TITLE: DIGITAL TALKING BOOKS. DAISY CONVERTER

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DATE: 09.06.2011
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Abstract

Abstract- The “DIGITAL TALKING BOOKS. DAISY CONVERTER” Project is developed by the EPS students in the February-June 2011 period for “Catedra D’Accessibilitat”, of the University’s Chair.

The “Digital Talking Books. DAISY Converter” project has been carried out within the European Project Semester with the help of Catedra D’Accessibilitat of Universitat Politècnica de Catalunya, Vilanova i la Geltrú.

The main purpose of the project is to develop an application that will convert a Text file to a Daisy File and a Daisy File to a MP3 Playlist. This application is correlated with the Marketing and User Research part; and in its essence aims at showing you that without a proper Marketing strategy and without a user profile this application cannot be feasible.

Therefore, in this report the emphasis will be on the following presentations: the Marketing analysis with as an end result a clear advertisement campaign advice. Furthermore the User Research includes a profile from the future user of the Daisy Converter. Another topic that will be mentioned in this report is the programming language that was used to develop the application and the design of the interface, which is the link between the product and the user.

Key words: Daisy Converter, Catedra D’Accessibilitat, Programming Language, Interface Design, Marketing Analysis and User Research
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1. Introduction

1.1 Subject and project purpose
The “Digital Talking Books. DAISY Converter” Project is based on the concept of the Daisy file format. Digital Accessible Information System (DAISY) is a multi-media publishing system that is recognized all around the world and is compatible with the World Wide Web. Also, DAISY is known as a standard based on XHTML and SMIL languages and the official agency for this standard is the DAISY Consortium. The Consortium was founded in 1996 and its vision is to ensure that people with visual disabilities have access to information and technologies.

There are about 284 million people in the world (5% of the whole population) [1] whom has a visual impairment or a total blindness. These people all have problems with reading without any tools. For those who have a light visual impairment there are easy solutions like glasses, lenses, or a magnifier. These are easy tools to make the reading easier without needing any help from other technical tools. But for those who have a strong visual impairment or are totally blind reading is still very hard or even impossible with this kind of tools. Therefore, DAISY developed a Talking Book technology [2]. Users need to buy a certain DAISY player - Figure 1, which can play the DAISY files. These files can be downloaded from the database from the DAISY Company. Unfortunately, these files are not for free but they cost about 10 to 30 dollars. [3]

For most of the visual impaired people it’s impossible to first of all buy the DAISY player (which costs about 550 dollars) [4] and then keep buying the DAISY files online for at least 10 dollars. Therefore, the EPS group was asked to make a converter for the DAISY files to a MP3 Playlist so that everybody can listen to the talking books the way they want (laptop, mp3 player etc.). In this way buying an expensive DAISY player would be avoided and the possibilities for people with visual disabilities will be strongly improved.

After understanding the Daisy concept, we had to define our aim and in order to achieve this we had tried to use the SMART approach that means that it has to be Specific, Measurable, Achievable, Realistic and Time-Bounded. Taking in consideration this attributes, we could enunciate our project aim as following:

“Create an application to convert a Text File to a Daisy File and a Daisy File to an MP3 Playlist using technical and human resources that will be the basis for a future benchmarking for the Faculty before the 9th June 2011.”

Figure 1 The Daisy Player
1.2 Plan of development
The plan of development consists in presenting the main activities that the Daisy Team had to fulfil until the 9th of June 2011. Therefore, the activities from this report are the following:

1. Marketing Analysis
2. User Research
3. Programming language and Interface Design

1.3 Project Management. Goals and tasks
To achieve the objectives of the Daisy Converter project we decided on the main tasks that are presented in Appendix I.

Every activity was defined taking into consideration each team member. Thereby, Anne is in charge with the User Research part due to her specialization in Human Technology, Guillermo with the Programming language because his specialization in Computer Science, Marco, specialization in International Technology Management and Christian, specialization in Industrial Management with the Marketing Analysis and Iuliana with the Interface Design due to her specialization in Virtual Instrumentation.

The main goals for the final report were to create the user profile, to develop the application, to design the interface and to advice the Chair about the advertisement campaign.
The project’s end goal is to develop the application that will convert a Text File to a Daisy File and a Daisy File to an MP3 Playlist. To get to this result support of a Marketing research is needed. The main parts of the project are:

- Market analysis and the advertisement campaign
- User Research
- Programming and the design of the interface

An overview of the coherence between the different specialties of the project is shown below in Figure 2:
2.1 Market analysis

Research design

![Diagram showing Internal Analysis, External Analysis, Software Comparison, and Advertising]

**Procedure**

*SWOT Analysis / Internal-External Analysis:* The Marketing analysis will be used to define the applications potentials in the market and to come to an advertisement campaign which promote and support the application. First of all, an SWOT analysis has been made to determine the internal strengths and weaknesses and the opportunities and treats of the Chair. The external analysis consists of the customer analysis which will be supported from the User Research. A competitive analysis is needed to get to know the competitors and dividing the opportunities and treats of the market. The requirements, the users, distribution and pricing of every competitor will be compared with each other. The result of this comparison is used to give recommendations about which specifications the application should have. The product positioning and the target market will be determined with the help of the User Research part.

*Software comparison:* To determine the used software licenses a comparison is made between free software and proprietary software. Based on the results of this comparison the way of distribution can be determined.

*The advertisement campaign:* This activity will be accomplished with help of the 3P’s: price, placement and promotion. The focus of the advertisement campaign is promoting the application in the best suitable way without the use of financial resources. The goal is to find free advertisement methods which will reach a broader public.
2.2 User Research

Research design

![Diagram of Research design - User Research](image)

Respondent

The respondents of this research will be students with a visual impairment or dyslexia. The Chair proposed to get us in contact with the PAD (Programma Atenció a la Discapacitat). This office helps students, who have a disability, with their problems which they underestimate during their studies at the UPC. The first idea was to make a questionnaire in English, get it translated by somebody who speak Spanish or Catalan, and hand it out at the PAD. But this would have taken a lot of time and would not have given that much response, and besides that the students of the EPSEVG are not representative for the whole group of students with a visual impairment or dyslexia.

So it was decided to use another method, forums. Not just random forums, but those who are meant for students with a visual disability or dyslexia. Taking in account the problem that not all the visual impaired, and especially not the fully blind ones, will use forums like this. A lot of students with dyslexia will use forums like this to share their problems with people that are in the same situation. For people with a (small) visual impairment it is also very common to use forums like this, and there can be gathered a lot of information from them by filling in the questionnaire. For the ones who have a total blindness it will be hardly possible to fill in our questionnaire, but that problem would have been the same with handing out the questionnaire at the PAD. So eventually we reach the same kind of students, but in a wider context and all over the world instead of only at the EPSEVG in Vilanova i la Geltrú.

Procedure

Desk research: The desk research started with making the research question to explore during the User Research. These questions had to cover the whole research, and had to be linked to different research methods.

As soon as this was ready the desk research started. The Chair handed out two different researches done before by the ONCE, a non-profit corporate organization that focuses its activities on the improvement of the quality of life of people with blindness or severe visual impairment from all over Spain.
Field research: After the desk research was completed the results had to be compared to what should be done during the research. With this information the content of the questionnaire was decided. The questionnaire contained the subjects which were not clear yet after the completed desk research. When the survey was ready it was uploaded online on different forums especially for students with visual impairments or dyslexia. In total a response of minimum 50 respondents was needed to have a valid and reliable result. Eventually the questionnaire resulted in 66 responses. These responses were only students who have a visual impairment or dyslexia.

Translation of the results. Implementation of the results: Both the results from the desk and the field research gave a clear image of the users. These results will be presented in the results section (Chapter 3). All the physical facts are summarized in a persona, which is a fictive person who stands for the respondents from the research. Also, the research results are translated in demands for the software and with those demands an interface design is created which fits with the future users of the application.

2.3 Programming

Research design

First of all the best suitable programming language needs to be determined because the application has to be an Open Source and multiplatform. So, a choice should be made between different existing programming languages. After chosen best suitable programming language the software of the application had to be developed. The used information for the software is an explanation of the Daisy File Format, SMIL management, XML management and Playlist creation. An interface is needed to use the application. The interface will be made with the outcome of the User Research part.
Procedure

Daisy to MP3 Converter: In order to develop the application taking into consideration the User Research requirements, the appropriate technologies that are compatible with the Daisy File format had to be found. Therefore, we worked with Synchronized Multimedia Integration Language and Extensible Mark-up Language. The benefit of SMIL is that several accessibility features have been added to this language to fit the needs of the Daisy File format. The main reason for using the XML files is because with it is easy to read and create files thanks to JDOM library for Java.

Text to Daisy: The conversion from a PDF file into a Daisy book is the second activity of the software development. This part incorporates different technologies such as Text Extraction from PDF file, Text to Speech, MP3 encoding and the creation of Daisy File. To make the Text Extraction possible PDFBox was used because it is an open source Java PDF library for working with PDF documents. The next step was to convert text into a voice file. For this part FreeTTS was used because is completely written in Java programming language. Another technology chosen was LAME, which is the most used open source encoder and helped converting WAV to MP3. After taking into consideration all these technologies the Daisy File could be created.

Interface: To design the interface of the project NetBeans 6.9.1 platform was used thanks to its benefits. One of the advantages of this program is that it already has a framework that helps the inexperienced programmer to build a Graphical User Interface easily. For the Daisy Converter project an interface was developed with a Java Desktop Application that has a Swing framework with the elements that was needed in order to fulfil the user profile.
3. Results

3.1 Marketing

3.1.1 Introduction “The Chair”
The Accessibility Chair is a management unit in the UPC, which promotes, coordinates and manages accessibility projects for the University. The Accessibility Chair depends on the vice-presidency of Institutional Relations and Regional Promotion of the UPC Barcelona Tech and gives services to the whole University.

