From Library to iPad: Articles and Social Circles for Novice Researchers

1. Acknowledgments
I would like to express my appreciation to my mentor and supervisor, Alma Culén. This thesis wouldn’t have been possible without her support and guidance. I thank her for her infinite patience and encouragement.

I would like to gratefully acknowledge the head of the Digital Services, Andrea Gasparini, who has been very helpful with deepening my understanding of how digital libraries work, providing some of the literature and more.

I am also grateful to all students from the University of Oslo that participated in this study and helped with prototyping and data collection. I should also thank the publishing house Akademika for providing the iPads for the study and special thanks to the IFI library staff for helping managing the loan of iPads.

2. Abstract
This thesis explores the possibilities of using iPad in a master study environment as a mobile tool for collaboration among students.

The study is done in the period of one semester at IFI2 building at the University of Oslo. 11 iPads were borrowed by participating students. Ethnography-based observations, workshops and interviews were used to collect some specific data about students’ use of iPad in their research habits. Requirements and needs for the mobile application were collected throughout the semester. After that, the mobile application is designed according to the needs and requirements of students. The prototype for the application was then tested with some of the study participants, and improvements were made. The application helps students organize into study or research groups. Within the group they can give ratings, comments and annotations of research articles they share. This activity is meant to help them understand the papers they read and have more enjoyable time studying than if they were doing it all alone.
3. Table of content

1. Acknowledgments.......................................................................................................................... 1
2. Abstract ........................................................................................................................................... 1
3. Table of content .............................................................................................................................. 2
4. Introduction ................................................................................................................................... 5
   Motivation for this thesis .................................................................................................................. 6
   Problem Space ................................................................................................................................. 6
   Research Questions .......................................................................................................................... 7
   Setting the stage ............................................................................................................................... 7
   Collaborative knowledge inquiry .................................................................................................... 8
   Digital Collaboration ....................................................................................................................... 10
   Digital Libraries ............................................................................................................................... 11
   Mobile Technologies & Collaboration in Digital Libraries ............................................................. 14
   Discussion ....................................................................................................................................... 15
5. The iPad and Digital Libraries ........................................................................................................ 16
   Mobile Technology usage ................................................................................................................ 16
   Why iPads? ...................................................................................................................................... 17
   Social Circles .................................................................................................................................. 18
   The Existing iPad Applications ...................................................................................................... 20
   IAnnotate ....................................................................................................................................... 20
   GoodReader .................................................................................................................................... 20
   Instapaper ....................................................................................................................................... 21
   Pages ............................................................................................................................................... 22
   Keynote .......................................................................................................................................... 22
   IThoughts ....................................................................................................................................... 22
   Resume .......................................................................................................................................... 23
4. Introduction

Graduate students and academics rely more and more on mobile technology. Tablets, such as iPad are used more and more frequently. How helpful can they be as a research tool? Is it just a clever shiny gadget for entertainment on long train rides and reading books or papers from a Dropbox, or can it be used in a more active manner in relation to research and other academic work? Having been given one nearly as soon as they came out, my task was to see how students and faculty react to them, what they use them for and to see if I can come up with some creative and innovative ways for them to be actively used by academics. To this end, I have got a part time job at the Institute of Informatics library to administrate the loan of iPads. These were to be used by a selected group of master students and faculty. After one semester of working in the library and making observations, I have come up with an idea for an app that can be used by master students and novice researchers to support their initial steps in the fields of their interest.

In the beginning of my work with the iPad, there were little resources and no information about their actual use, as they were so new. Gradually however, research on their use in general, as well as some in academia, in particular related to library sciences, became more frequent as mentioned in the work done by (Culen, Engen, & Gasparini, 2011), (Marmarelli & Ringle, 2011) and (Hu, 2011). Many school libraries are starting to use the iPad in libraries. An example is an elementary school in Phoenix that has opened the first iPad lab (mkaufman, 2010). Most of the educational institutions that have adopted the iPad are based on students of young age. This perhaps because the iPad is fun to use and the combination of fun and education has proved to be beneficial for children’s education as cited in (Bisson & Luckner, 1996) “Fun can have a positive effect on the learning process by inviting intrinsic motivation, suspending one’s social inhibitions, reducing stress, and creating a state of relaxed alertness”. In my thesis, I will discuss the iPad use as a research tool in the graduate student community. The bachelor level community could also be a potential audience for this research, especially in fields where there is a lot of reading.

In the next chapter of this thesis, I will bring forth some of the work in this area as it pertains to digital and social environments in academia and more specifically, libraries. After that, I will explain some of the theories and methods that were used in conducting this research and explain and analyze the gathering of information and needs from the interaction with the iPad users. The design process chapter explains in detail the process of designing, prototyping and analyzing the iPad application that is designed as part of my master thesis work. I will conclude with a discussion around the analysis of the findings.
Motivation for this thesis

Today's advanced technology enables digitalization of vast quantities of documents, both textual and visual. Many old books and journals have been digitalized. The ever-increasing number of scientific articles on the web makes it difficult for upper level and graduate students interested in starting their own research to select the appropriate, trustworthy articles or authors to begin with. Searching for the appropriate reading material becomes time-consuming and sometimes students get confused or misled. Some students are not well socially integrated among other fellow students, which makes it harder to find the right reading material through direct communication with peers. Additionally, there may be a problem of insufficient confidence around judging the reading material as good or not good and students often have problems asking the mentor or fellow students about quality judgments on articles. Many libraries of course offer librarian services for this purpose, but I would like to address this problem in the thesis, with a goal of proposing a mobile app that may help students with this particular issue using social circles and collaboration. It is my hope that this would make research material more available and easier to access for every student. But to make finding the right material easier, some sort of interaction and communication should be managed between the university library and the students, also between students. This communication may also take place in digital space. I wanted to investigate if the iPad would be the right tool to support this communication.

My personal motivation for designing a mobile application is to explore the capabilities of iPad programmatically by creating something genuine and innovative that would be specific for master students. This is also due to my personal experience with the lack of social communication among students at the university in the course of finding the right reading material and the right courses to take and also being part of studying circles.

Problem Space

The University of Oslo has established cooperation with many institutions globally under the international exchange program. Students come to Oslo to study for a semester or a year. These students may have difficulties in starting to work alone, not knowing what the expectations on the quality of their work are.

International exchange students and students that come from other universities to start master studies at the University of Oslo are among those who often find it difficult to socialize and integrate in new culture and different rules. For them too it may be difficult to find guidance into what ways and hints of research to follow and what research material to read.

There are many applications designed for the iPad for reading and annotating articles. These have advanced tools for organizing and managing users' articles that can be used as personal digital libraries. Some examples of such applications are iAnnotate, Papers, iThoughts, Numbers and Keynote. On the other hand, many social applications do exist for iPad but only on the entertainment level. There aren't so far any applications
that combine the social media and the digital libraries in one. By noticing this gap, my job in this thesis was to design an application that would bring social media and digital libraries together in one interface.

The modern tablets such as iPad, android tablet and Google tablet have numerous favorable features for my project such as touch interface, light weight, portability, cool design, accessibility to the wireless web and mobility which allows real time communication and collaboration by its textual interface, audio and visual features. The tablets seem to be the perfect environment for hosting the Mobile Library application. The platform chosen for my application is, as mentioned above, the iPad. This because it has perfect screen size, it seemed the coolest to me, but most importantly, the AppStore was the largest and has excellent support for developing apps. It was the best at the time I started with my work.

**Research Questions**

Based on the above, I decided to develop a mobile application for the iPad that will enhance the student experience when setting off on a research path. I formulate my research questions as follows:

*Is the (tablet, represented by) iPad the right tool to support social interactions among graduate students with the goal of enabling discussion about academic articles and resources through social media?*

*How can iPad features be used to enhance the students experience with a personal library app?*

**Setting the stage**

In order to understand the problem domain better, I would like to provide the literature overview of the relevant research areas. This thesis touches upon the areas of digital libraries, knowledge domain creation and social networks enabling collaboration.

The most relevant work related to both digital libraries and a knowledge environment that I found is the PhD thesis (Fast, 2012).

Fast’s thesis (Fast, 2012) is about evolution of digital libraries from document repositories towards creating knowledge environments. He discusses the role of interaction as means of transforming libraries from document repositories to knowledge environments. In addition to written documents, the idea of creating a visual knowledge environment is starting to evolve at the academic level as well. These knowledge environments are expected to be attractive for most of the students and help them locate what they need effectively, thus contributing to making knowledge environments useful and efficient. This approach was criticized for being based on false assumptions and limited notions of how people use information, those digital libraries should be more interoperable to make it easier to discover information across collections and should incorporate social features and support collaborative work. Fast reviews the sharium concept that defines digital libraries as virtual environments designed to support
collaboration between all users of a digital library. Social interactions are important in conceptualizing digital libraries when conducting knowledge-based activities.

Regarding collaboration, I have found the following three sources to be highly relevant for my work: Heath & Luff (Luff & Heath, 1998), (Sorensen, 2001) and Joshua Porter (Porter, 2008).

Heath & Luff (Luff & Heath, 1998) states that researchers around the world are concentrating their effort to address the ways in which mobility of people and their tools can support collaboration for an effective execution of their tasks and responsibilities. This is related to my research because I am going to study how iPad with its mobility feature could support the collaboration among students.

Sorensen et al. (Sorensen, 2001) in their paper state that how people interact and deal with each other in their social life is an important issue related to mobility and not just people being mobile, traveling and moving around. In this research I am going to study also how students share information with each other.

On the other hand, Joshua Porter (Porter, 2008) in his book discusses social web design and compares different social web sides. He goes deep into each detail of different designs in order to illustrate to the readers how an effective social website should be designed. He discusses the terms and features that are used in a social web setting for groups mainly. Some of those terms are: sharing, caring, conversing, friendship, arguing, rumor, mongering, gossiping, providing support, advocating for others, recommending. These are also crucial in designing the mobile application presented in this thesis.

Sismondo, in his book (Sismondo, 2010), is discussing the benefits and impacts of socializing the knowledge. He also approaches the evaluation of content contribution in social knowledge networks. In this research, participants were asked about how comfortable they are with different social features such as sharing personal information and knowledge contributions.

