.

The evaluations completed using the electronic version of the template will also be linked to the description of the corresponding products within the online catalogue of assistive devices maintained by the Centre. This catalogue is used to provide information about assistive technology to occupational, physical, and cognitive therapists, as well as special education teachers and other professionals throughout Denmark. This will also make the evaluations easily accessible to people such as the disabled themselves, which will help them compare different products and select those that best suit their needs.

### **Table of Contents**

ABSTRACT	1
EXECUTIVE SUMMARY	2
TABLE OF CONTENTS	8
CHAPTER ONE: INTRODUCTION	
CHAPTER TWO: BACKGROUND INFORMATION	
2.1 DISABILITIES	
2.1.1 Types of Disabilities	
2.1.2 Considerations When Designing for the Physically Impaired	
2.2 STATISTICS	
2.3 Assistive Technology	
2.3.1 The Basics of Software	
2.3.2 Communication Technology	
2.4 Critiquing a Product	
2.4.1 Rubrics	
2.4.2 Templates	
2.5 ORGANIZATIONS WORKING FOR THE INTERESTS OF THE DISABLED	19
2.6 SOFTWARE AVAILABLE FOR THE DISABLED	21
2.6.1 Communication Tools	
2.6.2 Hardware Replacement Software	
2.6.3 Talking Technology	
2.6.4 Environment Control Technology	
2.7 LEGAL ISSUES	
2.7.1 Danish Policies	
2.7.2 EU Standards	
2.7.3 United Nations Standards	
2.8 INTERVIEWS	
CHAPTER THREE: METHODOLOGY	
3.1 Information Gathering	
3.2 DECISION MAKING	
3.3 TEMPLATE CREATION	
3.4 INTERVIEWS	
3.5 Focus Group	
3.6 APPLICATION AND TESTING OF THE EVALUATION SYSTEM	
3.7 DATABASE CREATION	
CHAPTER FOUR: RESULTS	
BRIEFOVERVIEW	37
Detailed Analysis	
Instructions for Detailed Analysis	
SCORING SYSTEM	
CHAPTER FIVE: ANALYSIS	
5.1 IUSTIFICATION OF BRIEF OVER VIEW	51
5.2 JUSTIFICATION OF DETAILED ANALYSIS	
5.3 JUSTIFICATION FOR SCORING SYSTEM	
5.4 EXCLUSIONS	
CHAPTER SIX: ELECTRONIFICATION	75
CHAPTER SEVEN. TESTING	70

7.1 Testing Individual Questions	79
7.2 TESTING TEMPLATE INSTRUCTIONS	79
7.3 TESTING COMPLETED PRODUCT	80
CHAPTER EIGHT: CONCLUSIONS	81
8.1 Our Industry Leaders	81
8.2 KEEPING THE TEMPLATE GENERAL	
8.3 INCLUSIONS AND EXCLUSIONS	
8.5 INTEGRATION INTO THE CENTRE'S WEB DATABASE	
8.6 FURTHER TESTING OF THE EVALUATION TEMPLATE	
8.7 ELECTRONIFICATION	85
8.8 POSSIBLE FUTURE ADDITIONS.	
8.8.1 Disability Specific Additions	83 86
APPENDIX A - DANISH CENTRE FOR TECHNICAL AIDS FOR REHABILITATION AND EDIM	CATION 87
ADDENDIX R - CLOSSADV	00
A DENDIX C INTERVIEW WITH DAVID CLARK	
A DENDIX C - INTERVIEW WITH CTEEN HADTMANN	
ADDENDIVE INTERVIEW WITH TRACVE ANDERSEN	
ADDENDIVE INTERVIEW WITH TRINE DIEDDE AND THOMAS I VUNE	
APPENDIX C EQCUS COOLD OF STIC CADLEN, OF EWDIEDT, EDIX ADENDAL	
APPENDIX G - FOCUS GROUP OF STIG CARLSEN, OLE WRIEDT, ERIK ARENDAL	
APPENDIX H - INTERVIEW QUESTIONS FOR THE PROFESSIONAL	
APPENDIX I - INTERVIEW QUESTIONS FOR A SOFTWARE EVALUATOR	
APPENDIX J - WHEELS! EVALUATION	
APPENDIX K - CRITIQUE OF A DRAGON NATURALLY SPEAKING REVIEW	
APPENDIX L - AAATE INTERNATIONAL INFORMATION	
APPENDIX M - ITI : VOLUNTARY PRODUCT ACCESSIBILITY TEMPLATE	
APPENDIX N - OPERATING SYSTEM SPECIFIC ASSISTIVE SOFTWARE CREATION GUIDE	LINES 107
APPENDIX O - EVERYONE NEEDS ACCESSIBILITY, BY IBM	
APPENDIX P - PRINCIPLES OF ACCESSIBLE SOFTWARE, BY IBM	111
APPENDIX Q - IBM'S ASSISTIVE TECHNOLOGY OVERVIEW	112
APPENDIX R - IBM SOFTWARE ACCESSIBILITY CHECKLIST	113
APPENDIX S - TYPES OF ASSISTIVE TECHNOLOGY	115
APPENDIX T - TYPES OF ACCESSIBILITY	116
ACKNOWLEDGEMENTS	117
BIBLIOGRAPHY	118

# **CHAPTER ONE**

### - Introduction -

Today, almost fifteen percent of the five million inhabitants of Denmark are considered disabled. For these Danes, participation in society requires additional effort and is often limited by a lack of physical or mental ability. As a country that believes in the ideal of equality, it is important that measures be taken to provide the disabled with resources that will allow them to interact on the same level as the rest of the population. The advancement of modern technology in recent years has lead to the development of a variety of such resources, but in many cases their applications are still unknown to most people. Therefore, there arises a need for a standardized method of presenting information about these products to the public.

The organization responsible for making information on technical aids available to the public in Denmark is the Danish Centre for Technical Aids for Rehabilitation and Education (see Appendix A). The Centre conducts research and performs tests on assistive devices in order to ensure the quality of products that are available to the disabled. In this way, the Centre becomes an authority on information regarding assistive devices and can help professionals in the field select the products that best suit the needs of a disabled individual. Many of the newer assistive devices being created today are software based, and the Centre needs to evaluate them using a standard method just as they evaluate other assistive devices. The Centre and other similar organizations in Denmark have no such method currently available. The aim of this project was to provide the Centre with a tool to be used to evaluate these software products.

The tool that we have created is a template for software evaluation. This template consists of three parts, each of which provides information about a specific software package in a unique way. The first part is a brief overview of the software. Its aim is to give a synopsis of the package that is easily understood by someone who may not have much experience with computers. Part two is a detailed analysis, which is an in-depth evaluation of the most important aspects of all software. This section is to make more detailed information available for those who wish to get a comprehensive view of the software. This will be the section most valuable for occupational and physical therapists, or others who deal with selecting assistive devices for the disabled. The final part of the evaluation template is a scoring system, which is a way to give scores to the key features and aspects of the software in order to provide a basis for quantitative comparison among software packages. This scoring system will further help both the professionals and the disabled select the optimum quality software, once they determine from parts one and two of the template which software packages will suit their needs.

An effective evaluation template could only be created after extensive background research on software products and evaluation techniques. Current products on the market, as well as different procedures used to evaluate software in general are discussed later in this report in the Background Information chapter. The Methodology chapter of the report provides a more detailed description of the procedures that were followed to complete the project. A copy of the results of this project, our Software Evaluation Template, can be found in Chapter Four, and Chapter Five contains the reasoning behind the selection of questions included in that template and the justification for any exclusion that were made. Once the final version of the evaluation template had been created, the results were put into electronic form, as described in Chapter Six. Chapter Seven contains information on the testing of the evaluation tool and the results of those tests. The

11

final chapter of this report describes the conclusions drawn during the completion of this project as well as some suggestions for future use and modifications.

# **CHAPTER TWO**

## - Background Information -

Physical impairments can cause people to have limited us of various communication tools and other commonly used appliances. Even though these disabilities cannot be eliminated, a great deal of assistance is available through the use of technology that will allow better usage of these appliances. There is a wide range of products available that use hardware-simulation computer technology to make it possible for people with little or no motor skills to efficiently use different devices. These are talking products that help people with visual impairments to obtain relevant information in audio format, and environment control products that let the user control different household devices from a single point of operation. These are just a few examples of the wide variety of assistive software applications. This technology is discussed in detail in this chapter. There is also some relevant background information that will assist in the comprehension of the material in the succeeding chapters of this report. After reading this chapter, the reader should have a good knowledge of the material and issues related to software evaluation and assistive technology. Since much of the content of this section and the rest of the report will be dealing with topics that may be foreign to the layman, the technical terms will be italicized and are defined in the Glossary (Appendix B) of this document.

#### **2.1 Disabilities**

Although the words disability, impairment, and handicap appear to have similar meanings, the World Health Organization has a distinct definition for each of these terms. "An impairment is any loss or abnormality of psychological, physiological or anatomical structure or function; a disability is any restriction or lack (resulting from an impairment) of ability to perform an activity in the manner or within the range considered normal for a human being; a handicap is a disadvantage for a given individual, resulting from an impairment or a disability, that prevents the fulfillment of a role that is considered normal (depending on age, sex and social and cultural factors) for that individual." (WHO)

#### **2.1.1** Types of Disabilities

Disabilities are of two major categories, physical and mental. Physical disabilities prevent a person from fully utilizing his body. These could be caused by a birth defect, an accident or maybe a disease (Eligibility). The different types of physical disabilities are visual impairments, impeded motion, speech impairments, and hearing impairments (see Appendix Q for further descriptions). Mental disabilities include difficulty in comprehension and learning, and a lack of adequate problem solving skills. Each person with a disability has different needs, and therefore must use different products. Some people must use certain products for work, while others need products to assist them in their daily lives. That is why the needs of an individual must be considered at some point when evaluating *software*.

#### 2.1.2 Considerations When Designing for the Physically Impaired

There are many important aspects that must be considered when designing *assistive devices* for the handicapped. Each type of handicap has a different set of needs and abilities, so each product must be custom fitted to its target group. For instance, a product designed for the visually impaired must rely solely on the sense of sound and touch to perform its task. The manufacturer of a product designed for those who are paralyzed or missing a limb must recognize what parts of the body their customer is able to use and to what extent he is able to use them. The physical limitations are some of the more easily categorized disabilities and thus can be accounted for according to any one of the many available *rubrics*. One of these rubrics uses the MSIP method, which is as follows:

M- Movement controllable by the person

S- specific body Site which will use the *interface* 

I- the Interface most appropriate for the previous two factors

P- the specific Positioning of the interface

 (this was done to create a device that makes computers easier to use, but the basic principles of evaluation are still relevant) (Lee, 26).

#### 2.2 Statistics

Approximately 15% of the Danish population is disabled, according to the statistics provided by the European Commission DGV as shown in Figure 1 on the next page.



Figure 1: Disabled people as percentage of EU population

#### **2.3 Assistive Technology**

A wide range of *assistive technology* is available in various forms. There are software products that facilitate the use of computers by eliminating the need to use standard *hardware* that requires a certain level of dexterity in movement of body parts. Also available are *embedded systems*, with built in software, which come in a wide range of products that help disabled persons complete their daily tasks more easily.

#### 2.3.1 The Basics of Software

Software is the modern term commonly used to describe the entire set of *programs*, procedures, and related documentation associated with a system, especially a computer system (Webster's Dictionary). The goal of software is to provide the users of a system with an easy-to-use interface that will allow them to interact with and control the hardware of a device. The most

commonly known software packages are the ones made for the *personal computer*. These types of software packages are written by a *programmer* in one of a variety of available *programming languages* that are available today. Each software package has a specific problem or goal in mind during its creation and is thus created in a way that attempts to meet that goal or solve that problem. As with any product created, each software package is produced with a different set of base resources and available manpower. For this reason, products that appear similar may have different properties, which could be either a pro or a con to a potential user. This again necessitates thorough examination and understanding of these products.

#### **2.3.2** Communication Technology

Communication in this modern age can be challenging if a person is unable to utilize everyday appliances such as a telephone, television, and computer. An immobilized person has no way of communicating with the outer world if special assistance is not available. These issues are currently being addressed by most large manufacturers as they are making these devices more accessible to the disabled. Voice operated telephones, hand-held environment control devices, and talking watches are a few examples of devices that use embedded assistive software.

#### 2.4 Critiquing a Product

It is the difference in the quality of software mentioned above that creates a need for a method of comparing and contrasting these programs in relation to one another. Opinions of how to best evaluate any product fluctuate depending on personal perspective, so it makes sense to talk to many different professionals in this field to establish a base knowledge of a good critique. The

undisputed leading evaluator of products in the United States is an organization named Consumers Union, which publishes <u>Consumer Reports</u> magazine. The sole purpose of this organization is to be an objective source of criticism for all products developed in the US to provide consumers with enough information to enable them to choose the product that best suits all of their needs. This goal is shared by the Danish Centre and thus translated into the goal of this project. Consumers Union identifies key elements of a specific type of product and then catalogs each product according to its ranking in each of these key element categories (Digital Chaperones). Each evaluation should include what the features are and how well they work, what the product does, and how easy it is to use (Yakal 26). Some other important points to consider when doing these critiques are the possible failures of the product and any corresponding *fail-safes* that are in place (Yakal 24). If a product is going to malfunction, it is important to know whether or not the safety of the consumer has been taken into account by the manufacturer. <u>PC Magazine</u> is another source of evaluations and reviews in the US. We analyzed the review of Dragon Naturally Speaking, which is a *voice recognition* software, in this magazine (For a detailed description of the review, see Appendix K).

#### 2.4.1 Rubrics

One tool commonly used to standardize evaluations of products is a rubric. A basic rubric is a categorical list of features of a certain type of product that simply states if that feature is included or not (Should You Bank 29). A more in-depth rubric is the examination rubric, which provides a more thorough evaluation. In this type of rubric, the products are given a rating on each of their features and each rating is usually accompanied by a short comment to provide even more of an idea of the product's pros and cons (Yakal 26). This style is used by <u>PC Magazine</u> in its own critiques of products, specifically those related to computer systems. This makes sense since much

of the technology related to computer systems is very complicated and technical, and it could be hard for many to understand without an adequate description.

#### 2.4.2 Templates

Another form of evaluation of products is a *template*. These templates are created to be universal testing programs for a specific type of product. A common example is the mechanical golf ball hitter, which measures the drive distances of golf balls hit with a robotic arm. This allows for each ball to be tested under the exact same conditions. There can then be a fair analysis of the results and legitimate comparisons can be made. An example of a template more relevant to this project is the ITI: Voluntary Product Accessibility Template(see Appendix M for a more detailed description), which is used to evaluate web accessibility in certain software. This template, like many others, tries to assure that the product, software in this case, complies with all of the applicable regulations and laws. Discussion of the laws pertaining to software in Denmark can be found in succeeding sections of this chapter. These laws are needed to assure that the needs of disabled individuals are met.

#### 2.5 Organizations Working for the Interests of the Disabled

The Danish Centre assists the disabled by providing adequate information regarding assistive technology through research and testing. Before arriving in Denmark and first hand look at the work of the Centre, it was helpful to get some information from organizations and individuals who are involved in similar activities. Following is a description of some of the organizations in the United States that work parallel with the activities of the Danish Centre. Information obtained from these organizations in the form of catalogs and documents has served as a good resource for information on the disabled and various evaluation procedures.

Various organizations are actively involved in assisting the disabled with effective use of technology and software products. The Association for the Advancement of Assistive Technology in Europe (AAATE) is an organization that deals with providing information regarding assistive technology. Their motto is "to stimulate the advancement of assistive technology for the benefit of persons with disabilities including the elderly people." This is the motto that goes along with the constitution of the Association adopted in October 1995. Since then, approximately two hundred people from different areas - research & development, user, science, industry, or end-users - all over the world have become members of AAATE. (See Appendix L for a list of AAATE contacts)

ISdAC International Association is a non-profit group established in 1998 in Belgium. Its aim is to challenge Europe and its nations to make the Information Society fully accessible to people with disabilities (PwD), and challenge people with disabilities to demonstrate their abilities in an Information Society context by playing an active role in building a fully accessible Information Society in Europe (ISdAC).

The Center for Computer Assistance to the Disabled assists disabled people by providing information regarding products and referrals. This organization offers resource materials such as product literature and catalogs along with examples of *adaptive devices* and computer software (C-CAD).

The Office of Special Education and Rehabilitative Services (OSERS) is the US organization that handles the general advancement of assistive technology (Office). Another US organization aimed more at the research side of things is the National Institute on Disability and Rehabilitation Research (NIDRR). It provides leadership and support for a comprehensive program of research related to the rehabilitation of individuals with disabilities (National).

20

The Alliance for Technology Access is committed to making information and support services available to children and disabled people through a network of resource centers, vendors, distributors, affiliates and associates across the country (ATA). ATA also has some associate members, amongst who are *occupational therapists*, *physical therapists*, and experts who have volunteered to help disabled people with information, educational material and other available resources. The Center for Applied Special Technology in Peabody, Massachusetts is another non-profit organization that concentrates on developing helpful tools for the disabled through extensive research (CAST).

Learning Independence through Computers, located in Maryland, is another non-profit organization that works closely with disabled people and their families to educate them about the assistive technology that is available (LINC).

Each of these organizations produces catalogs and literature containing material on product use and evaluation. These organizations also evaluate and use software products available in the market. Their methods of evaluation and selection of products might not be perfectly suitable for The Danish Center, but research material obtained from these organizations provided us with valuable information regarding possible approaches.

#### 2.6 Software Available for the Disabled

The different types of handicaps present a need for a variety of different assistive devices. The focus of this section will be on assistive devices relating to software, the primary focus our project. People with physical disabilities can face many difficulties in communicating. While modern technology is making exchange of information easier and faster, it could hinder the use of communication devices due to its complexity and inaccessibility. Various software products are

21

available on the market that aid disabled people in communicating more effectively. Specially designed hands-free phones, *TTY* phones, voice recognition software, and 'smart home' software are some of the products that can assist disabled people in communicating without much difficulty.

#### **2.6.1 Communication Tools**

Able Phone (shown in Figure 2 below) is one of the leading manufacturers of such communication devices. One of their products, Model AP 100 VCS, is a hands-free, cordless, voice-activated speakerphone that does not require the use of any *switches* for operation. It is based on voice-activated dialing technology and is controlled by whistling into a headset. Whistling turns the phone on and numbers can be dialed using various voice commands. These kinds of voice operated phones range in price from \$200 - \$600 (Voice-Activated Cordless Phone).



Figure 2: Able Phone

Another medium of communication can be a computer phone. Computer users with different abilities can use their particular *input* method, for example, voice, special keyboard, or a head stick to access a computer's telephone. Computers with telecommunications software allow calls to be placed and answered through the use of the microphones and speakers, thus assisting in hands-free communication. The Ameriphone Dialog RC200 is a switch-adapted phone; another innovative

product that can be used by bed-ridden people as they can place the switch at a convenient location, (even their lap) to easily make and answer phone calls. (Remote Controlled Speakerphone). It can also be easily installed on a wheel chair or a desktop.

#### 2.6.2 Hardware Replacement Software

Some people have difficulties using the standard parts of a computer like keyboards, mice, etc. due to lack of fine *motor skills* required to use these devices. These people can use the voice recognition software that is extensively available. Dragon Naturally Speaking software is one of the most commonly used forms of voice-recognition software. A disabled person can speak into a microphone instead of typing with a keyboard. The speech recognition software *digitizes* the electrical signal from microphone and stores it in memory. It enables the user to type documents, fill out forms and work with a computer more conveniently (Dragon Naturally Speaking). The mouse of a computer can be replaced by a headpointing system. It includes headsets that enable the movement of the cursor on the screen with the movement of the user's head. Selections can be made by puffing on a tube that is attached to the headset. HeadMaster Plus is one such product developed by Prentke Romich Company in Ohio, US. It allows disabled people to use mouse-controlled programs and explore the web without any difficulty (HeadMaster Plus).

Tracker 2000 (shown in Figure 3) is another such device used to replace a mouse. This new product developed by Access Technology sits on top of the computer and tracks a tiny reflective 'dot' worn on the forehead or glasses. A person's head movement is elegantly converted into computer mouse movement (Tracker 2000).