The Accessibility Chair is organized in two areas:

- Project area
- Management area

The Daisy Converter Project is housed under the Project area. The Accessibility Chair activities are project-oriented. The Chair converge several sectors: public sector, private sector, and organization representatives of people with disabilities.

Thanks to the experience it is gaining, the Chair can identify the needs, resources and alliances so it can guarantee the correct development of the project. In this execution it may converge several sectors: public sector, private sector, organization representatives of people with disabilities.

**The Chair’s goals**
The objective of the Chair is to promote and coordinate projects about accessibility led from the University at the service of society. The Chair wants to be the bridge between the formative and researchable capacity of the UPC and the non-solved necessities of the people, which are in a disability and/or dependency situation.

The Accessibility Chair is specialized in universal accessibility, design for all and support technologies. The focus of the Chair is on [5]:

- Physical accessibility
- ICT accessibility
- Transport accessibility
- Support technologies
- Accessibility in education or Universal Instructional Design.

**Chair’s Aids**
The Chair’s aids for students with visual disabilities or dyslexia are laptops with specific software for text reading: JAW or ZOOMTEXT for reading the blackboard. Some of the students use a camera which records the blackboard and makes a visualization on their own screen at the same time. Fundación ONCE provides the software and the camera. UPC does not offer any technical support for these students. For students with dyslexia there is not a specific service except during an exam. Then they will have more time for making the
exam. They are also provided with copies of the exam where the text is zoomed or enlarged. These kinds of copies are made by the PAD service (Programa d'atenció al Discapacitat- Disabled support service/program) of the UPC. The UPC does not offer Braille machine or listening books. When students have a technical support need, the Fundación ONCE will provide them.

3.1.2 SWOT Analysis
In order to get a picture of the current market for audio book software, the department and future market was analysed with a SWOT-analysis. This is a tool for auditing the department and the future market for the application that was developed. With an internal analysis of the Chair the internal factors such as strengths and weaknesses were evaluated. The second part of the SWOT-analysis was to determine external factors such as threats and opportunities and a key aspect of this analysis is a comparative analysis of already existing software and companies. A User Research is included in the external analysis in order to get an overview of the future user of the application.

3.1.2.1 Internal Analysis
This analysis gives us an overview of the Chair’s internal strengths and weaknesses. The outcome factors are those who are giving the department the certain advantages and disadvantages when achieving the needs of the target market.

Strengths
The strengths that were focused during this analysis are the core competencies of the Chair and its staff. One factor that is a strength of the department is its personnel who have good knowledge about people with disabilities and implementing projects focused for developing educational projects for disabled people. Furthermore, a strong aspect to take in mind when it comes to the Marketing of the application is that the Chair has already established itself with a customer point-of-view, brand and linkage with working for the rights for education to disabled people. This linkage is something that can be build upon and can be used in the advertising plan.

In order to advertise the new application in the future the department has existing functions in the management area, which will make the advertising plan that the project develops more efficient. These functions include:

- Marketing
- Communication
- Public relationships

The Chair is also closely linked with different organizations that strive for people with disabilities and has a good chance to promote and distribute the application this way. [6]

Weaknesses
The most important weakness is that the market of the Chair, with the application in mind, is not that big. The aim of the advertising plan should be to expand the market from the students of the UPC and nearby people with connections to the Chair to the public market with users from all over the world. The department is not still linked with the DAISY Consortium when looked from the customer point of view. This is a fact that is going to be taken in consider when the advertising plan is carried out.
3.1.2.2 External Analysis
To determine the opportunities and threats of the Chair an external analysis is needed. The external analysis consists of four sub analysis; Customer analysis, Competitive analysis, Market analysis and Environmental analysis.

Users/Customer
The customers of the Chair are the users of the application. The users are students with visual impairment. The impairment is of such a kind that normal reading for the student is impossible or is so difficult that has a negative influence on the results of the student, even with the standard visual aids such as lenses and glasses.

Users can also have reading difficulties through another cause than bad sight. Students with dyslexia can be helped with this tool. This is a big target group, students with dyslexia have often not the necessarily help they needed. With the help of the Chair’s application a dyslexia student can increase his/her results. More information about the customer analysis is outlaid in the User Research part.

Competitive Analysis
The Chair is positioned in the visual impaired market, this market consists all the methods and applications which helps people with visual impaired vision to improve their sight or helping with reading. The Chair focus is on the students of the UPC with have an impaired vision. The competitors in this market are the suppliers of the listening books applications mentioned in the following analyze and other not mentioned suppliers of listening books. Other competitors are suppliers of different methods such as: BRAILLE, Electronic Note takers, Special Note Paper.

The primary competitors of the Chair’s application are the suppliers of listening books. These competitors can also be helpful for the Chair because the main focus of the Chair is to help the students with impaired sight. With this idea in mind it is not necessarily for the Chair to compete against the competitors. If a student chooses for another application, which is helping the student in the same way if the Chair’s application does, then the Chair’s goals will be fulfilled by that.

In order to get a good and clear image of how the market looks like for our application we have to map the competitors and other similar software for people with impaired vision. DAISY is the most common format and has been chosen as the official maintenance agency by the National Information Standards Organization (NISO) for the ANSI/NISO Z39.86 specifications for a Digital Talking Book. ANSI is the American National Standards Institute and oversees the development of standard and NISO is accredited by.

Book Wizard Reader
The Book Wizard Reader is a file supplied on the Book Wizard disc as an HTML (made with XML) document and you may read it from your browsing software. The file uses the DAISY 2.02 and DAISY/NISO Z39.86-2002 standards. These are the same standards as used for The Chair project. The file is suitable for translation into Braille and embossing. To instalment of the file is easy, by just putting the CD in the CD-driver and following the instructions.
The program runs only on windows, so it’s not compatible on Linux and Apple. The program itself is not downloadable in a legal way.
**Users**

Everybody is allowed to use the program. The program is specially made for students. There is a special Book Wizard, which can send the current book to a *Book Port*. The Book Port can read the current book and can store notes. In this way the user can take notes when listening to the book.

**Distribution**


**Pricing**

The product price is $39,-[7]

**Conclusion**

The book wizard is a British organization, which provides a wizard to listen to audio books. The Book Wizard Reader uses the same Daisy formats then the Daisy to MP3 format. The disadvantage of the Book Wizard Reader is that it’s only compatible with Windows. Apple or Linux are not supporting the program.

**Dolphin Easy Reader**

Easy Reader is accessible software for eBook readers, allowing users to read and listen to content through a combination of text, speech and images. The Easy Reader is compatible with the following books:

- DAISY 2 books (ncc.html)
- DAISY 3 / NIMAS books (.opf)
- DTBook XML books (.xml)
- HTML books (.html)
- TXT books (.txt)
- Open (unprotected) EPUB books (.epub)

To compare the Easy Reader with the Chair’s application two products of the Easy Reader are needed:

*DolphinReader:* There is a single user license which costs €55,-(ex. VAT). For education and libraries there are two options Single Site Licenses and Multiple Site License which cost respectively €2000,- and €5000,-. For annual education there is an Easy reader Subscription License which cost €1,- per student (whit a minimum of 300 students). Delivery cost are in the UK £10,- in the US $12,- and in other area £20,-.

**Extras:**

- 3 additional voices €120,-
- 1 additional voice €40,-
- Optional home extension licenses €0,20.[8]

*EasyConverter:* The single user license for the EasyConverter cost €1245. For each student who is using the EasyConverter a school has to pay €1,- per student (wit a minimum of 300 students). An extra user Licenses costs €750,- and an extra user licenses upgrade from previous versions cost €250,-.

**Users**

The EasyReader is mainly made for students, education and libraries, but it can be used by everybody.
Distribution
The full version of the program is sent in a box with is chipped to the buyers house. You can order it online or you can go to one of the Dolphin dealers. There is one Dolphin dealer in Spain.

Pricing
There are several pricings for different products. Because the DolphinReader and EasyConverter are the product wows fit is the best with our project, only the pricing of these two products are shown below.

Conclusion
The Dolphin Easy Reader is expensive compared with the DAISY Reader of the Chair. For a comparable program the payment for the Dolphin Reader is for a single user €1300,- and for a university whit a minimum of 300 users, and one license for the EasyConverter costs between €3.845,- and €6.845,-, depending on the Single or Multiple Site License.

The Dolphin Easy Reader is only compatible with Windows driving system. This is an opportunity for the Chair’s Daisy reader. Which is compatible with the three most used driving systems.

Amis
AMIS is short for Adaptive Multimedia Information System, and it is a software program that enables the user to listen to DAISY 2.02 and DAISY 3 audio books. One of the more important features of the software is that it is self-voicing, which makes specialized screen reading software unnecessary. The varieties of DAISY 2.02 and DAISY 3 supported by AMIS are:

✓ Full-text/Full-audio
✓ Audio-NCX
✓ Text-only
✓ Multi-volume with DAISY 2.02

With AMIS the navigation in a digital talking book is very extensive. It is possible to navigate by section, subsection, page or even phrase. A bookmarking option is available in the middle of reading with a click. Afterwards when the user has finished reading it is possible to navigate to the stored bookmark by selecting it from a list. A useful feature with this software is that the user can manipulate the interface by altering the font and the colours. Furthermore, is the possibility to change the speed of the audio to match the users requirements. An important feature is that AMIS automatically re-opens the most recent book at the point where it was stopped.

Users
The software is available for everybody.