**Collaborative knowledge inquiry**

Fast states in his work (Fast, 2012). In the sharium concept, digital libraries are interactive, virtual environments designed to support collaboration between all users of a digital library, including librarians.

People even if provided with all necessary tools doesn’t mean that they are able to solve all their information problems because human is social by nature. Social interaction is crucial to understand information and create knowledge.

University libraries are very interested in closing the gap between library and students, be available and motivate students to seek help from librarians. This effort however, should not rest with libraries only. Everyone concerned with effective knowledge environments should take part in creating them.
The engagement of other perspectives and minds collaboratively in the process of inquiring knowledge through digital libraries gives the necessary grounding for true learning.

In order to inquire the appropriate knowledge and be efficient at selecting it, communication and collaboration is a key to possess common knowledge. Some researchers at University of Illinois at Urbana-Champaign, see (Bishop, 2004), discuss the relation between the learner and the curriculum and the need of opportunities to share new ideas. They view the following as crucial:

- Inquiry or investigation: the natural desire to learn.
- Communication: the propensity to enter into social relationships.
- Construction: the delight in creating things.
- Expression or reflection: the desire to extract meaning from experience.

The diversity of minds, communities and cultures is viewed as a powerful tool for inquiring and processing knowledge. Digital libraries thus should have the capacity to be integrated into active collaborative learning so that all users can learn from each other. The user’s active pursuit of new knowledge is a cycle of action and reflection that can produce useful knowledge.

When students interact with each other’s ways of knowledge inquiry becomes visible and it opens new perspectives for them. I always found it interesting to see how students search for research material during my assistance at the library.

A group of students at the University of Michigan did a study on Science Inquiry (Kuhn, et al., 2012) and found:

“While using peer-collected data during science inquiry can be beneficial to students, and it may be advantageous to expand the ways that students can collect and review scientific data, using self-collected and peer-collected data can also pose distinct challenges to students who are not experienced with the science inquiry process. In addition to the constant challenge of reflecting upon and interpreting data for their explanations.”

Unless the students interact with each other’s ways of knowledge collection, they have nothing to compare efficiency of their own methods with. When students collaborate in groups they notice each other’s ways of thinking, strategies and habits of searching for information as well as what kind of key words they use and look for while searching.

The strategies of using keywords in search for information are various among students. The most common strategy is looking for title keywords.

In an academic level, students will have to do more than look for title keywords. The source of the information must be reliable and approved by academics. The information itself must be reviewed and evaluated. Evidently, the collaborative knowledge collection should be more specific and more limited.

Ultimately, students will approach their professors and librarians for help and hints on how to look for research material. But not all the students have the ability to ask for help and sometimes a communication misunderstanding can happen. Those students will
end up developing own strategies that may take more time and in worst cases not effective results.

**Digital Collaboration**

As (Williams & Rowlands, 2007) states in his report, the school yard is no longer the meeting place for students, they spend a lot of time connected to the web through computer and devices, chatting and sharing information with each other, they even make friends from around the globe. This is the power of the social features of the Internet.

The Internet has become a major host for learning environments. Many universities are investing a lot of money to make digital resources available on the web. If the social features of the web are used in the context of improving the digital learning, it could be far more beneficial. Student could learn faster than before, find and locate the appropriate information through collaboration and communication.

The core feature of collaboration is being a member various groups of interest. Since groups are mainly created by and for people that share the same interests, group members can easily share and access knowledge they would have used more time to search for on their own.

In [ (Porter, 2008), pp. 122] the author(s) says:

“Attachment to a group is one of the more straightforward reasons why people participate online. You can find a lot of people interested in the same weird things you are! Yahoo, Google, and MSN Groups are applications dedicated to supporting groups. They are massive. Each service has millions of members who create groups on nearly all topics known to mankind, from cricket fans to stupid joke buffs to alternative medicine consumers. Of course, you don’t need to use “group” software to be part of a group online. Groups are really the center of most social software”.

These new features that are born on the web can be a powerful tool supporting the optimization of a collaborative knowledge inquiry. But these features have to be used in a controlled environment. These features will gather together the different knowledge sources/interests on everyone’s computer/device. The most popular features are:

- Sharing.
- Rating.
- Commenting.
- Tagging.
- Instant messaging.

A good and legitimate combination of some of these tools could create a global social web for knowledge inquiry. This social web should apply under the laws and surveillance of the knowledge experts. Each piece of information created or updated on the web should be evaluated by experts with some specific credentials.

There are many digital libraries out on the web that universities have collaborations with, in giving the students access to their repositories through the web. Many of these
web sites do lack social interactions of any kind, including, rating and sharing functionalities.

**Digital Libraries**

This term combination brings to the imagination some concepts that Fast summarizes in his article (Fast, 2012), he did use a working definition, as “a digital library is a curated collection of digital objects in support of intellectual and creative work”. He describes this definition as an improvement to the digital library systems and a support to learning, education and research, not just digitalizing them. In [ (Fast, 2012), pp. 18] he says:

“Digital libraries gather together, organize, manage, preserve, and facilitate access to a body of information. They are curated collections of digital documents that can be searched, browsed, and in many cases, accessed remotely over the Internet.

No matter the size of collection or the type of information it contains, the essential character of the modern digital library is curated and searchable repository of digital documents.

Although successful, this approach to digital libraries is not without criticism. One criticism is that digital libraries are based on false assumptions and limited notions of how people use information (Dillon, 2002; Levy & Marshall, 1995; Soergel, 2002). Some have argued that digital libraries should be more interoperable, which would make it easier to discover information across collections (Besser, 2002). Others have argued that digital libraries should incorporate social features and support collaborative work (Bieber, et al., 2002; Bishop, Van House, & Buttenfield, 2003; Marchionini, 1999). All of these critiques suggest that significant limitations result when digital libraries are conceptualized and implemented as curated, searchable, document repositories. Digital libraries should do more than simply help people find information—they must also help people create knowledge from the information they do find. In other words, there is a gulf between digital libraries as they are (information, searching, and access) and digital libraries as they strive to be (knowledge, understanding, and insight).”

These paragraphs clearly present what digital libraries are at present, as well as some criticisms of this present state and highlight well the goal that the author aims at: support of knowledge-centric activities in a knowledge environment.

He continues to explain how adopting appropriate visual, interactive tools may lead to effective information processing. Interactive visual representations increase the ability of exploring, investigating and analyzing information. It can be used for developing digital libraries as knowledge environments.

When digital libraries are converted to knowledge environments, a number of activities can be combined to support finding, manipulating and creating knowledge. Activities as interpreting, modeling, problem solving, sense making and decision-making.

Fast is strongly advocating the idea of a digital knowledge environment that combines information with visualization. There are some examples of that kind of environments, in particular in design for children, 3-D applications, and computer games. But for a scientific level, organizing information in ways that make knowledge easily accessible, such environment would be much more expensive and challenging to design and produce well. Anyhow, scholars and scientists disagree with each other on conceptualization of this knowledge environment. It is a huge challenge both design-
wise, technology-wise as well as other resources-wise (financial for example) to achieve truly knowledge promoting activities and environments.

A very important point that was mentioned in the articles is the interactive creation and manipulation of digital information. I find this to be a scary option through which one may lose the true knowledge. Information may become even less reliable, not knowing who manipulated the information and what was done to it. For example, most scientist and especially students, use the referencing systems to find the correct information and to reference the work of others when publishing their own work. If this information (referencing systems) could be created and manipulated by many, it would lose its trustworthiness. This kind of environment can be created and manipulated only by the experts in the particular field.

In some other situations, digital visual information may have a huge potential to help both see and find information. In informatics for example an application that shows how programming code is executed, the user can write and enter some code and watch the execution dynamically. I missed this kind of knowledge environment when I was struggling to understand the logic of object-oriented programming. An environment like that could have provided much easier access to knowledge for me.

Some scholars suggest that the knowledge environments should be more social and collaborative. That is an effective way of making the search for the appropriate knowledge and information easier. It can also improve the search ability by learning from others socially. But putting this idea in a digital environment, we can’t get the real life experience. The most standard social functions when searching for information today are by reading comments added by other people who have read or seen information. Some websites use star, thumb or number rating. These options show how other people judged some information. Do these people share the same interest? How can we trust the judgment of these people?

There are some limitations to which level an environment can be social and be attractive at the same time among people. Nobody wishes to be addicted to a new Facebook or twitter. If the social degree of the environment is more widely and open, some people may be skeptical to it, due to the variety of the level of privacy from one person to another. Not everyone is willing to share their whole or parts of their identity to the World Wide Web. Even in closed circles as for example universities, are there students who are skeptical to the social life on the web.

An important scenario in information sharing is ownership, getting access to knowledge in a legal way and avoiding piracy. The university libraries have the responsibility of making access to knowledge easier for every student. Copyright and ownership should be taken into consideration while conceptualizing a digital social knowledge environment.

A digital social environment in an academic level should be professional based on principles and norms. It shouldn’t include entertaining functions like in other social networks that causes the loss of time among users. The useful features of popular social networks can be adopted in the knowledge environment as for example comments, like or not like and the amount of users that have seen or read particular information. In a way, the social network is turned into a learning network.
The picture in Figure 1 shows a screenshot of an iPad application (Inkling, 2011) that functions as an interactive textbook; the information is in form of text and visual graphics, photos and videos. The interesting feature of this textbook is the social part and instant note & comment mechanism. Someone can write a note inside an article and share it with a social network. This way one can get answers, help and opinions of other fellow people in a certain learning network:

Filtering and rating knowledge by anonymous and random people may spread less effective knowledge and loose some useful knowledge. We can look at Wikipedia for example, a well-known and trusted source of information used by millions of people from around the world. Anybody can write, publish and edit information in Wikipedia, even if some reliable person writes some information; it can be edited and changed by someone else. I usually use Wikipedia to find information, and I use that information while discussing and socializing with other people. In some way, I am spreading potentially wrong information.

The majority of people are using the web to find information and facts, but not everyone is good or knows how to find useful information. Students do learn some ways of finding correct knowledge by interacting and socializing with fellow students and teachers.
Some students are not good at socializing, too shy to ask for help. This can lead to a waste of a huge amount of time and being lost in information.

