Downloading music and videos from the Internet: a study of the accessibility of The Pirate Bay and the iTunes Store

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Abstract. Downloading of music and videos from the Internet has become incredible popular. Can the systems used for downloading these files be used by people with disabilities? This paper studies the accessibility of the popular file sharing system, The Pirate Bay and the first successful online digital music store, the iTunes Store. The systems are evaluated from the perspective of five fictitious characters that are created with the interaction design tool, Personas. By using the systems in the same way that users with low vision, blindness, dyslexia, colorblindness, deafness or motor impairments would use them, the strengths and weaknesses in the accessibility of each system is found. The study shows that The Pirate Bay is accessible to a high degree. This is much thanks to a well-considered design and the use of XHTML and Cascading Style Sheets for the user interface. The accessibility of the iTunes Store is poor. One reason for this is because the system is not designed to be used together with assistive technologies such as screen readers and keyboard shortcuts. The paper concludes with a discussion around the found results and how future systems of this type can, and must be accessible to a much higher degree.

1 Introduction

In recent years there has been a steady construction of new broad-band connections that has given many people, all over the world, fast access to the Internet. Many systems for sharing files over the Internet have also been created. These are two of the reasons why downloading of music and videos is one of the most popular things to do on the Internet today [1].

The Pirate Bay [2] (TPB) is one of the most used systems for finding media files online [3]. It is a website free of use that has a huge collection of links to music, videos and all other types of material that can be stored in digital form. Links to new material is added everyday by users of the system. As with many systems of this type, a lot of the material that can be found via TPB is covered by copyright laws. Over the last years this fact has caused a lot of discussions, updated copyright laws and also the shut down of some systems through court actions [4].

The popularity of systems for file sharing and the problems concerning copyright issues has also led to the creation of a new type of systems. These systems are known as online music stores and are a fully legal alternative to file sharing systems. The material that is available for download in the system is controlled by the company that owns it and the users pay for all material they download. The first really successful online music store is the iTunes Store [5], it was started by Apple Computers in 2003. The iTunes Store offers download of music, movies, TV-shows and Audio books, and is by far the most used online music store today [6].

Accessibility is about making things accessible for all people. Buildings equipped with wheelchair ramps are more accessible than buildings without ramps because people in wheelchairs can access them. Similarly, a software application or a website is accessible if it also can be used by people with disabilities. There are many reasons why systems should have a high degree of accessibility. One reason that will play an important role in the future is the fact that the population using computers are getting older. Disabilities increase with age which also means that the demand for accessible computer systems will increase [7].

In this paper the accessibility of TPB and the iTunes Store will be studied. Despite problems and discussions concerning file sharing and copyright issues there are absolutely no reason why these systems should not be available to people with a handicap. It seems that in a near future, Internet will be the most popular channel for most people to get this type of material [1]. This further sharpens the reason why these types of systems should be accessible to all people that want to use them.

The accessibility of the systems will be studied by taking the perspective of five persons with different disabilities. The accessibility of TPB and the iTunes Store will be tested with respect to how the disability affects the person's use of computers. The two systems are in many ways different from each other, but are used for accessing the same types of material. Are there any differences in the accessibility of the two systems? If so, what are the strengths and weaknesses of each system?

2 Downloading media files from the Internet

2.1 History

In the late 1990s a file format for audio called MP3 (MPEG-1 Audio Layer 3) became popular for storing and listening to music files on personal computers. The MP3 format made it possible to greatly reduce the amount of data required to represent audio in digital form, without any noticeable loss in audio quality. In June 1999, the file sharing platform Napster was released. The Napster software offered people with Internet connections the possibility to freely search for and download MP3-files from each other. Because of the user-friendly interface and the wide range of music available in Napster, it soon became very popular.

In February 2001, Napster had at least 26.4 million users worldwide [8]. Napster was shut down later that year as a result of lawsuits from the music industry

concerning copyright issues. But at this time many new file sharing systems had already appeared and most users just opted to use one of these systems instead. Many of these new systems developed technical solutions that made them less likely to be forced to shut down by court actions. The new systems also added new functionality and better designed user interfaces to increase the usability. Most systems of today support not only MP3-files to be shared and downloaded but also all other type of data that can be stored in digital form.

Ever since the shut down of Napster in 2001 record companies and lobbying groups have actively tried to stop the use of file sharing systems. The reason for this is that many files with copyrighted material are spread freely between the users of these types of systems. The companies are afraid for big losses in sell when people with a few mouse clicks can obtain the material for free. More than 150 of the countries in the world have copyright laws that under normal circumstances make it illegal to copy protected work [9]. Despite these laws many users continue to upload and download copyrighted material. According to a study from March 2005 about 36 million Americans, or 27% of the Internet users in America, download either music or video files online [1].