Figure 3: Tracker 2000

An on-screen keyboard is another hardware replacement software that can assist people with limited mobility. Figure 4 shows an on-screen keyboard manufactured by RJ Cooper & Assoc., Inc, which enables the user to select keys by using a pointing device such as a *joystick*, tracker, or headmouse. It consists of an auto-arrange windows system feature that allows other applications to run while OnScreen is being used (OnScreen).



Figure 4: On screen keyboard

#### 2.6.3 Talking Technology

Another technology used by disabled people comes in the form of talking products. Some people cannot read from a computer screen due to having a visual impairment or being completely blind. This problem can be overcome by using screen reader software programs that are available on the market. JAWS is a screen reader program that uses an integrated voice synthesizer and the computer's sound card to *output* the content of a computer screen to speakers. JAWS supports *web browsers* for Internet access, e-mail programs, *word processors, spreadsheets*, presentation software, web-development tools, and *database* management software (JAWS). Talking watches also fall into the category of these talking products. They have large *LCD* displays with time announcements, hourly announcements, and alarm features. They are available at prices as low as ten dollars.

#### 2.6.4 Environment Control Technology

Environmental control technology is a main focus of the Finish center for the disabled (Swedish), and it is very closely knit with software. The latest advancement in this type of assistive technology is the development of Automated (or Smart) Home Technology. Smart Home is the term commonly used to define a residence that uses a home controller to integrate the residence's various home automation systems, thereby enabling single-button and voice control of the various home systems simultaneously, in pre-programmed scenarios or operating modes (Smart Home). Smart Homes are particularly useful for disabled people as they can control various inbuilt automated features of their house from one point. Dal-Pres Aps, a Danish company, makes such software called GEWA Prog. The user can control all electric installations in the house by using just one handheld device. GEWA PROG is a strong infrared sending device (GEWA). Figure 5 gives an idea of how this technology is used.



Figure 5: Smart Home controller

#### 2.7 Legal Issues

As with any professional undertaking these days, there are certain legal issues that arise when creating, testing or cataloging software packages for the handicapped. Not only must these products and the evaluation process be in accordance with Danish law, but there are some European Union and United Nations (UN) standards that are also applicable and were taken into account while creating an evaluation template to be used by the Danish Centre.

#### 2.7.1 Danish Policies

In 1993, Denmark agreed to comply with the UN Standard Rules on Equalization of Opportunities for People with disabilities, which establish guidelines in many social areas for how people with disabilities can be guaranteed social accessibility.

For instance, Rule No. 5 states that:

For persons with disabilities of any kind, States should (a) introduce programs of action to make the physical environment accessible; and (b) undertake measures to provide access to information and communication.

Also, according to the Freedom to Choose Action Plan of Denmark:

States should ensure that new computerized information and service systems offered to the general public are either initially accessible or are adapted to be made accessible to persons with disabilities. (Freedom to Choose)

#### 2.7.2 EU Standards

The European Commission launched the eEurope initiative on 8th December 1999 with the adoption of the Communication eEurope - An Information Society for all. The eEurope Action Plan associated with this initiative has set the following goals.

- Review Information Society legislation and standards on accessibility. Recommendation to take account of people with disabilities in the public procurement of information and communications products and services.
- Commitment to make all public Web sites and their content accessible to people with disabilities.
- Create centers of excellence in each Member State to develop an EU curriculum in Designfor-All. (EU Standards)

#### 2.7.3 United Nations Standards

States should ensure the provision of assistive devices and equipment, personal assistance and interpreter services, according to the needs of persons with disabilities, as important measures to achieve the equalization of opportunities.

States should support the development, production, distribution, and servicing of assistive devices, equipment, and the dissemination of knowledge about them (United Nations).

#### 2.8 Interviews

In order to gain further information concerning design considerations and the needs of the disabled, two interviews were conducted. One of these interviews was with a member of the WPI faculty, while the other was with a professional in the field of assistive technology. Both of these interviews were semi-structured, with some prepared questions used at the beginning of the interview, followed by discussion periods in which the subjects of the interviews were prompted to lead us in the direction they felt would be the most useful.

The first of these interviews was conducted with Holly Ault, a Mechanical Engineering professor who works with a variety of technical aids. In addition to her contacts within the college system, she is also associated with a local hospital. From this interview insight was gained into what considerations must be made when creating a technical device.

The second interview was with David Clark from Boston who works as a consultant for organizations working with handicapped people. He was able to give information on what types of considerations are made in the marketing of technical aids, specifically software. The most important aspect of creating technical aids currently is a concept referred to as universal design.

28

Within universal design, a software program is designed with everyone in mind, not just a single group of people. There is not much software that is specifically created with the disabled in mind (See Appendix C for a transcript of our interview with David Clark).

# **CHAPTER THREE**

## - Methodology -

This chapter describes the methods that were used to accomplish the goals of this project. Moving forward from the collected background information into a more comprehensive understanding of the Centre's operations and objectives allowed us to begin work on a mutually satisfactory project. Once we established that our goal was to create a procedure for evaluating software for the disabled, we needed to do further research in order to become well acquainted with both software evaluation techniques and the needs of the disabled. In addition, interviews and meetings were conducted with some of the Centre's employees as well as others in the field of assistive technology. This provided us with first-hand knowledge of the wants and needs of those who we aim to help with the results of this project. We then devised a standard method of software evaluation and tested it using a variety of products available in Denmark. Details on our methods of information gathering, decision making, template creation, interviewing, and testing can be found in the following sections of this chapter. The last section of this chapter describes the conversion of our evaluation template into an electronic format.

#### 3.1 Information Gathering

Since the goal of our project was ultimately to create an evaluation template for assistive software, our first step was to gather information on different methods of evaluation. We discovered what criteria are commonly used when evaluating software and how those criteria can be

measured. A variety of different software magazines as well as some professional product reviews on software were analyzed. Further description of these reviews can be found in the Background Information chapter along with the other information that we obtained before the start of this project.

In addition to reviewing material on software evaluations, we also gathered information from various sources focusing on disabilities and the assistive devices that aid them. This information was combined with the basic requirements of any software package to create a master list of all possible criteria that could be measured with our evaluation method.

#### **3.2 Decision Making**

Deciding what information should be included in our evaluations was a crucial part of the template creation process. We reviewed the list of criteria that we had created, and weighed the pros and cons of including each piece of information about a software package in our evaluation template. If we determined that a particular feature or aspect was important enough to include, we then had to determine its level of importance and where it belonged in the template. Careful analysis of the purpose of each part of the template (the Brief Introduction, Detailed Analysis, and Scoring System) led to the inclusion or exclusion of each possible criterion.

#### **3.3 Template Creation**

Once we had a list of the important elements within software, we could then derive questions that asked the evaluator for key information about each of these elements. Next came the process of combining similar questions and compiling them into an easy-to-follow template. We also created a set of instructions to accompany the template so that the evaluator has a better understanding of how to answer the questions. The first draft of our template was thus created, enabling us to take copies of it to our interviews.

#### 3.4 Interviews

Semi-structured interviews were conducted both with people who work within the Centre and with professionals who work closely with the disabled. The questions asked were based on the individual's work in the field of technical aids and pertained to the subject's needs for an evaluation of a software product. At the end of each interview, each subject was given our evaluation template and asked to give us their feedback. This helped us in deciding whether the needs of these people were met by our template. A synopsis of each interview, as well as the feedback gathered during the process, is compiled in the Appendices. Interviewees include: Steen Hartmann, an *information technology* consultant concentrating in special education (see Appendix D); Trygve Andersen, an educational consultant (Appendix E); Trine Bjerre, editor of HIT magazine, and Thomas Lyhne, the Centre's database manager (Appendix F).

#### **3.5 Focus Group**

A focus group was conducted in much the same way that the interviews were done. Three people from the Centre's office in Århus who deal with software creation and evaluation participated in the focus group. These three participants were Stig Carlsen, a software developer, and Ole Wriedt and Erik Arendal, both of whom evaluate software. A general discussion was initiated by posing some questions, after we provided background on the project. This discussion began with the components of a software evaluation in general and then moved on to the individual components of our template. From this, a large amount of information was gathered using an unstructured format. A detailed description of the focus group is available in Appendix G.

#### 3.6 Application and Testing of the Evaluation System

Once the evaluation template was created, it was important that the template be tested on some examples of software. This was done by acquiring copies of various types of software and evaluating them using our template. In some cases the same piece of software was evaluated by all three members of our project team, and the evaluations were then compared to establish the consistency of the template. During these evaluations, we were able to identify the sections that needed revision for clarity. It was important that all of the questions posed within the evaluation be clear and easy to answer. The testing proved to be a good technique for discovering the weaknesses in our product.

In order to ensure that our template performed at the necessary level, the evaluations created using this system were compared with other commercially available evaluations of the same software. From these comparisons, we were able to determine the accuracy and effectiveness of the template and identify any parts that needed revision. This last technique was limited in some cases, as certain commercially available reviews were not as detailed as our evaluations.

#### **3.7 Database Creation**

Once the final evaluation system was complete it was converted into an electronic form. This was done by entering each element of the evaluation template into a *Microsoft Access* database

33

form. This was done for the Brief Overview, the Detailed Analysis, and the Scoring System. The electronic version of the template was designed to contain a series of *pop-up* windows, each containing a question to be answered by the user and any accompanying instructions. Once the evaluator has answered all of the questions included in our template, a copy of the evaluation is stored in the database and can be easily accessed for viewing or printing. This database can also be linked to the Centre's website database and can allow online users to access these evaluations. A search query section of the database was also created to allow a user to search for specific words, scores, or questions throughout the template. To make the evaluator's job easier, the electronic version of the scoring system was designed so that the computer will do any mathematical calculations.

# **CHAPTER FOUR**

# - Results -

The following pages contain the final version of the Software Evaluation Template as it would be

presented to an evaluator.
# ASSISTIVE SOFTWARE EVALUATION TEMPLATE EVALUATOR'S COPY

PART ONE: Brief Overview

PART TWO: Detailed Analysis

\* Instructions for Detailed Analysis

PART THREE: Scoring System

For the Danish Centre for Technical Aids for Rehabilitation and Education

### PART ONE:

### **Brief Overview**

The Brief Overview is best filled out after already having completed both the Detailed Analysis (Part Two) and the Scoring System (Part Three). After completion of the Parts Two and Three, the evaluator should have a good knowledge of the operation of the software. The aim of this section is to provide a potential reader of this evaluation with quick a summary of that knowledge. First, provide the user with the objective of the software. This is meant to be factual in nature, and should be a fairly concise description of what the software is designed to do as well as its target audience. Next, list some of the significant pros and cons to be brought to the user's attention. The opinions that are asked for in this part of the Brief Overview include what is good about the software, what could use improvement, and a complete impression of the software as a whole. Once you have listed the important pros and cons, give the reader a brief judgement of the software. This judgement should include what audience you recommend it for, if any at all and how good the software is in general. Finally, the overall score at the bottom is derived from the scoring system, and is intended to supply the reader with a simple impression of the quality of the software.

### **Brief Overview**

1.1 PRODUCT NAME:	
1.2TYPE:	
1.3 MANUFACTURER:	
1.4 OPERATING SYSTEM(S):	
1.5 LANGUAGE OPTIONS:	
1.6 PRICING (and Licensing) INFO:	
1.7 DATE OF EVALUATION:	

#### **1.8 WHAT IS THE OBJECTIVE OF THIS SOFTWARE?**

\_\_\_\_

#### **1.9 PROS**

#### 1.10 CONS

#### **1.11 JUDGEMENT**

### 1.12 OVERALL SCORE\*: \_\_\_\_

<sup>\*</sup> See Scoring System results section for more information on the scores of this product

### Part TWO:

### **Detailed Analysis**

The Detailed Analysis is the first section of the evaluation that should be filled out. Doing so will provide the evaluator with a better understanding of the software in order to complete the other two sections. The majority of the questions posed as part of the Detailed Analysis deal with factual information. These are along the lines of what a software program can and cannot do; therefore there is very little room for opinion within these questions. However, not all of the questions are factual in nature; some involve pure opinion, and these questions must be treated differently from the others. In order to answer these opinion-based questions, the evaluator must take a step back from the program. This is done to ensure an objective answer to the question, one that may be used by everyone. In order to ensure that all of the evaluations are conducted in the same manner, instructions have also been created for each question within the Detailed Analysis. These are located in the pages following the analysis itself, and should be referred to if there is any doubt as to what the question is asking. In this evaluation, it is most helpful to make generalizations and support them with specific examples.

### **Detailed Analysis**

#### 2.1 What are the system requirements?

Operating System\_\_\_\_\_

Processor Speed\_\_\_\_\_

RAM\_\_\_\_\_\_

Hard Disk Space\_\_\_\_\_\_

Video/Sound Card\_\_\_\_\_\_

Internet Connection\_\_\_\_\_\_

Additional Software\_\_\_\_\_\_

Additional Hardware\_\_\_\_\_\_

Special Requirements\_\_\_\_\_\_

#### 2.2 What language options are included in this software?

2.3 What skills are needed to install, set up, start, and use the software?

2.4 What type of environment is this software intended to be used in or suited for?

2.5 What types of input and output does this software use?

2.6 What other types of software / hardware can this software interact with?

2.7 How does the user interact with the software?

2.8 If possible, how can the user customize the software to adjust to his own needs?

\_\_\_\_\_

- 2.9 Are the on-screen (or voice) instructions easy to follow?
- 2.10 Describe the design of the user interface.
- 2.11 What forms of help are built into the software program?
- 2.12 What forms of help are available outside the software program?
- 2.13 What aspects of the software consume the majority of the user's time?

•

2.14 Are there any technical problems in running this software? If so, how severe are the errors and how complicated are the solutions?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

- 2.15 What is the process for updating / maintaining this software?
- 2.16 What are the safety / security issues related to this software?
- **2.17** Describe the usefulness of the software.

### Instructions for Detailed Analysis

#### I 2.1 What are the system requirements?

Operating System: list the operating systems that the software is compatible with Processor Speed: what is the minimum processor speed required for normal operation of the software

RAM: minimum amount of RAM required for normal operation of the software Hard Disk Space: space required for installation and operation of the software Video/Sound Card: required type of card Internet Connection: what minimum speed, if any, Internet connection is needed

Additional Software: other programs required to achieve the objectives of the software Additional Hardware: other accessories required to use the software Special Requirements: any other requirements for normal operation

#### I 2.2 What language options are included in this software?

List any languages (e.g. English, Danish, German) that can be used as output and/or input by the software. Describe the extent to which each of these languages is employed within the software.

#### I 2.3 What skills are needed to install, set up, start, and use the software?

Describe all the tasks that a user would need to be able to do in order to install, set up, start, and use the software. Be sure to indicate which category each task is applicable to. Please mention if professional help is needed and how often does the user need a professional's help to get familiarized with proper functioning of software.

e.g. installation requires the user to change hardware settings on the computer

#### I 2.4 What type of environment is this software intended to be used in or suited for?

Where is the software supposed to be used?

e.g. office, home, public library, hospital, school

What type of computer is it intended to be used on?

e.g. Personal Computer, laptop, onboard computer

Is the software designed to be used for training/education?

Are there any other special environmental needs of the software?

e.g. minimal background noise required for voice recognition

Is it meant to be used by a single person or by a group of people?

#### I 2.5 What types of input and output does this software use?

List the media used by the software to receive information.

e.g. speech, typing, motion, touch

List the media used by the software to provide information.

e.g. visual, auditory, tactile, electrical signal

#### I 2.6 What other types of software / hardware can this software interact with?

List the devices used by the software to receive information.

e.g. keyboard, mouse, joystick, scanner, touch pad, motion sensors, microphone List the devices used by the software to provide information.

e.g. speakers, monitor, printer

List the additional software that can be used in conjunction with this software. e.g. word processors, email clients, web browsers

#### I 2.7 How does the user interact with the software?

Describe here, in general, how the users access and utilize the features of the software. It should be a brief overview to provide potential users with a general idea of the procedures used to communicate with the software. If applicable, mention what role the input and output devices as well as the other software and hardware play in this user-software interaction.

e.g. to use an email program, the user provides the program with the name, address and information to be sent to a recipient using a keyboard or a microphone in conjunction with voice recognition software. The software then sends the information across the Internet to the recipient. The software then provides the user with a text and/or audible message confirming that the message has been sent, using either the monitor and/or speakers.

#### I 2.8 If possible, how can the user customize the software to adjust to his needs?

What aspects of the program may be changed by the user, if any, and how much modification is allowed in each of these aspects.

e.g. the size text is displayed on the Internet may be enlarged or shrunk within Internet Explorer with the largest size being twice that of the smallest text

#### I 2.9 Are the on-screen (or voice) instructions easy to follow?

Qualitative assessment of the ease of use of instructions included throughout the software.

#### I 2.10 Describe the design of the user interface.

Describe, in general, the layout of the user interface provided in the software. Are the features easily accessible through this interface? Are they clearly labeled with appropriate size, color and font? If applicable, describe the accessibility of features through an audible interface.

#### I 2.11 What forms of help are built into the software program?

Describe the available forms of help that are included in the software program

e.g. pop-up text explanation when you hover over an item with a pointer,

a help index directing the user to appropriate resource

#### I 2.12 What forms of help are available outside the software program?

Describe any forms of help that are available for the software but not built into the software. e.g. online help, customer support line, instructions manual

#### I 2.13 What aspects of the software consume the majority of the user's time?

Note: Please answer the questions below keeping in mind speed of the computer being used and the system requirements of the software.

How much time does the software take to download/install? How much time does it take to load every time the program is started? How much waiting time is involved for the software to perform an action. Are there any unnecessary/redundant menu items that have to be gone through to access certain features?

Does the software ask any unnecessary/trivial questions while accessing different features? Overall, please describe if it is worth spending time to get the software to work?

Is actual use of the software significant enough to spend time in going through the process of getting familiar with the software?

## I 2.14 Are there any technical problems in running this software? If so, how severe are the errors and how complicated are the solutions?

If any errors were encountered within the program, what are they and what did they do?

If the problem could be solved how complicated was it, and was any technical assistance required to do so?

e.g. a pop-up window stating that an operation cannot be run can either be closed and use of the software continued, or it could close the program whenever this operation is run

#### I 2.15 What is the process for updating / maintaining this software?

How often are the updates provided for this software and how crucial is the timely installation of these updates? Is the user notified of any new updates that are important for proper functioning of software? How complicated is the process of updating the software? How frequently must routine maintenance be performed (e.g. running a scan disk) and how complicated is the maintenance process?

e.g. Windows updates are available on the Microsoft website and are easy to download but the updates are not necessary to continue proper functioning of the current software.

#### I 2.16 What are the safety / security issues related to this software?

Describe any potential hazards (physical or mental) to the user and any steps that the software manufacturers have taken to avoid these potential hazards (e.g. software is used to control a door but frequently closes and opens the door accidentally). List any flaws in the security of the software (e. g. can be easily broken into by unauthorized users). Are there security measures in place to keep the software safe from malicious users? Are there any features included to prevent data loss in case of any system failure that could occur?

#### I 2.17 Describe the usefulness of the software.

How well does the software perform its intended operation?

Does the end result of the program justify the time taken to learn its use?

e.g. voice recognition software that takes six hours to train, and still has a large amount of corrections that must be made is not very useful.

# <u>PART THREE</u>: Scoring System

The scoring system is designed to provide a general numerical evaluation of the quality of the software. This is done by reading statements about the software, or things associated with the software, and then commenting on the truthfulness of these statements. In this way, numerical scores can be assigned to each facet of the software. The concepts focused on within the scoring system are as follows: Ease of Operation, Installation/Setup, Input Quality, Output Quality, User Interface, Customization, Help, Technical Performance, Safety/Security, and Updates. A person looking at the results of the Scoring System may look at either the scores to individual questions, the scores for each section of the system, or at the total score for the software itself. This allows someone to draw his own conclusions as to the importance of certain aspects of the software program. To fill out each individual section, follow the instructions below.

Give each statement a score from 1 to 5 (see below for values associated with 1 through 5) depending on how accurate it is. If the statement does not apply to the software in question, simply circle the N/A option for not applicable.