Based on this discussion and assumptions, any digital knowledge environment must be controlled, manipulated and created by trustworthy academics. This kind of knowledge sources attracts people and gains their trust. These environments can be created within closed circles so that only students and academics can filter, rate it and manipulate it. When making a knowledge environment social, people in circles that share the same interest in a particular field of knowledge, will be able to share interesting information with everyone in the circle.

Mobile Technologies & Collaboration in Digital Libraries

In the course of developing mobile technology systems in knowledge environments, how people interact with each other and how they use objects and tools to accomplish their should be seriously considered (Luff & Heath, 1998). Kakihara (Sorensen, 2001) argued that being mobile is not just about how people move but about how they preform and interact, he reviewed the human interaction dimensions when studying mobility: spatial, Temporal and contextual. By modern mobile technologies, we become independent of the geographical constraints. IPad and tablets are good examples of modern mobile technologies. They can be a key to a successful mobility so the students don’t need to be geographically dependent on any location in order to be on the web and be social and interactive in a knowledge environment.

Collaborating at distance when working in groups or projects is very necessary, modern mobile technologies could facilitate that matter, it allows the performance of activities geographically independent. Collaboration is a central topic not only in an educational setting but also in life situations (Luff & Heath, 1998). A student could be out in a park, on the way home/university and at the same time if he is using an iPad for example could perform task collaboratively, send email, instant messages, comments etc. This way, educational processes could be speeded up and much time could be saved.

Awareness or being kept up to date within projects or groups is a big benefit for mobile collaboration (Belotti & Bly , 1996). The author noticed that awareness dropped considerably off outside walking distances. Telephones don’t play a substitute role for the face to face communication and collaboration. Mobile technology systems providing video and audio features to enable communication between people and document sharing, solutions like these have been tried to substitute the real life communication and collaboration (Luff & Heath, 1998). Although real life experiences can’t be perfectly substituted by mobile technology, but people do adapt to new technology especially todays advanced modern mobile technologies like iPad and other tablets where real life experience have been tried to be simulated to the highest level possible. One thing that can be solved by using tablets is the geographical independency.

Taking the iPad and tablets, a potentially great example of mobile technology system, it is not only a device that is fit to be mobile, function as a tool and as a storage device, it can enhance instant communication and collaboration without having to create movement, quick access to information, create discussions independently of the
geographical location. The wireless feature of iPad makes it easy for a group of
students to simultaneously work on documents and update instantly each member of
the group without having to make a movement. Without using mobile technology
systems, collaboration would be dependent on the physical presence of students in
front of a computer or paper. Some issues should not be left out here concerning
computers and is their physical characteristics. A laptop for example can be heavy to
carry around, not all students can afford to buy one while a tablet is comparatively less
expensive than computers and laptops. Computers located at the university are to no
support for mobility, the students are bound to the location while working on projects
and in groups.

Working with a group depends also on a verbal communication at times, something that
is not always allowed in computer rooms or libraries at the university.

Discussion

In summary of this relevant work by (Fast, 2012), (Luff & Heath, 1998), (Belotti & Bly ,
1996), (Inkling, 2011), (Porter, 2008), (Williams & Rowlands, 2007), (Kuhn, et al., 2012),
(Bishop, 2004) and (Sorensen, 2001) we can see that digital libraries should include
social interactions. The tools that are needed to create successful digital knowledge
environments should include modern mobile social interactivity in order to enhance the
real time interaction with information.

After analyzing these resources and understanding the potential they have, it is in order
also to discuss some limitations and issues that are hindering the creation of a perfect
digital and social knowledge environment.

Some of these limitations that I have identified are:

• Skepticism among adult people.
• The extension of the socialization and collaboration in the knowledge
  environment.
• Difficult for academics to change environment and traditional methods.
• A weak willingness among students for trying new ways of seeking knowledge.
• Copyright and ownership of knowledge.
• Useful knowledge can be lost and less useful knowledge can be favored.
• The trust between knowledge providers and knowledge seekers may weaken.
• A professional digital knowledge environment is expensive.
• Disagreement on conceptualizing this knowledge environment by scientists.

My thesis is in some way an angle that shows what may be done to make a step
towards including social interactions as part of the digital library services. I believe that
functional, visual, collaborative and sharable environments should be created at all
educational institutions. The environment can for example be a redesign of the university webpages into an interactive mobile application. One should not be afraid to change traditions that are outlived, even if it is in small steps. The trust issues are important. However, the academics and supervisors could be involved in commenting, rating and sharing content published in a digital social knowledge network. That means evaluating and controlling the content created by students in the environment.

5. The iPad and Digital Libraries
This thesis addresses, in part, the problem of creating a digital knowledge environment for iPad and tablets. Tablets are relatively new technologies that can be customized to conceptualize a knowledge environment. Apple has made it possible for users to create own defined applications. That is an opportunity for me to try creating an application for hosting a part of the knowledge environment. The challenge is using iPad’s capabilities optimally to create a digital environment that covers most of students’ needs with modern interaction functionalities.

I now review some uses of iPad in collaborative situations from the literature.

Mobile Technology usage
Mobile technology offers support for group or circle members to collaborate on for example a project or study together without being physically present in a specific location. Heath & Luff (Luff & Heath, 1998) reviewed some situations where this has been tested and presented. The following are four examples examining mobile technology usage:

- Subway station. As described by (Luff & Heath, 1998), for employees at subway and metro stations in order to have the latest information updates about traffic, regional maps, safety routes, general data, concerns, station diagrams and have access to facilities and coordinate with co-employees, a mobile technology system could be the answer and is crucial to allow this kind of mobile interactions.
- Constructions sites. In construction sites, mobility is very important. Workers are moving around different physical locations and require access to information from other workers. (Luff & Heath, 1998) Give an example of a pilot project where a mobile system is used to support the foreman in monitoring the work done by the employees in different locations. The mobile system that was designed was made to replace the allocation sheets that the foreman used to view the work progress, identify problems and other activities. The allocation sheets of work progress are mobile, the foreman collects them from around the construction site already filled out by responsible personnel, checked and passed on to the appropriate persons out on the site. Mobile systems, in addition to doing the same work as the sheets, they enhance quick and accessible information movement around interested personnel. This allows the foreman to discuss various details with the employees whatever their location, and help solve problems and difficulties before occurring.
- Hospitals. In hospitals, (Luff & Heath, 1998) mentions that traditional paper records still remain as an important resource because of its flexibility and easy mobility, it is easy to carry
paper around and locate it in a practice, clinic or an office. (Alsos & Svanæs, 2006), states that combining two devices will allow health workers to treat handheld devices and pc’s as one system so that collaboration will be easy and thereby improve the work efficiency. One of their findings was on social and contextual factors that affect its usability, which is very relevant to learning via mobile systems. They referred to ISO 9241-11 identifying usability as: “the extent to which a product can be used by specified goals with effectiveness, efficiency, and satisfaction in a specified context of use”.

• Study groups. An example of iPad use within book clubs or study groups presented by (Buchanan & Pearson, 2010), one of the main aims of using iPad in collaborative situations is to minimize the traditional way of group work when using paper based tools and provide the technological features of the device in addition. They state how mobile and collaborative it is to work with physical paper and books in a collaborative environment without having to use technology. But this way of collaboration has its issues for example referencing a specific section can be tricky, the reader who is guiding their colleagues to a particular place must identify its physical location, and this can give rise to co-ordination problems. A second issue is that the readers’ individual notes are separate and sharing ideas can lead to considerable duplication of effort (Buchanan & Pearson, 2010).

**Why iPads?**

(Buchanan & Pearson, 2010) Discuss some factors of the iPad choice. In contrast to pc and laptops, iPads are small and portable enough to be held like a clipboard or printout and have the size of a book. The ability to connect to the Internet wirelessly is the backbone of real time collaboration. And also the multi-touch nature of the iPad screen significantly improves the interface interaction promoting almost sub-conscious behavior via ‘lightweight’ gestured techniques.

The authors argue why not use other eReaders than iPad. eReaders do include non-back lit eInk displays - a technology that minimizes eye strain while reading. However, eReaders don’t offer possibilities to program. The authors with close interaction with these devices discovered that they suffer from serious usability issues. They concluded that iPad was the best choice, the physical size and multi-touch screen interaction ensures easy manipulation. The wireless feature ensures live interaction among group members.

Usability guru Jacob Nielsen in his blog (Nielsen, 2011) shows in Figure 2 the graphical representation of factors contributing to tablets popularity.
Social Circles

The biggest example for a successful social network nowadays is The Facebook and how the ownership side is managed (Figure 3). Taking these powerful features of ownership that Facebook have and implementing them in a social knowledge environment where people could create groups and invite selected users with the appropriate credentials and then share, rate and comment information.

Figure 2: Jacob Nielsen representation of factors contributing to acceptance of tablets.

Figure 3: Left menu links to Facebook groups

Figure 4: Header of a Facebook group
UIO Informatics library (Library I., 2011) have a group on Facebook (shown in Figure 4) that is open for public for everybody on Facebook. The Facebook Group contains many images of the locals of the library and a map of it. When opening the website one can see posts by the administrators of the page to the left and the right with a vertical line that splits the two columns. One can see also links to other libraries’ Facebook webpages. One can see how many do like the group which means how many are subscribed to the posts posted on the page. It shows 78 for the IFI library, a number relatively small compared with the amount of students studying at IFI. There were a lot of posts posted by the library personnel but almost nothing posted by students and very few posts are liked by users or even commented. But the web page for the new science library at Vilhelm Bjerknes' Hus (Library U. S., 2011) had more activity and recent posts but 478 subscribers is still a small number compared to how many students study science at UIO. The lack of subscribers must have a good reason. It could be the lack of publicity, marketing and of administration of the page.
The Existing iPad Applications

iAnnotate

iAnnotate is an application that enables one to add own notes to materials in pdf format on your iPad. The developer describes what the App does as follows:

“Our development team has designed iAnnotate to enhance your productivity as you work. The app’s intuitive interface and comprehensive, customizable set of features let you annotate, manage, and share documents from your iPad. Daunted by a large collection of unorganized PDFs? Then use iAnnotate's fully searchable Library to organize, find, and read your documents (Branchfire, 2012).”