2.2 The Pirate Bay

In January 2007, TPB is ranked as the worlds 268th most visited internet site [3] and calls itself for *"the world's largest BitTorrent tracker"*. The site had over 1.4 million registered users and more than 4.5 million downloads was under progress at the same time [2]. TPB was started by the Swedish anti-copyright organization Piratbyrån [10] (The Pirate Bureau) in 2004. Today the website is run by a few individuals in Stockholm, Sweden. All use of TPB is free; income comes from advertising on the website and by donations from users, see figure 1 for a screen shot of the user interface.

All material found on TPB is added by the users, and everyday lots of new material is made available through the system. The description of material that is made available through TPB is given by the user who adds it. This means that the length and quality of the descriptions varies. Most descriptions are only written in English. The user interface of TPB was in January 2007, available in 29 different languages. Much of the material that can be found on TPB is unlicensed copies of copyrighted material. According to the copyright laws in most countries this means that a user breaks the law when copyrighted material is downloaded. The problem for companies and organizations that want to close down file sharing systems is that the systems themselves often are fully legal. By using a technology called BitTorrent, no copyrighted material is ever stored by TPB. The system only contains intelligence that helps users to download and share files with each other.

BitTorrent is a data transfer protocol designed to spread large amounts of data widely without unnecessary use of costly bandwidth and server recourses. The material available from TPB is represented by .torrent files in a searchable index at TPB. A .torrent file contains information about the data to be shared

and the host computer that coordinates the file distribution. To download material found on TPB a .torrent file is opened in a type of computer software called BitTorrent client. When the download starts TPB tells the BitTorrent client about other users who already got the data or is on their way to download it. Fragments of the material are then downloaded from these users. When all the fragments are downloaded the data is put together and the download is completed. There are many BitTorrent clients available for free for most computer platforms. Opera, a web browser famous for good accessibility support, has a BitTorrent client included from version 9.10 and later [11].

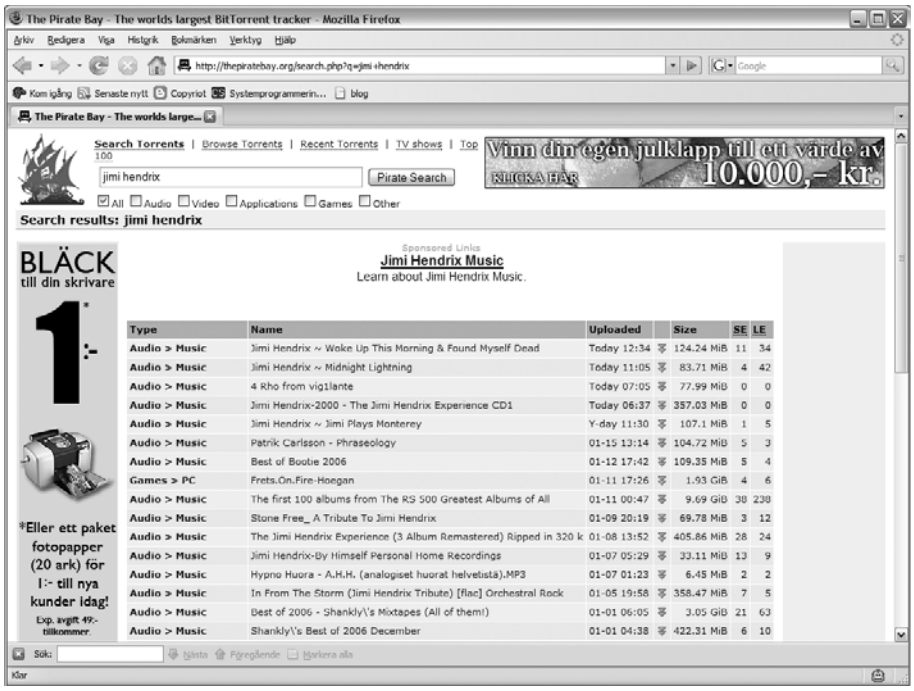

Fig. 1. Screenshot of the user interface of The Pirate Bay.

2.3 The iTunes Store

The popularity of file sharing and the problems concerning copyright issues has led to the creation of many new systems where people can purchase and download copyrighted material legally. The iTunes Store is run by Apple Computers and is the first really successful online digital music store. It was first opened on April 28, 2003 and has today a catalogue of more than 3.5 million songs. According to a speech given on September 12, 2006 by Steve Jobs, CEO of Apple Computers, *"iTunes has a market share of 88% for legal US downloads"* and *"customers have*

purchased and downloaded over 1.5 billion songs" [6]. See figure 2 for a screenshot of the user interface of the iTunes Store.