Distribution
As mentioned above, with the software available for all users, the software is highly accessible. The software is open source and it is downloadable from the DAISY consortium Internet homepage.
Pricing
As a part of a DAISY project, AMI follows the main idea of the Consortium. This way of thinking has resulted in that the software is free of charge for everyone.

Conclusion
When the software is compared against our project's DAISY to MP3-playlist application one distinguishing aspect is noticeable. The advanced navigation possibilities are loosed when converting from the SMIL file to M3U. [10]

Audible
The Internet based digital audio book seller audible is the biggest company on the commercial market. Audible is a subsidiary of Amazon and besides the audio books the company sells radio and TV programs and audio versions of magazines and newspapers. The total amount of titles available on the Internet is 85 000. The used file formats are .AA and .AAX and they are proprietary. Audible software is widely multi-platform and supported ones are Microsoft Windows, Mac OS, Android OS and Apple OS. In recent years Audible has strived towards developing systems to improve mobility options with audio books and has there for made a deal with Apple to proved their library on Itunes Music Store. A user with an IPod or IPhone can download the audio book directly to his device from ITunes and does not need to transfer the file from a computer to the mobile device. The company has also released software called Audible Air which makes the same downloading process available for Palm OS, Windows Mobile and Symbian mobile devices.

Users
The service is available for everybody no matter origin.

Distribution
The main distribution channel is the main webpage of Audible. All of the available titles can be downloaded there with a PC or Mac. Another important and growing distribution channel is ITunes Music Store, where as mentioned before, one can directly download the audio book for the mobile device.

Pricing
To gain access to the audible audio books a membership is required. This membership has a monthly fee of 14.95 €. When downloading a title a fee has to be paid varying of the title. Normal prices for an audio book are between 10$ and 30$. [11]

Conclusion
With Audible being a commercial business with strive for economical winnings it has somewhat different goal then NLS and Daisy. This comparison is necessary to do to get an overview of the commercial market of audio books. As it is now, Audible holds almost near-monopoly on this market and for a DAISY based application to compete against Audible prices would have to be lower than the prices of Audible titles.

National Library Service
The United States of America based department of the Library of Congress, with the name National Library Service (NLS) is a free digital audio book library for American citizens with physical impairments that prohibit them from reading regular print. The file format of the NLS-audio book is a proprietary encryption
extension to the DAISY standard. In other words the basic structure of an NLS format and DAISY format are quite similar, however, certain information tags in the SMIL file and the audio itself is encrypted and in order for playback, decryption is necessary. The encryption is done to prevent unauthorized individuals, not having the qualifying disabilities, from accessing the materials. Due to this encryption playback is only possible on players, which specifically implement the necessary algorithms and key management. NSL selects which books to publish for full length digital talking books, this because of strict provisions of the U.S copyright law and permissions of authors and publishers. The recorded formats NLS offer, are in analogue cassettes and digital cartridges.

Users
To gain eligibility of the NLS libraries the user must be a resident of the United States living the country or domiciled abroad. Also a certificate is needed to prove that the user is blind or disabled. The certifying authorities include doctors, nurses, optometrists, therapists or in the absence of these professional librarians or any other person granted the permission by the Library of Congress.

The following persons are eligible for service:

1. Blind persons whose visual acuity, as determined by competent authority, is 20/200 or less in the better eye with correcting lenses, or whose widest diameter of visual field subtends an angular distance no greater than 20 degrees.

2. Other physically handicapped persons are eligible as follows:
   a. Persons whose visual disability, with correction and regardless of optical measurement, is certified by competent authority as preventing the reading of standard printed material
   b. Persons certified by competent authority as unable to read or unable to use standard printed material as a result of physical limitations.
   c. Persons certified by competent authority as having a reading disability resulting from organic dysfunction and of sufficient severity to prevent their reading printed material in a normal manner.

Distribution
Distribution of NLS digital talking books is available for download through the NLS Braille and Audio Reading Download (BARD) services. It is also possible for an eligible user to lend both the material and playback hardware via postage-free mail. This option is made available through a network of regional and sub regional libraries nationwide.

Pricing
The main idea of the creating of this service is that is has to be free of charged for everyone with eligibility for it. This is the reason why it is totally cost free to the user. [12]

Conclusion
The restricted market size for NSL is an aspect one has to bear in mind when comparing market segments to the DAISY markets. Daisy SMIL files not being encrypted and free to use by anyone is surely an advantage. And with the NLS market only in United States Daisy has a definitely strong position on the global market when compared with NLS.
Comparison

The results of the comparison analysis are used to define the opportunities and threats out of the market.

<table>
<thead>
<tr>
<th>Software</th>
<th>Operating System</th>
<th>Users</th>
<th>Pricing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Book Wizard</td>
<td>Windows</td>
<td>Students with V.I.*</td>
<td>$39,-</td>
</tr>
<tr>
<td>Dolphin Easy Reader</td>
<td>Windows</td>
<td>Students with V.I.*</td>
<td>€3.845,-/€6.846,-</td>
</tr>
<tr>
<td>Amis</td>
<td>Windows/Mac/Android</td>
<td>Everybody</td>
<td>Free of charge</td>
</tr>
<tr>
<td>Audiable</td>
<td>Windows/Mac</td>
<td>Amazon users</td>
<td>€14,95,- monthly</td>
</tr>
<tr>
<td>N.L.S**</td>
<td>Windows</td>
<td>U.S. Citizens with V.I.*</td>
<td>Free of charge</td>
</tr>
</tbody>
</table>

*(V.I.) Visual Impairment
**(N.L.S) National Library Service

The result of the comparison analysis is that all the applications are possible to be run on Windows and one of the software (Audible) can also run on Mac. There is one application (N.L.S), which only distribute in the United States. On the world market this will not be a competitor of the Chair. There are suppliers of listening books, Book Wizard and the Dolphin Easy Reader who are focusing on students; both of them are coming with a charge.

3.1.3 Market Analysis

The communication market analysis is an analysis of the market and where the product is situated. In this analyze first the market and the competitors are determent. The opportunities for the product are determined and the users/customers are defined to know what the target market is. As final the product positioning is determined.

Market

The audio book market is changing. Did in the past books recorded onto cassettes lead the market, now a day audio books are more on CD’s or downloadable. Because of these changes the number of sales rose. The bestsellers have an audio edition. Every year the audio book market is growing. From 1996 till 2010 the Audio book sales have been growing with 4.5 % each year and it has a total of sales of $2.08 billion in 2010. The expectation is that the market of audio book will keep on growing in the future. [13][14]

Target Market

First of all, the target market of the Chair is students with visual impairment at the University Politecnica De Catalunya (UPC). With this first step the Chair can monitor the application, on user friendly and defects. With the results the Chair can “fine tune” the application. The application is downloadable for everybody, but the recommendation for the Chair is to support only the UPC students, because the Chair will have a big workload if they support all downloads. The support of the application outside the UPC has to lay at another organization, such as the Daisy Consortium. The Chair needs to contact the Consortium about the possibilities.
Product positioning
Product positioning is what the customer believes about the product value. It is a comparison to other available alternatives offered by competitors.
The application of the Chair is free software which is distributed without any charge. The software is comparable with other consisting listening books software, which most of the time is not distributed without a charge. The application is downloadable for everybody.

Opportunities
When comparing with the other software and commercial Digital Talking Book sellers the Daisy converter advertisement should concentrate on that it is developed mainly for educational purposes for people with visual impairment. While other software that has been analyzed concentrate on other aspects, the Daisy Converter advertisement campaign would gain customers if stressing the fact that it has been developed in a university environment, taking in mind demands and requirements of students with impaired vision and dyslexia.
The fact that none of the competitors has a listening book application, which is compatible with Linux, is an opportunity which should be one of the foundations in the advertisement campaign amongst the aspect that Daisy converter is multi-platform, covering Windows, Mac OS and Linux. Among the compared software none had this feature and that is a key aspect of the advertisement campaign. The national library service is only active on the market of the U.S.A. There are only two out of the five competitors who are distributing their application without any charge. An opportunity for the Chair is to distribute the application without of charge. Another opportunity is the growing market. And the rising popularity of listening books.

Threats
The competition of the Chair has years of experience in Daisy Books and the most of them are commercial orientated. Because they have more money to spent then The Chair, the advertisement of these companies will be better or intensive then the advertisement of the Chair. The Chair’s converts DAISY files into MP3 files, which are easy to use for everybody, also easy to share on an illegal way, wit less sales as result.
SWOT Matrix
The SWOT matrix is the result of the Internal and External analysis and it gives an overview of the Strengths and weaknesses and the Opportunities and Threats of the Chair.

Table 2 SWOT Matrix The Chair

<table>
<thead>
<tr>
<th>Strengths</th>
<th>Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Existing knowledge of working with disabled persons</td>
<td>✓ Growing market for the last 14 years</td>
</tr>
<tr>
<td>✓ Experience with implementing projects focused on disabled people in educational environment</td>
<td>✓ Future market growth of audio books</td>
</tr>
<tr>
<td>✓ Existing brand linkage between the department and people with disabilities</td>
<td>✓ No competition on Linux operating systems</td>
</tr>
<tr>
<td>✓ Management area with specialized staff in marketing, communication and public relationships</td>
<td>✓ Low competition on Mac operation system</td>
</tr>
<tr>
<td></td>
<td>✓ The only application which is compatible with Windows, Mac and Linux</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Weaknesses</th>
<th>Threats</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Size of market</td>
<td>✓ Competition whit years of experience in the production and use of audio book applications</td>
</tr>
<tr>
<td>✓ Non-existing linkage between the department and DAISY Consortium in a customer point of view</td>
<td>✓ Competition has more capital to spend on advertisement and development</td>
</tr>
<tr>
<td></td>
<td>✓ Converting DAISY to MP3 might increase illegal share of the files, resulting in less sales</td>
</tr>
</tbody>
</table>

3.1.4 License comparison
Free software license and proprietary license are compared and a conclusion of which license is used for the Chair’s software is made.