1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree

In order to get the overall score for a category, take the average of all applicable scores within that category and round it off to the nearest whole number. To calculate the total score for the program, simply add together the scores for all the applicable questions, and once again find the average score and round it to the nearest whole number. This total score is then also applied to the Brief Overview (Part One) in the Overall Score section.

#### **EASE OF OPERATION**

<ul> <li>3.1 The skills required to operate this program fall into the target end-user's developmental range.</li> <li>3.2 The software can be started before each use with minimal wasted effort.</li> <li>3.3 This software package can be used effectively by a layman.</li> </ul>		1 1 1	2 2 2	3 3 3	4 4 4	5 5 5
<b>Overall Score for Ease of Operation</b>		1	2	3	4	5
INSTALLATION/SETUP						
<ul> <li>3.4 This software package can be installed with ease.</li> <li>3.5 Hardware associated with this program requires little effort to set up.</li> <li>3.6 Training required by this software is uncomplicated.</li> <li>3.7 Software can be installed and setup with minimum redundancy and wasted time.</li> </ul>	N/A N/A	1 1 1	2 2 2 2	3 3 3	4 4 4	5 5 5
<b>Overall Score for Installation/Setup</b>		1	2	3	4	5
INPUT QUALITY						
<ul><li>3.8 The input methods are relevant and efficient.</li><li>3.9 Redundant or accidental inputs by the user are well compensated for.</li><li>2.10 This are served as a s</li></ul>	N/A	1 1	2 2	3 3	4 4	5 5
<ul><li>3.10 This program provides Reyboard access to all dialogues, menus, and tools.</li><li>3.11 Input from hardware devices is accurate.</li></ul>	N/A N/A	1 1	2 2	3 3	4 4	5 5
<b>Overall Score for Input Quality</b>		1	2	3	4	5
OUTPUT QUALITY						
<ul><li>3.12 The colors in this program are appropriately chosen.</li><li>3.13 Warnings, alerts and important messages are easy to read in</li></ul>		1	2	3	4	5
<ul><li>the time that they are visible.</li><li>3.14 The software can operate effectively over a wide variety of</li></ul>		1	2	3	4	5
<ul> <li>screen resolutions.</li> <li>3.15 Information provided audibly is presented in visual format as well.</li> <li>3.16 The visual outputs have adequate accompanying text.</li> <li>3.17 The output methods are meaningful and effective.</li> <li>3.18 The visuals are appealing.</li> <li>3.19 The audio is understandable.</li> <li>3.20 The audio is pleasing to the ear.</li> </ul>	N/A N/A N/A N/A N/A	1 1 1 1 1 1 1	2 2 2 2 2 2 2 2 2 2 2	3 3 3 3 3 3 3 3 3	4 4 4 4 4 4 4 4	5 5 5 5 5 5 5 5 5 5

Overall Score for Output Quality	1	2	3	4	5
----------------------------------	---	---	---	---	---

#### **USER INTERFACE**

3.21 3.22 3.23 3.24 3.25 3.26 3.27 3.28	<ul> <li>This software maintains a consistent predictable layout and behavior.</li> <li>The user interface is simple to navigate for the target end-user.</li> <li>Command items and buttons have logical names and/or icons.</li> <li>Features of the software can be accessed without unnecessary work</li> <li>The meaning of visuals is consistent throughout the interface.</li> <li>The software provides full access to all aspects of the program from the keyboard.</li> <li>An easy method is available to select any desired window and bring it to the front.</li> <li>There is adequate direct access to palettes and toolbars.</li> </ul>	N/A N/A	1 1 1 1 1 1 1 1	2 2 2 2 2 2 2 2 2 2 2 2 2	3 3 3 3 3 3 3 3 3 3 3 3 3	4 4 4 4 4 4 4	5 5 5 5 5 5 5
	Overall Score for User Interface		1	2	<b>3</b>	4	5
<u>CUS</u>	TOMIZATION						
3.29 3.30 3.31 3.32 3.33 3.34	The user has a wide range of volume control within the program. The form in which text is presented can be easily modified. A convenient system is provided to save the user's personal data. Customization of the software functions is easy to do. The program settings can be changed without difficulty. The software can be trained to perform new tasks with little effort.		1 1 1 1 1	2 2 2 2 2 2	3 3 3 3 3 3	4 4 4 4 4	5 5 5 5 5 5
	<b>Overall Score for Customization</b>		1	2	3	4	5
пы	<b>JP</b>						
3.35 3.36 3.37 3.38	The documentation provided with the software is of a high quality. The training materials included with this software are adequate. There is adequate assistance for a user who has troubles with this software. The available help resources can be accessed quickly and directly.	are.	1 1 1 1	2 2 2 2	3 3 3 3	4 4 4 4	5 5 5 5
3.35 3.36 3.37 3.38	The documentation provided with the software is of a high quality. The training materials included with this software are adequate. There is adequate assistance for a user who has troubles with this software. The available help resources can be accessed quickly and directly. <b>Overall Score for Help</b>	are.	1 1 1 1	2 2 2 2 2 <b>2</b> <b>2</b>	3 3 3 3 <b>3</b> 3	4 4 4 4 <b>4</b>	5 5 5 <b>5</b>
3.35 3.36 3.37 3.38 TEC	The documentation provided with the software is of a high quality. The training materials included with this software are adequate. There is adequate assistance for a user who has troubles with this softwa The available help resources can be accessed quickly and directly. <b>Overall Score for Help</b>	are.	1 1 1 1	2 2 2 2 2 2 2 2	3 3 3 3 <b>3</b> <b>3</b>	4 4 4 <b>4</b>	5 5 5 <b>5</b>
3.35         3.36         3.37         3.38         TEC         3.39         3.40         3.41         3.42         3.43	The documentation provided with the software is of a high quality. The training materials included with this software are adequate. There is adequate assistance for a user who has troubles with this software The available help resources can be accessed quickly and directly. <b>Overall Score for Help</b> <b>CHNICAL PERFORMANCE</b> This software program meets any applicable legal obligations. This software program complies with applicable standards. This software program uses system tools whenever possible. Loading time is acceptable for the size of the program. The overall speed of the program is sufficient for the complexity of the coeffusion.	are.	1 1 1 1 1 1 1 1 1 1 1 1 1	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	4 4 4 4 4 4 4 4 4	5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5

3.45	Any errors present may be fixed with a minimal working			•	•		_
	knowledge of computers.		1	2	3	4	5
3.46	The software cooperates with special OS access features in the OS and third party access software.		1	2	3	4	5
	<b>Overall Score for Technical Performance</b>		1	2	3	4	5
<u>SAF</u>	ETY/SECURITY						
3.47	There are adequate fail-safes incorporated where necessary to prevent the user from being physically harmed or mentally distressed.	N/A	1	2	3	4	5
3.48	The software has adequate protection against malicious users.		1	2	3	4	5
3.49	There are adequate fail-safes incorporated to protect against data loss.		1	2	3	4	5
	<b>Overall Score for Safety/Security</b>		1	2	3	4	5
MA	INTENANCE						

### 

3.50	Available Technical Support is easy to contact and helpful.	1 2 3 4 5
3.51	The maintenance costs of this software are reasonable.	1 2 3 4 5
3.52	The subscription is easy to maintain.	1 2 3 4 5
3.53	The updates are easily available and accessible to all users.	1 2 3 4 5
3.54	There is adequate and timely notification of new updates.	1 2 3 4 5
3.55	Once the user has an update, it is easy to install and apply it.	1 2 3 4 5
3.56	The software updates are necessary.	1 2 3 4 5

#### Overall Score for MaintenanceN/A 1 2 3 4 5

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#### TOTAL SCORE

Score from:	Ease of Operation
	Installation/Setup
	Input Quality
	Output Quality
	User Interface
	Customization
	Help
	Technical Performance
	Safety/Security
	Maintenance

Total score for software package12345

# **CHAPTER FIVE**

# - Analysis -

This chapter analyses the results of our project provided in the Results chapter. The methods by which these results were obtained are described within the Methodology chapter. The goal of this project was to provide the Danish Centre for Technical Aids for Rehabilitation and Education with a comprehensive evaluation tool that they could use to evaluate the existing software packages on the market. In the following sections, a description of the software evaluation tool that we created to accomplish this goal is provided.

Our tool is a Software Evaluation Template, consisting of three parts, all of which are to be filled out by a software evaluator. Part One is the Brief Overview section, where a description of the function and goals of the software is provided along with a few essential bits of information about the product. The description in this section is very general and meant to be easily understood by a person with limited experience with computers and software. See section 5.1 for a detailed description of the Brief Overview as well as the rationale behind the selection of its components.

The next section of our Software Evaluation Template, Part Two, is the Detailed Analysis. In order to fill out this section, the software evaluator must conduct a very detailed examination of the software and answer all of the applicable questions. A completed Detailed Analysis will be an in-depth explanation of every aspect of the piece of software being evaluated. This analysis is for use by professionals in the field of assistive technology, or others who are familiar with software and its features. There are also instructions that were created to guide the software evaluators in their use of the software evaluation template. See section 5.2 for a detailed description of the Detailed Analysis and the accompanying instructions as well as the rationale behind the selection of their components.

The final section of our Software Evaluation Template is Part Three, the Scoring System, is a way to assign numerical values to the most important features of a piece of software. The purpose of assigning these values is to have a means of quantitative comparison between the different software packages available. This section is for use by professionals and any potential users who are looking for a simple way to discover the level of quality within the software. See section 5.4 for a detailed description of the Scoring System as well as the rationale behind the selection of its components.

A description of the electronic version of our Software Evaluation Template can be found in Chapter Six. Also found within this chapter is an explanation of the methods used in the creation of this version.

50

#### 5.1 Justification of Brief Overview

#### 1.1 PRODUCT NAME

JUSTIFICATION: This item is obviously important, as it lets the reader know immediately what software product is being evaluated.

#### 1.2 TYPE

REFERENCES: Appendix S – Types of Assistive Technology Appendix G – Focus Group of Stig Carlsen, Ole Wriedt, Er...

JUSTIFICATION: Though still in the formative stage, the Danish Centre in Århus is working on a classification system for assistive software products. They are attempting to assign a "type" to each product as a way to categorize them. These types have also been identified by other organizations; see Appendix S for a definition of the most commonly assigned types of assistive technology. Also, the Centre's website has a type classification for many of the products that are currently in the online database. That is why it was considered important to include this item in the Brief Overview.

#### 1.3 MANUFACTURER

JUSTIFICATION: The reader of the evaluation at some point needs to know who produced the software, so they know where to get it if they decide that they like it. Our debate was whether or not this item fit into the Brief Overview section. The deciding factor was brand name association, which means that a user could already like or dislike a particular software manufacturer. This would be important information for some people to know, and thus we included it in this section. It was also in many of the software reviews we came across.

#### **1.4 OPERATING SYSTEM(S)**

REFERENCES: Appendix N – OS Specific Assistive Software Creation Guide... "Digital chaperones for kids". Consumer Reports. March 2... Appendix E,F,G – Interviews and Focus Group in Århus

JUSTIFICATION: If a potential user wishes to use the software, he must be able to install it on a computer that is available to him. If the software product cannot operate on the operating system(s) that his computer uses, it is useless to him. Information on the operating system(s) used by a software product was found on virtually every software review and evaluation that we examined. Also, each operating system has its own guidelines on creating assistive software (see Appendix N). These differences in OS standards could determine whether or not the software will work with other software products that a potential user may already have. That is why this item was included in the Brief Overview, and our interviewees in Århus agreed.

#### **1.5 LANGUAGE OPTIONS**

REFERENCES: Appendix F – Double Interview with Trine Bjerre and Thom...

#### Centre Liaison – Niels Erik Mathiassen

JUSTIFICATION: Yet another item that was highly debated in this section. We felt that language options are an important factor when a reader is determining whether he will be able to use the product or not. However, there was an argument made by Trine Bjerre, a Danish Centre employee in Århus (see Appendix F), that the only software that would be evaluated at the Centre would be software in Danish. Keeping in mind our goal of a general evaluation template for all software, this item was included, as software is produced in many different languages.

#### 1.6 PRICING (AND LISCENSING) INFO

REFERENCES: Appendix G – Focus Group of Stig Carlsen, Ole Wriedt, Er... "Swedish Handicap Institute". http://www.hi.se/english/de...

JUSTIFICATION: The price of a product is often a determining factor in the purchasing of a software product. Though it might not be of concern if a disabled person needs a piece of software, especially in Denmark where necessary assistive devices are paid for by the government (Swedish), we felt it would still be important to most people. The evaluator can also include licensing and subscription information (recommended by Stig Carlsen) here that would be helpful when purchasing the software for large groups of people.

#### 1.7 DATE OF EVALUATION

REFERENCES: Appendix G – Focus Group of Stig Carlsen, Ole Wriedt, Er...

JUSTIFICATION: An important factor that was neglected in the early versions of our Software Evaluation Template, the Date, was added in the final version. During our focus group in Århus (see Appendix G) it was mentioned that a state-of-the-art software product today, could very well become antiquated within a few years. It is for this reason that we put the date of the evaluation as an item on the Brief Overview so that the user has a good understanding of what an evaluator's perspective might have been at the time of the evaluation. It is also important because of ever improving speed and functionality of computer hardware, which highly affects the operation of software.

#### 1.8 WHAT IS THE OBJECTIVE OF THIS SOFTWARE?

REFERENCES: "National Institute on Disability and Rehabilitation Researc... "Swedish Handicap Institute". http://www.hi.se/english/de... Church, Gregory. The Handbook of Assistive Technology. S... "Digital chaperones for kids". Consumer Reports. March 2... Appendix D, E, F, G, H – Interviews and Focus Group in Den...

JUSTIFICATION: This is the most important item on the Brief Overview. Information on the objective of the software product is crucial in determining whether or not the reader will continue reading the evaluation. If the reader does not know the objective of the software, he will not know if it will be of any use to him at all. This fact was mentioned time and again in the resources mentioned above and was reiterated during every interview we conducted within Denmark.

#### 1.9 & 1.10 PROS & CONS

REFERENCES: "Zone Alarm Pro 3.0". ZDNet UK Reviews. http://www.zdn... Appendix G – Focus Group of Stig Carlsen, Ole Wriedt, Er...

JUSTIFICATION: These two items are grouped together in this justification because they are so closely related. By providing some pros of the software the evaluator can point out to the reader the aspects of the software that he finds good. Conversely, in the cons section, he can point out the bad aspects of the software to the reader. This idea of pros and cons was taken from ZDNet's UK review site (Zone). It was then found on multiple other sites where the results of simple reviews could be viewed.

#### 1.11 JUDGEMENT

REFERENCES: "Zone Alarm Pro 3.0". ZDNet UK Reviews. http://www.zdn...

JUSTIFICATION: This item was also taken from ZDNet Reviews, only the name was changed from verdict to judgement (Zone). This item gives the evaluator a chance to state his opinion on the overall quality of the software and its usefulness in a very subjective manner. The word verdict was replaced with judgement at the suggestion of the participants of our focus group (see Appendix G).

#### 1.12 OVERALL SCORE

REFERENCES: "Zone Alarm Pro 3.0". ZDNet UK Reviews. http://www.zdn... Centre Liaison – Niels Erik Mathiassen

JUSTIFICATION: By far the most controversial element of our Brief Overview. As for the inclusion in the Brief Overview, it was at the request of Niels Erik, our liaison an the Danish Centre. It is included in this section to give the reader a quick insight into the general quality of the software product as determined by our Scoring System. More detailed justification for the creation of the overall score can be found in the section on Scoring System justifications.

#### **5.2 Justification of Detailed Analysis**

#### 2.1 What are the system requirements?

JUSTIFICATION: System requirements are crucial as some software packages can work only on certain platforms and require the computer to have certain features. The user needs to make sure that all the system requirements are met before even looking into other features of the software. If these are not taken into account, the software might not function properly or might not accomplish the desired goals efficiently. Following aspects of system requirements were included in the final template:

Operating System: list the operating systems that the software is compatible with Processor Speed: what is the minimum processor speed required for normal operation of the software

RAM: minimum amount of RAM required for normal operation of the software Hard Disk Space: space required for installation and operation of the software Video/Sound Card: required type of card Internet Connection: what minimum speed, if any, Internet connection is needed Additional Software: other programs required to achieve the objectives of the software Additional Hardware: other accessories required to use the software Special Requirements: any other requirements for normal operation

JUSTIFICATION: We decided to include these particular system requirements after doing some research on which system requirements specifications are critical for proper functioning of a software package. Our focus group (See Appendix G) participants also agreed upon including these essential elements. The "minimum resolution required for the video card" was also suggested to be included as part of this question by Stig Carlsen, one of the participants of the focus group. Considering the fact that most of the modern computers come with resolutions that are compatible with most software packages, we decided not to include it. If absolutely needed, it can be described as a special requirement.

#### 2.2 What language options are included in this software?

# List any languages (e.g. English, Danish, German) that can be used as output and/or input by the software. Describe the extent to which each of these languages is employed within the software.

JUSTIFICATION: Language options were included because language is an important factor in deciding whether or not the software is meant for a particular user. Although Trine Bjerre (See Appendix F) suggested that it wasn't important for the Centre's publications, because they only publish software available in Danish, there are other advantages of including it. The editors of the publication can decide on whether or not to publish software evaluation based on which language it is available in. It will also be helpful for the users to be aware of any other language options that might be available in the software package.

2.3 What skills are needed to install, set up, start, and use the software?

Describe all the tasks that a user would need to be able to do in order to install, set up, start, and use the software. Be sure to indicate which category each task is applicable to. Please mention if professional help is needed and how often does the user need a professional's help to get familiarized with proper functioning of software.

e.g. installation requires the user to change hardware settings on the computer

JUSTIFICATION: In order to ensure proper installation and working of the software, it is important to know what kind of skill levels are required to use it. The users need to know if they are capable of getting the software to work properly. Informing the user of the advanced computer skills required to install, set up or use the software might save him from spending money on incomprehensible and complex products. Ole Wriedt (see Appendix G) from the focus group also mentioned that some software packages require professional help and this help might have to be extended over a period of time. Therefore, we added that as one of the elements that should be mentioned while answering this question.

2.4 What type of environment is this software intended to be used in or suited for? Where is the software supposed to be used?
e.g. office, home, public library, hospital, school
What type of computer is it intended to be used on?
e.g. Personal Computer, laptop, onboard computer
Is the software designed to be used for training/education?
Are there any other special environmental needs of the software?
e.g. minimal background noise required for voice recognition
Is it meant to be used by a single person or by a group of people?

JUSTIFICATION: Different software packages are meant to be used in different environments. The same software can prove to be the best for office work but it could be of no use if used at home. One software product might be meant to be used in a group setting while another product might be good only for individual user. Being aware of the environment is, therefore, a key factor when software is being bought for a specific purpose. This was also agreed upon by our focus group as well as our interviewee Trygve Andersen (see Appendices F and G)

#### 2.5 What types of input and output does this software use? List the media used by the software to receive information. e.g. speech, typing, motion, touch List the media used by the software to provide information. e.g. visual, auditory, tactile, electrical signal

JUSTIFICATION: When evaluating assistive software, whose intended purpose is assisting the disabled, it is extremely important to find out the different input and output methods used for user-software interaction. This helps identify if the software is appropriate and accessible for a person with a certain disability. Therefore, this factor plays a key role in the software selection process.

#### 2.6 What other types of software / hardware can this software interact with? List the devices used by the software to receive information. e.g. keyboard, mouse, joystick, scanner, touch pad, motion sensors, microphone List the devices used by the software to provide information.

#### e.g. speakers, monitor, printer List the additional software that can be used in conjunction with this software. e.g. word processors, email clients, web browsers

JUSTIFICATION: In addition to knowledge of media of interaction, it is also important that the user knows about different input and output devices that he needs. If these devices are critical to proper functioning of the software, the user should be aware of the fact that he needs to purchase them along with the software, if need be.

#### 2.7 How does the user interact with the software?

Describe here, in general, how the users access and utilize the features of the software. It should be a brief overview to provide potential users with a general idea of the procedures used to communicate with the software. If applicable, mention what role the input and output devices as well as the other software and hardware play in this user-software interaction.

e.g. to use an email program, the user provides the program with the name, address and information to be sent to a recipient using a keyboard or a microphone in conjunction with voice recognition software. The software then sends the information across the Internet to the recipient. The software then provides the user with a text and/or audible message confirming that the message has been sent, using either the monitor and/or speakers.