The iTunes Store can only be run through Apple Computers digital media player application iTunes. The iTunes application is used for playing and organizing digital music and video files and is available for Mac OS X and Windows 2000 or later. The iTunes Store is explored through a web based interface that is presented in an embedded web browser within the iTunes application. This provides a seamless experience allowing users to browse, preview and purchase music, audio books and video files.

To be able to download material from the iTunes Store a user must have a credit card with a billing address in a country where the store is available. In January 2007, the iTunes Store was available in 21 countries. In the Euro zone, all songs are sold for €0.99 each and the price level is around the same for all countries where the iTunes Store is available. Video material is only available in the United States where TV-shows are sold for $1.99 and movies are priced from $10 to $15 each. The only software application that is allowed to play files downloaded from the iTunes Store is iTunes itself. The files can also be played by Apple Computers popular portable media player, iPod. The files in the iTunes Store are encrypted with FairPlay technology to prevent unauthorized use. FairPlay controls that not more than five different computers is used to play a downloaded file. It also limits the number of times an audio file can be burned and stop videos from being burned to DVD discs that can be played in DVD players.

The success of the iTunes Store has shown that there is a market for this type of systems. It is hard to say what will happen with file sharing systems and online music stores in the future. Today it seems that both these kind of systems will be around for years to come.

3 Accessibility

3.1 Background

Accessibility describes to what degree a system is usable for as many people as possible without modification. Today there are few software applications and websites that offer both great accessibility and great design. A reason for this can be that it is easier to create a system with just a good design, then to create a system with both good design and good accessibility. Bob Regan means that *"there are few technical reasons for the tension between accessibility and design"* but that there is a *"false perception among designers that accessibility represents a restriction on creativity"* [12]

Most countries in the world have laws to ensure that people with disabilities are fairly catered for. One example is United Kingdoms Disability Discrimination Act from 1995; it says that *"it is unlawful to treat disabled people less favorably than other people, for a reason related to their disability"*. The act takes as an example that if *"an airline company provides a flight reservation and booking*

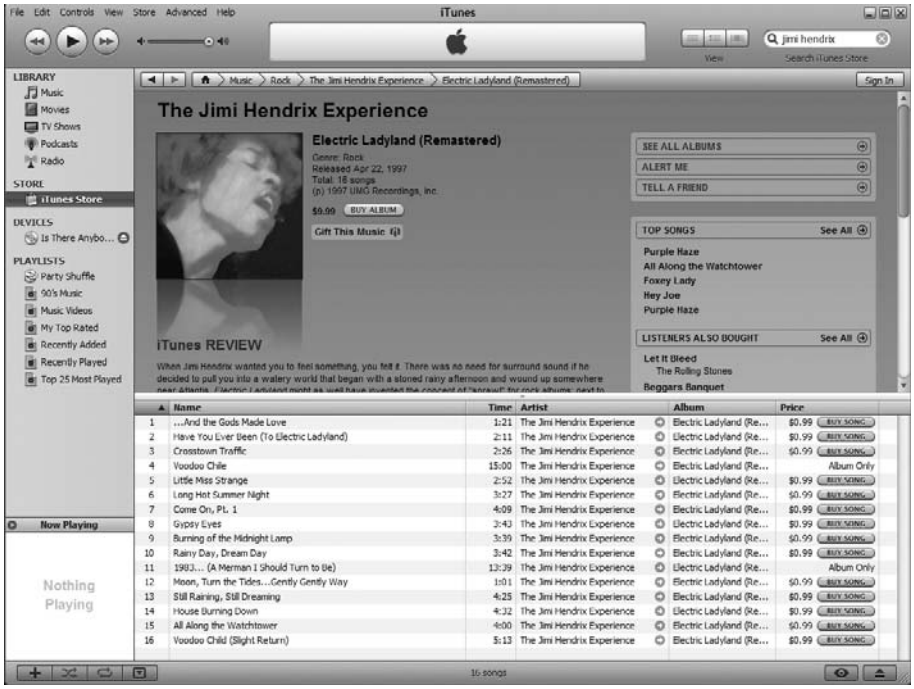

Fig. 2. Screenshot of the user interface of the iTunes Store.

service to the public on its Web site. This is a provision of a service and is subject to the Act" [13]. A step towards more accessible websites has also been taken by the European Union (EU) who wants to *"ensure that all public websites are accessible by 2010"* [14].