Free software
When designing the software an important decision that has to be made is whether to make the application to free or proprietary software. The term free software is not to be mistaken for the meaning of free of charge (freeware). With this in mind a defining description of it would be that it is a matter of liberty, rather than price. This gives the user freedom to run, copy, distribute, study and also make changes and improve the program. One has to be able to run free software for any desired purpose at any given time.

With free software a user has also the privilege to redistribute copies without asking the software developer for permission. These copies might also be with or without modifications. Being free software one does not have permission to redistribute the modified copies.
Free Software Foundation - History
The first steps to create the foundation were in 1983 by a man named Richard Stallman when he initiated the GNU-project. This project contained development of an operating system that was free software. In 1985 he published the GNU manifesto that stated the definition and ideology of free software and outlined the goal of the GNU-project. Today the foundation is non-profit and promotes computer user freedom all around the world.

Examples of free software
A large amount of software that has been admitted to the Free Software directory, which is a project of Free Software Foundation and UNESCO (United Nations Educational, Scientific and Cultural Organization), are listed on the Internet.[15] The most well know software’s are:

- GNU/Linux, Linux kernel and BSD operating systems.
- GNU Compiler Collection and C-library
- MySQL
- Apache web-server

Free software licenses
In order to make software free it has to be released under a license. A feature that was wanted for this project was that the license should have a strong Copyleft aspect. Copyleft means that all developed software from the original software is kept as free software. Copyleft also grants users to develop and redistribute the software. All these features are what we are striving for with the Daisy converter application. [16]

Proprietary Licenses
Till 1969 computers were huge and expensive, computers were often leased instead of bought. Software was made available to the customer without any charge the software source code was usually provided. In 1969 IBM “unbundled” the software from the hardware sales. IBM divided his software in two main categories: System Control Programming (SCP), this software remained free to customers, and Program Products (PP) The PP was made available by charge. The decision of IBM to made software available on charge was a huge help for the software industry. Software development raises and companies which only focused on software arisen. [17]

The Free Software Foundation divined proprietary licenses as software that not meets the free software criteria. A company or an individual person owns the exclusive auteur rights of the software. The source code of the software is not free for change and is not to see for the users.

To run the source code, a binary machine code is given by producers of proprietary software. The computer of the user can read this code. The code is not readable for humans. Companies use copyright and patents to protect the source code for adaption. Third parties only could access to the source code with the so named ‘non-disclosure agreement’.
Software is proprietary when it meets the following criteria’s: [18]

- The user is not able to use the program for every purpose
- The user has no access to the source code
- The user is forbidden to make copies of the software
- The user may not improve the program

Proprietary software can be spread for free or for compensation. The biggest commercial software-packets are proprietary. Microsoft, Google, Adobe and Apple are using proprietary license. In this way the companies stay in charge of their software. Companies like Microsoft shouldn’t exist anymore if they didn’t use Proprietary licenses. [19]

**Vendor Lock In**
Disadvantage of proprietary is the change of Vendor Lock In. A customer becomes so dependent of the supplier that a change of supplier without huge financial consequences is not possible. Old versions are not anymore support by the supplier. New updates have been bought from the same supplier. Even if the supplier doesn’t give the right product, the customer will stick with the same supplier, because a change of supplier costs in business millions. There are many examples in which suppliers of software stopping updating older versions on purpose, so the customer has to buy a new version. Customers have to stay at the same supplier, because all the other programs are only working with software of this supplier. [20]

**Apple Inc. and Microsoft**
Recent examples of Vendor Lock In are for example the way how Apple Inc. and Microsoft are spread their software. Microsoft is using an extensive set of Application Programming Interface (API). This means that all the software can work with each other. Through the API’s programmes from other software suppliers cannot work with Microsoft software. In the year 2004 the European Union and the European Commission started a case against Microsoft (European Union Microsoft completion case). Microsoft founded guilty and had to pay a fine of €497million (The largest fine ever handed out by the EU). Microsoft released Windows XP without the Windows Media Player, they give the source code of Windows Media Player free, but did not give the specification. The lack of giving the requested information, Microsoft was fined for multiple times more with a fine in 2009 of not less than €1.06 billion.

In January 2009 the European Union started an investigation of the bundling of Windows Internet Explorer and Windows operating Systems. The EU allowed competing browsers on windows operating systems. Microsoft had to provide a “Ballot Box” in which customers can choose one of the twelve popular browsers. [21]

**AppleInc.**
Apple is a good example of the negatives of proprietary license for the user. Apple forbids users from running Apple application on other than Apple hardware. In this way Apple links his software with his hardware. Customers who are willing to use Apple software have also to buy Apple hardware. [22]
3.1.4.2 Chosen Free Software License
The best free software license needs to be determined. Out of a selection of three different free software licenses the best is chosen. The three free software licenses are GNU General Public License v.3, GNU lesser General Public License v.3 and GNU Affero General Public License v.3.[23]

3.1.4.1 GNU General Public license v.3 (GPLv3)
This license grants user to redistribute copies of the software, for free or for a charge, but they have to pass on the freedoms that they themselves received with the program. The license also declares that the software does not have any warranties but developers of the software have to state that their product is marked as changed so if any problems occur authors of previous versions will not got blamed.

3.1.4.2 GNU Lesser General Public license v.3 (LGPLv3)
The LGPL has the same structure as the GPL but is not as strong copyleft as GPL. It allows non-free modules to be linked with the free software.

3.1.4.3 GNU Affero General Public license v.3 (AGPLv3)
This license is a strong Copyleft license and has the same structure as the GPL but it has an additional paragraph that demands users who interact with the software over networks to share the source code. This license is thereby recommended to software’s that will be run over network. [24]

3.1.5 Advertisement- marketing mix
The advertisement campaign is made with the use of the 3p’s of the marketing mix. The 3P’s used are price, placement and promotion [25]. Before the advertisement campaign the brand awareness and enhance firm image are determined to create a base for the advertisement campaign.

Brand awareness
An important objective to achieve within the advertisement campaign is to create brand awareness. In the case of the Daisy converter application a linkage between the developed application and the Daisy consortium would help achieving this goal. This would be made possible by incorporating the Daisy consortium logo in all advertisement material. When concentrating on this linkage and also incorporating advertisement of the University Polytechnic of Catalonia a differentiation is created. With this differentiation the Daisy converter application is pointed out as software for educational purposes developed in University environment with previous experience in helping students with disabilities.

In addition to these aspects there is an opportunity to advertise the application together with different organizations that the Chair of Accessibility has connections with, for example ONCE.

Enhance department image
An aspect of the communication objectives is to enhance the image that customers and persons with connections to the Chair of Accessibility, have of the department. This objective has quite far the same structure as the brand awareness objective. The goal is to develop the application advertising in a way that
enhances the image of the department. This thing is possible to achieve, as it is for now, in a way were CATAC and Daisy consortium would be linked together and with the application itself. This might be a webpage on the Chair of Accessibility's homepage, where the application is presented. Presenting the application together with the logos of the department, Daisy Consortium and for example logos of different organizations that the department is already in connection with would enhance the image.

**Price**
The application of the Chair is distributed without a charge. The application is meant to help people with visual impairment and is distributed by a non-profit organization.

**Placement**
Distribution channels are necessary to distribute the application of the Chair. First of all the application needs to be downloadable from the CATAC webpage, or there should be a linkage to the download page. There is chosen for the Sourceforge webpage.

Sourceforge is a webpage were registered users can download, create and publish free software applications without cost. The site contains 230 000 projects and has 2 million users today. The site has approximately 2.5 million visitors per month so there is a huge opportunity to make advertisement here for the Chair.

A user can create an own project on the site and develop it before publishing. To start the user has to create an account. After that he has to determine which free software license to use, in our case the choice would be GPL. Then the user has to provide a description of the project before finally registering the project. By uploading our application to Sourceforge a big global market opens and further development of the application is more plausible. [26]

**Promotion**
The new application of the Chair needs advertisement to get it known by potential users. Because the advertisement needs to be free of costs there is chosen for online advertisement. This Chapter gives an overview of the different ways of promoting the application on the net. The webpage of the Accessibility Chair and the connection with the Daisy Consortium will be outlined. Furthermore, the use of social media will be emphasized.

**Accessibility Chair**
The application will be downloadable from the site of the Chair. Information about the application, hothouse the application and information about the target market and users is given. Logos of the Accessibility Chair and perhaps other sponsors who are already linked with the Chair can appear on the site.

**Daisy Consortium**
The Daisy Consortium is an international association that develops, maintains and promotes international DAISY (Digital Accessible Information System) Standards”. It is an organization supported by multiple companies with experience in accessible information systems. The organization is one of the most know consortiums of
accessible information systems in the world. The Daisy Consortium developed in cooperation with the National Library Service, and a variety of other North American organization the Daisy Standard. The most used standard for listening books.

A link between the Daisy Consortium and the Accessibility Chair will improve the brand image of the Chair’s application. Because the Chair does not have any budget, it would be hard to be placed at the Daisy Consortium site. Becoming friend developer of the Daisy consortium a fee of $3040, - have to been paid. This might be an option in the future when the Chair is trying to distribute his product wider and outside the UPS.