Some of the users say: "Light years ahead of the other PDF annotation apps," "an indispensable tool to have," and "the reason I bought an iPad." (Branchfire, 2012).

Figure 7: shows how an annotated document looks like and how simple the file organization is

Although iAnnotate is successful, attractive and a colorful tool for annotating, commenting and highlighting pdf, the only way to share the annotations and personal work is via mail or Dropbox. It isn’t easy to get opinions on own annotations. The features of annotating, highlighting, folder structure of iAnnotate and other features are an inspiration for the features designed in my mobile application.

GoodReader

GoodReader® is the super-robust PDF reader for iPad - the #1 selling non-Apple app for iPad in USA in 2010! Mashable describes it as “a Swiss Army knife of awesome!” Reviews worldwide hail it as “essential,” “the best,” “magnificent” and “the killer app”. With GoodReader on your iPad, you can read virtually anything, anywhere: books, movies, maps, pictures. Use it once and
you'll be hooked. Soon you'll be wondering how you ever managed to use your iPad without GoodReader (Ltd., 2012).

It is an annotating and commenting tool which is relatively rich and colorful. It contains a bottom toolbar with many different tools. In addition to the possibility of creating connections and syncing own work through Mail, Google Docs, Dropbox, SkyDrive and others. The colors may seem a little strong and not professionally programmed, but the tools and the annotating features could be inspiring in designing the mobile application.

![Figure 8: A sample PDF in GoodReader](image)

**Instapaper**

Save web pages for later offline reading, optimized for readability on your iPhone or iPod touch's screen. Featured by Apple and critically acclaimed by top blogs, newspapers, and magazines! Great for long articles and blog posts that you find during the day and would like to read, but don't have the time when you find them. Save with Instapaper, then read later when you're commuting, in a meeting, or waiting in line. Need something to read? You can browse articles that your friends posted on Facebook, Twitter, or Tumblr. Or browse the Editor's Picks, curated by hand from the Instapaper community's most-saved stories. Sending to Instapaper is
supported by over 150 other iPhone and iPad apps! You can even send long emails to Instapaper to read later (Arment, 2012).

It is an application specific for converting websites into text for reading purposes. The feature that is interesting for me in this application is sharing via email, Tumblr, Twitter, Facebook, Pinboard, Evernote, or other supported apps.

Pages

Pages is the most beautiful word processor you’ve ever seen on a mobile device. This powerful app has been exclusively designed for the iPad, iPhone, and iPod touch. Create, edit, and view documents wherever you are. Pages works with iCloud, so your documents stay up to date on all your devices — automatically. And the Retina display on the new iPad makes everything you do in Pages even more brilliant (Apple, Pages, 2012).

The features of importing files, viewing and editing them are some potential features that could be implemented in my mobile application.

Keynote

Keynote is the most powerful presentation app ever designed for a mobile device. Built from the ground up for iPad, iPhone, and iPod touch, it makes creating a world-class presentation — complete with animated charts and transitions — as simple as touching and tapping. Highlight your data with stunning 3D bar, line, area, and pie charts, animated with new 3D chart builds such as Crane, Grow, Radial, and Rotate. Use full-screen view to present right on your iPad, iPhone, or iPod touch. Or use video mirroring to present on an HDTV, and preview your slides and notes on your device using the Presenter Display. The Retina display on the new iPad makes everything you do in Keynote even more brilliant. Keynote works with iCloud, so your presentations stay up to date on all your devices — automatically (Apple, Keynote, 2012).

This is an application that functions almost as PowerPoint which is also a potential feature for my mobile application.

Evernote

Evernote is an easy-to-use, free app that helps you remember everything across all of the devices you use. Stays organized, save your ideas and improve productivity. Evernote lets you take notes, capture photos, create to-do lists, record voice reminders--and makes these notes completely searchable, whether you are at home, at work, or on the go (Evernote, 2012).

This is also a set of functionalities that could be implemented in the mobile application.

iThoughts

iThoughts is a mind mapping tool for the iPhone/iPod Touch. If you have an iPad then please check out iThoughtsHD. Mind mapping enables you to visually organize your thoughts, ideas and information (CMS, 2012).

Organizing thoughts is something that could be helpful in group studies.
Resume

All these features and functionalities that these cool applications mentioned above contain, if implemented in one application, could be a powerful application that could be very useful in a study environment. We can categorize the functionalities that these apps contain in:

- Annotating & Highlighting.
- Commenting and rating.
- Publishing, Syncing and sharing.
- Presentation.
- Text editing.
- Mind mapping.
- Taking notes, photos and audio recording.

Nielsen and Budiu (Nielsen & Budiu, 2010) did a usability test on a range of iPad applications. They compared using web browsers vs. iPad apps in an iPad. According to their study, web browsers on iPad are not optimal, links are too small and fonts are not very suitable for reading. Although, Safari or mobile specific websites maybe a solution. They made some suggestions that should be considered while designing apps for iPad that could compensate websites:

- Using and taking advantage of features available on iPad while designing applications.
- Implementing all features that are available on a website within a specific application.
- Possibly give some more features and advantages that are not available on a website.

The most challenging aspect of iPad application design is to know what users want to do and how they prefer to do it. Getting users interested in using the application and eventually telling friends and others about it. That is why it is crucial to involve the users in the design. That is what I am trying to do in this research.

6. Methodology

I choose to use user-centered design approach in the process of designing the Mobile Library in order to make the application most likely to be accepted among students. It is they who will use it then their opinions and feelings about it are important for the design. Working at the IFI library as an assistant and attending different courses made it easy for me to interact with many students.

User-centered design

In broad terms, user-centered design (UCD) is a type of user interface design and a process in which the needs, wants, and limitations of end users of a product are given extensive attention at each stage of the design process. User-centered design can be characterized as a multi-stage problem solving process that not only requires designers to analyze and foresee how users are likely to use a product, but also to test the validity of their assumptions with regards to user behavior in real world tests with actual users. Such testing is necessary as it is often very difficult for the designers of a product to
understand intuitively what a first-time user of their experiences, and what each user's learning curve may look like (Wikipedia, User-centered design, 2012).

The main difference from other product design philosophies is that user-centered design tries to optimize the product around how users can, want, or need to use the product, rather than forcing the users to change their behavior to accommodate the product. (Wikipedia, User-centered design, 2012).

To support the user-centered design and gather data for design, I have conducted an ethnographic study during my work hours at the library and during courses I took. Some of the work was also done during breaks, in more informal settings. Some of the methods that were used in the ethnographic based study are observations, a focus group, interviews and workshops. Data was collected by using triangulation via observation, interviews and focus groups to establish the needs and requirements for the mobile application. Triangulation is used to indicate that more than two methods are used in a study with a view to double (or triple) checking results. This is also called "cross examination" (Wikipedia, Triangulation (social science), 2012).

The design and deployment for a mobile system is crucial, the designers need to take in account the way work is normally done, before getting into solutions that will replace traditional ways of doing collaborative work. It is very important to examine how people engage in activities with others when they are in a mobile situation, and the various artifacts and tools which are present and featured in those activities (Heath, 1998).

Human centered design is a framework that focuses on the user perspective when developing software to create effective systems. In this framework, developers involve end-users that are in the topic domain. Through design iteration, developers get constant feedback from end-users and continue developing based on the feedback of use of earlier designs. In order to include usability requirements in software development process, there are some processes that should be considered (Maguire, 2001):

- Plan the human-centered design process.
- Understand and specify the context of use.
- Specify the user and organizational requirements.
- Produce designs and prototypes.
- Carry out user-based assessment.

**Research environment**

The environment location was the University halls and the library. The tools that were used are iPhone for taking photos, notes and audio recordings, an iPad for taking notes, reviewing applications and testing prototypes, MacBook Pro for coding the application and Dropbox for storing notes, recordings, images, resources and writings. Dropbox made it easier to access my master folder anywhere anytime. My mentor had access to my Dropbox so that we could coordinate effectively. It saved a lot of time. Microsoft Word was used as writing tool.
Observations

Observational techniques are an important aspect of many qualitative research studies and of case studies. Observations may be direct (when the researcher is performing the observation) or indirect (where participants for example may observe their own behavior in form of logs, journals and like that are reported to the researcher. Establishing a relationship between the researcher and the students that were using the iPads was necessary in this study. Students needed to be observed both directly and indirectly. In order to keep track of the observations, notes were taken and put into a weekly log.

Direct observation of participants was carried out during course hours, breaks, after and before classes ours. This was done since the loan out of iPads until their return at least once a week in about 18 weeks. During my services as an assistant at the library, I was also able to observe some of the participants that used the informatics library as a location for their studies. There was little form of indirect observation, some cases of that were when participants weren’t present at IFI. They had to send me an email about it. All this is shown under the design process in the first section.

Focus group

A focus group is a form of qualitative research in which a group of people are asked about their perceptions, opinions, beliefs, and attitudes towards a product, service, concept, advertisement, idea, or packaging (Wikipedia, Focus group, 2012). The participation of several individuals in a focus group provides the possibility of a broad range of viewpoints and insights. Discussions can reveal the similarities and differences between opinions (Lazar, Feng, & Hochheiser, 2009).

I arranged a focus group with the participants that were members of the project group of inf5261 who all had an iPad. The subject was how to make iPad useful and beneficial in our studies when we want to research a new area of study.

Interviews

An interview is a conversation between two people (the interviewer and the interviewee) where questions are asked by the interviewer to obtain information from the interviewee (Wikipedia, Interview, 2012).

The interviews had to be done in order to establish the needs and requirements for an application that would be helpful for students and make research easier. In addition, the students who borrowed iPads were interviewed for their use and interaction with the pad and how it could be helpful in their studies. This is done through direct feedback from the user group.

The questions for the interviews were prepared in advance. Most of these questions were semi-structured in order to go deeper into the details. A semi-structured interview is a method of research used in the social sciences. While a structured interview has formalized, limited set questions, a semi-structured interview is flexible, allowing new questions to be brought up during the interview as a result of what the
interviewee says (Wikipedia, Semi-structured interview, 2012). From that, a discussion happened according to the answers, because there were different levels of use and interpretation of the iPads by different students. That is also a reason why interviews were run individually. During the interviews, interviewees were observed to make a relation between what they say and what they do.