JUSTIFICATION: The answer to this question describes the functionality of the software. During our interview with Trine Bjerre and Thomas Lyhne (see Appendix F), it was brought up that functionality was one of the most important features of a software evaluation published in the Danish Centre's magazine HIT. They described the Detailed Template as being too technical for HIT's readers but liked the Brief Overview section of the evaluation template. We considered their idea of making functionality a part of the Brief Overview but decided to include it in this part of the template, because adding functionality would make the Brief Overview too long, which would defy the purpose of that section of the template. The editors of the magazine can, however, use the Brief Overview along with this question to create a complete review of the product. This is also a crucial element for the user to know as he can go through and compare functionalities of different products, which would help him decide which product is best suited for him.

#### 2.8 If possible, how can the user customize the software to adjust to his needs?

What aspects of the program may be changed by the user, if any, and how much modification is allowed in each of these aspects.

#### e.g. the size text is displayed on the Internet may be enlarged or shrunk within Internet Explorer with the largest size being twice that of the smallest text

JUSTIFICATION: Since assistive software is used by people with different kinds and extents of disabilities, customization is an important aspect that the software needs to have so that it can be adjusted to the needs of the disabled person. We added this question after it was brought up in our interview with Trygve Andersen (see Appendix E)

#### 2.9 Are the on-screen (or voice) instructions easy to follow?

Qualitative assessment of the ease of use of instructions included throughout the software.

JUSTIFICATION: If the instructions are hard to understand, novice users might have to struggle in order to follow the steps needed to set up or operate the software. The evaluation of software should give the user an idea of clarity and ease of use of instructions.

#### 2.10 Describe the design of the user interface.

Describe, in general, the layout of the user interface provided in the software. Are the features easily accessible through this interface? Are they clearly labeled with appropriate size, color and font? If applicable, describe the accessibility of features through an audible interface.

JUSTIFICATION: User interface is one of the most important aspects of design for software. The user does not need to deal with the complexity of inner workings of the software but a good interface plays a significant role in maintaining user's interest in it. This question was initially designed to describe the organization of the menus in a software package but our focus group (see Appendix G) brought up the point that some software programs do not have any menus. This led us to ask the evaluator about the overall interface.

#### 2.11 What forms of help are built into the software program? Describe the available forms of help that are included in the software program e.g. pop up text explanation when you hover over an item with a pointer, a help index directing the user to appropriate resource

JUSTIFICATION: At some point almost every user, beginner or professional, needs to depend on help to carry out some operations of the software. If the user knows about the skills required to use the software and identifies that some help might be needed to use the software, it should be made known to him what kind of help is available in the software package. This will also assist the user in deciding whether professional assistance is needed or not for using the software package.

#### 2.12 What forms of help are available outside the software program?

Describe any forms of help that are available for the software but not built into the software.

#### e.g. online help, customer support line, instructions manual

JUSTIFICATION: If a user has exhausted all the help resources built into the software package and is still having trouble solving some of the problems, there should be a reliable source of help available outside of the software. An evaluation must reveal the help resources available for the software, if the user needs some help in troubleshooting.

#### 2.13 What aspects of the software consume the majority of the user's time?

Note: Please answer the questions below keeping in mind speed of the computer being used and the system requirements of the software.

How much time does the software take to download/install? How much time does it take to load every time the program is started? How much waiting time is involved for the software to perform an action. Are there any unnecessary/redundant menu items that have to be gone through to access

certain features? Does the software ask any unnecessary/trivial questions while accessing different features?

# Overall, please describe if it is worth spending time to get the software to work? Is actual use of the software significant enough to spend time in going through the process of getting familiar with the software?

JUSTIFICATION: Tryge Anderson (Appendix E) brought up a noteworthy point that some software packages take more time to download, install, set up and become familiar with than to perform the operation that they are meant to be used for. Therefore, it is important for the user to know if it is worth their time to go through these procedures. In addition to this, using software can be very annoying when the user is asked redundant questions or is provided with irrelevant or obvious information, which is only a waste of time. Our liaison also emphasized the inclusion of this aspect in an evaluation.

## 2.14 Are there any technical problems in running this software? If so, how severe are the errors and how complicated are the solutions?

If any errors were encountered within the program, what are they and what did they do? If the problem could be solved how complicated was it, and was any technical assistance required to do so?

> e.g. a pop-up window stating that an operation cannot be run can either be closed and use of the software continues, or it could close the program whenever this operation is run

JUSTIFICATION: Nobody likes to use a software package that comes with unavoidable errors that hinder normal operation of the software or just annoy the user. The severity of these errors needs to be brought to the user's attention. If the use of software is significant enough, the user may be willing to deal with the errors. The issue of annoyance of errors was also brought up in our focus group by Stig Carlsen (Appendix G).

#### 2.15 What is the process for updating / maintaining this software?

How often are the updates provided for this software and how crucial is the timely installation of these updates? Is the user notified of any new updates that are important for proper functioning of software? How complicated is the process of updating the software? How frequently must routine maintenance be performed (e.g. running a scan disk) and how complicated is the maintenance process?

> e.g. Windows updates are available on the Microsoft website and are easy to download but the updates are not necessary to continue proper functioning of the current software.

JUSTIFICATION: Updates could be necessary for some software packages and, in some cases, they might enhance the functionality and efficiency of the current software. The value of software could decline if it is not upgraded or maintained as recommended by the manufacturer. It is essential that the user be notified of the updates and maintenance procedures.

#### 2.16 What are the safety / security issues related to this software?

Describe any potential hazards (physical or mental) to the user and any steps that the software manufacturers have taken to avoid these potential hazards (e.g. software is used to control a door but frequently closes and opens the door accidentally). List any flaws in the security of the software (e.g. can be easily broken into by unauthorized users). Are there security

### measures in place to keep the software safe from malicious users? Are there any features included to prevent data loss in case of any system failure that could occur?

JUSTIFICATION: If there is a likelihood of the user being endangered by the use of software, an evaluation should describe the severity of any such potential hazards. Security is an issue, in particular, for web based software products. It is important that a secure connection be provided during the use of software or at least the user be made aware of any potential weaknesses in the system.

#### 2.17 Describe the usefulness of the software. How well does the software perform its intended operation? Does the end result of the program justify the time taken to learn its use? e.g. voice recognition software that takes six hours to train, and still has a large amount of corrections that must be made is not very useful.

JUSTIFICATION: Some software packages might accomplish their intended goals adeptly and accurately but could prove to be worthless. A good evaluation should not only describe the objectives of the piece of software in consideration but it should also portray the potential uses of the product. This also helps in deciding whether the software is worth paying the price for.

1.1.1

#### 5.3 Justification for Scoring System

There is an "N/A" included for all items that might not apply specifically to certain types of software but are very important aspects of most software products. In these certain types, there is a parallel rating for the equivalent aspect in that product. For instance, a program might not use visuals, so you would only rate the audio in this case. These N/As do not factor into the overall score.

#### EASE OF OPERATION

## 3.1 The skills required to operate this program fall into the target end-user's developmental range.

REFERENCES: Vanderheiden, Gregg C. Ph.D. <u>Application Software...</u>

JUSTIFICATION: The wording used in the Application Software Design Guidelines was "software should minimalize the skills and abilities needed for use" (Vanderheiden). However, we must remember that our aim is to keep our Software Evaluation Template general and not all software is supposed to be simple. There are some very good software products for the disabled that require a high level of competence to use.

#### 3.2 The software can be started before each use with minimal wasted effort.

#### REFERENCES: Microsoft Windows Guidelines for Accessible Software De...

JUSTIFICATION: It is important that a user be able to start the software without having to go through too many unnecessary steps. If he has to waste all of his time starting the program every time, it becomes less effective. "A good software package should load automatically", says Microsoft.

#### 3.3 This software package can be used effectively by a layman.

REFERENCES: Appendix G – Focus Group of Stig Carlsen, Ole Wriedt, Er...

JUSTIFICATION: Many software programs can be used in some fashion by just about anyone, but a good software program in the eyes of the participants of our focus group (see Appendix G), can be used effectively by a person with limited knowledge of computers or some form of disability.

#### INSTALLATION/SETUP

#### 3.4 This software package can be installed with ease.

REFERENCES: Appendix G – Focus Group of Stig Carlsen, Ole Wriedt, Er... Software Evaluation Instrument http://www.pwcs.edu/i-tec... JUSTIFICATION: Easy installation is a very convenient aspect of a software product. If the software cannot be installed easily, the installer may get frustrated and give up. "It must be made clear though that the intended installer is not always the end user" (Focus Group). Some software will be directly accessible and some software will be compatible (see Appendix T), meaning that a disabled person or a professional might be the one installing the software. This is a tricky question to rate, but we feel that it has been phrased in such a way as to eliminate any ambiguities.

#### 3.5 Hardware associated with this program requires little effort to set up. N/A

REFERENCES: Software Evaluation Instrument http://www.pwcs.edu/i-tec...

JUSTIFICATION: First, there is an "N/A" rating on this item due to the fact that there may not be any hardware associated with a particular piece of software. Second, this item was included because a large part of the setup for many of the assistive software packages is the setup of hardware. If we wish to provide an accurate rating of the installation and setup, this question must be included in the scoring system.

#### 3.6 Training required by this software is uncomplicated. N/A

REFERENCES: Appendix G – Focus Group of Stig Carlsen, Ole Wriedt, Er... Appendix K – Critique of Dragon Naturally Speaking Review

JUSTIFICATION: Our focus group pointed out that many of the software products they require need to be trained in one way or another. An example is the popular voice to text software, Dragon Naturally Speaking, which must first learn the user's voice and vocabulary before it will work effectively.

#### 3.7 Software can be installed and set up with minimum redundancy and wasted time.

REFERENCES: Appendix G – Focus Group of Stig Carlsen, Ole Wriedt, Er...

JUSTIFICATION: Similar in reason to the hardware setup, any unnecessary lengthy installation of the software detracts from the appeal of the product to most users. The participants of the focus group (see Appendix G) liked this item, as they found it something that was commonly commented upon in software reviews.

#### **INPUT QUALITY**

#### 3.8 The input methods are relevant and efficient.

REFERENCES:Appendix P – Principles of Accessible Software, by IBM<br/>Vanderheiden, Gregg C. Ph.D. <u>Application Software...</u><br/>Yakal, Kathy. "Tax Software 2001 Style: Better, S...

JUSTIFICATION: Taken from the IBM Principles of Accessible Software (Appendix P) and a review by PC Magazine, this item rates the overall methods of input. This is important, as the complexity of some input devices and programs can be very high at times and sometimes

unnecessarily so. Gregg Vanderheiden also comments on the relevance of input methods. Taking the example of IBM, an industry leader, we included this item in our scoring system.

#### 3.9 Redundant or accidental inputs by the user are well compensated for. N/A

REFERENCES: Vanderheiden, Gregg C. Ph.D. <u>Application Software...</u>

JUSTIFICATION: In many cases, particularly with disabled users, keys may be pressed or held down for too long. It is a good quality of a software product to be able to differentiate between purposeful and accidental inputs. This idea was taken from the Application Software Design Guidelines.

#### 3.10 This program provides keyboard access to all dialogues, menus and tools. N/A

 REFERENCES:
 Appendix P – Principles of Accessible Software, by IBM

 Vanderheiden, Gregg C.
 Ph.D.
 Application Software...

 Nordic Guidelines for Computer Accessibility.
 Second Edit...

 Microsoft Windows Guidelines for Accessible Software De...

JUSTIFICATION: All of the sources above mention keyboard accessibility of all features as an important part of any software product that is used by the disabled.

#### 3.11 Input from hardware devices is accurate.

*N/A* 

JUSTIFICATION: This item is a simple rating of the accuracy of the input. If the inputs are erroneous, then the software will not function as intended.

#### **OUTPUT QUALITY**

#### 3.12 The colors in this program are appropriately chosen.

REFERENCES:Vanderheiden, Gregg C. Ph.D. <u>Application Software...</u><br/><u>Macintosh Human Interface Guidelines</u>. 29 July 1996. A...<br/>Appendix R – IBM Software Accessibility Checklist<br/>"Colorfields". <u>http://www.colorfield.com</u>

JUSTIFICATION: "If colors are used to represent information, they must be clearly distinguishable" (App Guide 12). This is just one of the considerations when rating this item. If the colors detract from the main focus of the software, then the product becomes less effective. The colorfields website and the Macintosh Human Interface Guidelines both identify the choice of "visually appropriate" colors for the needs of the user as an important part of software functionality.

#### 3.13 Warnings, alerts and important messages are easy to read in the time that they are visible.

REFERENCES:Vanderheiden, Gregg C. Ph.D. <u>Application Software...</u>Appendix G – Focus Group of Stig Carlsen, Ole Wriedt, Er...

JUSTIFICATION: For any user, it is important to have adequate time to see any important messages that are displayed by the software. That is why we included this item in our Scoring System. The wording of this was taken from the Application Software Design Guidelines, and we got many positive comments from the focus group participants and others on this item.

#### 3.14 The software can operate effectively over a wide variety of screen resolutions.

REFERENCES:Appendix G – Focus Group of Stig Carlsen, Ole Wriedt, Er...Macintosh Human Interface Guidelines. 29 July 1996. A...

JUSTIFICATION: This item was included as a direct result of a suggestion of one of the members of our focus group, Stig Carlsen. He mentioned that some software products would operate poorly at different screen resolutions, or sometimes not operate at all.

#### 3.15 Information provided audibly is presented in visual format as well. N/A

 REFERENCES:
 Vanderheiden, Gregg C. Ph.D. <u>Application Software...</u>

 <u>REQUIREMENTS FOR ACCESSIBLE SOFTWARE DES...</u>

 <u>Nordic Guidelines for Computer Accessibility</u>. Second Edit...

 Appendix Q – IBM's Assistive Technology Overview

JUSTIFICATION: Once again the wording of this item was taken from the Application Software Design Guidelines (Vanderheiden 18) though the idea was present in several other sources we reviewed. It is important for many users that the software "provides a visual cue for all audio alerts" (Requirements 1). This idea of output redundancy will also apply to the justification for item 3.16. The Macintosh Human Interaction Guide also states specifically "software should never rely only on sound to provide information."

3.16 The visual outputs have adequate accompanying text.

*N/A* 

<b>REFERENCES:</b>	Microsoft Windows Guidelines for Accessible Software De
	Nordic Guidelines for Computer Accessibility. Second Edit
	Appendix O – "Everyone Needs Accessibility". IBM Inc
	Appendix R – IBM Software Accessibility Checklist
	Appendix Q – IBM Assistive Technology Overview

JUSTIFICATION: Alternative text is required for all images in order to comply with the global HTML standards (see Appendix O). An entire chapter is devoted to the design of text equivalents for visuals in Microsoft's Guidelines for Accessible Software Design. Obviously, this is an important aspect of assistive software and thus it was included in our Scoring System.

3.17 The output methods are meaningful and effective. N/A

REFERENCES:Appendix P – Principles of Accessible Software, by IBM<br/>Vanderheiden, Gregg C. Ph.D. <u>Application Software...</u>

JUSTIFICATION: Much the same as item 3.8, output methods are also important to functionality of a software product. Once again referring IBM (Appendix P) and the Application Software

Design Guidelines, we determined that this item was important and should be included in our Scoring System.

#### 3.18 The visuals are appealing.

REFERENCES: "Courseware Criteria". Southern Regional Education Board... "Evaluation Standards for Learning Materials". Multimedia

JUSTIFICATION: This item is appropriate for our Scoring System because aesthetic value is one of the things that many user's look for when they are choosing which product they like the best. In the references above, the evaluation of course software includes this quality as well.

#### 3.19 The audio is understandable.

N/A

NIA

REFERENCES:"Courseware Criteria". Southern Regional Education Board...Macintosh Human Interface Guidelines. 29 July 1996. A...Appendix G – Focus Group of Stig Carlsen, Ole Wriedt, Er...

JUSTIFICATION: Along the same lines as item 3.18, it is important that the quality of the audio be good as well as the quality of the visuals. However, the quality of the audio can be broken down into two parts, item 3.19 and 3.20. This item, referenced in the Courseware Criteria and the Macintosh Human Interface Guidelines, is important because users must be able to understand the information in the software program that is being presented to them in audible format. The members of our focus group also agreed that this was a very important aspect of assistive software (see Appendix G). The "N/A" is added to the scoring options for this item because there may not be any audio involved with the software.

#### 3.20 The audio is pleasing to the ear.

N/A

REFERENCES: "Courseware Criteria". Southern Regional Education Board... <u>Macintosh Human Interface Guidelines</u>. 29 July 1996. A... "Evaluation Standards for Learning Materials". Multimedia

JUSTIFICATION: Also referenced in the Courseware Criteria and the Macintosh Human Interface Guidelines is the aesthetic quality of the sound. In item 3.19, the evaluator is asked to rate how effectively the software conveys audio information to the user. Here, they are asked to rate how good the quality of sound is. For example, there may be music in the software that is perfectly understandable, but contains annoying noises or high-pitch noises. In this case, item 3.19 alone would not effectively evaluate the entire aspect of audio in the software package. That is why we have included this item in our Scoring System. Once again, the "N/A" is added to the scoring options here because there may not be any audio involved with the software.

#### **USER INTERFACE**

#### 3.21 This software maintains a consistent predictable layout and behavior.

REFERENCES: Vanderheiden, Gregg C. Ph.D. <u>Application Software...</u>

"Evaluation Standards for Learning Materials". Multimedia Appendix P – Principles of Accessible Software, by IBM

JUSTIFICATION: "It is important for an accessible software package to maintain a consistent, predictable layout and behavior in order to make it easier for people with disabilities to understand how things should operate and what they mean" (Vanderheiden 8). This was the major reason for including this item. However, it was also mentioned in a set of evaluation standards on learning materials by MERLOT (Evaluation) and in IBM's Principles of Accessible Software (see Appendix P).

#### 3.22 The user interface is simple to navigate for the target end-user.

REFERENCES: Appendix G – Focus Group of Stig Carlsen, Ole Wriedt, Er... Microsoft Windows Guidelines for Accessible Software De...

JUSTIFICATION: In earlier versions of the Scoring System, this item was labeled "menus are simple to navigate", but the participants of our focus group reminded us that not all programs have menus and we adapted the question. This was done keeping in mind our goal of making a general software evaluation template that would be applicable to all assistive software. It is important that the user be able to navigate the software in order to use it to its fullest potential. Microsoft agrees on this point and has dedicated a section of its software design guidelines to the creation of a disability-friendly user interface.

#### 3.23 The command items and buttons have logical names and/or icons. N/A

REFERENCES: Vanderheiden, Gregg C. Ph.D. <u>Application Software...</u>

JUSTIFICATION: It is important that any buttons, menu items, or any form of command be logically named or have a graphic that accurately represents it. For users that are not familiar with the software yet, these names and icons would be the only way for them to figure out where they want to go next in the program without consulting the instruction manual or an assistant. This item was also mentioned in the Application Software Design Guidelines (Vanderheiden 16).

#### 3.24 The features can be accessed with no unnecessary work.

REFERENCES: Appendix G – Focus Group of Stig Carlsen, Ole Wriedt, Er... "Software Review Process". Transylvania County School...

JUSTIFICATION: This item came up in one of our brainstorming sections, and when some research was done on it we found the concept to be in many credible sources. In earlier versions of the Scoring System, this item was labeled "menus are organized effectively", but the participants of our focus group reminded us that not all programs have menus and we adapted the question. We also found a similarly worded item in a software review template by the Transylvania County School System (Software). If the user interface is well organized, the user can spend less time and work getting to the features they need and more time using those features.

#### 3.25 The meaning of visuals is consistent throughout the interface.

#### REFERENCES: "Evaluation Standards for Learning Materials". Multimedia

JUSTIFICATION: It can be very confusing for a user if the same graphic or symbol is used to represent different things in different parts of the user interface. We felt it was important to include this item, for many of the same reasons as item 3.24. If the names are both logical and consistent throughout the user interface, a user should have no trouble navigating his way through the software. That is why we included this item in our Scoring System. The wording for this item was taken from MERLOT (Evaluation).