It should be worthy to get in contact with the Daisy Consortium and try to build a band between the Chair and the Consortium. Because it’s in the beginning not possible to put the Chair’s name on the Daisy site, it might be possible to put the Daisy Consortium logo on the webpage of the Chair; in this case the department has to negotiate with the Daisy Consortium. [27]

Social Media
Social Media is a wide used and spread online platform, in which there is an interaction between the users. Social Media is a perfect platform to advertise a product. There are several ways to advertise with the help of social media.

Corporate Profiles
Corporate Profiles are profiles like any other personal profiles like pages on Facebook, LinkedIn or Twitter only then for companies. Such kind of profiles working the best when people can be fan of the companies profile can share them with other people and can post the brand-logo on their own profile. This way of advertisement is most of the time for free. [28]

For the Chair it is a good idea to make a Facebook, Twitter and LinkedIn account. They are all for free and the Chair can reach broad target group. With these accounts the Chair easily can share information about the application and also get feedback on the application.

Facebook
To reach a broad target group, creating a Facebook profile is a good option. Facebook is the biggest information network in the world, with more than 500 million users in July 2010 and still growing [29]. When creating a Facebook profile, users can “like” the Chair’s profile and share it with other Facebook users. This is a free and easy way to get the application known. This kind of advertisement is especially for these persons with a visual impairment who are still using a computer.

The Facebook profile of the Chair should have an introduction of the Chair with her goals and where they stand for. The site also needs to have a clear explanation of the application, what the application is and how it works. An explanation of the target group and an example of potential users should stand on the site. A linked to the Chair website should be posted on the Chair’s Facebook page; also the link of the Twitter account and the LinkedIn account should be on the Facebook page.
Twitter
Twitter is a social network with almost 100 million users around the world at the beginning of 2010[30]. It is possible to use Twitter by instant messaging, SMS or web interface. Twitter is for business a good way to interact with their customers, give fast information or feedback about their products. Other users of Twitter can follow the information posted on the twitter page. The Chair can use Twitter to advertise their application, give support to their customers and get feedback on their application. A linkage to the Chair website and the Chair’s Facebook and LinkedIn page needs to be on the Chair’s Twitter account.

LinkedIn
LinkedIn is a business related social network, the network is used by more than 100 million users.[31] LinkedIn is manly used by employees searching for jobs, but it is also a great opportunity for the Chair to get their application more known within the business class. It is possible to create a business page on LinkedIn. On this business page it is possible to place short business information (1500 characters) on the page such as brief introduction about the Chair and his application, with links to the Chair’s- site, Facebook and Twitter account.

Reciprocal Links
The Chair can also use reciprocal links; reciprocal links make it able for other companies to share their link on the Chair’s webpage, other way around the Chair also can put his link on the other companies’ webpage. The Chair can start sharing links with companies who are making aids for visual impairment. In this way the Chair doesn’t only help the company but also the users of the application, if they need new aids for their visual impairment. Also, put the links on forums about visual impairment. In this way people with visual impairment can directly access the application. [32]

Banner
A banner is a graphic advertisement on a webpage, it is the same as a reciprocal link but then with the graphic design. It’s same like the reciprocal linkage a linkage between the webpage’s of two different companies. The Chair can also use this kind of advertisement to get their application more known. There are several sites that are helping companies to make such banners. [33]
3.2 User research
To have a clear image of who the users are, what they want and how they will use this (want it) the result of the user research (see appendix I and II) are translated to a persona, physical facts of the user, and technical demands of the software.

3.2.1 Persona
A persona is an example of a person who could be the user of the product. This is a virtual person, and the personal details of this person are based on the results of the research. The persona can help the designer of the product with keeping in mind who the user can be.

Sarah

![Sarah, persona from the future poster](image)

Name: Sarah  
Age: 25  
Disability: Strong dyslexia

This is Sarah, she’s 25 years and she studies electronics at the EPSEVG in Vilanova I la Geltru, close to Barcelona. She still lives with her parents in Barcelona, but travels every day to Vilanova I la Geltru to study. Sarah really likes to study, but she does have some problems with studying. She has a very strong version of the disability called Dyslexia. This is a learning disability that impairs a person’s fluency or comprehension accuracy in being able to read, and spell. It is a neurologic disease so it cannot be resolved, but it can get be better by training. When Sarah started her study at the EPSEVG she contacted the Accessibility Office to help her training to keep her dyslexia down as much as possible. This includes exercises to practice reading, and by just doing the disability will have the least impact.
Physical facts from the respondents

Age:

Average: 24,6
Range: 13\textendash}32
Median: 21
Total response: 66

Sex:

Male: 24
Female: 42
Total responses: 66

Visual impaired: 12
Dyslexia: 48
Both: 6
Total responses: 66

Figure 17 Respondents who ever contacted an accessibility office

Yes: 42
No: 24
Total responses: 66

Figure 18 Dividing disabilities respondents

Visual impaired: 12
Dyslexia: 48
Both: 6
Total responses: 66

Figure 19 Dividing sexes respondents

Male: 24
Female: 42
Total responses: 66

Figure 16 Respondents who found the accessibility office useful

Visual impaired: 12
Dyslexia: 48
Both: 6
Total responses: 66

Figure 15 Respondents interested in using the DAISY converter

No: 30
Yes: 36
Total responses: 66

Figure 15 Respondents interested in using the DAISY converter

Yes: 36
No: 30
Total responses: 66
### 3.2.1 Demands of the software

#### Table 3 Demands of the software [40]

<table>
<thead>
<tr>
<th>Demand</th>
<th>Which includes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visibility of system status</td>
<td>The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.</td>
</tr>
<tr>
<td>Match between system and the real world</td>
<td>The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.</td>
</tr>
<tr>
<td>User control and freedom</td>
<td>Users often choose system functions by mistake and will need a clearly marked &quot;emergency exit&quot; to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.</td>
</tr>
<tr>
<td>Consistency and standards</td>
<td>Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.</td>
</tr>
<tr>
<td>Error prevention</td>
<td>Even better than good error messages is a careful design, which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action.</td>
</tr>
<tr>
<td>Recognition rather than recall</td>
<td>Minimize the user's memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.</td>
</tr>
<tr>
<td>Flexibility and efficiency of use</td>
<td>Accelerators -- unseen by the novice user -- may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.</td>
</tr>
<tr>
<td>Aesthetic and minimalist design</td>
<td>Dialogues should not contain information, which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.</td>
</tr>
<tr>
<td>Help users recognize, diagnose, and recover from errors</td>
<td>Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.</td>
</tr>
<tr>
<td>Help and documentation</td>
<td>Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.</td>
</tr>
<tr>
<td>Avoid jargon</td>
<td>Never use jargon which can only be understand by the maker (technician) but write in text which is easy to understand for the user.</td>
</tr>
<tr>
<td>Use clear contrast</td>
<td>Especially with the visual impaired and colour blinded people it is very important to use clear contrast. (See figure 20)</td>
</tr>
</tbody>
</table>
3.2.2 Interface design

Gathering together the results from the user research and translate that to an interface design that fits with the needs and demands from the user the interface shown below is the interface that fits with the users.

![Interface design](image)

**Figure 21 Interface design - User Research 1**
Figure 22 Interface design
User research 2

Figure 23 Interface design- User research 3
3.3 Software development

3.3.1 Programming Language
One of the main tasks of the project was to find the best language to develop the application. The first problem was the existence of an incredible amount of programming language, so it was needed to filter them. In order to reduce the number of options to make the application multiplatform and Open Source, in Programming Language (PL) this terms are Booleans (it is or is not), so the options could be reduced to only a few. The list was reduced to only three PL, Python, C++ and Java. C++ was the first option discarded to the fact that it is not fully platform it will depend on the external libraries used. Python is completely multiplatform but there is not an official framework to develop the screens. So, our final choice was Java, it is multiplatform regardless the libraries used and is easy to develop a desktop application thanks to strong frameworks as Net Beans or Eclipse.

3.3.1.1 The software
Due to the fact that the team had a lack of programmers it was decided to apply “Agile software development”. This methodology is applied when there is not enough time for design and specification and most of the efforts are focused on the implementation. Also, this methodology fitted our project because of the changing requirements from the Accessibility Chair.

The software implementation was divided in two parts, user interface and core application. A plan was established in order to develop the project. The core application will work as server, which receive orders from the user interface and give response to the different commands. Based on this system of work, the next step was moving to a brief stage of design and specification in order to make clear how both parts should communicate.

The first version of the application was operative in 18th of March; this iteration was a simplified version of the application. It had some mistakes and bugs, but gave us the chance to show it to the supervisor in order to gather more information and it was needed to add more requirements to the project, which were:
1. Convert different volumes of a book in only one playlist;
2. Rename the MP3 files names and copy them to a local directory;

With this information work was started on these new requirements and also on fixing bugs from the first version. In one week, until March 25th the next generation was ready. The efficiency was improved and the new requirements were implemented. The next iteration was presented to the supervisor for further instructions. This time only few minor requirements were emphasized.

In the next sub-chapters the technologies used to develop the Daisy application and a part of the Interface Design and Specifications are presented.
3.3.1.2 Technologies used
In this sub-chapter the technologies used in order to develop the Daisy application are described. Thereby, the following are presented: Daisy File Format, SMIL Management, XML Management and Playlist Creation. After that an explanation of how the application is working will be described.

3.3.1.3 Daisy File Format
DAISY digital talking books are fully accessible for persons with print disabilities, such as those with blindness, low vision, hearing impairments, deaf-blindness, motor disabilities, dyslexia, and a wide range of cognitive/intellectual disabilities. DAISY digital and talking books offer the benefits of regular audio books, but they are superior because DAISY includes navigation. There are six embedded "navigation levels" for content (i.e. other objects such as images, graphics, MathML for displaying synchronized text to speech).