The interview questions and discussions were modified and taken to a higher level from week to week since most of the students that borrowed the iPads have never used one before, and they needed time to get acquainted with it.

The challenge was that open-ended and discussions often resulted in a vast variety of answers that took time to analyze and transcribe. Another challenge is that I sometimes did not get all the answers I needed, because conversation would take some other direction and the time would run out. Also, all the interviewees have had an attitude towards the iPad as a new technology, and most of their answers, whether positive or negative were influenced by these attitudes.

In this research, in order to collect more specific and narrow data, the interviewees were the students that borrowed the iPads, students that were members of my group in the master course inf5261 and some other random students that already had their own iPad.

The questions of the interviews were managed by me and were specific and narrow to the subject of this research.. The interviews were semi-structured in order to have room for clarifications and let the conversation go where it may (Lazar, Feng, & Hochheiser, 2009).

The recording of the answers was mainly taking notes. In case the interviewee didn’t have enough time, the conversation was recorded by using the recording tool of iPhone. The notes were written in a word document, every participant had its own section. All these sections were arranged by dates, in this case, weeks. The participants were asked in advance for permissions for audio recording and picture taking, most of them agreed to that, some didn’t want to be taken picture of.

Most of the weekly interviews took place at random places at IFI. Some interviews were scheduled mutually or by mail/sms. The interviews were held after, before or during break time of the weekly course hours that the participants and I attended at the same time. There were cases where participants weren’t physically present at the university, the interview then was held through email. Some of the interviews were held at the informatics library during my service hours as an assistant. This is also shown under the design process chapter in various sections.

**Workshops**

The usability testing in this research concerned the mobile library application that was prototyped. It involved participants attempting various task in a specific environment in the early stages of the application development (Lazar, Feng, & Hochheiser, 2009).

The purpose of the usability testing is finding flaws in the interface. In these early stages, style and color preferences were not concerned. The focus was on the concept
of the idea, privacy, confusing and misleading concepts and flaws that would cause problems for users (Lazar, Feng, & Hochheiser, 2009).

A usability testing also concerned using the applications that the participants were requested to download for this purpose. iAnnotate and iThoughts were downloaded on each participant’s iPad for use during their studies. The participants were requested to give feedback on their experiences using these applications. The workshop is illustrated under the design process in the section of prototype 2 in high fidelity.

**Prototyping**

Both low fidelity and high fidelity prototypes were used in the design process. Low fidelity prototypes were in form of storyboards drawn on a wall board and paper. The high fidelity prototypes were in form programmed design software using programming tools and languages and installing it on an iPad. These prototypes are detailed in the Design process chapter under the section of prototyping.

(Soegaard, 2010) Defines prototyping as:

“Prototyping is a method used by designers to acquire feedback from users about future designs. Prototypes are similar to mock-ups, but are usually not as low-fidelity as mock-ups and appear slightly later in the design process.”

He also states some of the advantages of prototyping:

- Prototypes incite criticism from users because they may be low-cost and low-fidelity. If a user is presented with an early version of a system that has required substantial work, he/she is likely to be more reluctant (as well as able) to criticize it.
- Prototypes comply with the wish to show fast results to the client
- Prototypes have the advantage of ‘grounding’ the discussion during a user session, making sure the session does not get too much off track.
- Not only can the prototype function as a discussion medium between designer and user but also between the members of the design team. Thus, prototypes may help facilitate work across disciplinary borders, bringing together a disparate team.
- Prototypes make it possible to do usability testing early in the development process.
- Prototypes incite and legalize experimentation as they are inexpensive to alter.
- Prototypes focus on content and functionality and turn attention away from details of graphic design.
- Prototypes make it possible to get a formal approval of the design from both programmers and the client before you proceed to the development stage
Figure 9: Iterative design process.

Figure 7 shows the circular process of iteration during the design. Needs, limits and requirements are gathered through the evaluation of prototyping results and then evaluated and implemented in a new iteration of the design until no further considerable needs are found. Prototyping is used under the design process. More about it is shown under the high fidelity prototyping.

Analyzing qualitative data

Qualitative data analysis generally consists of three stages. We start with a data set that contains information about a substance (Lazar, Feng, & Hochheiser, 2009):

- Analysis: Identify the major components of that substance.
- Drilling down into each component and studying the properties and dimensions of each one and how they relate to each other.
- We use the knowledge we gained from studying each individual component to better understand the original substance and make inference about that substance.

The components that are studied in this research are:

- The user group, which is the master students.
- The iPad technology.
- Material search behavior of master students.
- Social knowledge behavior of master students.

The analysis is shown in the design process chapter.

Case

On the 24th January 2011, the university library in cooperation with me, Alma Culén, Andrea Gasparini, Jo Herstad and Berit E. Strange (Figure 8), agreed to hand out some
iPads to students at IFI throughout the semester so that I can perform a research on the use of it among students.

A mutual deal was made between each student and me to be followed up and questioned or interviewed once a week. The interviews were about the progress of the use of the iPad, specifically in the study and research setting. Most of these students have never used iPad before.

7. Design Process
Prior to starting with design process, I used triangulation to gather data about using the library, using the iPad and using the social media was used.

As mentioned earlier, direct and indirect observations were used, focus group and interviews.

Gathering information about the use of iPad
In all, fourteen participants were observed weekly and notes were written in a log. The findings are summarized in the following categories.
Participants that borrowed iPads

These participants have almost never used an iPad before with the exception of two that did own an iPad from before. Some of them did on occasions, but did not own one. 11 of the participants were master students, 1 was a PhD student and the remaining 2 were bachelor students.

To begin with, the students that were members of the iPad project group inf5261 got a free card of 200 kroners for buying iAnnotate and iThoughts. The idea is to get students acquainted with the device and some of its capabilities.

Here is short about each and what they used prior to the study.

1. The participant is 23 years old and studies bachelor in informatics. She owns an iPad but hesitates to invest into more advanced applications because she is new to the iPad world and doesn’t know students that have iPads. So she uses it mainly to raid using web browsers. She uses iBooks, Facebook, Trafikanten, Mail and Safari. She doesn’t like Safari because it is slow and freezes often.

2. The participant is also 23 years old and studies Entrepreneurship and Innovation. He owns an iPad for about a year. He is very well engaged into it and have the most recent and known applications on the market that are useful in his studies and entertainment, he reads thesis related articles much while sitting on the long way bus ride home, he quotes “I like iPad because I can have a lot of my data in a little light device”. But he uses a laptop for writing. Some of the applications that he uses frequently are:
   - iBrainstorm.
   - ideaSketch.
   - iAnnotate.
   - iCalender.
   - QuickOffice.
   - FastPdf+.
   - Web browsers.

3. The participant is 24 years old and studies Entrepreneurship and Innovation, he didn’t use it much for other than entertainment purposes, some reading and mail but did use it when his laptop broke down. He prefers iPad because he doesn’t easily get distracted by wanting to use other open entertaining software, which is the case in using a laptop.

4. This participant is 33 years old, exchange student from Kenya and studies Entrepreneurship and Innovation, he used the iPad every day for searching and reading thesis material and reading news. He used Safari as a tool for that and mail. He also used some applications for reading the Bible. Later in the semester he started using iAnnotate and Dropbox, he rates the iPad 4/5. He would prefer if there were a built in camera on iPad.

5. The participant is a 28 years old exchange student from Uganda who also studies Entrepreneurship and Innovation. He also used it for searching and reading
thesis material, news and mail. He used mostly Safari, Dropbox and iAnnotate for that purpose. He did download applications for entertainment purposes and Facebook.

6. The participant is 25 years old and studies masters in informatics. He didn’t like the idea of no file system and no multitasking system. He is a programmer and prefers the mouse and the keyboard. He liked playing multi-touch games on the iPad but it became less fun afterwards. He jail broke his iPad and installed a Terminal in order to get to the root of iAnnotate everything was sandboxed.

7. The participant is a 47 years and also studies masters in informatics and works as a communication coordinator at Sunnaas Hospital. She uses the iPad for reading and downloading articles for her master thesis. She doesn’t like the virtual keyboard, difficult to hit the keys. She wants a camera on the iPad so that she can use it as a communication tool for the patients in a hospital. She prefers iPad because she can search down 300 pages articles using key words and she doesn’t have to carry these heavy paper articles but rather have them on the pad. She uses iBooks to store her articles. She wants to buy an iPad because she is becoming more dependent on it.

The next participants have never used an iPad before.

1. The participant wasn’t able to fully use the iPad because of the technological barrier but used it to read course articles.
2. The participant is 32 years old studies masters in Social Media. She used the iPad at home on free time just for web surfing and email reading.
3. The participant is 58 years old who studies masters in informatics. He couldn’t understand the concept of downloading apps and creating an account, he was uncomfortable using it and finds it hard to get used to it, prefers a laptop and would rather buy a new laptop than a new iPad.
4. The participant is 68 years old PhD student in informatics. She always asks about what applications to download and what is best to use, she has a sun that designs applications. She discovered that she could store articles in other external applications as EverNote but didn’t like the auto correct function so she had it disabled, and then read these articles on her travels to the university. She used to read the AftenPosten news application which according to her is something between the paper and web edition.
5. This participant is a 28 years old master student at informatics. He enjoys the iPad, he reads course article. He went further and tried writing and taking notes during lectures but couldn’t keep up with the lecturer because the process of writing on iPad using the virtual keyboard was slower than handwriting. He tried a mathematical application that can be used for taking mathematical formulas and symbols.

Non-student iPad borrowers:
1. The IFI professor uses the iPad for watching TV. She doesn’t like Apple restrictions and the idea of having to connect to iTunes. She prefers open-source software.
2. The head of the IFI library didn’t use the iPad at all.
Focus group
In the middle of the semester, I arranged a focus group with five of the master students that borrowed the iPad. They were asked openly about how much they use it for reading, annotating, taking notes and whatever in a study level. There were some disagreements about how useful the iPad is in studies. Most of the students said they used it for reading course and thesis articles and some of them even started annotating using iAnnotate. One student finds the iPad not useful in studies, because of the weak virtual keyboard and Apple restrictions and sandboxing of applications. All the participants agreed that the virtual keyboard is uncomfortable to use but the majority liked using the multi-touch functionality for zooming and swapping through articles and annotating. The main benefit of using iPad according to those who have a lot to read does not have to carry around tons of papers and books but put everything in the device or access it through Dropbox.
A couple of participants did use the iPad for reading academic material more than others. Others used it for reading news, Mail and Facebook. A couple used it for playing multi-touch games also, which was cool and new.