As mentioned in the introduction, the population of people using computers is getting older [7]. This will lead to higher demands on systems to support users with low vision and poor hearing and is a strong reason why computer systems have to be more accessible. Offering accessible systems also mean that legislation in the area is followed. The most important reason to why systems should have a high degree of accessibility is because it makes it possible for more people to use them.

3.2 Assistive technologies

When designing a system for accessibility it is important to support different kinds of assistive technology. Assistive technology is when hardware, software, or a combination of both is used to support a person with a disability to perform a task. The following types of assistive technologies were used during the evaluation of the accessibility of TPB and the iTunes Store.

– A **screen reader** is an assistive technology that identifies and interprets what is displayed on the screen. This is presented to the user by a syn-

thetic voice or a refreshable Braille display. A Braille display is a device for displaying Braille characters. Screen readers are most often used by blind persons.
- A **screen magnifier** is a software application that magnifies a portion of the screen so that it can be viewed more easily. Screen magnifiers are used primarily by individuals with low vision.
- A **joystick** can be used instead of a mouse to control the mouse pointer.
- By using the **keyboard shortcuts** available in most computer software, a combination of keys can perform operations commonly done by the mouse.
- By setting up a computer to use **Sticky Keys** the functionality of the keyboard can be changed. Sticky Keys helps with the use of keyboard shortcuts by letting the user press down just one key at a time. Sticky Keys is the name of this function in the operating system Windows XP but the same functionality is available in most operating systems. Assistive technologies for mouse and keyboard are often used by people who have problem with motor control or have weak strength in their hands.

4 Material and methods

Below follows a description of the material and the method used during the work with this paper.

4.1 Material

- **Systems evaluated:**
  - iTunes 7.0.2.16 [5]
  - The Pirate Bay 2.0 [2]
- **Computer:**
  - Dell Inspiron 6400, laptop with 15.4" screen
- **Operating system:**
  - Microsoft Windows XP Professional SP2.
- **Web browsers:**
  - Microsoft Internet Explorer 7.0.5730.11
  - Mozilla Firefox 2.0.0.1 [15]
  - Opera 9.10 [11]
- **BitTorrent clients:**
  - uTorrent 1.6, English version [16]
  - Opera 9.10 [11]
- **Screen magnifier:**
  - Microsoft Magnifier
- **Screen reader:**
  - JAWS v7.10.452 [17]
- **Other tools:**
  - Colorblind Web Page Filter [18]
  - The W3C Markup Validation Service [19]
  - The W3C CSS Validation Service [20]

4.2 Method

The accessibility of TPB and the iTunes Store is studied from the perspective of five persons with different disabilities. Although they do not exist in real life they all represent real people with disabilities, and they use their computer in the same ways that real people with disabilities use their computers. This kind of case descriptions has earlier been used by Mark Pilgrim in his inspiring book *"Dive Into Accessibility"* [21] and by Lidström and Zachrisson in their book *"Aktiv med dator"* [22] (Active with a computer).

The fictitious characters used for the evaluation of the systems were created with a method called Personas. This method is a common tool in Interaction Design where the character that is created represents a specific type of user that might use a site or product. By describing the characteristics and environment of one person he or she can stand as a realistic representation for a particular type of users [23].

The degree of accessibility of TPB and the iTunes Store was evaluated by doing experiments. The experiments were made on the basis of each person's way of accessing the computer. By using the systems in exactly the same way that the person described would use them, problems and opportunities in the accessibility of the systems were found. In addition to the experiments, a more theoretical study was also made. By reading material published on the Internet by people with disabilities more information about common problems with the access to these kinds of systems were found. Scientific work that has been published around these kinds of systems was also read.

By studying two systems that in many ways are quite different from each other, strengths and weaknesses within the design of each system will be found.

5 Evaluation of the accessibility of TPB and the iTunes Store

Below is a description of each person and disability presented together with the result from the evaluations of the accessibility of TPB and the iTunes Store.

5.1 Georgios, a 62 year old man with a visual impairment

Georgios lives in Kalymnos, Greece. All his life Georgios has been working as a fisherman. He is now retired because of his cataract which has deprived him much of his sight. He has two sons; they live in Athens, far away from Kalymnos. Georgios loves to write and tell stories; a few of them have been published in local papers over the years. A year ago he bought a computer and after much training he has learned how to use it to write down his stories. The screen resolution of his display is sat to 800 by 600 pixels and he writes with large letters that is clearly shown on the screen. After he bought his computer, Georgios has started to send e-mails to his sons. He is proud to be such an experienced computer user. Georgios has heard that a lot of music is available on the Internet and wants to try to download these music files.