#### 3.26 The software provides full access to all aspects of the program from the keyboard.

#### REFERENCES: Appendix R – IBM Software Accessibility Checklist Vanderheiden, Gregg C. Ph.D. <u>Application Software...</u> <u>Nordic Guidelines for Computer Accessibility</u>. Second Edit...

JUSTIFICATION: Only upon the review of a large number of sources that cited this item as an important aspect of assistive software did we decide to include it in our Scoring System. Sources such as IBM, Vanderheiden and the Nordic Cooperation on Disabilities all cite this item specifically. That is why it is included in our Scoring System. They state that keyboard accessibility to all features will allow disabled users to access them using various forms of alternative inputs that simulate keyboard inputs (Vanderheiden 14).

#### 3.27 An easy method is available to select any desired window and bring it to the front.

REFERENCES: Vanderheiden, Gregg C. Ph.D. <u>Application Software...</u>

JUSTIFICATION: The Application Software Design Guidelines mentioned this item as an important aspect of a software product (Vanderheiden 16). This is a good method to include in a software program because there are many times when unwanted windows may appear on top of the window the user wishes to access, and if there is no easy way to get to the desired window, then he can become frustrated with the interface.

#### 3.28 There is adequate direct access to palettes and toolbars.

#### REFERENCES: Vanderheiden, Gregg C. Ph.D. <u>Application Software...</u>

JUSTIFICATION: Yet another idea taken from Vanderheiden's Guidelines (Vanderheiden 16). If the user does not have direct access to these toolbars then any repetitive tasks that need to be completed could become very arduous. However, if the user has short-cut keys or some form of direct link to the toolbar, he will have no problem in quickly using any of the tools available in the software.

#### **CUSTOMIZATION**

#### 3.29 The user has a wide range of volume control within the program.

REFERENCES:REQUIREMENTS FOR ACCESSIBLE SOFTWARE DES...<br/>Appendix R – IBM Software Accessibility Checklist<br/>"Software Review Process". Transylvania County School...<br/>Vanderheiden, Gregg C. Ph.D. <u>Application Software...</u>

JUSTIFICATION: Volume control is an important aspect of the software as each individual user has a volume level that he prefers. In some cases, an individual may require a certain volume level in order to hear the audio output from the software at all. IBM (see Appendix R, item 3.3) and the US Department of Education (Requirements 2) say it is important that a program allow the user to adjust the volume level. The Application Software Design Guidelines (Vanderheiden 18) cite the adjustability of volume as important as well.

#### 3.30 The form in which text is presented can be easily modified.

# REFERENCES:Vanderheiden, Gregg C. Ph.D. <u>Application Software...</u><br/><u>Macintosh Human Interface Guidelines</u>. 29 July 1996. A...<br/><u>Nordic Guidelines for Computer Accessibility</u>. Second Edit...

JUSTIFICATION: If a user has sight impairment, or simply wishes to view the text associated with the program in a different manner, it should be possible for him to do so without much added effort. Vanderheiden mentions the ability to change the size of the text as a guideline when creating accessible software (Vanderheiden 17), but there are also other forms in which the text may be presented. If the user is blind, he may want the text to be relayed to him through a brail system or some other format. This item is important to software that is meant to be accessible to everyone. The Macintosh Human Interface Guidelines and the Nordic Guidelines for Computer Accessibility also mention customization of text output as one of their guidelines.

#### 3.31 A convenient system is provided to save the user's personal data.

JUSTIFICATION: This item is important because many users will wish to save some form of data in the software programs that they use. Whether it is high scores in a game, their vocabulary for a speech-to-text program, or any other form of data, some form of data is usually saved. If the software is to be considered good, it must have a convenient system in place for saving the user's personal data.

#### 3.32 Customization of the software functions is easy to do.

REFERENCES: Nordic Guidelines for Computer Accessibility. Second Edit...

JUSTIFICATION: If it is hard to customize the software, then all of the customization features included lose much of their appeal to the user.

#### 3.33 The program settings can be changed without difficulty.

REFERENCES: Nordic Guidelines for Computer Accessibility. Second Edit...

JUSTIFICATION: The term "program settings" covers a wide variety of settings that can be changed within a software program. These range from window size options to menu customization and are one of the major ways a user customizes his software. If these are easy to change, a user will be able to have a product that best suits his current needs. The Nordic Guidelines for Computer Accessibility mention customization as a key aspect of software.

#### 3.34 The software can be trained to perform new tasks with little effort.

REFERENCES: Appendix E - Interview with Trygve Andersen

JUSTIFICATION: The idea for this item was given to us by Trygve Andersen in our interview in Århus (see Appendix E). He mentioned that an important aspect of assistive software is the ability to train it to perform new tasks or modify the current tasks. An example he gave was a teaching program that had a certain number of lessons included, but eventually more needed to be added in order to continue the use of the software.

#### <u>HELP</u>

#### 3.35 The documentation provided with the software is of a high quality.

JUSTIFICATION: It is important to have a good set of instructions that go with the software package so the user is able to operate a software program that he is unfamiliar with.

#### 3.36 The training materials included with this software are adequate.

#### REFERENCES: Appendix E - Interview with Trygve Andersen

JUSTIFICATION: This item was derived from an idea given to us in our interview with Trygve Andersen (see Appendix E). It is important that any professional who may be helping a disabled person train to use a program be provided with adequate materials to do so in an effective manner.

#### 3.37 There is adequate assistance for a user who has troubles with this software.

JUSTIFICATION: If the user runs into some form of trouble while using the software product, it is important that he has adequate assistance in alleviating that trouble. If there is not adequate help available, even a problem that might be very simple to solve could leave the user confused and lost.

#### 3.38 The available help resources can be accessed quickly and directly.

JUSTIFICATION: Often there is a time dependency when a user is operating software. If he only has an hour long class, for example, help must be accessed quickly in order to have enough time to get some functional use out of the software.

#### TECHNICAL PERFORMANCE

#### 3.39 This software program meets any applicable legal obligations.

REFERENCES: Appendix O – Everyone Needs Accessibility, by IBM Inc...

JUSTIFICATION: In Appendix O, there is a series of descriptions of legal standards that are applicable to assistive software products. It is important that a software product meet these standards, both global and local, in order to assure that the user does not get an inadequate product. In our Background Information chapter, there is information on a few of these legal issues, as this is one of the original items that we meant to include in our evaluation system.

#### 3.40 This software program complies with applicable standards.

REFERENCES:Nordic Guidelines for Computer Accessibility. Second Edit...Macintosh Human Interface Guidelines. 29 July 1996. A...Microsoft Windows Guidelines for Accessible Software De...

JUSTIFICATION: All of the sources above mention the use of system standards when creating a software product in order to allow for maximum compatibility with other software programs. Given that many software products are designed to interact with some other form of software (an operating system for example), it is important that these standards are used to increase flexibility of software usage.

#### 3.41 This software program uses system tools whenever possible.

REFERENCES:	Nordic Guidelines for Computer Accessibility. Second Edit
	Vanderheiden, Gregg C. Ph.D. <u>Application Software</u>
	Macintosh Human Interface Guidelines. 29 July 1996. A
	Appendix R – IBM Software Accessibility Checklist
	Microsoft Windows Guidelines for Accessible Software De

JUSTIFICATION: Similar to item 3.45 above, system tools are a way in which to increase the compatibility of software devices. For example, rather than having a software program output directly to the monitor, a program should use the tools included in whichever operating system it is operating on to produce the output. In this way, other programs could use that output in other ways as all programs are handled by the OS. All of the above resources cite the use of system tools as a feature of good software.

#### 3.42 Loading time is acceptable for the size of the program.

JUSTIFICATION: A user must load the program into memory before each usage. The faster this is done, the more time the user can spend operating the software.

#### 3.43 The overall speed of the program is sufficient for the complexity of the software.

REFERENCES: Appendix G – Focus Group of Stig Carlsen, Ole Wriedt, Er...

JUSTIFICATION: The speed of operation of the software is important to many users, especially with the current capabilities of many computer systems. However, the complexity of the software must be taken into consideration when rating its speed. That is why we phrased the question in the manner you see it above. The idea to include the relativity of software speed in our scoring system was brought up in our focus group in Århus.

#### 3.44 There are very few errors present in the software.

JUSTIFICATION: This item allows the evaluator to assess the number of errors that are present in the program. By doing this, the reader of the evaluation can then know how many errors to expect during the operation of this software.

#### 3.45 Any errors present may be fixed with a minimal working knowledge of computers.

JUSTIFICATION: This item qualifies the complexity of the errors that are present in the software program. If a user is unable to correct problems that occur, then the software could become less effective or completely useless.

## 3.46 The software cooperates with special OS access features in the OS and third party access software.

REFERENCES: Appendix T – Types of Accessibility Appendix N – Operating System Specific Software Creat... Vanderheiden, Gregg C. Ph.D. <u>Application Software...</u>

JUSTIFICATION: The term compatible access (see Appendix T) refers to a software product's ability to interact with other assistive technology that a user may already be familiar with. This idea of cooperation with third party software has been included in this item. Also included is the compatibility with operating system specific accessibility features (see Appendix N). The wording of this question was taken from the Application Software Design Guidelines (Vanderheiden 9).

#### SAFETY/SECURITY

# 3.47 There are adequate fail-safes incorporated to prevent the user from being physically harmed or mentally distressed.

JUSTIFICATION: User safety is an important aspect of every product, software or otherwise. This item gives the evaluator a chance to warn the reader of any particularly high levels of danger associated with the software.

#### 3.48 The software has adequate protection against malicious users.

JUSTIFICATION: Software security is becoming an important issue in today's world. There are malicious users on the Internet who can cause serious problems and gain access to sensitive information if adequate safeguards are not included in the software. It is also possible for users who share resources in other ways to gain access to someone's information if the software is not secure.

#### 3.49 There are adequate fail-safes incorporated to protect against data loss.

JUSTIFICATION: Along the same lines as item 3.48, the user's personal data is a valuable thing to him. Loss of data due to a program error, or an error that could have been prevented by a fail-safe can result in the loss of important information and can cause frustration in the user.

#### MAINTENANCE

#### 3.50 Available Technical Support is easy to contact and helpful.

JUSTIFICATION: The downfall of many software products is their technical support line. This item gives the evaluator a chance to rate the technical support associated with the product. When the reader sees this score, he will be able to determine whether or not the technical support will be of any use. While this item is not technically built into the software product, we feel that it should be included in the Scoring System because it is part of the overall package when it is purchased.

#### 3.51 The maintenance costs of this software are reasonable.

JUSTIFICATION: If it is necessary to hire a professional to maintain your software or get frequent and costly repairs to maintain the software, its value to the user could depreciate.

#### 3.52 The subscription is easy to maintain.

REFERENCES: Appendix G – Focus Group of Stig Carlsen, Ole Wriedt, Er...

JUSTIFICATION: Stig Carlsen gave us the idea for this item in our focus group (see Appendix G). This item was included because subscriptions to software are becoming increasingly common in today's market and could be a factor in determining the value of the software to certain users.

#### 3.53 The updates are easily available and accessible to all users.

JUSTIFICATION: The updates do not do a user any good if he cannot access them. This item gives the evaluator a chance to relay information about the accessibility and availability of updates to the reader of the results of his evaluation.
# 3.54 There is adequate and timely notification of new updates.

JUSTIFICATION: Along the same lines as item 3.53, the updates also do a user no good if he does not know about them. A program like Windows that has automatic notification of updates would get the highest score in this category, while a program that gave no notice at any location about the new updates would receive the lowest score. We feel this is an important item and sufficiently different from the other items to be included in our Scoring System.

# 3.55 Once the user has an update, it is easy to install and apply it.

JUSTIFICATION: Also along the same lines as item 3.53 and 3.54, the update does not do any good for a user if he cannot figure out how to apply it. These three items are all essential in maintaining a current software product in today's ever-changing technology market.

# 3.56 The software updates are necessary.

JUSTIFICATION: This item is included in conjunction with the 3.53, 3.54 and 3.55, and will allow the evaluator to assign a score to the usefulness of the updates of the software. A software update that does not change the operation of the program is of no use to any user.

### 5.4 Exclusions

From the very beginning of our project, the most important point to be considered was how general or specific the evaluation template should be. The specifications provided by Niels-Erik indicated that the evaluation template needs to be designed so that the basic features of all software products can be evaluated regardless of the function or type of the software. He also specified that the questions in the template should be applicable to every software program. As more information was collected about the different elements of software products that need to be considered in evaluations, it became evident that adding aspects related to specific software products will only result in an excessively large template. There is a wide range of products available and they all have countless special features that would need to be evaluated in a product specific template. Therefore, we designed our template with a broad range of products in mind so that it could be used to evaluate important aspects of all software in a thorough manner. When this template was presented to the Centre's employees, some of them expressed concern that the template was too general (see Appendices E, F, and G). Since the objective of our project was to create a standard template that could be used for most of the evaluations, it was decided, with our liaison's consent, that the template be kept as general as possible.

Another debatable issue in creating the template was the relative importance of the questions in the Scoring System. It was brought up during our interviews that an overall score given to a software package might give the readers of an evaluation a wrong impression of the quality of the software. They argued that the relevance of a particular question might differ based on the needs of different people. Therefore, it was suggested that a certain weight be given to every question in the scoring system so that the overall score for the software better reflects the quality of the software. The idea of weights was not implemented as it is nearly impossible to give such weights to the different features of the software unless the needs of the user and type of the software are identified. However, the categories and statements in the scoring system were extensively revised to eliminate any ambiguities and to assure the equal importance of all the questions. The weighting was left to the evaluator's or the professional's discretion as he would be in the best position to decided the importance of different features, if needed.

# **CHAPTER SIX**

# - Electronification -

As described in the Project Results and Analysis chapters, the Software Evaluation Tool, the final product of this project, was designed and created after careful consideration of the pros and cons of including each aspect of software products. After we had established the efficiency and thoroughness of our evaluation tool, we decided to convert our tool into a format that would make it user-friendly. Electronification would allow our evaluation tool to be used in many computer based applications at the Danish Centre and elsewhere. We used Microsoft Access to create this electronic version because it provided the tools we needed to create an application that could be used on any computer. With MS Access we were able to create a database to store the results of our evaluations and link them to the Centre's online database.

The electronic version of our Software Evaluation Template consists of three parts, with the same content as the hard copy version of the template. The questions in Part One (Brief Overview) and Part Two (Detailed Analysis) of the evaluation tool are presented to the user in a series of popup *windows*. Each window is a *Form* and is based on a *Table* that contains different *fields* whose values are to be filled in by the evaluator using the form. The windows are designed to consist of a title describing the part of the template that contains the question, the question itself, and any instructions to be used to answer the question. There is also a blank *text box* where the user types his answers to the questions (see Figure 6). It also contains *command buttons* that allow the user to move back and forth between different questions. The answers entered by the user are then stored in the corresponding fields of the table according to the question number. The answers stored in the tables are then *output* to a *report*, which consists of a compilation of all the questions along with their answers obtained from the user. This report "pops up" as a separate window when the user is done his evaluation or makes a request for one (see Figure 7). The user can then save or print the report.



Figure 6: Initial form



Figure 7: Final Report form

The third part of the evaluation tool, the scoring system, involves numerical operations and is therefore more intricate than the other two parts. However, the basic format and functionality of the electronic version of all three parts is very similar. As explained in the previous chapters, the Scoring System is divided into categories, which consist of statements that ask the user to rate the quality of different features of software. Accordingly, the electronic version of the Scoring System is designed to be presented as a series of pop-up windows for these categories. Each window is again a form based on a table, and the user input obtained is output in the form of a report once again. The window consists of the title, depicting the part of the evaluation tool that the evaluator is currently working on (in this case, the Scoring System), any instructions to help the evaluator answer the question, the name of the category, and the items that are included in that particular

category. Each statement in these categories is followed by five checkboxes on a scale of one through five, representing the scores to be given by the user. The user can select one of these checkboxes and the corresponding number is used in the final calculations to obtain the overall score for each category and eventually the overall score for the software product. The calculations are performed by using various functions and commands available in MS Access. The final scoring system with all the check boxes marked by the user, along with the total scores, is presented as a report and can be printed and/or saved by the user.

The electronic version of the evaluation template provides the user with a well-organized interface that reduces any hassle involved in using the hard copy version. In the electronic version of the Detailed Template, the instructions for answering questions are provided in the same window as the question, which is less complicated than the corresponding hard copy version where all the instructions are provided in a separate document. In the electronic version of Scoring System, the user does not need to waste time in calculating the results of the ratings, because this is done by the computer. The electronic version is more likely to produce an error-free and legible final report. The electronic copies of evaluation can also be easily linked to the Centre's database of products.

# **CHAPTER SEVEN**

# - Testing -

In order to achieve the best results possible on our Software Evaluation Template, many rounds of testing were required. These were done in several stages ranging from testing of individual questions, to the much more complex usage of the final results.

# **7.1 Testing Individual Questions**

After having drafted all the questions for the template, their content and implied meaning was analyzed by the three members of our project group. These discussions resulted in further refinement of the wording of the questions. The template thus obtained was passed on for further revisions and feedback to our liaison Niels-Erik, our advisor James Demetry, and the Centre's employees in Århus. The input from these external sources provided us with an objective opinion of what the questions were asking further clarifying their wording.

#### 7.2 Testing Template Instructions

Once the questions had been given their first round of testing and subsequent revisions, it was time to examine the instructions that had been drafted. In order to do this, group members examined a piece of software on their own. The questions were then answered, paying as little attention to the actual question as possible, and focusing on the directions that accompany the question. In this way, three different opinions were gained related to how helpful the instructions were. If any of the evaluators had difficulty answering a question for their piece of software, then the instructions needed either clarification or the addition of more examples. The instructions were also passed on to our liaison, advisor, and Centre employees for a final round of revisions.

# 7.3 Testing Completed Product

Once the questions and the instructions had been completed, the entire package could be assembled. With all of the material in one place, further testing was then in order. The material that was focused on in this round of testing was the flow from one question to the next, as well as the flow between sections of the evaluation.

In order to perform these tests, each group member took a copy of the template, and evaluated the same piece of software, *Microsoft Word*. Once these three evaluations were complete, the results of these were compared with each other, and a discussion ensued. As a result of this discussion, some minor changes were made to the order in which questions were posed. The final section of the template that needed examination was the overall score. In order to test this, the score obtained from the Microsoft Word evaluations was compared with our view of the software as a whole. As these two viewing methods coincided, giving Microsoft Word a four out of a possible five, the template was deemed complete.

With a now complete template, the only step left was to perform a sample evaluation using it. The product that was chosen for this evaluation was Wheels! by RJ Cooper. The resulting evaluation can be found in Appendix J.

# **CHAPTER EIGHT**

# - Conclusions -

Now that the results of the project have been laid out and analyzed, it is important to present the conclusions that we have drawn while completing this project.

# 8.1 Our Industry Leaders

As seen in the justifications in the Analysis chapter, we used many sources during the creation of our evaluation template. Microsoft Windows Guidelines for Software Development, IBM's Assistive Technology Overview and the Macintosh Human Interface Guidelines are few of the resources that lend credence to different aspects of the template. These three organizations form a large portion of the computer and software industry, and their methods and opinions are respected by most in the technology field. It is for this reason that we gave particular weight to the standards and information they provided us with. The Accessibility Software created by Gregg Vanderheiden Ph.D., a well-known guru in the field of assistive technology, was also given a large amount of weight. Through these, and many other sources, we obtained sufficient justification for creating the template as it currently exists.

#### 8.2 Keeping the Template General

As per our liaison's expectations and guidelines for the end product of the project, we decided to keep our Software Evaluation Template general enough to be applicable to all types of assistive software. At many points during the progression from one version of the template to the next, we pondered the option of including more detailed questions regarding features of a particular type of software. For example, the template could include a question on how well the *voice recognition* features of a software work but that would make it more specific. While this is good for any voice recognition software, it then makes the Software Evaluation Template less effective for any software that does not use voice recognition. For this reason, the fine line between generality and thoroughness was the aim of our Software but not so much as to be specific towards any type of software.