The participants when asked about their use of the library. Most of them use the physical libraries for studying, finding research material and getting guidance. Some others use mostly the digital libraries and use the physical library only to borrow books. Most of the participants would rather use the digital libraries for research if it was easier enough.

Interview with the head of Digital Services at UiO (Andrea Gasparini)
The role of digital services is to develop and operate common services for all universities libraries to support researchers and students in their work. There is need to make the digital services visible and available for all the users within and outside the university, they have 4-5 people working on the access level and 3-4 people working on buying the electronic resources. Students can use VPN or Cisco to log on off campus and get access.
A lot of users prefer using Google Scholar but don’t know that there is a lot of work done by digital services behind that like negotiations, buying and giving access. The main challenge is marketing the services well enough so that the effort and money don’t go wasted. The library uses 60 million kroners on electronic resources and only 11 million on paper resources. Anyway, loan of paper book is going down but the number of visits to the library is going up.
The digital library at the University of Oslo is using different database systems and the resources are indexed in different ways, it is the job of the Digital Services to make it clear for the users how to search for resources. BISYS is one of the search engines at the library, which is relatively old. The government and many stakeholders influence changing it to something new.
If we consider some of this information while developing the Mobile Library application, some services have to be created in order to make all the resources available on the application. Rating and commenting the articles will be a challenge since the library databases are indexed differently. Another challenge is making the application available across other known and used platforms since not everyone is able to or wants to use the iPad.

The Library is currently running the INFORMATION MANAGEMENT FOR PHD-CANDIDATES project and the question that came up is how does this fair in comparison to the Mobile Library Application. Here is short about the information management project:

The aim of the project is to develop information literacy education modules for PhD students. The modules will be tailored to this target group by taking into account their information searching behavior and information needs, as documented in the existing literature and as revealed by the project own findings. The modules will contain open access online resources and teaching portfolios for seminars within PhD programs. The project will be run as collaboration between five Nordic academic libraries and is mainly funded by Norwegian ABM-utvikling (UIO, 2012).

Andrea explains further that the theme of this report is how the PhD candidates are working to identify and assess academic sources and relevant literature. Furthermore, the authors of the report deals with how PhD candidates relate to publishing their own research, what they perceive as challenging in these processes, and what they expect to find as support and guidance in research libraries. By looking closely at the PhD candidates’ practice, research challenges in everyday life and experience with library services, the authors provide a knowledge base library, which can be exploited when they are developing their services. At the same time, the report provides Ph.D. candidates and researchers a way to reflect on their own challenges.

The survey that forms the basis for this report was conducted as part of the project "Information Management for Knowledge Creation" (2010-2013). The project is collaboration between the university libraries in Bergen, Oslo and Aalborg, the Norwegian School of Library and Library at the University of Bergen. The project received development funds from the National Library of Norway.

When Andrea was asked about my idea of the mobile library application compared to this project. He thinks that my idea takes more account of the user perspective and social navigation. Students help each other when they study and this creates conversations, being able to see and read what others think about the article is actually important and instructive. But I should remember also that there may be some pitfalls here: If all read the same article, then it may be that some good articles are not read because nobody commented on them.

I then asked Andrea if he thinks that students will use iPad if the mobile application was available. He replied that he have seen in Bergen that students do not do as the school wants them to do. Then it is a risk that the iPad will be used only for homework studies and not used to foster innovative ways to study or create and share new learning objects (video, text, sound that can be shared). On the other hand, the universities should keep trying to find out what it takes to succeed.
Summary of outcomes
Based on the interviews, observations, focus groups and interaction with the participants in this study, the students that got more use out of the iPad could be leveled up as the following:
1. The students that owned an iPad.
2. The students that were pushed and encouraged to use the iPad and got support and help using it.
3. Students with sense of exploration to new technology.
4. Students that have got time to use it.

The main benefit that these participants agree on is that they can have many documents, articles, books and such in a single light device instead of having to handle a lot of paper. Also, the opportunity to use different document management applications such as iAnnotate for taking notes and highlighting text and then storing it in Dropbox for making it available on any other computer device with Internet access was observed practical for some students.

The students that didn’t benefit from the iPad:
1. Students that weren’t encouraged and supported to use it.
2. Students that didn’t have time for it because of busy studying schedule or personal matters.
3. Students that are much older and have skepticism to newer technologies, not easy for them to learn it and get used to it.

Both groups, the ones that thought the iPad was cool and the ones that did not, thought that if they got some real value back from using the device, they would use it.

The majority of master students are busy studying, learning about a new device, iPad, appears time consuming and unnecessary, especially if there is little information about the benefits of it. Apple restriction policies are also a factor in hindering students from getting acquainted with it. Creating an iTunes account, registering personal information and visa card information, some participants get skeptical, hesitate and find it unworthy.

The idea of developing a research and social application specific for master students could get them interested in using iPad and thereby borrowing one from the library or eventually buying one. In the next section, I will walk through the design process of the Mobile Library application and the analysis the results of the participants’ interactions with it.

Mobile Library: Application Design
Based on the data collected from the interviews and observations, and since there weren’t any iPad applications that were specific for the master research studies. Ideas of an application that will help students easily find research materials in a social context were appearing.
Before starting the programming, the ideas had to be sketched. This was done by first writing down the thoughts and keywords on yellow note papers and then sketching it using the iPad application iThoughts as shown in the image above. The basic idea is to merge the digital resources of the University library in a social user interface.

So the sketch is actually based on thoughts, ideas and feedback gathered during the interaction with the participants that borrowed the iPads and reviews of different relevant iPad applications on the Apple Store as iAnnotate, Papers, Dropbox and iThoughts, social media examples from the web like Facebook.

**Low Fidelity Prototyping**

Before starting the coding of the application, I wanted to draw the views of the user interfaces that were likely to be the concrete views of the application like articles and circles. Because it is easy and time saving to draw and redraw the application on a board and on paper based on the user feedback, rather than starting the programming immediately. The storyboards below are based on the sketch above.

The sketch was transformed to an iPad friendly storyboard using a big board and color markers inside a lab at IFI. The flow of the story is based on navigation where the users have private profiles and can login using password and username. They can navigate to specific articles through an RSS reader that displays articles published. The RSS reader will show articles from top sorted according to popularity which is based on rating and number of times read. The user could find, join and create circles where he can invite other students too and follow them up.
Three random IFI students were asked kindly for participating in a 5-10 minutes interview individually. The participation had to be done individually in order to get each one’s opinion uninfluenced by others. One of the participants was already present at the laboratory. The other was at a room at the same floor. The third participant was at the
library and was an acquaintance of mine. They were given a walk through the flow of the user interfaces and the concept of the idea illustrated on the storyboard. They were then openly asked about their opinions.

The first participant was an exchange design student from India who used a Samsung Galaxy tablet. He wants the visual representation to be iPad friendly and not web look alike. A dynamic interface and not RSS reader. Concentrate on the Article view. Create left and right menus. Auto save own work and publishing it optionally. Auto sync after offline mode. Showing articles that concern each circle. He says that the visual representation is important and not the social part, don’t make it like Facebook.

Figure 14: Interview with the first participant

The second participant is a master student in design who doesn’t use iPad or any other tablet. He finds the idea is cool and likes the concept, nice to have an internal application for IFI. He likes the circles idea, following and sharing happenings and following others. He wants the visual representation to be changed, being able to hide windows. He has nothing against rating and sharing own annotations.

Figure 15: Interview with the second participant
Improving the storyboard

After walking through the participants' feedback and analyzing it. Some interesting ideas showed up. Making a connection between the circles and the article collections instead of having them lose in an RSS reader. So, when a user logs in he could navigate to a view called the library where he will be presented by a collection of folders or links, each represents a group he is member of. Each folder contains the articles published within that particular group. When the user clicks on an article, the article will be opened in a view that contains tools for annotating, rating and writing comments on the article. Dropdown menus could be a solution to handle the navigation. These menus will be present through each view after the login. In the next section I will draw a new storyboard that tries to meet those needs.

Storyboard 2

This time, the storyboard was drawn on a big piece of paper because the quality of the drawings on the wall board weren't clear enough. Different views of the application were drawn on the paper next to each other. Then the big piece of paper was hanged up on the wall board at the same laboratory for the presentation purpose.

This time, also three people participated in the study individually. Two master students and an iPad researcher.
The participants in this stage are totally different from the ones that participated on the first stage because of availability issues.
He is an iPad researcher. He asked the question: What is the motivation for designing this? He suggested looking at websites that implement comment rating (stackoverflow for ex.) . He suggested the method of reacting, curating and creating. Immediate feedback could make the app interesting. Comment voting, Article comparison. He suggests focusing on limited and finite work/search and he liked the idea.

Figure 17: Interview with the first participant

This participant is also an iPad researcher who studies masters in informatics. He suggested interactive and instant commenting. He wants more functionalities on the left side menu on the Article view and he also likes the idea.

Figure 18: Interview with the second participant
Participant 3
She is a graduate information design student. She liked the concept and the design. She suggested rewarding for sharing annotations by either getting feedback from other users on your annotations or having an algorithm that calculates a compatibility score with all other students you follow and who have annotated the same article.

Analyzing the feedback and getting ready for prototyping
Other than the appreciation of the idea among these participants, social functionalities were highly mentioned during these interviews. Instant commenting, immediate feedback, annotation comparison and most importantly comment rating. Anybody could write any comment on an article but others might find the comment not worthy or not truthful. Liking and not liking the comments would be a good mechanism for sorting the comments and presenting the highest rated comments on top of the comment list in an article.

Concentrating on the Article view and giving it more functionality was also mentioned during the interviews. One interesting suggestion is to concentrate on finite and limited work, users should not get lost in a series of interactions that could create confusion.