TPB: When Gergios is out on the Internet he uses the web browser Mozilla Firefox. With Firefox he can easily increase elements of a web page by pressing Ctrl++ on the keyboard. This method for increasing the size works well for most web pages that use Cascading Style Sheets (CSS) to control the design. The user interface of TPB is represented by XHTML-pages whose design is controlled by CSS. When Georgios tries to increase the page by pressing Ctrl++ the size of all text, buttons and links on TPB is increased so that Georgios more easily can see them. It is only the pictures that are not increased in size, but this is not a problem, as no important information in the system relies on them. TPB is fully accessible to Georgios.

The iTunes Store: When Georgios starts iTunes, the text size in the application is so small that he can barely see it. A friend, who often helps him with his computer, finds two options under preferences called *"source text"* and *"song text"*. By changing them from small to large the text of most controls in the interface gets a little bigger. When Georgios starts to explore the iTunes Store he discovers that the size of the text used in the store is always the same. The size of this text can not be changed and it is way to small for Georgios to be able to see it. By using his screen magnifier, Georgios is able to see the text and navigate in the user interface of the iTunes Store. A problem is that the iTunes Store is not designed for displays with a screen resolution as low as 800 by 600 pixels. Therefore much of the material shown on the pages in the iTunes Store is hidden outside the edge of the screen and is only shown by using the scroll bars. Georgios magnifier software makes it possible for him to use the iTunes Store but the accessibility is very poor.

5.2 Yuriko, a 21 year old woman who is blind

Yuriko lives in Kyoto, Japan. She studies philosophy and history of science at the University of Kyoto. Yuriko has been blind her whole life. She often tries to find literature for her studies in digital form so that she can use it with her screen reader software. Yuriko uses a screen reader called Jaws with Japanese voice synthesis. Jaws help her to use other computer software such as the web browser Internet Explorer and the suite of productivity programs in Microsoft Office. On her spare time Yuriko loves listening to music and she is also rather talented when it comes to playing the piano. She has never downloaded music from the Internet before but thinks it something she probably will do often in the future, if it works well.

TPB: Yuriko tries the web-based interface of TPB together with Internet Explorer and her Jaws screen reader software. She can immediately access the system. After changing the language of the user interface from English to Japanese, Yuriko has no problems using TPB. The use of valid XHTML in TPB makes it easy for the screen reader to interpret the web pages. The simple structure of TPB helps Yuriko to easily search and navigate in the system. Yuriko has

heard from a friend that many of the most popular BitTorrent clients can be used together with her screen reader software. She decides to try a client named uTorrent. After downloading and installing the application she downloads a few music albums and some audio books without much trouble.

The iTunes Store: When Yuriko start the iTunes application she immediately notices that the system is not designed to be used together with screen readers. Jaws can not read any part of iTunes or the iTunes Store. With its current design it is very hard to use the iTunes software for a blind person [24]. Brian Hartgen has a blog where he writes about news concerning access to portable media players for visually impaired persons. The following text is taken from there: *"from a screen-reading perspective, iTunes is one of the most difficult pieces of software to use. This is because it uses non-standard windows controls to display and manage items, and so screen reading technology does not stand a chance of reading the screen contents. Even the application's menu bar is inaccessible"* [25].

5.3 Ole, a 14 year old boy with dyslexia and color blindness

Ole lives in Narvik, Norway. He knows very much about computers and often helps his friends when they have problems with their computers. Ole likes to be out on the Internet. On web pages with much text it often takes a long time for him to understand the information that is given. This is because of his dyslexia. Ole has difficulties to read and write text which has delayed his studies so he is one year behind his classmates in school.

Approximately 7% of the male population in the world is color blind. Ole has Deuteranopia; a type of color blindness that makes, red, orange, yellow, and green look all alike. The hues, violet, lavender, purple, and blue also look very similar to each other. Ole's color blindness seldom gives him any problems. But sometimes systems have graphics that only uses color coding to present and separate information. That type of information is then often hard to perceive for people who are color blind.

Ole likes listening to music and he is a big fan of Jimi Hendrix. Some of his friends have started downloading music and movies from the Internet. Now he also wants to do this.