#### 8.3 Inclusions and Exclusions

Due to the reasons mentioned in the previous section, the process of determining which questions to include and which to exclude was such a crucial part of our project. Many aspects and features of software were extracted from initial research for such elements and this list of potential software evaluation criteria was appended after discussions with our liaison and interviews with professionals in the field of assistive technology. As mentioned in our Methodology, our decision making process was carried out by taking the information we gained from our various sources and determining the importance of each item to the evaluation of all software products. As described in the Analysis chapter, there was a great deal of thinking and reasoning behind inclusion of every item in our template. If it was not possible to justify the relevance of a question to software products in general, that question was not included in our template. However, the most important of the items that were excluded from our template for one reason or another were not discarded but are available in Chapter Five, with their justification for being excluded, in case they can be used in future Software Evaluation Templates.

# 8.4 Usage of the Software Evaluation Template

After having completed our evaluation system for software products, the potential uses of this system must be discussed. According to Niels-Erik, our liaison at the Centre, there will be a team of software evaluators assembled to begin using our template to evaluate current software products available on the market. They will be following the instructions accompanying the template and completing the evaluations as a team. By doing these evaluations as a team, they can ensure the consistency and standardization of the evaluations, thus eliminating any biases by a particular evaluator. Once they have completed the evaluations, the results can then be catalogued and distributed to professionals in the field who deal with disabled individuals. This information will help disabled persons get the best software to suit their particular needs. They will be able to read an evaluation and ascertain the usefulness and quality of that software product depending on their own requirements and concerns.

### **8.5 Integration into the Centre's Web Database**

One of the easiest ways of accessing any of the information available from the Danish Centre for Technical Aid for Rehabilitation and Education is their website, www.hmi.dk. On this website, there is an online database containing information on current assistive technology in Denmark as well as products available for use from many other countries. Currently, there are no evaluations of software on the site, but with our electronic version of the Software Evaluation Template, the evaluations could be linked directly to the database. Any users of the database, mostly professionals, could access the evaluation done by the Centre for any software product that they find in the database. The only concern is within the realm of legal issues, as the information on the site is factual in nature but these software evaluations are dependent on the opinions of the evaluators. If they were to publish a bad review of a software product on the site, the manufacturer could complain that opinionated information was being presented more as facts about the software. That is why it must be clear to any potential reader that the evaluations are the opinion of the person who evaluated the software and do not represent facts proven by the Centre.

### **8.6 Further Testing of the Evaluation Template**

In order for these evaluations to be posted on the website or published in HIT Magazine (the Centre's magazine on assistive technology), they must be perfect. Though the Evaluation Template has gone through many rounds of testing and revisions, it is necessary to distribute it to even more people in the field to get some comments on its effectiveness. Therefore, it was distributed to a board of Special Education teachers, with the help of Steen Hartman, and some of the Centre's staff in Århus that deals with Information Technology. There are many more people who will be viewing the results of these evaluations. One possibility to present the results of our project will be at the International Society for Augmentative and Alternative Communication (ISAAC) international conference in Ødense, Denmark this August. The conference is held in order to promote the sharing of information on assistive technology and would be a good place to enlist feedback.

## **8.7 Electronification**

It will also be possible to get feedback on the usage of the electronic version of our Software Evaluation Template. The electronic copy was created in order to give future evaluators a user-friendly way to enter and later retrieve the information regarding a software product. This electronic copy is created in a standard format by using Microsoft Access; this ensures that the information can be easily accessed by others. Using the electronic copy, transmission of the evaluation materials will be as simple as sending an email with an attachment. Since databases are fairly small in size relative to today's *hard drives*, thousands of evaluations stored in a single database can be easily accessed and searched.

#### **8.8 Possible Future Additions**

Creation of a general Software Evaluation Template applicable to all assistive software concludes our project, but there are a few ideas and recommendations that could be implemented to make further additions to this template.

### 8.8.1 Disability Specific Additions

First, someone who is familiar with all aspects of disabilities could create disability-specific appendices to the evaluation template. These appendices could include questions about the software that would be useful to persons with a specific type of disability. These would most likely be filled out by an intermediary professional familiar with both the software and the disability in question.

85

#### 8.8.2 Software Type Specific Additions

Much the same as the thought of adding appendices based on individual disabilities to the evaluation template, would be the addition of software type-specific (see Appendix S for assistive software types) appendices. In this case, additions would be made depending on what aspects the software contained. These would very likely be lengthy and complicated, but could be useful to a professional in selecting the best software product of a particular type. However, any kind of appendix would then cause the software evaluations to be different and thus the standardization of the evaluations would be compromised.

These two types of additions, while interesting, were not included because they did not meet the objectives of our project. The end product of this project, the Software Evaluation Template, satisfies the needs of the Centre, in a manner that was suggested by our liaison. It provides general yet comprehensive and standard evaluations of all software products.

# Appendix A - Danish Centre for Technical Aids for Rehabilitation and Education

Outline of the Danish Centre for Technical Aids for Rehabilitation and Education

The Danish Centre for Technical Aids for Rehabilitation and Education is an organization located in Denmark created for the sole purpose of being the Danish authority on technical aids. The Danish Centre operates both on a national and an international level, in co-operation with disability organizations, government authorities, institutions, research center and clearing houses, local contacts in the field of rehabilitation and education, as well as manufacturers and suppliers. The Centre was founded in 1980 as a non-profit organization and since 1985 has been partly financed through public funding granted by the Association of County Councils and the municipalities of Copenhagen and Frederiksberg. The other part of their funding comes from independent testing and various contributors throughout the world concerned with assuring that modern technical aids are safe and adequate enough to help the handicapped. The aim of the Centre is to contribute to the creation of equal opportunities for disabled persons - within the areas of rehabilitation, assistive technology, special education, and ICT (information- and communication technology) accessibility. When it comes to the quality or lack of quality of a technical aid, the Centre has done enough research and testing to make a judgment that consumers and companies can trust.

# **Appendix B - Glossary**

These are some of the more technical terms used throughout the report.

Adaptive Device	a device that can be customized
Assistive Device	a device designed to aid disabled people in compensating for their disabilities
Assistive Technology	a piece of equipment or a software product that is used to increase, maintain, or assist the functional capabilities of individuals with disabilities. In short, it can be any device or technique that assists people in removing or reducing barriers and enhancing their daily activities. Assistive technologies include magnifiers, screen readers, closed captioning, keyboard enhancements, and highlighting software. (see APPENDIX Q for more details)
Command Button	a small outlined area in a form or report that you can click to select to give an instruction to a computer or device to perform a specific task.
Database	a collection of information organized in such a way that a computer program can quickly select desired pieces of data.
Digitize	to translate into a digital form
Embedded System	a specialized computer system that is part of a larger system or machine
Fail-Safe	a backup operation that compensates automatically for any failure to the system
Field	a space allocated for a particular item of information
Form	a formatted document containing blank fields that users can fill in with data.
Hands-free Phone	a phone that does not require the use of hands to be operated
Hardware	refers to objects that you can actually touch, like disks, disk drives, display screens, keyboards, printers, boards, and chips
Information Technology	the broad subject concerned with all aspects of managing and processing information using computers, especially within a large organization or company.
Input	whatever goes into the computer
Interface	the place at which independent and often unrelated systems meet and act on or communicate with each other e.g. user interface, the keyboard, mouse, menus of a computer system, allows the user to communicate with the operating system.
Joystick	a lever that moves in all directions and controls the movement of a pointer or some other display symbol on a computer screen
LCD	abbreviation of Liquid Crystal Display, a type of display used in digital watches and many portable computers

Microsoft Access	a database management system released by Microsoft Corporation
Microsoft Word	a Word Processor released by Microsoft Corporation
Motor Skills	physical abilities
Occupational Therapist	a professional who helps people improve, develop, recover, or maintain daily living and work skills
Output	whatever comes out of a computer
Personal Computer	a computer built around a microprocessor for home or office use
Physical Therapist	a professional who provides services that help restore function, improve mobility, relieve pain, and prevent or limit permanent physical disabilities of patients suffering from injuries or disease
Pop-up	opening of a window on a computer screen on execution of a command
Program	a set of coded instructions that enables a computer to perform a function
Programmer	an individual who writes programs (See also Program)
Programming Language	an artificial language used to write instructions that can be translated into machine language and executed by a computer
Qualitative Analysis	the act of decomposing a substance into its constituent elements
Report	a formatted and organized presentation of data.
Software	the programs that control the functioning of hardware
Spreadsheet	a table of values arranged in rows and columns
Switch	a small lever or button
Table	refers to data arranged in rows and columns
Template	a gauge used to create or evaluate a product
Text box	a rectangular display area on a form or report used to get user's input
Voice Recognition	the field of computer science that deals with designing computer systems that can recognize spoken words
Web Browser	a software application used to locate and display Web pages
Word Processor	a program that enables you to create, edit, and print documents on a computer
Window	an enclosed, rectangular area on a display screen

# Appendix C - Interview with David Clark

Transcript of Interview with David Clark

Q: Are their any software features that you use that are designed for the disabled?

A: I focus on the built in features of the programs that are available in the software mainstream. There are accessibility features in programs like Microsoft Word that make it much easier to use for those who need help.

Q: What forms of evaluation do you currently use for software programs?

A: If an evaluation is needed for a certain disability, the program is given to a person or group of people with that disability, and they evaluate it. It is hard for me to decide what would work for a person if I don't have the disability that they do.

**Q:** What do you look for in a product you are thinking of using?

A: If it (the program) can be used without the mouse it is much easier to use. The keyboard can be emulated by a number of methods.

**Q:** Can you think of any software programs on the market that are designed with the disabled in mind?

A: There is nothing I can think of off hand. Less and less is being done with the disabled as the target audience. Most things now involve built in features with the concept of being universally designed.

Q: What does "universally designed" mean?

A: When a program is universally designed it is designed with everyone in mind. There is no need for special programs to make it work for certain people, it is made to work right for everyone in the first place.

Q: What are some of the built in features that you use in your daily life?

A: One of the major ones is my keyboard layout. I have my computer set to type in Dvorak instead of the normal Qwerty. This means I don't have to move my fingers as much in order to type. I have also taken the auto correct function within Microsoft Word and added some other functions to it, changing it into an abbreviation expander.

**Q:** What are some of the key characteristics in software that makes it usable by a wide variety of people, including the disabled?

A: The major, and basically only, requirement is that it be easily customized. If a person with disabilities is able to change the program around to fit their needs, then most of the difficulties can be overcome.

Q: Are there any universally programs that are accepted as the standard in their category?

A: Not really. Everyone uses something different. Each program has its strong points and weak ones. What program a person uses depends on what they need to get from it.

# **Appendix D - Interview with Steen Hartmann**

# Synopsis of interview with Steen Hartmann

Began interview with a brief background of ourselves and what the goal of the project was, and then moved on to what Steen does for a living. He is a consultant for the area around Copenhagen, working with Special Education in particular. Through this work he interacts with people having a large variety of different disabilities. In Steen's own experience he has had difficulty explaining the pros and cons of an aid to a person looking to make a purchase. He has also encountered problems explaining why he likes an individual product more then another one. He feels a standard method of producing evaluations would make this much easier, as there would then be a point-by-point comparison available to use for his explanations.

Currently there is no set method for evaluating software. This requires each of the teachers that Steen interacts with to become familiar with every program released in a given software type in order to draw conclusions on which one is the best within that genre. This process is very time consuming and can involve a large monetary investment in order to purchase the software required for testing.

Steen has agreed to provide copies of our evaluation to the teachers that he works with, in order that they too may give us feedback. These same teachers will be utilized in the testing of the final evaluation. They will apply the entire evaluation to a software program of their choice, and provide additional feedback on the use of the evaluation. In all, Steen was very enthusiastic about the project, and eagerly awaits a final draft coupled with sample evaluations.

# Appendix E - Interview with Trygve Andersen

# Synopsis of interview with Trygve Andersen

The primary concern that was expressed during the course of this interview was the fact that our template was too general. Trygve would have liked us to focus more on specific sections or aspects of software; in his case he was concerned with rehabilitation software. He himself is an educational consultant that performs his own evaluations of software in order to better recommend a product to those he is aiding. In this capacity he works primarily with people having speech and literacy problems.

Usability came up as another of Trygve's concerns about what should be added onto the template. It was his belief that questions should be added addressing the quality of the software, and how well it performs. This can be simplified into a question along the lines of "Does this software meet the goals that have been set forth?"

In addition to the feedback that Trygve was able to give us, he also brought with him an example of the evaluation method that he currently uses when looking at a piece of software. The main categories that compose this evaluation were: learning, presentation, flexibility, system requirements, motivation and emotional effects, and the technical quality. From these categories, and the questions that came with them, we were able to refine some questions in the template, as well as add additional questions.

# **Appendix F - Interview with Trine Bjerre and Thomas Lyhne**

Synopsis of interview with Trine Bjerre and Thomas Lyhne

This interview was conducted with two participants as the questions to be posed to each were the same, and they were both looking at the template from the same view point. Trine is the editor of HIT magazine while Thomas is in charge of the database for the Centre. These positions require them to present material to the public on a regular basis, which was the view they had of our template.

The primary concern that was expressed was who the target audience of a review would be. The reviews that are currently published in HIT are of a very subjective nature, with concrete factual information not being a primary concern. They did say that a standard method of evaluation would be useful; however Trine and Thomas want to insure that the method of this evaluation does not become too rigid. A very short discussion works best for the publications within the magazine, and this would correlate to the brief overview section of our template.

As well as the formatting concerns presented in light of who the target audience is, some additional comments were provided on the specific nature of the questions. It was thought that the use of examples within the instructions is very helpful when one is attempting to write an answer. In addition to an increase in examples, they felt that some questions should be split up into two or more questions. This would allow for more detail in the answering of these questions. Along with splitting up questions, another concern was raised as to the ambiguity of having level based items present in the detailed evaluation. The example they gave was "What is the difference between beginner and intermediate computer skills."

# Appendix G - Focus Group of Stig Carlsen, Ole Wriedt, Erik Arendal

# Synopsis of focus group discussion

These three gentlemen work together in software creation and evaluation. Stig heads a team that produces software and web-based materials, while Ole and Erik evaluate these materials and provide feedback. They felt that the evaluation template in general went into a lot of detail, at times even too much. It was also expressed that while they would like specific sections added for different aspects of software, the evaluation would become much too long if this was done. They liked the brief overview, with only a couple minor additions. Due to the constantly changing world of software, they felt that the date the review was conducted on should be included. Along with this a brief statement of who the software's target audience is would be helpful as well.

Within the detailed analysis section of the template many comments were made that would aid in the general layout of questions. These included the adding of a certain component to a question or the changing of a word. In general they liked the ability to label a section poor, fair, or good, as this would save a lengthy explanation. However, having two different sections in which scores are assigned seemed to be redundant. The usefulness of the software was brought up, with a concern of how well the software aided the end user.

Within the scoring system, a major concern was the weighting system that had been proposed. It was thought that this was much too variable from one piece of software to the next, as well as between individual users. The concept of an overall score was another thing that was brought up, as it prompts the reader to ignore the rest of the evaluation, and simply make judgments based on this score.

# Appendix H - Interview Questions for the Professional

PROFESSIONAL (OT,PT, etc.)

1.	Name       Email:         Date       //         Location       Fax:
2.	What is your profession?
3.	In what way do you interact with or help the disabled?
4.	What types of assistive devices do you work with?
5.	How do you select which products you will recommend / use?
6.	Are there any assistive software packages that you use? What are they?
7.	How are these software packages used to help disabled people?
8.	What information would you require / want from an evaluation of these types of software?

# Appendix I - Interview Questions for a Software Evaluator

1.	Name   Interviewers     Date   /     Location
2.	What is your profession?
3.	What kind of software do you evaluate?
4.	What is the first step when you start to evaluate a piece of software?
5.	What kinds of evaluation tools do you use during your software evaluations?
6. ev	Are there other people that evaluate the same software as you? How do their methods of valuating compare with yours?
7.	What are the most important aspects of software that need to be evaluated?
8.	How do you present the information about software evaluation once you are finished?
9	Who uses the information (evaluation) once you are finished?

# **Appendix J - Wheels! Evaluation**

#### **Brief Overview**

PRODUCT NAME: Wheels! TYPE: educational MANUFACTURER: RJ Cooper OPERATING SYSTEM(S): all Windows, Macintosh LANGUAGE OPTIONS: English PRICING INFO: free 7 use evaluation period, \$29 registration code DATE OF EVALUATION: April 20, 2002

#### WHAT IS THE OBJECTIVE OF THIS SOFTWARE?

This software package is designed to teach a person how to use an electronic wheelchair, while keeping them entertained. It is intended for all people restricted to wheelchair, but has some value for all groups of people.

# PROS

When this software is first installed, it is very good looking. The three dimensional aspects of the game are well done, keeping the person interested. There is a very straightforward approach to game play, making for a very short learning time. The image driving a wheelchair is also maintained throughout the program, as running into walls damages the main character, much as it would a person and their wheelchair.

#### CONS

Installation of the software was slightly complicated, and could not be done by a person with limited computer knowledge. There is also a lack of detailed instructions, leaving the user to simply wander around in the beginning of the game.

## JUDGEMENT

If you are looking for a way to teach someone how to drive a motorized wheelchair, then this software is definitely one that you should consider. Due to the availability to download a free demo from the Internet, it is almost a shame if it is not at least looked at as a possibility. If you are not in need to training software, this program is still able to provide some cheep laughs, and is a great way to waste some time.

# OVERALL SCORE\*: <u>3</u>

<sup>\*</sup> See Scoring System results section for more information on the scores of this product

## **Detailed Analysis**

#### 2.1 What are the system requirements?

Operating System: Windows or Macintosh Processor Speed: 200MH RAM: 64 MB Hard Disk Space: 200KB Video/Sound Card: none required Internet Connection: none required Additional Software: none required Additional Hardware: joystick, mouse, and/or keyboard Special Requirements: none

#### 2.2 What language options are included in this software?

All output is present in English.

Input is not present in the form of a language.

**2.3 What skills are needed to install, set up, start, and use the software?** *Installation requires a working knowledge of computers.* 

Set up requires a detailed knowledge of the end-user.

Starting and using the program are very simple.

# 2.4 What type of environment is this software intended to be used in or suited for?

This software was designed to be used in both the home, and within a clinic. It was created with a

desktop computer in mind, but may be adapted to a laptop.

The target user is a person that has recently been restricted to a wheelchair, and it is intended to teach

them how to maneuver their wheelchair effectively.

### 2.5 What types of input and output does this software use?

Input is registered as either the movement of an object, or the pressing of a button.

All output is presented visually.

#### 2.6 What other types of software / hardware can this software interact with?

This software has been designed as a stand-alone product and is unable to, nor does it require to, interact

with any other form of software.

This software is able to receive signals from a keyboard, a joystick, and a mouse, with two different

settings each for the mouse and joystick. All buttons associated with all three media may be customized to desired functions within the game. All outputs are displayed on the screen.

# 2.7 How does the user interact with the software?

To use this program, one moves around the screen in a first person view using the methods that have been bound to such movement. These movements include going forward and backward, turning left and right, opening

doors, and throwing pies.

# **2.8 If possible, how can the user customize the software to adjust to his own needs?** *The user may customize the input methods that are used within the software. These are very flexible,*

allowing for almost any combination of methods that the program can receive information from.

- **2.9** Are the on-screen (or voice) instructions easy to follow? *There are no on screen or voice instructions to follow.*
- 2.10 Describe the design of the user interface.

The user interface is designed with a row of menus across the top of the screen that is accessible by

pressing the Esc key. These menus may then be navigated using either the arrow keys, or the mouse/joystick.

- **2.11 What forms of help are built into the software program?** *There is no help within the software program.*
- **2.12 What forms of help are available outside the software program?** *The manufacturer of the software may be contacted via email, otherwise no other help is available.*
- **2.13 What aspects of the software consume the majority of the user's time?** *Most of the time using the software is involved in actual game play. There is very little down time*

involved in both the installation and the loading time. Most menus need never be accessed, so there is no wasted

time within these, and only questions that are ever asked are a single confirmation of the last action taken, and

this is rare.

- 2.14 Are there any technical problems in running this software? If so, how severe are the errors and how complicated are the solutions? No technical errors were encountered.
- **2.15** What is the process for updating / maintaining this software? There is no need to update this software, if it ever becomes out dated, it should simply be replaced.
- **2.16 What are the safety / security issues related to this software?** No information is ever entered into to the program that would prove to be harmful to a person if another

user accessed it. Any safety issues are well taken care of, showing that events that would harm a real person, also

harm the on-screen character.