A suggestion that sounds a bit advanced was annotation comparison, it could make the application more interesting but implementing it could be a challenge. Other than that, no further feedback was received and it was time to start programming a prototype that could be installed on iPads and presented to some users for testing. The next section illustrates the process of that phase.

High Fidelity Prototyping
This phase is important because it will go deeper in the design and will examine every detail of it. The participants in these stages of prototyping will get a real life experience of the application by interacting with it through the iPad. They will be able to touch the interface of the application and give detailed and powerful feedback about it. The low fidelity prototypes were visual only which can’t give the whole real life experience of the design.

The iPad’s operating system is called iOS. Apple has developed an integrated development environment called Xcode. It is a downloadable and installable package that contains a suite of software development tools for developing software for both iOS and OS X (WIKIPEDIA). The programming language that Apple uses mainly is called Objective-C which is an object oriented language (WIKIPEDIA). The Xcode was installed on my mac computer. It included an iPad simulator for running the application during the programing.

Getting acquainted with development environment of Xcode was challenging and time consuming. After some efforts, the first iPad prototype was ready. In order to install the prototype on an iPad I had to subscribe on Apple’s developer program and pay 99$ per year.
Prototype 1
In this phase, I programmed an iPad application that had a navigation system and a user-interface based on the drawings of the second storyboard and analysis of the users’ feedback. The application wasn’t connected to any database and not fully functional yet. I installed the prototype on my iPad and presented it to 3 participants.

The user logs in and gets forwarded to the home page and can see a list of news and happenings within the application for example someone commented, published or rated an article. He can be able to navigate to different parts of the application as notes, friends, circles by clicking on the buttons on the top navigation bar and left side menu. If the user clicks on one of the news feeds, he will then be forwarded to the article page.

The library page shows a structure of files that each represents a circle that the user is member of, when the user touches one of the files, a list of the articles published, either by him or other members of that circle, will be presented below, he can then click on one of the articles and it will be presented in the article view automatically. The two article views in figure 22 and 23 show the same view but with different navigation systems, one with a dropdown menu and the other with a top menu. They have also different rating mechanism. One with +/- option and the other with like and don’t like buttons. The participants will decide which mechanism is preferable. The bottom toolbar can be used for commenting, annotating, displaying comments, saving annotations and publishing an article, with or without annotations, within other circles that the user is a member of.
Sharing Files
Sharing files with people from the iPad couldn't be simpler. Just press a button to email a link to the file, or copy the link to your clipboard and insert it anywhere, such as your favorite instant messaging app or a text message.

Favorites
When you mark a file as a "favorite", the file automatically downloads and saves to your iPad for fast access and offline viewing. Sync to the latest version with the press of a button.

There's an app for that
You can use any of your favorite apps to view or edit the files in your Dropbox. Dropbox allows you to export your files to any app that can open them.

Galleries & Photo/Video Uploads
Taking notes as shown in figure 25 is something that students could like to have on the mobile application. The users are also able to see a friend’s profile, the groups he is member of, send her or him email and add as a friend as shown in figure 27. It is also possible to add, join, create and delete a circle, sort by popularity or own groups and see a list of its members as shown in figure 26.

The participants were given the iPad that contained the application and were requested to navigate and explore it. After that, they were requested to openly give their opinions in general. The first participant is a professor at IFI. The second is an iPad researcher who participated earlier in the second storyboard prototyping. The last participant is a master student in informatics who attended a course with me.
Some interesting suggestions were given on this high-fidelity prototype. Most of the suggestions concerned rating functions, using numbers instead of sliding. The difference between colors, text and backgrounds should be made clear so it can be clear visually and readable. Using self-described title names on the buttons. One interesting suggestion is creating several views using different backgrounds and several article views containing different rating options and then presenting it to the participants for testing and feedback. This way, the participants will be able to choose which features are better.

It was late in the semester and a workshop hasn’t been conducted yet. It was time to arrange one and invite some participants to it. The workshop was necessary in order to create a discussion among the students around the social functionalities of the application.

Prototype 2

After a lot of time spent on improving the application connecting some part of it to a local database like the commenting system and adding different views for testing, a prototype was ready for the workshop. This prototype contains different backgrounds so that the participants can decide which is better suitable. Light brown, dark brown and dark gray are the backgrounds used in this case. Three article views were added that contains three different rating options: Slide, numbers and like/not like. Self-described button tiles were used as “Comment” instead of “add comment” and “Comments” instead of “All comments“.

A login page is what the user will see once he clicks on the icon of the application. When a user enters a valid user and password and clicks the login button, he will be
forwarded to a home page that contains the new happenings in form of a news feed and a navigation mechanism on the top menu as shown in figure 29.

On the update list within the home page, a function of sorting the news feed according to categories as shown in the figure could be implemented.

The user could navigate to the library as shown in the image, and then click on a circle, the application will update a list below with articles that the members of this circle have published. This list could be sorted by popularity, annotated articles or newly published.

Figure 28: The home page and the library view
For obtaining a circle’s information and its members’ list, one can navigate to the circle view by clicking on the circles button on top navigation bar and select a specific circle as shown in figure 30. And by clicking on the Custom button on top right in the navigation bar, one can create or join a circle.

When the user clicks on an article within the library or a newsfeed within the home page, he will be directed to the article page. He can see a list of comments that are submitted by other users in the group concerning that particular article.

The user can tap the comment field to make the virtual keyboard slide up, write a comment and hit the “Add” button below the writing field as shown in figure 32. Then the application will alert the user with the event of the comment being added to the article and the comment will be shown and added to the list of comments for that particular article. The Font and background-foreground colors used in the writing fields could be discussed among the participants. The rating mechanism shown above is Like/Don’t like and a counter that shows how many did like the article and how many didn’t. The figure also shows a navigation system on the top menu in form of buttons that leads to the available views in the application. On the bottom toolbar there are some tool buttons in addition to commenting and listing up comments as annotating, saving the article with or without the annotations and publishing it within selected circles, but that is not implemented yet and the participants will be made aware of that.
The users have the opportunity to find other students and see what groups they are member of, see their contributions, add them as friend and send email to them. The student name is shown on top left as shown in figure 33.

By clicking on the button called “Friends” through the top navigation bar from any view of the application views the user will be lead to the friends view and then when she or he selects a user, the information of that particular user will be displayed on the Student Profile view as shown in figure 33. By hitting the “Mail” button, a mail page will slide up. When the user hits the “Add” button, the application alerts the user with an option message, cancel or add. In order to find new friends, one has to do it through the circle info page where the members of a circle are listed up.
The users are able to take notes that are private for them during course hours’ maybe and save them into the database as show in figures 34 and 35. But they cannot publish them within circles. Because notes are something personal for many students, that doesn’t need to be published.

The notes will be displayed and sorted by date on a list in a box below the yellow writing field. Whether to have the note feature or not and eventually the choice of the font, background and foreground colors will be discussed with the participants.

Figure 32: Finding and adding friends
Workshop 1

The motivation and goal of the workshop is to make the participants preform the social interactions even though it wasn’t fully functional and they were aware of that. These social interactions were in form of tasks such as one participant adding a comment to an article or rating it and the other participant reading the comment and the rating instantly.

On the 26th of May 2011, four participants were present at the laboratory in the 7th floor at IFI. This is the first of two workshops that concerned the same prototype, but with different participants. The four participants were separated into two groups of two persons according to their line of master studies. My supervisor helped me conduct the workshop with one of the groups. They were requested to hand me their iPads so that I could install the Mobile Library application on them, then they were given a little time to get acquainted with it. A lot of introduction and explaining had to be done around the application before separating them and starting the questions. I prepared the questions that were to be asked to the participants during their interaction with the applications in advance.

The participants were among the ones that borrowed the iPads at the start of the semester. Three guys and a girl, two of the guys do study masters in Entrepreneurship and Innovation, the girl and the third guy do study masters in informatics design. All of them know each other since we all are attending a course together.
The questions that the participants were asked are:

1- What is your first impression?
2- Do you find concepts and symbols understandable? Are there any confusing concepts?
3- Is it easy to navigate? How should the navigation system be?
4- Could you think of better ideas for structuring the navigation?
5- How do you find the comment system? Do you want to sort the comments? Do you want your comments visible to everyone that reads the article or only within the specific the group? Do you want your name stamped on the comment? Do you want to rate comments/ your comments rated?
6- How do you find the library structure?
7- Do you want more functions on the group custom system?
8- Do you want your groups visible to others? Do you want your friends visible to others?
9- How much and what kind of info do you want visible to others on your profile? How would you like to be emailed by anyone on the network or should it be done only by friends/group members?
10- Will you use the app in your studies? Will you tell your friends about it?
Figure 36: During the workshop
The audio of the sessions during the workshop were recorded using iPhone’s recording application. The audios were transcribed afterwards and evaluated in the section of workshop evaluation below.

**Workshop 2**

One the 28th of May 2011, the same kind of workshop as the first one was conducted this time with different participants. Two girls that are bachelor students last year, one of them studies informatics and the other studies psychology. The informatics student has her own iPad and was among the participants in the weekly observations and interviews so she was a little bit aware of the concept of the study, the other have never used one before and have never seen the application either.

They were given my iPad that had already the Mobile Library application installed on it. I introduced the application and gave them the iPad to play with it. They asked some questions to clarify the flow of the application and got answers. Then I requested them to do the tasks and asked them the questions, same questions that were asked on the first workshop.

**Workshop Analysis**
Every student got the opportunity to comment and tell his opinion about different parts of the design. Then they were questioned specifically about most of the details.

**Appearance:**
Most of the students did like the appearance of the design. Some of them thought the design is gray and dark. They suggested that the backgrounds should be lighter with maybe a university logo and the components should be darker in order to make it more visible and comfortable to look at. One student wants it to be more like Fronter and maybe using skins.

**Consistency:**
Since I used only names on almost all the buttons of the design, the students when asked, some of them liked the names, it makes it clear and not having to remember symbols, some of them wants symbols if they can learn them.

**Navigation:**
That navigation structure was not very appreciated by all of the students. It was confusing with so many buttons and views. Some of them suggested having one button on every view, the back button. Some students thought it is fine, because it doesn’t take many steps to do a task or navigate to another view.