TPB Ole's color blindness does not lead to any problems with observing any information given in TPB. The system is well designed, uses good contrast and color schemes that work well for people who are color blind [18]. The interface of TPB is mostly based on text, and pictures are seldom used in the interface. Search results are shown in a table with one row for each found torrent file; a maximum of 30 files is shown on each result page, see figure 1. The description of the material is provided by the same user who added it to TPB. Most descriptions are written in English and Ole has big problems trying to read and understand what they say. When Ole does a search for Jimi Hendrix at TPB it results in over 150 found torrent files. It is difficult and takes long time for Ole to pick out

the torrent files he is interested of from this big collection of results. TPB gives no good support for people with dyslexia and therefore it often takes very long time for Ole to find the material he is looking for.

The iTunes Store Ole installs the iTunes software on his PC and his father creates a user account and makes a deposit of $30 for him to buy songs for. Ole's color blindness does not give him any problems using the iTunes Store. This is because the system it is well designed and uses color schemes that work well for people who are color blind [18].

Ole normally has problems reading text in his native language of Norwegian. The fact that the Norwegian version of the iTunes Store is completely in English makes it harder for him to read and understand the information that is given. To find songs and albums in the store he tries to use the search function. He fills in *"Jimi Hendrix"* in the search box and then presses the Enter button. After a few seconds the search result is presented on the screen together with some small pictures showing the album covers. This is of great help to Ole when he tries to find albums and songs in iTunes. Thanks to the pictures he does not have to read as much text and it helps him to find the material he is looking for much faster.

A great feature for Ole in the iTunes Store is the possibility to listen to 30 second previews of all the songs available in the store. Instead of just representing a song by showing the name of it, the song is also represented as an audio preview. This is a good complement for all people who have problems with understanding the text. Despite his dyslexia, the iTunes Store is, thanks to the audio previews and the representation of albums as pictures, really easy to use for Ole.

5.4 Liz, a 32 year old woman who is deaf.

Liz lives in San Francisco in the United States. She is an experienced user of computers and often uses them in her work as a teacher for deaf children. Liz was born deaf. On her spare time she enjoys to be out sailing and reading books. She has just bought a new portable computer. Liz loves watching movies and now she wants to start download and watch them on her new computer.

TPB When Liz first tries to use TPB she finds that the whole first season of her favorite TV-show Battlestar Galactica has been uploaded by a user. The material is copied directly from the Battlestar Galactica DVD, so the original subtitles are available in the options. Liz also tries to download some other movies and TV-shows. Many of these files are compressed copies of DVDs or ripped directly from TV. Therefore they have no subtitles. Luckily for Liz subtitles for most of the movies and TV-shows is available for download on Internet. The subtitles are often created by persons who have written down the entire dialog by themselves. By using a free media player, such as VLC [26] and the downloaded video and subtitle file, her movies are shown with subtitles. Liz deafness does not affect her use of TPB at all.

The iTunes Store Liz has no problem to install the iTunes Software and create a new user account. As in most computer software, no important information is given only by sound in iTunes. Because of Liz deafness, the music available in the iTunes Store is of no interest to her. Instead she tries to download the first season of Battlestar Galactica. Unfortunately for Liz there are no support for subtitles for any of the TV-shows and movies available in the iTunes Store. Because no subtitles are available, the iTunes Store is of no use at all to Liz.

5.5 Mary, a 46 year old woman with multiple sclerosis

Mary lives in Bexley, a suburb outside of London. About 15 years ago she got the diagnosis multiple sclerosis (MS). Her disease has forced her to retire from her work as a physiotherapist. Mary now spends much of her time at home in her apartment where she lives with her husband John, and her younger son Ted. In her home she has a computer that has been specially adjusted to suit her needs. Because the strength of her hands is reduced, Mary has problems using a traditional mouse. Instead she uses a joystick. With the joystick it is easier to control the mouse pointer but her precision is bad, so she prefers to use the keyboard as much as possible. Her computer is set up to use Sticky Keys. Mary loves listening to music and owns over 700 CD records, mostly jazz and rock from the seventies. Because she spends so much of her time at home she would really like to learn how to download music directly to her computer.

TPB There are no specially designed keyboard shortcuts in TPB for control of the user interface. However, the well structured design of the web pages makes it is possible to use the TAB-key to navigate between all links in the system. By pressing the Enter-key a highlighted link can be chosen. The whole user interface of TPB is possible for Mary to access without using her joystick but this type of navigation sometimes takes long time. The worst case scenario is when many search results are shown at the same time; this leads to that it takes over 100 strokes on the TAB-key for Mary to access a link at the bottom of the page. TPB is possible to use for Mary by just using her keyboard, but she prefers to sometimes use her joystick to save time.