There are three basic types of DAISY Digital Talking Books:
a.) Audio with NCX: DTB with structure. The NCX is the Navigation Control Centre, a file containing all points in the book to which the user may navigate. The XML textual content file, if present, contains the structure of the book and may contain links to features such as narrated footnotes, etc. Some DTBs of this type may also contain additional textual components, for example, index or glossary, supporting keyword searching.
b.) Audio and full text: DTB with structure and complete text and audio. This form of a DTB is the most complete and provides the richest, multimedia reading experience and the greatest level of access. The XML textual content file contains the structure and the full text of the book. The audio and the text are synchronized.
c.) Text and no audio: DTB without audio. The XML textual content file contains the structure and full text of the book. There are no audio files. This type of DAISY DTB may, for example, be rendered with synthetic speech or with a refreshable Braille display.

The XML Document Type Definition (DTD) used for the textual content files of DAISY DTBs is the DTBook DTD. It is a machine-readable list of allowable tags, the attributes that may be applied to them, and rules on where the tags may be used. For example, sentence tags (<sent>) can be used inside paragraph tags (<p>), but not the other way around. To verify that a document has been marked up in accordance with a DTD, one runs a program called a validating parser that compares the markup with the DTD and lists any errors that may be present in tags, attributes, etc. [34]

After a brief introduction in Daisy File Format and after identifying the main requirements, it was decided to use SMIL and XML files for a better development of the application. Both kinds of files are presented in the next two sub-chapters.
3.3.1.4 SMIL Management
SMIL stands for Synchronized Multimedia Integration Language, is a language for describing audiovisual presentations and is written in XML. SMIL can be used to create Internet or Intranet presentations, has been described as the Internet answer to PowerPoint, SMIL presentations can display multiple files at the same time and SMIL presentations can contain links to other SMIL presentations.

A SMIL file contains all the information necessary to describe a multimedia presentation, the layout of the presentation, the timeline of the presentation and the source of the multimedia elements. SMIL files are stored with the file extension .smil.

Since SMIL is based on XML, the tags are case sensitive. All SMIL tags require lowercase letters. A SMIL document must start with a <smil> tag and end with a </smil> closing tag. It may contain a <head> element and must contain a <body> element. The <head> element is used to store information about the presentation layout and other Meta information. The <body> element contains the media elements. [35]

The DAISY profile is new for SMIL 3.0. With the release of SMIL 3.0, the pre-existing DAISY standard has gotten the opportunity to move into the mainstream of multimedia development. Several accessibility features have been added to the SMIL language, and a fully-conforming language profile has been defined for DAISY books.

Although SMIL has always been an integral part of the DAISY standard, none of the existing profiles fit the needs of DAISY. The full language profile is too large to be considered practical, while the tiny profile lacks certain timing, state, and media object modules required by DAISY. The Unified Mobile profile also lacks some of what is necessary for representing DAISY books in SMIL (e.g. the state modules), and include modules which are not required by DAISY (e.g. animation, tiling, and transitions modules). [36]

3.3.1.5 XML Management
The Extensible Mark-up Language (XML) is a subset of SGML and its goal is to enable generic SGML to be served, received, and processed on the Web in the way that is now possible with HTML. XML has been designed for ease of implementation and for interoperability with both SGML and HTML.

XML was developed by an XML Working Group (originally known as the SGML Editorial Review Board) formed under the auspices of the World Wide Web Consortium (W3C) in 1996. It was chaired by Jon Bosak of Sun Microsystems with the active participation of an XML Special Interest Group (previously known as the SGML Working Group) also organized by the W3C. The membership of the XML Working Group is given in an appendix. Dan Connolly served as the Working Group's contact with the W3C.

The design goals for XML are: XML shall support a wide variety of applications, XML shall be compatible with SGML, it shall be easy to write programs which process XML documents, the number of optional features in XML is to be kept to the absolute minimum, ideally zero, the design of XML shall be formal and concise and XML documents shall be easy to create.
The terminology used to describe XML documents is defined in the body of this specification. The key words are: must, must not, required, shall, shall not, should, should not, recommended, may, and optional, when emphasized. [37] Thanks to JDOM library for Java it is easy to manage XML files in order to read, create and manipulate the files.

3.3.1.6 Playlist Creation

In order to organize the created MP3 files with an audio book feature a playlist is needed. Two of the most common playlist formats are M3U and PLS. These files are simply text files containing links to the proper file. Both file formats have the same originator, Winamp. This playlist format is the one that is the most common today, considering MP3 playlists. M3U playlists do not store any music data, only filenames and track info (time, artist, album, etc.). An M3U playlist contains the specific location addresses to one or several media files (MP3, WMA, etc.). The entries in an M3U playlist can be comments, blanks or resources to render.

The following section is about the M3U playlist format that was used to develop the application. This playlist format is the one that is the most common today, considering MP3 playlists. M3U playlists do not store any music data, only filenames and track info (time, artist, album, etc.). An M3U playlist contains the specific location addresses to one or several media files (MP3, WMA, etc.). The entries in an M3U playlist can be comments, blanks or resources to render. A comment line begins with the pound sign, #. Blanks are ignored.

A resource address can be anything the M3U reader is capable of understanding. These include absolute file system paths, relative file system paths (with the base undefined by the file format), and URLs. A simple M3U file can, as it has been said, be written in an absolute and a relative file system path. Here are a few samples of simple M3U playlists:

a. M3U playlist with absolute file system path:

```
# Comment
C:\My Audiobooks\Daisy\The_Catcher_In_The_Rey\1.Syllabus.mp3
C:\My Audiobooks\Daisy\ The_Catcher_In_The_Rey\1.Chapter_One.mp3
C:\My Audiobooks\Daisy\The_Catcher_In_The_Rey\1.Chapter_Two.mp3
```

b. M3U playlist with relative file system path

```
# Comment
Daisy\The_Catcher_In_The_Rey\1.Syllabus.mp3
Daisy\ The_Catcher_In_The_Rey\1.Chapter_One.mp3
Daisy\The_Catcher_In_The_Rey\1.Chapter_Two.mp3
```

In the case of the Extended M3U, the first line that is “#EXTM3U” is the description of the format. The second and third entries work together. The second begins “#EXTINF:” which serves as the record marker. The “#EXTINF” is always the same. After the colon comes a number: this number is the length of the track in seconds, then a comma and the name of the tune. The second line of this pair (the third line) is the actual file name of the media in question. Below is a sample of an extended M3U playlist [38].

```
#EXTM3U
#EXTINF:2303,Chemestry – Chapter One
C:\My Audiobooks\Engineering\Chemestry\1.Chapter_One.mp3
#EXTINF:2439, Chemistry – Chapter Two
```
3.3.5 Text to Daisy

The purpose of this part is to convert a PDF file into a Daisy book, making this format more accessible to visual impaired people.

As this part includes more technologies, the team had to make a survey for the different technologies implied in the program: Text extraction from PDF file, Text to Speech, which converts the text into a WAV file, MP3 encoding and finally Daisy File creation. As the programming language of the application was Java, it was needed to find libraries which fit in the project not only for their features but their licenses too, because as an Open Source project it was not allowed to use privative software.

Due to the lack of time and human resources to develop an application that fits all the requirements of the Chair, the team and the supervisor decided to develop a simplified model of the application with the following features:

- PDF containing an outline is the only format admitted by the application
- The voice files are generated only in English.

3.3.6 Text extraction

During the survey many libraries were found that could fit the program, looking for a really concrete functionality, which all the libraries include, a small library was search for in order to not make a heavy application. The choice was to use PDFBox.

Developed by the Apache Foundation, PDFBox is an open source Java PDF library for working with PDF documents. This project allows creation of new PDF documents, manipulation of existing documents and the ability to extract content from documents.

Using this library the first component of the application was developed. It is in charge of loading the PDF document, find the different parts (chapters) of the document and extract the text of each section. This extracted text is passed to the second component, which will convert it into a voice file.

3.3.7 Text to Speech

This second component required a library that converts text into a voice file. After the survey two options that fit on the project were found:

a.) Festival: offers a general framework for building speech synthesis systems as well as including examples of various modules. As a whole it offers full text to speech through a number APIs: from shell level, though a Scheme command interpreter, as a C++ library, from Java, and an Emacs interface. Festival is multi-lingual (currently English (British and American), and Spanish) though English is the most advanced. Festival is free software. Festival and the speech tools are distributed under an X11-type licence allowing unrestricted commercial and non-commercial use alike.

b.) FreeTTS: is a speech synthesis system written entirely in the Java programming language. It is Open Source and maintained by a community that supports the project. FreeTTS is used because it is written completely in Java and will run over any operative system without using external libraries. Festival is written in C++ and requires the use of external libraries to be executed on Java Virtual Machine. Using FreeTTS the team build the second module of the application. This component converts the Text into an Audio file where the text is converted into a voice file. The Output files are .wav, this audio format is not compressed, it
means that the files are large and make difficult to move. Furthermore, the requirements given by The Chair specified that the audio files should be MP3, which lead us to the third module.

3.3.1.7 WAV to MP3
For this module the first step was to make our own MP3 encoder using Tritonus or JLayer Libraries, but the idea was dismissed due to the technical complications that implied. So, it was decided to use LAME which nowadays is the most used Open Source encoder.

Like all MP3 encoders, LAME implements some technology covered by privative licenses. The developers of LAME do not themselves license the technology described by these patents. Distributing compiled binaries of LAME, its libraries, or programs that derive from LAME in countries that recognize those patents may be patent infringement.

The LAME developers state that, since their code is only released in source code form, it should only be considered as an educational description of an MP3 encoder, and therefore does not infringe any patent by itself when released as source code only. At the same time, they advise users to obtain a patent license for any relevant technologies that LAME may implement before including a compiled version of the encoder in a product. Some software is released using this strategy: companies use the LAME library, but obtain patent licenses.