## 2.17 Describe the usefulness of the software.

This software is very good at its intended purpose. All aspects of a wheelchair are implemented in the

software, and it is quite entertaining.

# Scoring System

# EASE OF OPERATION

3.1 The skills required to operate this program fall into the target end-user's developmental range.						4	5
3.2	3.2 The software can be started before each use with minimal wasted effort.					4	5
3.3	This software package can be used effectively by a layman.		1	2	3	4	2
	<b>Overall Score for Ease of Operation</b>		1	2	3	4	5
<u>INS</u>	TALLATION/SETUP						
3.4	This software package can be installed with ease.		1	2	3	4	5
3.5	Hardware associated with this program requires little effort to set up.	N/A	1	2	3	4	5
3.0 3.7	Software can be installed and setup with minimum redundancy	N/A	1	2	3	4	5
	and wasted time.		1	2	3	4	5
	<b>Overall Score for Installation/Setup</b>		1	2	3	4	5
INP	<b>PUT OUALITY</b>						
<ul><li>3.8 The input methods are relevant and efficient.</li><li>3.9 Redundant or accidental inputs by the user are well compensated for. N/A</li></ul>						4 4	<b>5</b> 5
3.10 This program provides keyboard access to all dialogues, menus, and tools. N/A					3	4	5
3.11	3.11Input from hardware devices is accurate.N/A					4	5
	<b>Overall Score for Input Quality</b>		1	2	3	4	5
<u>OU</u>	TPUT QUALITY						
3 17	The colors in this program are appropriately chosen.		1	2	2	4	5
3.13	Warnings, alerts and important messages are easy to read in		1	Z	3	4	5
2 1	the time that they are visible.		1	2	3	4	5
5.14	screen resolutions.		1	2	3	4	5
3.15	5 Information provided audibly is presented in visual format as well.	N/A	1	2	3	4	5
3.16 The visual outputs have adequate accompanying text. N/A				2	3	4	5 5
3.17 The output methods are meaningful and effective. N/A 3.18 The visuals are appealing N/A				2 2	3	4	5
3.19The audio is understandable.N/A					3	4	5

The audio is pleasing to the ear.	N/A	1	2	3	4	5	
<b>Overall Score for Output Quality</b>		1	2	3	4	5	
R INTERFACE							
This software maintains a consistent predictable layout and behavior. The user interface is simple to navigate for the target end-user. Command items and buttons have logical names and/or icons. Features of the software can be accessed without unnecessary work The meaning of visuals is consistent throughout the interface. The software provides full access to all aspects of the program	N/A N/A	1 1 1 1	2 2 2 2 2	3 3 3 3 3	4 4 4	5 5 5 5 5	
from the keyboard. An easy method is available to select any desired window and bring it to the front. There is adequate direct access to palettes and toolbars.		1 1 1	2 2 2	3 3 3	4 4 4	5 5 5	
<b>Overall Score for User Interface</b>		1	2	3	4	5	
TOMIZATION							
The user has a wide range of volume control within the program. The form in which text is presented can be easily modified. A convenient system is provided to save the user's personal data. Customization of the software functions is easy to do. The program settings can be changed without difficulty. The software can be trained to perform new tasks with little effort.		1 1 1 1 1 <b>1</b>	2 2 2 2 2 2	3 3 3 3 3 3	4 4 4 4 4	5 5 5 5 5 5	
<b>Overall Score for Customization</b>		1	2	3	4	5	
<u>.P</u>							
The documentation provided with the software is of a high quality. The training materials included with this software are adequate. There is adequate assistance for a user who has troubles with this software. The available help resources can be accessed quickly and directly.	/are.	1 1 1 1	2 2 2 2	3 3 3	4 4 4 4	5 5 5 5	
<b>Overall Score for Help</b>		1	2	3	4	5	
CHNICAL PERFORMANCE							
This software program meets any applicable legal obligations. This software program complies with applicable standards. This software program uses system tools whenever possible.		1 1 1	12 12 12	333	4 4 4	5 5 5	
	The audio is pleasing to the ear. Overall Score for Output Quality AINTERFACE This software maintains a consistent predictable layout and behavior. The user interface is simple to navigate for the target end-user. Command items and buttons have logical names and/or icons. Features of the software can be accessed without unnecessary work The meaning of visuals is consistent throughout the interface. The software provides full access to all aspects of the program from the keyboard. An easy method is available to select any desired window and bring it to the front. There is adequate direct access to palettes and toolbars. <b>Dorall Score for User Interface</b> <b>TOMIZATION</b> The user has a wide range of volume control within the program. An easy method is available to salect any desired window and bring it to the front. The user has a wide range of volume control within the program. The form in which text is presented can be easily modified. 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Deverall Score for Customization Customization provided with the software is of a high quality. The training materials included with this software are adequate. Deverall Score for Help The valiable help resources can be accessed quickly and directly. Customization provided with this software are adequate. The available help resources can be accessed quickly and directly. Customized the program meets any applicable legal obligations. The software program meets any applicable legal obligations. The software program uses system tools whenever possible.	The audio is pleasing to the ear.       MA       1         Overall Score for Output Quality       1         RINTERFACE         This software maintains a consistent predictable layout and behavior.       1         Command items and buttons have logical names and/or icons.       N/A         Features of the software can be accessed without unnecessary work       1         The software provides full access to all aspects of the program from the keyboard.       N/A       1         An easy method is available to select any desired window and bring it to the front.       1         The user has a wide range of volume control within the program.       1         The user has a wide range of volume control within the program.       1         The user has a wide range of volume control within the program.       1         The software (an be easily modified.       1         A convenient system is provided to save the user's personal data.       1         Customization of the software for Customization       1         Decall Score for Customization       1         Customization provided with the software is of a high quality.       1         The documentation provided with the software are adequate.       1 <t< td=""><td>The audio is pleasing to the ear.       NM 1       2         Overall Score for Output Quality       1       2         RINTERFACE         This software maintains a consistent predictable layout and behavior.       1       2         Command items and buttons have logical names and/or icons.       N/A       1       2         Features of the software can be accessed without unnecessary work       1       2         The user interface is simple to navigate for the target end-user.       N/A       1       2         Features of the software can be accessed without unnecessary work       1       2         The software provides full access to all aspects of the program from the keyboard.       1       2         An easy method is available to select any desired window and bring it to the front.       1       2         There is adequate direct access to palettes and toolbars.       1       2         Overall Score for User Interface       1       2         Tot kort main which text is presented can be easily modified.       1       2         A convenient system is provided to save the user's personal data.       2         Overall Score for Customization       1       2         De</td><td>The audio is pleasing to the ear.       V/A       1       2       3         Overall Score for Output Quality       1       2       3         RINTERFACE         This software maintains a consistent predictable layout and behavior.       1       2       3         The user interface is simple to navigate for the target end-user.       N/A       1       2       3         Features of the software can be accessed without unnecessary work       1       2       3         The software provides full access to all aspects of the program from the keyboard.       1       2       3         An easy method is available to select any desired window and bring it to the front.       1       2       3         Overall Score for User Interface       1       2       3         Dimer is adequate direct access to palettes and toolbars.       1       2       3         Overall Score for User Interface       1       2       3         The other may def range of volume control within the program.       1       2       3         Customization of the software functions is easy to do.       1       2       3         Decer for Customization       1       2       3</td><td>The audio is pleasing to the ear.       M/A       1       2       3       4         Overall Score for Output Quality       1       2       3       4         RINTERFACE         This software maintains a consistent predictable layout and behavior. The user interface is simple to navigate for the target end-user. Command items and buttons have logical names and/or icons. Features of the software can be accessed without unnecessary work The meaning of visuals is consistent throughout the interface.       N/A       1       2       3       4         An easy method is available to select any desired window and bring it to the front.       N/A       1       2       3       4         Overall Score for User Interface       1       2       3       4         Tomourse for user has a wide range of volume control within the program. The form in which text is presented can be easily modified. A convenient system is provided to save the user's personal data. Customization of the software functions is easy to do. The program settings can be changed without difficulty. The documentation provided with the software are adequate. The vailable help resources can be accessed quickly and directly.       1       2       3       4         Overall Score for Customization       1       2       4         Overall Score for Help       1       2       3       4         Devall Score for Hel</td><td>The audio is pleasing to the ear.       MA       1       2       3       4       5         Overall Score for Output Quality       1       2       3       4       5         RINTERFACE         This software maintains a consistent predictable layout and behavior. The user interface is simple to navigate for the target end-user. Command items and buttons have logical names and/or icons. Features of the software can be accessed without unnecessary work The meaning of visuals is consistent throughout the interface. N/A       1       2       3       4       5         The software provides full access to all aspects of the program from the keyboard. An easy method is available to select any desired window and bring it to the front. There is adequate direct access to palettes and toolbars.       1       2       3       4       5         Overall Score for User Interface       1       2       3       4       5         TomIZATION         The user has a wide range of volume control within the program. The porgram settings can be changed without difficulty. The program settings can be changed without difficulty. The software can be trained to perform new tasks with little effort.       1       2       3       4       5         Overall Score for Customization       1       2       3       4       5         Declocumentation provided with the software ac a</td></t<>	The audio is pleasing to the ear.       NM 1       2         Overall Score for Output Quality       1       2         RINTERFACE         This software maintains a consistent predictable layout and behavior.       1       2         Command items and buttons have logical names and/or icons.       N/A       1       2         Features of the software can be accessed without unnecessary work       1       2         The user interface is simple to navigate for the target end-user.       N/A       1       2         Features of the software can be accessed without unnecessary work       1       2         The software provides full access to all aspects of the program from the keyboard.       1       2         An easy method is available to select any desired window and bring it to the front.       1       2         There is adequate direct access to palettes and toolbars.       1       2         Overall Score for User Interface       1       2         Tot kort main which text is presented can be easily modified.       1       2         A convenient system is provided to save the user's personal data.       2         Overall Score for Customization       1       2         De	The audio is pleasing to the ear.       V/A       1       2       3         Overall Score for Output Quality       1       2       3         RINTERFACE         This software maintains a consistent predictable layout and behavior.       1       2       3         The user interface is simple to navigate for the target end-user.       N/A       1       2       3         Features of the software can be accessed without unnecessary work       1       2       3         The software provides full access to all aspects of the program from the keyboard.       1       2       3         An easy method is available to select any desired window and bring it to the front.       1       2       3         Overall Score for User Interface       1       2       3         Dimer is adequate direct access to palettes and toolbars.       1       2       3         Overall Score for User Interface       1       2       3         The other may def range of volume control within the program.       1       2       3         Customization of the software functions is easy to do.       1       2       3         Decer for Customization       1       2       3	The audio is pleasing to the ear.       M/A       1       2       3       4         Overall Score for Output Quality       1       2       3       4         RINTERFACE         This software maintains a consistent predictable layout and behavior. The user interface is simple to navigate for the target end-user. Command items and buttons have logical names and/or icons. Features of the software can be accessed without unnecessary work The meaning of visuals is consistent throughout the interface.       N/A       1       2       3       4         An easy method is available to select any desired window and bring it to the front.       N/A       1       2       3       4         Overall Score for User Interface       1       2       3       4         Tomourse for user has a wide range of volume control within the program. The form in which text is presented can be easily modified. A convenient system is provided to save the user's personal data. Customization of the software functions is easy to do. The program settings can be changed without difficulty. The documentation provided with the software are adequate. The vailable help resources can be accessed quickly and directly.       1       2       3       4         Overall Score for Customization       1       2       4         Overall Score for Help       1       2       3       4         Devall Score for Hel	The audio is pleasing to the ear.       MA       1       2       3       4       5         Overall Score for Output Quality       1       2       3       4       5         RINTERFACE         This software maintains a consistent predictable layout and behavior. The user interface is simple to navigate for the target end-user. Command items and buttons have logical names and/or icons. Features of the software can be accessed without unnecessary work The meaning of visuals is consistent throughout the interface. N/A       1       2       3       4       5         The software provides full access to all aspects of the program from the keyboard. An easy method is available to select any desired window and bring it to the front. There is adequate direct access to palettes and toolbars.       1       2       3       4       5         Overall Score for User Interface       1       2       3       4       5         TomIZATION         The user has a wide range of volume control within the program. The porgram settings can be changed without difficulty. The program settings can be changed without difficulty. The software can be trained to perform new tasks with little effort.       1       2       3       4       5         Overall Score for Customization       1       2       3       4       5         Declocumentation provided with the software ac a

3.42	Loading time is acceptable for the size of the program.		1	2	3	4	5
5.45	of the software		1	$\mathbf{r}$	3	1	5
3 44	There are very few errors present in the software		1	$\frac{2}{2}$	3	4	5
3.45	Any errors present may be fixed with a minimal working knowledge of computers.		1	2	3	4	5
3.46	The software cooperates with special OS access features in the OS and third party access software.		1	2	3	4	5
	<b>Overall Score for Technical Performance</b>		1	2	3	4	5
<u>SAF</u>	ETY/SECURITY						
3.47	There are adequate fail-safes incorporated where necessary to prevent the user from being physically harmed or mentally distressed	N/A	1	2	3	4	5
3.48	The software has adequate protection against malicious users.	1 2 3	34	5	5	'	5
3.49	There are adequate fail-safes incorporated to protect against data loss.		1	2	3	4	5
	<b>Overall Score for Safety/Security</b>		1	2	3	4	5
MAI	INTENANCE						
3.50	Available Technical Support is easy to contact and helpful.		1	2	3	4	5
3.51	The maintenance costs of this software are reasonable.		1	2	3	4	5
3.52	The subscription is easy to maintain.		1	2	3	4	5
3.53	The updates are easily available and accessible to all users.		1	2	3	4	5
3.54	There is adequate and timely notification of new updates.		1	2	3	4	5
3.55	Once the user has an update, it is easy to install and apply it.		1	2	3	4	5
3.56	The software updates are necessary.		1	2	3	4	5
	<b>Overall Score for Maintenance</b>	N/A	1	2	3	4	5

# TOTAL SCORE Score from: Eas

Score from: Ease of Operation <u>5</u> Installation/Setup <u>4</u> Input Quality <u>4</u> Output Quality <u>3</u> User Interface <u>3</u> Customization <u>2</u> Help <u>2</u> Technical Performance <u>4</u> Safety/Security <u>3</u> Maintenance <u>N/A</u>

# Total score for software package 1 2 3 4 5

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# **Appendix K - Critique of a Dragon Naturally Speaking Review**

With version 5 of Dragon Naturally Speaking recently released, a review of the new features that are present was required. This review begins with an explanation of what speech recognition programs are in general, and then moves on to the history of Dragon Naturally Speaking and its various versions. Once this preliminary material has been taken care of, the content of the software is then evaluated.

In order to understand what makes Dragon Naturally Speaking a good program, the features that are included must be listed, and then explained. This is done by taking the most important feature present in the program, and moving from this to the least important. Such concepts as the time it takes to teach the program (30 minutes for 90 percent accuracy) and how the program itself is loaded are all explored. Anything that has changed from the previous version (version 4) is gone into in detail.

Once the various functions of the program have been laid out, there are still other concepts that must be addressed. With Dragon Naturally Speaking, this concept is its versatility. It can be used with almost any program relying on text (word processors, email) as well as having a hand held version for dictation. The review is summed up with the statistics relating to the program, such as required system specifications, included hardware, and price. Nowhere is there a solid approval or rejection of the software given, this is drawn from the review as a whole.

# Appendix L - AAATE International Information

# AAATE National Contacts.

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Spain:	Cristina Rodriguez Porrero	ceapat@seg-social.es	CEAPAT.
Sweden:	Hakan Neveryd	hakan.neveryd@certec.lth.se	CERTEC, Lund University.
Switzerland:	Jean Claude Gabus	gabus@fst.ch	FST.
Brazil:	Maria de Jesus Goncalves	mjesus@alpha.hydra.com.br	
Israel:	Lawrence Normie	Inormie@jdc.org.il	GeronTech - The Israeli Center for Assistive Technology & Aging.

# **Appendix M - ITI : Voluntary Product Accessibility Template**

ITI: Voluntary Product Accessibility Template is a template created for testing web accessibility software called "PageScreamer" developed by Crunchy Technologies, a developer of accessible packaged software products and custom applications for business and government clients. This software can be used by handicapped people to read web pages. The template is designed so that the software complies with Section 508 Software Applications and Operating, which incorporates binding, enforceable standards into federal procurement regulations. The given template can serve as a good source of background information for our project(Page Screamer). This and other available documents can provide us with some knowledge of how these kinds of templates are designed.

Wisconsin Assertive Technology Initiative is a document used by Madison Wisconsin Metropolitan School District's Assistive Technology Department in assessment of the needs of students with disabilities (Assertive Technology). The template includes a series of questions that ask for information about the student and the answers help in deciding the kind of assistive technology needed by the student.

These documents are illustrations of how information is gathered and utilized by organizations to be able to meet the needs of disabled people. We can use this as another background information resource for our project.

# **Appendix N - Operating System Specific Assistive Software Creation Guidelines**

# http://ncam.wgbh.org/cdrom/guideline/access\_issues.html

# Windows OS

Microsoft provides detailed information on building accessible software for the Windows platform. The Microsoft Accessibility and Disabilities Group has created tools, documents, and APIs that offer ways to take advantage of access features in the operating system and provides information on other ways to make software more accessible. The Microsoft Windows Guidelines for Accessible Software Design provide comprehensive information on creating accessible software.

In particular, the Microsoft Active Accessibility API (MSAA) uses programmatic means to help software communicate with assistive technologies. MSAA exposes elements of the screen and their state. It also exposes the focus of the screen. Using MSAA, software developers can use entirely custom graphical interfaces while still making each element known to an assistive technology which has been programmed to read this information and convey it to the user.

# **Macintosh OS**

All Macintosh computers ship with several accessibility features already installed that support users with sensory or physical disabilities. Developers may want to test their products with these features invoked to determine whether their software is operable by users requiring assistive technology. Some of the pre-installed accessibility features include:

- Text-to-speech technology including the PlainTalk speech synthesizer.
- Voice recognition technology.
- CloseView, a built-in screen magnifier for low vision users.
- StickyKeys, software that allows users to strike keys one at a time in cases where two or three keys would normally be pressed simultaneously, such as Shift-F9.
- MouseKeys, software that allows users to control all mouse movements by typing on the numeric keypad.

In addition to the built-in accessibility features for the Macintosh, Apple maintains a list of Mac-based assistive technology available from vendors outside of Apple. OutSPOKEN is the only screen reader developed for the Macintosh platform. For this reason developers should test their products with OutSPOKEN. Users who are blind will not be able to use educational software if the product is not compatible with this screen reader.

Apple also has a developer website that contains an array of resources including the Macintosh Human Interface Guidelines. This document provides "authoritative information on the theory behind the Macintosh 'look and feel' and the practice of using individual interface components. This book includes many examples of good design and explains why one implementation is superior to another."

### The Java<sup>TM</sup> Platform

The Java<sup>™</sup> platform is an attractive development environment for creating accessible educational software for several reasons:

- A platform-independent language allows educational software to be accessed from both Macintosh and Windows.
- Accessibility support is built into Java technology's core structure and is supported by the Swing user interface components which include an effective keyboard interface.
- The Java accessibility API, a standard extension in the Java 2 platform, eliminates the painstaking retrofitting previously required to enable assistive technologies (e.g., screen readers) to interact effectively with mainstream applications. The Sun access team has also developed the Java Access Bridge which allows users to run Java applications with their platform-specific assistive technologies.
- The Java accessibility API contains several properties that enable developers to determine how assistive technology reports the presence and status of a particular object. Two of the most crucial properties are an object's accessible name and accessible description.
### **Macromedia Director**

Macromedia Director is a commonly used authoring tool for educational software, but it has significant limitations for accessible design. No comprehensive guidelines are available for creating accessible software in Director. Use the information in the section on disabilities, functional limitations, and accessibility tips, and consult the general guidelines on software accessibility referenced at the beginning of that section.