The iTunes Store The iTunes application has keyboard shortcuts for all the important functions for playing and organizing files. However, in the iTunes Store part of the application there are only three keyboard shortcuts available, *"Go to the next page"*, *"Go to the previous page"* and *"Check for new podcast episodes"*. These keyboard shortcuts are far from enough to make it possible to navigate in the iTunes Store without using of some kind of pointing device. Mary must therefore use her joystick most of the to be able to navigate in the iTunes Store.

5.6 Summary of the results

Table 1. Summary of results found for the accessibility of TPB and the iTunes Store.

	TPB	**iTunes Store**
Low vision	Good accessibility	Poor accessibility
Blindness	Good accessibility	No accessibility
Dyslexia	Poor accessibility	Good accessibility
Color Blindness	Good accessibility	Good accessibility
Deafness	Good accessibility	No accessibility
Motor impairment	Poor accessibility	Poor accessibility

No accessibility - The system can not be used or is of no use.
Poor accessibility - The system can be used, but just to a certain degree.
Good accessibility -The system can easily be used to a high degree.

6 Discussion

The discussion consists of four parts. The first part is about the method used in the study. It is followed by discussions about the results found for the accessibility of TPB and the iTunes Store. The last part of the discussion is thoughts and observations around the accessibility of present and future systems for download of music and videos.

6.1 Method

The method used for evaluation of the two systems in this paper took the starting point from the author. By creating five fictitious persons and taking their perspective I tried to use the systems in exactly the same way that these persons would use them. A different way to test the systems could have been to study when real people with these disabilities try to use them. This would have been interesting because a person who lives with a disability has a lot more experience of the difficulties it leads to and how to overcome them. To do this type of real world user study, much more time and resources would have been needed. Factors, such as how used the user is to computers would also have a more influence on the result. By doing all the tests by myself, I could quickly get information about the accessibility of the two systems. I believe that the result reflects the accessibility of TPB and the iTunes Store well.

6.2 The accessibility of TPB

The accessibility of TPB was good for four of the six types of disabilities that were evaluated. The most important reason for the high accessibility of TPB is because it is accessed through ordinary web pages. By using this widespread technology TPB offers a service that can be used with all popular web browsers on all computer platforms. The pages are coded with XHTML and styled by CSS. This means that the data and the information about how the data will

be presented are separated from each other. All data is stored in the XHTML-file and can easily be accessed by assistive technologies such as screen readers. The CSS-file contains all information about how the data shall be presented. By adding information to the CSS-file, assistive technologies can control the style of the web page. For example by increasing the contrast or magnifying the text. TPB uses a simple design for the user interface that helps to increase the accessibility of the system. All important information on the website is given by text and no part of the system relies only on graphics. It is therefore possible for people who have problems to see information presented on a screen to use assistive technologies to access the information in other ways.

The fact that most information on the website is given by text seems to be an important factor for the high accessibility of the system. But as the study shows this also leads to poor access to TPB for people with dyslexia. All descriptions to the torrents available from TPB are created by the users of the system. This means that the quality and length of the descriptions varies much between different torrents and most descriptions are only available in English. TPB have no standard for what type of information that should be included in the description and how this information should be formatted. This makes TPB less accessible for all people that for some reason have problems with reading or understanding text. Some of the descriptions in TPB also include parts of ASCII art (pictures pieced together from text characters). These pictures might look good when showed on the screen but is very hard to interpret for assistive technologies such as screen readers. By creating a template for how a description must be structured, the description would be much easier to read. It would also make it possible to identify different parts of information in a description without any need to read it first.

The accessibility of TPB for a person who has trouble using a pointing device was poor. Although the whole user interface of TPB is possible to access without using the mouse pointer, it is sometimes needed to press down the TAB-key over 100 times to highlight a link far down on a page. Adding keyboard shortcuts that give the users more control over the user interface would increase the accessibility of TPB for people who have problem controlling some sort of pointing device.

6.3 The accessibility of the iTunes Store

The size of the text in the iTunes Store can not be changed, so people with low vision must use a screen magnifier to be able to see the information presented in the system. It is not possible to navigate in the system without using some kind of pointing device. There is no support for subtitles for the videos in the iTunes Store, so the system is of no use for people who are deaf. Screen readers do not work well together with the user interface, so the system is impossible to access for blind users. The overall impression of the accessibility of the iTunes Store is poor.

In the evaluation of the system it was only the user with color blindness and dyslexia that easily could access the iTunes Store. This was because most text in the system is accompanied by pictures and a possibility to preview parts of the

audio and video material. The pictures and previews work as a great complement to the text and increase the usability of the system. In the marketing for the iTunes Store the high usability is often mentioned and a big part of its success can probably be given to the systems ease of use. Unfortunately, good usability is not the same as good accessibility.