For this legal reason LAME encoder is used but it is not include it in the application and should be installed by the user. The decision was taken in order to keep the project completely Open Source which is one of the main requirements. For a further release of the application The Chair must decide to obtain the licenses required to distribute the application including LAME, develop its own encoder or use a different encoder.

3.3.1.8 Daisy File creation
Once the text has been converted to an MP3 file, the application uses this information to create a Daisy File. It means that the application have to create the .smil files (including the master.smil and the Chapters.smil). This part required XML creation, as the smil files are XML documents, so it was decided to use the same library from the first part, JDOM.

An important step was to design the interface for the “Daisy Converter” Project. In order to achieve this, the NetBeansIDE 6.9.1 platform is used to help us to make our own application interface thanks to its flexible architecture. In the next sub-chapter are presented the benefits of the software.
3.3.2 Interface Design

The NetBeans Platform is a generic framework for Swing applications. It provides the "plumbing" that, before, every developer had to write themselves saving state, connecting actions to menu items, toolbar items and keyboard shortcuts, window management, and so on. The NetBeans Platform provides reliable and flexible application architecture. Because the NetBeans Platform architecture is modular, it's easy to create applications that are robust and extensible. [39]

These are the main attributes that lead us to choose the NetBeans IDE 6.9.1 platform in order to develop the interface for the Daisy Converter Project. GUI Builder enables us to very easily design the application's layout.

In order to develop a Graphical User Interface (GUI) it was needed to take into consideration both the requirements of the user profile and of the market. Therefore, it was simple and easy to use visual elements, because the users are persons with disabilities. These elements had to fulfil complex functions and to trigger different actions.

In the following sections an overview of the main components used as a framework in NetBeans IDE 6.9.1 are presented. The application of the “Digital Talking Books. Daisy Converter” project is by far more complex and for this reason it is described in detail the functionality of this multiplatform. NetBeans can create executable JAR for any Java project. For the Daisy project it was chosen to use a Java Desktop Application (Figure 24) thanks to the fact that it has already build a framework and it is using custom Java lines for the source code.

![Creating a Java Desktop Application in NetBeans](image)

**Figure 24 Creating a Java Desktop Application in NetBeans**

After creating the Java Desktop Application work was started with the GUI provided by the IDE platform, the DaisyInterfaceView.java, Figure 25.
The main advantage of the Graphical User Interface is that it can free the inexperienced user of learning complex Java commands. Other strong points of the GUI are: the menus, the windows and the desktop. The menus let us execute different commands by selecting a choice from a menu (e.g. File Menu, Edit Menu, Window Menu). The area on the display screen contains many icons that represent real objects on a real desktop. The windows of the multiplatform have the advantage that it can run a different program or display files; this improves the flexibility and reduces the execution time.

In addition to their visual components, GUI makes it easier to move data from one application to another. This strong point is used to make the connections between the interface and the Java program. The main classes that used are JFrame and JPanel and are presented in detail, as follows.

The JFrame class is one of the most important classes and is defined in the javax.swing package. The swing package contains related classes for writing Java applications. When building a GUI, the JFrame is the basis of every application because represents a framed window, which allows the user to start adding components. Also, the JFrame class can be extended and the View subclass inherits many methods, such as Frame, Window, Container, Component and Object. Due to the Component class, which is abstract, the objects can be displayed on the screen thanks to the following methods that are used: isVisible/ setVisible, getSize/setSize, getLocation/setLocation. This method allows the user to establish the parameters of the frame as the application that he wants to develop requires. The Container class acts like an organizer; this means that collects the components to organize them visually. In order to succeed this it is used the LayoutManager. The Window class represents a raw window, a window without borders. The Frame class represents a window with Border and it has a title area where the user can specify icons or titles. Finally, the JFrame class contains all this classes and it has an associated content pane, which shows its visual contents. The JFrame appears as a standard window. In Figure 26 it is shown the JFrame used to develop the interface of our project.
After building the JFrame for our interface, next step was to add more objects to it, each from a subclass extending JPanel. The method that the system automatically calls to redisplay the contents of the JPanel is the paintComponent method. To be able to call this method is needed to store information about each object. The elements used in designing the Daisy application interface are: JLabels, JButtons, RadioButtons, ButtonGroup, MenuBar, MenuItem and JFileChooser and they are represented in Figure 27.

The JFileChooser (Figure 28) and ButtonGroup are invisible elements and are enclosed in the JPanel.

For these elements to trigger different actions the addActionPerformed method was used, for example for the Process File button:

```java
private void processActionPerformed(java.awt.event.ActionEventevt) {
}
```
To add this method to any type of element these simple steps should be used:
1. Right click on the element and select from the pop-up menu the Properties item;
2. Select the Events item and on the actionPerformed ellipsis add the new handler for the element.

The JFileChooser uses the same method to trigger different actions, but in order to open just one type of files, in our case just .smil or .pdf file, a new custom filter should be written. To achieve this, from the Properties pop-up menu we selected the ellipsis File Filter and add a new filter for the element. These steps are shown in Figure 29.

![Figure 29 Adding the JFileChooser custom filter to the interface](image)

This filter will create automatically in the source code a new class and after that the lines for the JFileChooser were written:

```java
class FilterSMIL extends javax.swing.filechooser.FileFilter {
    @Override
    public boolean accept(File file) {
        // Filter logic
    }
}
```
After presenting the classes and the methods used it is easier to understand what action each element is supposed to trigger. Therefore, in the following section are described the elements and their actions.

From the tool panel were choose two menuBars: one for the File Menu and one for the Help Menu. In the File Menu a new menuitem, Exit is added. This item will close the running application either by a simple click on Exit or by pressing the key combination Ctrl + Q. The purpose of this interface is to open different files from different paths. When the user will run the application, the connections between the interface and the Java program will open and play the files. Thereby, a list where the files will be displayed is used, an Add File Button to add the files to the list, a Remove File Button to delete the files from the list and a Process File Button to open the items selected. Due to the fact that the interface has two types of files that the application has to read, two RadioButtons were used. These buttons will let the user to choose the type of files that he needs to open. Also, a progress bar was added to the application so that the user can be able to view the evolution of the opened files. The elements are shown in Figure 30.

![Figure 30 The elements of the interface](image_url)
To summarize, this sub-chapter is a brief overview of the interface of the “Digital Talking Books. Daisy Converter” project. To design it the NetBeans IDE 6.9.1 multiplatform with the Java Desktop Application option was used. After analyzing the Marketing and User Research reports, an interface easy to use for the disabled people was made.
4. Discussion

4.1 Conclusion Marketing

When adding all the data of the SWOT analysis and reviewing it, conclusions that define the guidelines of the application itself and the advertising of the software were made. As a main idea the software has to be operative developed so that it can be run on every system. This makes the software more attractive to users and widens the market of the application.

With the Chair being a non-profit organization the most logical solution for the software should be that it would be free of cost for everyone. The new linkage with the department and the DAISY consortium could be used as a base to gain new sponsorships. This linkage should be emphasized in the advertising of the application. This is also good for the firm image of the Chair, who then also gets known outside the UPC.

The implementation of the advertising plan and software itself is the strong point of the department. It has the advantage of the management area with specialized skills in marketing, communication and public relationships. An important aspect is also that the department is used to handle projects of this kind and implement them into educational environments.

4.1.1 How to distribute the application

The benefits of making the application free software overweight benefits of proprietary software. Free software enables customers to download the application without permission and make desirable modifications to it if needed. If the software would be proprietary a smaller market would be the result because of the fact that users are not allowed to redistribute the application. The possibilities of an extended market are greater with free software and it would enhance the image of the Chair of Accessibility. Furthermore, the development of the application is more possible if the software is free. The ideology of the department is to help people with disabilities and making the application free software opens opportunities to future developers to improve the application. This is an advantage for both people with visual impairments and the Chair of Accessibility.

The one license that permits all these demands is the GPLv3 and this would be the best choice. The aspect of that the application can be used by everyone without any special permission is a boost to the market size of the Daisy converter. This makes the distribution more effective and more customers are reached. In addition to this, the market size would also be widened because of user would be allowed to redistribute the application without restrictions.

The application needs to be downloadable from the CATAC webpage or a linked to the download page Sourceforge. Sourceforge is used to reach a broad group of potential users. When using Sourcforge as a distribution channel a big global market will open and further development of the application is possible.

4.1.2 How to advertise the application

The Chair has to make a webpage on their site with information and a download link of the application. Beside that the Daisy Consortium needs to be contacted about the possibilities to link the Chair with the Daisy Consortium. The Chair can use social media by creating an, Facebook, Twitter and LinkedIn account with information about the Chair and linkage to the download of the application, to reach a broad target
group. Reciprocal links and banners can be used to get visitors from other sites, like company sites and forums of visual impairment aids.

4.2 Conclusions User Research

4.2.1 How will the product be used
During the questionnaire a lot of the respondents said that they would like to use the DAISY converter for helping them with studying. Logically people with visual impairment or/and dyslexia have problems with reading. And even though people with dyslexia can read it will take much more time, and the main focus will be on reading the text instead of studying. Most of the respondents said they study really good with listening. So a good way for them will be to use the DAISY converter. For example, if the PowerPoint slides and the notes taken by the student can be put together, and converted to a speech, so that the student can listen back to his or her own notes and the PowerPoint at home, this will save a lot of time, irritations and effort with studying.

4.2.2 How should it be used
For a long time it was impossible for blind people to use the Internet properly like the “normal” people are using it. But since a while there are a lot of tools which make entering the internet much easier for those who have a visual disability. For example the Braille keyboard (see Figure 31).