Applications created with Director are not compatible with assistive technologies. For example, text drawn to the screen may be read by a screen reader, but no information about the object containing the text is communicated. This means a blind user might hear the words on a button but not realize that it is a button. In addition, many developers use graphics to draw their buttons and on-screen messages to create a customized visual design, but Director does not provide a way to label these graphics with text so that they can be interpreted by a screen reader.

Director does not by default support using the keyboard to interact with on-screen controls. Developers generally create mouse interactions for each object. If an application has a series of buttons displayed, the developer must add code to permit use of the tab key to move the focus from item to item and to have the enter key or spacebar trigger activation of the button.

In addition, the custom menu bars developers can create for the Macintosh OS in Director, look like operating system menu bars, but do not behave in a standard way. They are not compatible with screen readers for Macintosh. All features made available in the menus must be available in some other way, such as with a keyboard shortcut or in an accessible dialog box. Because of these limitations, developers using Director to create educational software must create directly accessible applications. This includes building a full keyboard interface so that students who cannot use a mouse can access the software, and providing full audio output for visually impaired users. Audio can be provided by recording a narrator voicing all text or by using text-to-speech software to voice text strings.

### Web and HTML

Content written in HTML can benefit from the extensive work on accessibility done by the World Wide Web Consortium (W3C), an industry consortium that aims to lead the World Wide Web to its full potential by developing common protocols that promote its evolution and ensure its interoperability. The Web Accessibility Initiative (WAI) at the W3C coordinates with organizations and industry representatives to ensure that the Web is accessible to people with disabilities. See www.w3.org/WAI for more information.

Software which presents content written in HTML and other web technologies should follow the Web Content Accessibility Guidelines. Software which allows users to author their own web content should follow the Authoring Tools Accessibility Guidelines. Both of these documents are available at the WAI web site.

Software which provides a proprietary interface to HTML content should follow the User Agent Accessibility Guidelines. Users should be able to choose their own web browser to view material provided by the software. Students with disabilities can then take advantage of assistive technologies that software developers may not be aware of. Locking users into a specific browser can reduce the accessibility of even well-designed web content. Assistive technologies for use with HTML content may include a talking MathML browser or plug-in, or access features designed into mainstream browsers like Internet Explorer. Additionally, there are specially designed talking web browsers on the market like HomePage Reader and pwWebSpeak. Creating content according to the Web Content Accessibility Guidelines and allowing users to view it in the browser most accessible to them is the easiest method of creating accessible software.

# Appendix O - Everyone Needs Accessibility, by IBM

### http://www-3.ibm.com/able/reasons.html

#### **Everyone Needs Accessibility**

Society has benefited in many ways from the information technology revolution. However, not everyone can reap the benefits of this technology change. People with disabilities cannot participate fully because much of the technology is not designed for accessibility.

According to the World Health Organization, more than 750 million people worldwide have a disability and over 54 million are in the United States. The number is growing, in part, because people are living longer. The Census Bureau says 36% of people age 55 to 64 have a disability. Nevertheless, more seniors than ever want to lead active lives and continue working beyond 65.

For a younger group, the Census Bureau says 15% of people age 22 to 44 have a disability. And statistically, most people during their lifetime will have a disability or experience a limitation that will temporarily or permanently affect their lives.

Millions of people want and need accessibility to advancing technology. Unfortunately, the needs of people with disabilities, the largest minority group in the U.S., are often forgotten as designers and developers strive to meet deadlines and surpass competitive requirements. The good news, however, is that with few exceptions the technology is available to accomplish accessibility, and using this technology is not difficult or expensive if accessibility features are included in the initial design of IBM products.

#### An Increase in Your Customer Base

The millions of people with disabilities who want and need to use technology have an estimated \$175 billion in disposable income and are potential customers. In addition, many techniques and solutions that address the needs of people with disabilities also address the needs of people as they grow older. The mature customer is the nation's fastest growing age group. Therefore, making products accessible is just good business.

The issue of accessibility is becoming a force in the marketplace. Businesses, vendors, and organizations are increasingly doing business only with those companies that offer accessible products because they must meet the needs of their employees and customers, and meet legislation and purchasing requirements.

#### **Compliance with Worldwide Regulations and Standards**

Many regulations and standards are in effect in the U.S. and worldwide. The following sections summarize the major regulations driving accessibility.

#### Section 508 of the Rehabilitation Act

This is the most recent law relating to accessibility and is often referred to as "Section 508." In 1998, the president signed into law the Workforce Investment Act, which amended Section 508 of the Rehabilitation Act of 1986 and significantly expanded and strengthened the technology access requirements of the 1986 act. In effect, the new law requires that federal procurement of electronic and information technology after August 2000 must be accessible to federal employees who have disabilities and to members of the public with disabilities who need to use that technology. States that receive federal funds under the Assistive Technology Act of 1998 are also required to comply with Section 508. The federal government is the largest purchaser of computer software. Section 508 also applies to Web sites that are produced for government agencies. For additional information about Section 508 of the Rehabilitation Act, visit: http://www.usdoj.gov/crt/508/508home.html and http://www.access-board.gov/.

### Americans with Disabilities Act (ADA) of 1990

The Americans with Disabilities Act (ADA) of 1990 prohibits discrimination on the basis of disability in employment, programs, and services provided by state and local governments, as well as goods and services provided by private companies. It applies to all businesses as well as to goods and services provided by governments. The ADA requires that all public facilities be accessible. In addition, all business of 15 or more employees are required to make their facilities and information technologies accessible to employees who have disabilities. For additional information about the Americans with Disabilities Act (ADA) of 1990, visit: http://www.usdoj.gov/CRT/ada/adahom1.htm.

### Section 255 of the Telecommunications Act of 1996

Section 255 of the Telecommunications Act of 1996 requires that manufacturers of telecommunications equipment and software ensure that such equipment be directly accessible to people with disabilities if that access is "readily

achievable." If direct accessibility is not readily achievable, the manufacturer must make the equipment compatible with peripheral devices used by people with disabilities, if "readily achievable." Section 255 requires the U.S. Access Board to issue guidelines that set forth criteria for accessibility and compatibility. These are available at: http://www.accessboard.gov/telecomm/html/telfinal.htm For additional information about Section 255 of the Telecommunications Act of 1996, visit: http://www.w3.org/WAI/References/Policy#255.

### State Regulations

In addition to federal legislation, many states have enacted laws that address accessibility. For example, Texas passed a bill directing the Texas Education Agency to investigate ways to develop electronic textbooks that are accessible to students who are blind or who have visual impairment. In California, Code of Regulations Section 55370 states that the requirements of the Americans with Disabilities Act are applicable to distance education courses. Finally, New York state's Information Management Technology Policy 96-13 requires that both state employees and citizens with disabilities have reasonable access to electronic and information technology. It is probable that every state will develop its own accessibility requirements, similar to those of section 508.

### **Worldwide Regulations**

Regulatory compliance is also an important reason to produce accessible Web sites in other countries. For example, the Nordic countries have published their own set of accessibility guidelines, and Portugal and Thailand have recently introduced legislation that directly requires Web accessibility. Other countries, such as Australia and Canada, have legislation that makes it a civil right for individuals with disabilities to be able to access certain kinds of information. Additional information about these and other policies is available from the World Wide Web Consortium's Web Accessibility Initiative at: http://www.w3.org/WAI/References/Policy.

### **Global Standards**

Producing accessible products will help ensure that your company meets certain national and international standards and guidelines. For example, alternative text for images is required to meet the Hypertext Markup Language (HTML) 4.0 standard. The following standards and guidelines address accessibility issues:

- World Wide Web Consortium (W3C) recommendations, including:
  - o HTML 4.01
  - Cascading Style Sheet (CSS) 2.0
  - Web Content Accessibility Guideline 1.0
  - o Authoring Tools Accessibility Guidelines 1.0
- American National Standards Institute (ANSI) and International Organization for Standardization (ISO) standard documents in progress

### **Accessible Products Benefit Everyone**

Many products used today, such as the telephone, the typewriter, or voice recognition software, were initially designed for people with disabilities. Considering the requirements of a person with a disability often results in a product that benefits everyone. In Europe, this is called "Designing for All."

All of us are "disabled" in certain situations. Suppose you are traveling in a taxi and want to access a Web page over the telephone. When you are on the phone, you are "blind" and could benefit from sites that are accessible in those situations.

Accessible Web sites will make it possible for software technologies to be more effective. For example, search engines can locate and catalog information presented in images by using the alternative text associated with the image, and multimedia players can search and index multimedia content using the captioned text associated with video tracks. Accessibility often makes Web sites more user friendly. For example, a Web site that complies with the accessibility checklist has a more consistent user interface and is easier to learn. The site will also transform gracefully, so it can be used by earlier versions of browsers.

### **Appendix P - Principles of Accessible Software, by IBM**

### http://www-3.ibm.com/able/principles.html

#### **Choice of input methods**

Support the user's choice of input methods including keyboard, mouse, voice, and assistive devices via the serial port. The primary requirement is to provide keyboard access (mouse-less operation) to all features and functions of the software application. The operating system usually provides support for input via the serial port, keyboard movement of the mouse pointer, and other keyboard enhancements.

### **Choice of output methods**

Support the user's choice of output methods including display, sound, and print. The primary requirement is to provide text labels for icons, graphics, and user interface elements and to support visual indications for sounds. Implementing the accessibility APIs (e.g., Java Accessibility, Microsoft Active Accessibility, etc.) for the target platform will meet this principle.

### **Consistency and flexibility**

Make the application consistent with the user's choice of system behavior, colors, fonts sizes, and keyboard settings. Provide a user interface that can be customized to accommodate the user's needs and preferences including fonts, colors, and display layout.

# Appendix Q - IBM's Assistive Technology Overview

### http://www-3.ibm.com/able/disability.html

Assistive technology is a piece of equipment or a software product that is used to increase, maintain, or assist the functional capabilities of individuals with disabilities. In short, it can be any device or technique that assists people in removing or reducing barriers and enhancing their daily activities. Assistive technologies include magnifiers, screen readers, closed captioning, keyboard enhancements, and highlighting software. Assistive technology uses the coding and content of your Web site and makes it accessible.

Meeting the standards of an accessible Web site first requires an awareness of the special needs of users who have disabilities. The four main categories of disabilities are visual, hearing, mobility, and cognitive and learning disabilities. Each person with a disability might encounter one or more barriers that can be eliminated or minimized by the Web developer, the browser, the assistive technology, or the underlying operating system software and hardware platform.

### Visual

People with visual disabilities are individuals who are blind, have low vision, or have color blindness. People who are blind need text equivalents for the images used on the Web page, because they and their assistive screen reader technology cannot obtain the information from the image. A person who has a visual disability will not find the mouse useful because it requires hand and eye coordination. Instead, this person must navigate the Web page using only the keyboard. For example, the Tab key is used to move the focus to the item that needs to be selected. A screen reader then announces the item so the user knows where the focus is on the page. The user then presses the Enter key instead of "clicking" the mouse button.

Those who have low vision need the assistance of a hardware or software magnifier to enlarge the text beyond simple font enlargement. People who are color blind or who have low vision benefit from good contrasting colors. When information is presented by color alone, a person who is color blind misses that information. Similarly, if information is presented using any attribute by itself (for example, contrast, depth, size, location, or font), a user who has low vision might not detect the difference.

Magnification might reformat the location, change the contrast, or distort the size and fonts of the text and objects on the Web page. It is best to use multiple attributes. For example, if both color and a fill pattern are used on different bars on a graph, they can be viewed in either color or black and white. Instead of using size attributes on the font element to denote a heading, the heading element should be used to correctly mark up a heading so that assistive technology can identify headings.

### Hearing

People who are deaf or hard of hearing require visual representations of auditory information that the Web site provides. Solutions for these disabilities include closed captioning, blinking error messages, and transcripts of the spoken audio. The primary concern is to ensure that audio output information is provided in a redundant equivalent visual form.

### Mobility

People with mobility disabilities have physical impairments that substantially limit movement and fine motor controls, such as lifting, walking, and typing. Mobility impaired individuals experience difficulties in using the computer's input devices and in handling storage media. Solutions for persons with mobility disabilities include switches, latches, and controls that are easy to manipulate, and diskettes and media that are easy to insert and remove. Additional solutions include alternate input capabilities, such as voice input or the ability to enter information at the user's own pace. For example, sequences of keystrokes can be typed, one at a time, rather than simultaneously as in Ctrl+Alt+Del. Many of these needs are supported by assistive technology, operating systems, and hardware platforms. Furthermore, making the Web site accessible will make it more compatible with voice input and control technologies.

### **Cognitive and Learning Disabilities**

People with cognitive or learning disabilities, such as dyslexia and short-term memory deficit, need more general solutions, which include providing a consistent design and using simplified language. For example, by using a template, a Web developer can reuse the same layout and design for each page, so a person with a cognitive disability can more easily navigate through a Web site. People with cognitive or learning disabilities can also benefit from redundant input, such as providing both an audio file and a transcript of a video. By simultaneously viewing the text and hearing it read aloud, they can take advantage of both auditory and visual skills to comprehend the material better.

# Appendix R - IBM Software Accessibility Checklist

http://www-3.ibm.com/able/accesssoftware.html

	IBM Software Accessibilit August 2	ty Checklist - 24, 2001	Version 3.1
1	Keyboard access	Yes No Planned N/A	Comments
1.1	Provide keyboard equivalents for all actions.		
1.2	Do not interfere with keyboard accessibility features built into the operating system.		
2	Object Information	Yes No Planned N/A	Comments
2.1	Provide a visual focus indicator that moves among interactive objects as the input focus changes. This focus indicator must be programmatically exposed to assistive technology.		
2.2	Provide semantic information about user interface objects. When an image represents a program element, the information conveyed by the image must also be available in text.		· · · ·
2.3	Associate labels with controls, objects, icons and images. If an image is used to identify programmatic elements, the meaning of the image must be consistent throughout the application.		•
2.4	When electronic forms are used, the form shall allow people using assistive technology to access the information, field elements and functionality required for completion and submission of the form, including all directions and cues.		
3	Sounds and Multimedia	Yes No Planned N/A	Comments
3.1	Provide an option to display a visual cue for all audio alerts.		
3.2	Provide accessible alternatives to significant audio and video.		
3.3	Provide an option to adjust the volume.		
4	Display	Yes No Planned N/A	Comments
4.1	Provide text through standard system function calls or through an API (application programming		

	interface) which supports interaction with assistive technology.		
4.2	Use color as an enhancement, not as the only way to convey information or indicate an action.		
4.3	Support system settings for high contrast for all user interface controls and client area content.		
4.4	When color customization is supported, provide a variety of color selections capable of producing a range of contrast levels.		
4.5	Inherit system settings for font, size, and color for all user interface controls.		
4.6	Provide an option to display animation in a non- animated presentation mode.		
5	Timing	Yes No Planned N/A	Comments
5.1	Provide an option to adjust the response times on timed instructions or allow the instructions to persist.		
5.2	Avoid the use of blinking text, objects or other elements.		
6	Documentation	Yes No Planned N/A	Comments
6.1	Provide documentation in an accessible format.		
6.2	Provide documentation on all accessibility features including keyboard access.		
7	Verify Accessibility	Yes No Planned N/A	Comments
7.1	Test for accessibility using available tools.		

# **Appendix S - Types of Assistive Technology**

### http://ncam.wgbh.org/cdrom/guideline/tech.html

### **Types of Assistive Technology:**

**Screen readers:** software for blind users that finds information on the computer screen and communicates it to the user either with text-to-speech software or hardware or a refreshable Braille display. Refreshable Braille displays use pins that move up and down to spell out words in Braille and are the fundamental means of access to computers for users who are deaf-blind. Screen readers are generally designed to get information using the standards of the operating system for which they are created; software that adheres to those standards will be most accessible, whereas software that ignores them may be impossible to access.

**Screen magnifiers:** software for low vision users that enlarges the screen image many times. Screen magnifiers may also permit the user to change the default colors of the display, for example, by using reverse video if that provides better contrast. Screen magnifiers track the cursor or the active region of the screen in order to automatically enlarge the portion of the screen the user needs to see. Therefore, software that uses a custom cursor may pose a challenge for accessibility since the wrong portion of the screen may be magnified.

Adaptive keyboards: a variety of keyboard options for users with physical disabilities who cannot use a standard keyboard. Keyboards may be smaller for users with little range of motion or larger for users without fine motor control; they may offer fewer choices for users who benefit from structured choices or provide a way to type with one hand for users who cannot use both hands. Additionally, software can be used to simulate a keyboard on the user's monitor. These on-screen keyboards allow those who cannot use other keyboards to type by pointing with a mouse (or an assistive technology that emulates a mouse). Software that uses the operating system's standard methods of reading input from the keyboard should not have difficulty being compatible with adaptive keyboards; reading keystrokes directly from the keyboard rather than through the operating system is likely to cause trouble.

Word prediction software: speeds up typing by presenting likely word choices as the user types. This software is often used with adaptive keyboards for users with physical disabilities. It is also beneficial to users who have difficulty with spelling or vocabulary.

**Voice recognition software:** allows the user to input data or control the computer by speaking. This is beneficial to users who have difficulty typing. Generally, software that allows full access through keyboard commands will be well suited for use with voice recognition.

**Single switches:** hardware for some users with physical disabilities who can only control the computer with one or two specific movements. Switches are used with software that scans through options on the screen allowing the user to trigger the switch when the option they wish to choose is highlighted. Single switches can be used in conjunction with on-screen keyboards and word prediction software. The scanning software can be used to create customized screen layouts for use with a variety of software. However, every clickable spot in the layout must be identified manually in advance.

# **Appendix T - Types of Accessibility**

### http://ncam.wgbh.org/cdrom/guideline/tech.html

### **Types of Accessibility**

Software accessibility solutions fall into two categories: directly accessible and compatibly accessible. A "directly accessible" product is designed so that a person with a disability can operate all on-screen controls and access the product content without relying on the aid of an assistive technology. For example, to be accessible to users with low vision, directly accessible software offers features to enlarge all controls and on-screen text and is designed with high contrast colors or provides features that allow users to choose appropriate colors. To be accessible to blind users, a directly accessible product should have a keyboard interface with audio output. Such a keyboard interface will also provide access for many users with physical disabilities. Audio output should announce the presence and status of all on-screen controls and convey the atmosphere of the software. A built-in method of using a single key to scan through choices in the software will provide access for users who can only use a single switch as input. Teachers of students who are visually impaired report that their younger students get limited training with assistive technologies. For this reason, direct access is most crucial in products targeted for the elementary and middle school level.

Direct access has many benefits. The greatest is that the user is able to access educational software without needing special assistive hardware and software. This keeps costs down for schools and reduces the technical difficulties common when using assistive technology with multimedia software. It also allows the student with a disability to sit at any computer rather than always being directed to the adapted workstation. The more flexible classroom environment this creates benefits everyone. Finally, having the accessible interface designed by the people creating the software creates a better interface since the designers understand the educational intent and user interface model. An assistive technology must interpret the information given to it.

A "compatibly accessible" piece of software is designed with assistive technology in mind. This level of access assumes the user has a preferred assistive technology package installed and is relatively comfortable with it. Software that falls into this category is likely to be targeted at the high school level and beyond. Deaf-blind students are the exception to this target age. These students cannot use directly accessible technologies and rely on compatibly accessible materials from a young age. A compatibly accessible product is designed with "hooks" to facilitate ease of use with a screen reader, screen magnifier, or alternative input devices such as adapted keyboards or single switches. These hooks can be implemented by developers with tools such as Microsoft Active Accessibility (MSAA) and the Java Accessibility API from Sun Microsystems, (discussed in more detail in the section on development environments). Exposing the system cursor, using standard controls and fonts, and following the operating system's human interface guidelines can also help make a product compatibly accessible.

Compatible access has some advantages. It provides consistency of operation between applications since users already know how to navigate with their assistive technology or continually gain competency in doing so. In some cases it may be less expensive to develop software this way. Relying on the assistive technology package for text-to-speech capability in place of adding audio to a product can save on disk space for larger applications. Compatibly accessible products may be the only means of access for some users, i.e. deaf-blind Braille users using screen readers to interact with computers. Building software compatible with assistive technologies should use a single set of programming techniques to create software that works well with screen readers, alternative input devices (switches, on-screen keyboards, voice recognition), and any other input or output device that is not part of a standard computer.

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