Many of the things that make the iTunes Store easier to use for people without disabilities, decreases the accessibility of the system for people with disabilities. It seems like it under the design process for iTunes Store has been more important to create an innovative system with new functionality, rather than follow standards for how software usually are designed. The many new design approaches to the iTunes Store makes the support for traditional assistive technologies very poor.

The possibility to approach a system using just a keyboard is still valid in most systems but in the iTunes Store it is impossible to navigate in the system without using some kind of pointing device. The pages shown in the iTunes Store looks like web pages and uses similar technology. But the pages can only be accessed from the iTunes application, and the code behind the pages is hidden so screen readers can not read the code behind the pages. The only way for screen reader software to interpret what is shown on the screen is by using image processing. Today there is no screen reading technology available that has the capacity to extract the right information and present it for the user.

A support for use of different skins with the iTunes application and the iTunes Store could be a way to increase the accessibility. There are many desktop applications available today that can use different skins to change the appearance of the user interface. Two media players that has this functionality are for example VLC [26] and Winamp [27]. By make it possible to create skins to control the appearance of the user interface, people will soon start creating skins specially designed to support users with different disabilities. Another solution for increasing the accessibility of the iTunes Store would be to release a second, simpler version of the iTunes application. In this version the accessibility of the system could be more important than the usability and esthetic.

Under the process of evaluating the accessibility of the system I found that there seemed to be no support for subtitles for the videos bought from the iTunes Store. No information about this matter could be found on the support pages for the iTunes Store. Therefore an e-mail was sent to the iTunes Store Customer Support with the following question: *"Is it possible to watch movies in the iTunes Store with subtitles?"*. The answer from Customer Support was: *"Unfortunately, at this time, our movie files available do not include subtitles. I can see where this might be beneficial to have — use the iTunes Feedback page to submit your comments about our movie features"* [28].

No information about if support for subtitles will be available in future versions of the iTunes Store have been found. Adding subtitles to the videos that can be bought in the iTunes Store would increase the accessibility a lot. Not only people with hearing impairments would benefit from this but also people who are not native English speakers.

6.4 The accessibility in future systems

An event that attracted much attention during the work on this paper was when Apple Computers biggest competitor Microsoft released their new system for digital music sales. The system is called Zune and has many similarities with the iTunes system. One of these similarities is unfortunately the user interface of the software that is used to buy media files. The Zune system seems to have all the same accessibility problems that the iTunes Store have. This means that two of the biggest systems for legal download of copyrighted material from the Internet can not be used by people who are blind, deaf or that for some reason can not use a pointing device.

An important reason for the high accessibility of TPB was that the system could be accessed by all types of web browsers. There are many online stores for digital media available that can be accessed directly from web browsers. Is the accessibility of these systems higher than the accessibility of Zune and the iTunes Store? I have tried a few different systems and not found a single one with an accessibility that comes close to TPB. So why is the accessibility of these systems so poor? Common for most online digital music stores is that they can only be used together with the web browser Internet Explorer. This browser lacks some of the functionality that are available in other web browsers and that can help people with disabilities to access web pages. Another problem is the massive use of technologies such as ActiveX Controls, JavaScript and Macromedia Flash. The use of these technologies makes it hard for assistive technologies to help users to use the systems. Studies of these types of systems would be interesting to find out how these systems could be designed to be possible to use for people with disabilities.

It is important that online stores for digital media become more accessible. One way of doing this can be to reduce the control over the system. For example are subtitles for almost all popular movies available in many different languages on the Internet today. These subtitles are often created by amateurs for free. By allowing subtitle files to be used together with a bought movie file, users who are deaf or does not understand the language used in the movie would have a reason to start using the system. Another idea presented earlier in the discussion was to make it possible to create skins to control the appearance of a system. This would make it possible to design solutions for users with special requirements. Another problem with the very strict control over the systems is that if a user succeeds with downloading the material it is not sure that he or she will be available to watch or listen to it. Material downloaded from the iTunes Store can for example only be used on Apple Computers portable media player, iPod. There are a few different types of iPod models available but no model is easy to use for persons with low vision or motor impairments. Many other portable media players are available that are much easier to use but these can not be used because Apple Computers does not allow their competitors to play the material.

TPB and the iTunes Store was chosen for this study because they at the time the paper was written was two of the most popular and successful systems. Few studies about the accessibility of these types of systems have been done. Al-

though, I believe that many will be produced before a system that are accessible for all people is created.

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