This keyboard doesn’t only have special Braille keys which make the typing easier for blind people but it also has a special tactile plate where the user can lay his fingers on and with the help of a special software the content which is shown on the screen will appear in the Braille language on the tactile plat so that the user can “feel” what’s on the screen.[6u] In this way the user is able to type and read. But this method still coast lot of effort.

A lot of the users (see appendix II) said the best way to learn for them is by listening. Following a presentation by listening to an interesting speaker is not such a big problem for them, but as soon as reading the PowerPoint is important, or for example they have to read literature it’s is taking much more effort.

This is a perfect change for the Chair to help these students with learning by listening. The DAISY converter will allow the students to convert digital books (PDF) to a spoken book, and they will even be able to scroll by chapter, section, pages and even by sentence. People with dyslexia don’t like to be treated differently than the other students, they don’t like to stand out.

4.3 Conclusions Software development and Interface design
In order to develop the application, the appropriate programming language that could help us to make the conversion from Daisy File to MP3 Playlist was needed. Our final choice was Java, because is a multiplatform regardless the libraries used and is easy to build a graphical user interface thanks to strong frameworks as NetBeans or Eclipse. Also, besides Java were used different technologies like Daisy File Format, SMIL Management, XML Management and Playlist Creation.
The application is a simplified version of the requirements given by the Chair. The conversion from Daisy file to MP3 Playlist is completely functional allowing the extraction of the audio files from a Daisy Book and creating a MP3 Playlist that can be played on any MP3 player device.

Text to Daisy needs more improvements to be completely functional, such as support for different languages and input formats. To implement these features it is necessary to rebuild the interface to give more configuration options to the user (language, input or quality of MP3).

To design the interface for the “Daisy Converter” Project the NetBeansIDE 6.9.1 platform was used that helped us to make our own application interface thanks to its flexible architecture. Thanks to its benefits the application’s layout could be designed and correlated with both requirements for the User Research profile and of the Marketing Analysis.
5. Acknowledgments

The "Digital Talking Books. Daisy Converter" project has been carried out within the European Semester with the help of Catedra d’Accessibilitat of Universitat Politecnica de Catalunya, Vilanova I la Geltru. Daisy Team would like to thank all the colleagues for their implication in the project. The achievement of the project was possible also thanks to our supervisors Bernardino Casas, Ariadna Llorens and Raquel Vallez.
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Appendix

Appendix I

Raw results Desk Research

Users
There are over 284 million people in the world who are visually impaired [1u]. From these people about 39 million people are totally blind and 245 million people over the world have low vision impairment. An interesting fact about this group of people is that 90% of the visually impaired people live in a developing country (a country with a very low level of material well-being). This can mostly be explained by the high level of material solutions giving in the more advanced economies.

Because of all the new technologies developed for this kind of disability the number of visual impaired people over the world has greatly reduced in the last 20 years. Some examples of these tools developed are Braille, electronic note takers, special notepapers, tactile tools, voice-activated equipments and one of the newest tools is talking books. In the following paragraphs these technologies will be explained a little further.

Existing methods

Braille
Braille is a very old technology, which is used very often by the blind or strongly visual impaired people. Each Braille character is made up of six dot positions (two columns of three dots) [42]. Each position of the dots stands for a character from the alphabet. This technology allows the blind or strongly visual impaired people to read or type. Typing is possible by two different kinds of technology.

The first one is to connect a Braille keyboard (Figure 32). This keyboard doesn’t only allows the user to type easily but it also a way to read. In the lowest bar the text showed on the screen will appear as Braille text on the keyboard an in this way the user is able to read. [43]

Figure 32 Braille keyboard

The second one is to use special Braille stickers (see Figure 33), whom can be glued on a keyboard [44]. In this way the user is able to type easily by feeling the Braille characters. The big disadvantage of this method is that the user is able to type, but he still can’t see what’s happening on the screen. So that’s why this method is mostly used in combination with speaking technologies.

Figure 33 Braille stickers
Electronic note takers

This method is especially useful for those whom have a relatively light visual impairment or the ones with reading disabilities like for example dyslexia. The user is able to write down notes or make drawings/diagrams on a normal paper with this special pen (see Figure 34) [45]. This pen will translate these notes and drawings immediately to typed text and graphics. In this way the user doesn’t have any problems with reading back their own notes or graphics but they can easily look them up in their computer. And in this way the user is able to make adjustments on these notes, and the text can be transferred to special speaking technology software which will speak the notes out loud.

But for those who have problems with actual writing there is also another solution, named electronic note taker as well (see Figure 35). This machine looks like an extraordinary keyboard with Braille keys on it. It actually looks a lot like the Braille keyboard explained before, except that this one is not connected to a computer or what so ever.

This machine is especially for those whom have a very strong visual disability or are totally blind. [46] The machine has the special Braille keys on it and has the opportunity to read the text, which is written, out loud so that the user can listen to their own notes again, like other people would read their own notes back on the paper or computer.

Research about disabilities on the University

Students with disabilities, the majority (55%), to begin studies, contact the Student Care Disabled (SAD). Particularly to request the removal of barriers those directly affects them and hinder their access to campus or classroom. In fact, the vast majority, 88% are users of these services. [47]

20.8% of the disabled people whom contacted de SAD uses technical tools which the SAD offers [48]. It is also important to note that in the vast majority of cases, the technical resources that respondents need to study, and were previously used by them (e.g. a laptop) or obtained from external institutions such as ONCE.

Visually impaired people do have problems with some methods such as using PowerPoint or write notes on the board. But not in all cases, since they have the habit of systematically requesting notes (in cases not using a laptop), to the extent that in some cases it seems useful that methodology, and then ask for such materials
The vast majority of students, 63% said that their integration in the classroom and its relationship with partners is "indifferent to their disability [49]." In fact, show even annoying as with the questions to understand the approach itself is a form of discrimination. However, when analyzing the subgroup that uses assistance is already 40% stating that their integration is worse than others or is forced by her disability.

A total of 17% of universities have quality certification of accessibility, although in these cases is a partial level. Exactly the same happens with DALCO criteria (ambulation, seizure, Location and Communications) that are missed by 83% of universities and the other only partially met [50].

58% of universities received specific public funding to improve accessibility, 71% of cases are IMSERSO aid and the ONCE Foundation and 57% of cases are autonomous government assistance.

As the staff from the University manages issues of accessibility, it is noteworthy that often the Vice President of Infrastructure (or equivalent) responsible for managing the Accessibility Plan or the elimination of barriers in their absence. In fact, 83% of the universities do not have a head of design for all, and among the remaining 17% should be noted that those responsible for exercising this area architecture, disability issues or those responsible ergonomics [52].
Figure 37 Percentage of colleges that conducted services in the SAD [18]

Figure 38 Percentage of colleges with disability training activities for staff [19]
Appendix II

**Raw results field research**

1) **Age:**
   - Average: 24.6
   - Range: 13 → 32
   - Median: 21
   - Total response: 66

2) **Sex:**

   ![Figure 39 Dividing respondents by sex](image1)

3) **Disability:**

   ![Figure 40 Dividing respondents by disability](image2)

4) **(if visual impairment)**
   - How strong is your visual impairment?
A small overview of the results with this question:

**Visual processing.** 20% sight, *mild-moderate, N/A, coordination problems.* - 4

5) What kind of problems do you underestimate during your studies?

* A few examples of answers given to this question:

E.g.:
- ✓ Moving text, whole effect around words, find colours harder to read than others, difficulty remembering sequenced visual material and remembering it in a sequence
- ✓ Can’t read the PowerPoint presentation during my classes
- ✓ Reading far away
- ✓ Time required to spot little mistakes, especially when I read my own work
- ✓ Takes more time to read a book
- ✓ Grammar
- ✓ Timing & grammar
- ✓ Writing/reading academic papers takes more time

6) Did you ever go to an Accessibility office to ask for these problems described in the question above?

![Bar chart: Percent respondents who went to an Accessibility office](image)

Figure 41 Percent respondents who went to an Accessibility office

7) (If yes at the question above) How does the Office help you with these problems?

* An overview of some of the answers to this question

✓ When I was younger I had a weekly training in reading and spelling
✓ I received a collared overlay test and a referral to an optician. My lectures were asked to do things like let me use a Dictaphone. I was given free text to speak software and a scanner which read text back to me.
✓ Grammar
✓ I don't want privileges over another students, I think dyslexia is something learned, so it can be unlearned. Since I'm aware of it I am spending more time on it and getting better and better on languages. Even to the point of people not noticing I have dyslexia.
8) Do these solutions given by the Office help you with your studies?

![Figure 42 Percent who found the accessibility office useful](image)

9) Are you interested in using the DAISY Converter

![Figure 43 Percent respondents who are interested in using the DAISY converter](image)

10) Would the DAISY converter help you with the problems you experience during your study?

![Figure 44 Percent of the respondents who think the DAISY Converter will help them with their problems](image)
11) (if yes at the question above) How would the DAISY Converter help you?

✓ It doesn’t need me to read, just listen. However such a software does already exist so it either has to be better or cheaper
✓ To spot mistakes
✓ If I had to read something far away I wouldn’t have to struggle to see it.
✓ If everybody uses this during tests it would be fair, because then I’m just as fast as the others without a disability
✓ To help with reading
✓ To study, I can learn much better when I hear something.

12) (if yes at the question above) In what context would you use the DAISY Converter?

✓ Study, I would never use it for reading for pleasure. That is where the audio books are for
✓ To spot mistakes
✓ During tests
✓ For education and listening to books
✓ To convert text (I need to read) to speech