**Privacy:**
The female students don’t want to have pictures on their profile, they don’t want to show their email and groups to anyone but to the members of the groups they are member of. The male students have no problem with exposing personal info to everyone on the network. But mail should be protected from spam and unnecessary emails.

**Considerable suggestions:**
- The chat functionality was among the discussed suggestions. Some students want to be able to chat within groups instead of sending emails. They also thought of messaging and having an own message box.
- Skins.
- Profile customization.
- Using the app after finishing the university and sharing with people all over the world.
- Getting updates from friends and groups I want to follow, not from every friend on my list and group I am member of.
**Final interviews**

The participants in this stage were asked a few general questions around their study habits. Four participants were interviewed individually, two boys that study masters in Entrepreneurship and Innovation, one girl studies bachelor in informatics and another girl that studies bachelor in psychology. The questions that these participants were asked:

1. What would you use the iPad for in your education (reading and sharing)?
2. How often do you share academic work?
3. Which programs do you use for your academic work/Research? (Dropbox/Google Doc etc.)
4. Do you use social networks for academic work?
5. What is your first impression?
6. Is it easy to navigate?
7. Which theme do you prefer?
8. What functionalities would like on the app?
9. Which rating systems do you prefer?
10. Would you use the app? Would you recommend it to a friend?

All of the participants would rather use iPad for reading study related articles and take notes than reading on papers. They do share reading articles either within groups or by request. Most of them use email or/and Dropbox to store or/and share academic work, one participant uses Google Docs in-group, papers to organize articles, Hipertranscribe to transcribe interviews and Skype to share links. Some of the social media used by those participants are Skype, Facebook, Dropbox, Google Docs, twitter and email.
All the participants did try the Mobile Library application on iPad. They got full inspection and got assistance for using the app. The users were excited to test the application, some of them wants bar buttons on top as a navigation system instead of the dropdown list. One user finds the dropdown list easier. Most of the users want lighter theme with dark writing because it is intuitive, easy to see and attractive, one user thinks themes are irrelevant.

**Evaluation**

According to the results of the workshops and interviews that concerned the mobile library application, the participants’ satisfaction showed that these features were the factor:

1. The ability to create and join circles where one can access, publish, comment and rate articles. A participant could for example easily find the appropriate and interesting articles by joining circles that share the same interests or joining circles that friends and interesting students are already member of.
2. Rating and commenting articles makes it easy to find interesting articles that many students have read and liked.
3. Having access to the majority of the appropriate reading material through a single application.
4. The social parts of the application make it interesting. Being able to follow up friends, their comments, what they like and what they publish.
5. The touch ability of the iPad makes it easier to navigate and swipe through article pages.
6. The uniqueness of the application for Oslo University students only and more specifically masters students.

**Challenges**

Most of the challenges in this research were related to the interaction with the participants. Some participants weren’t at the university every week and some were a little shy and conservative to talk to. A particular student didn’t want to be taken picture of. Some participants felt like being stalked and obligated to give reports on their iPad use.

Encouraging the participants and convincing them to use the iPad in their studies was also a challenge. The reasons were either the age and not used to new technology or the changing of study habits, which can be like a mountain to climb. The master students do have a structure they follow and a lot to do concerning their thesis, especially those who do work besides studying, they don’t want something else to learn, mainly if it is new and relatively unknown, and it is like an extra burden for them.
The technical barriers of iPad and how Apple wants thing to be done was a factor of hindering some participants of fully interacting with the device. Some participants were skeptical to the iTunes registration rules and exposing a visa card and such information.

Programming for iPad in the world of Apple using Xcode and objective-c on the platform of IOS was something new and different than any other programming environment that we had come across at the university. It took time to learn the tool, platform and the programming language. The environment was relatively new since iPad is a new technology, seeking for knowledge around that on the web and books don’t always give helpful results. That is why a lot of time went to getting acquainted with the environment.

**Summary and future work**
During the workshop sessions, students came up with some considerable ideas and requirements that could be implemented in the later versions of the application:

- Reading an abstract of every article before viewing the whole of it.
- Changing the name of “Circles” into something more common in the student environment, like “Groups”.
- Creating groups with different subjects like events, seminars, projects, and conferences etc. In order to be aware of happenings that could be useful for the user’s studies and research.
- The empty space on the views should be used effectively.
- Comment rating system.
- Initials or names stamped on the comments should be customized in the profile.

It is not easy to satisfy all the users but privacy and the goal of the application should meet the satisfactions. The application should be made more attractive in order to increase the amount of users. There are many ways of styling it but since different students like different styles, skins and themes should be implemented.

**8. Conclusion**

The butter of results of this research is the design of the Mobile Library application. The application helps students join circle studies, find relevant reading materials through the circles and find study friends. The relevance of the reading materials is decided by the readers through rating features and commenting. Any user can upload articles to a circle and get feedback about them. All the participants were asking about the release of the application and would gladly use it, especially those with iPads. The digital services are also interested in testing and applying the application within the university.
What could be done is making the application available for other platforms and tablets so that students won’t have to buy an iPad. Using tablets for hosting such an application could also be a burden for the library in terms of maintenance and licensing, but what matters for its success is the availability and visibility of resources to the students and the accessibility through the Internet off campus.

Using iPad and tablets as a studying tool among students without guidance and support has shown unsuccessful results. They would use it mostly for browsing the web, reading mails and playing games. After a while the students get bored of playing and will put it at home and maybe use it on the weekends and spare time for the same thing. But with support and encouragement they will eventually start using it for their studies, especially reading and annotating using different applications that are designed for that purpose.

There are many walls to climb for a student to start using iPad effectively, some of these are iTunes profiling policies, the cost of the iPad which is a bit higher for the average student, finding the appropriate applications among the vast variety on the Apple Store, the weak features of iPad such as the virtual keyboard that is uncomfortable to use even though one can purchase an external keyboard that is much more useful, spending a lot of time in getting acquainted with it and changing their study habits. That is why the Mobile Library application is proposed in this research that is specific for master students who are new beginners in the search for research material.

Is it worth investing in an iPad if students are only going to use it for reading and annotating, knowing that they have to use desktop computers or laptop for writing, that means they might have to walk around with one more device in their back pack. One alternative is using iPad in spare time or during travelling, either back and forth to the University/Work or vacation, for annotating and highlighting articles, saving it in Dropbox or other sharing tools for then accessing them through a computer while writing the master thesis or other writings.

Highlighting article text on iPad is very well suited by using the touch features of clicking, swiping and dragging. IAnnotate is a powerful tool for that purpose that many participants did appreciate and make use of in their preparations for the master thesis.

Reading articles on iPad is also easier, it is difficult to say easier than reading on a normal computer, but the multi-touch features of iPad makes it easy to zoom in and out swipe trough pages of an article.

One constrain in this research is that I didn’t use any surveys in this study. This is a weakness in this research and the reason was shortage of time.

9. Bibliography


24) MARMARELLI, Trina and Martin RINGLE. 2011. The Reed College iPad Study.


31) SORENSEN, Masao Kakihara & Carsten. 2001. Expanding the 'Mobility' Concept.

32) THAULE, Jimi, Bettina Grödem KNUTSEN, and Trude EIKEBROKK. EXPLORING HANDHELD DEVICES AND DIGITAL LEARNING: THE IPAD PROJECT AT OSLO UNIVERSITY COLLEGE. Oslo: Sciecominfo.


41) WILLIAMS, Peter and Ian ROWLANDS. 2007. THE LITERATURE ON YOUNG PEOPLE AND THEIR INFORMATION BEHAVIOUR.

10. Appendices

Appendix 1: iPad borrowers log

1. (Had iPad in 1 year):
   1- Gender: Male
   2- Age: 23.
3. Name:
4. Studies: entrepreneurship and innovation.
5. Project (Inf5261): iPads.
6. What apps do you use frequently: iAnnotate (), net surfing, Mail, Contact list, Calendar and Angry birds. “I like iPad because I can have a lot of my data in a little light device”.
7. What do you use it for: Reading master thesis material like pdf’s and annotating
8. iPad is not flexible, cannot be used as a computer.
Week 12: He read a lot of articles on iPad related to master and uses his laptop for writing the same time.
Week 13: He is too busy with the master thesis. He uses iPad on the bus to edit documents using QuickOffice. He uses FastPdf+ to read docs, articles and books, an app he thinks is more practical than other doc reading apps, it is faster. He uses Mi+ to Skype and msn with friends.
Week 14: Reads thesis related articles and annotates on iAnnotate. Reads on iPad and writes on laptop at the same time.
Week 16: Reading master journals. Plays final fantasy game, doesn’t like playing games on iPad, because he likes physical buttons rather than multi-touch.
Week 18: Reading journals for the thesis.

2. (Never had iPad before, doesn’t use it every day):
1- Gender: Male
2- Age: 24.
3- Name:
4- Studies: entrepreneurship and innovation.
5- Project (Inf5261): iPads.
6- What apps do you use frequently: Net surfing, Nba, Music and Twitter.
7- What do you use it for:
8- Plays Bow master with his father, his father likes it, enjoys reading and annotating on iAnnotate.
week 12: He likes to read and annotate with iAnnotate, he prefers iPad because he gets distracted by wanting to use other open entertaining programmers while using a pc.
Week 13: He didn’t use it much lately other than playing games and reading a bit because he has to write the thesis on a desktop.
Week 14: games
Week 16: Doesn’t use it much, used it when his laptop was down, reading, mail, news and fun stuff.

3. (Had iPad)
1- Gender: Male
2- Age: 28
3- Name:
4- Studies: entrepreneurship and innovation.
5. Project (Inf5261): iPads.
7. What do you use it for:
8. Starting to get used to it, uses iAnnotate.

Week 12: Uses it every day, reads and searches for reading stuff to his master, check the news and mail.
Week 13: Was busy this week, didn’t see him.
Week 14: Mail, surfing and Facebook.

4. (New to iPad, MacBook & iPhone user)
1. Gender: Male.
2. Age: 30
3. Name:
5. Project (Inf5261): iPads.
6. What apps do you use frequently:
7. What do you use it for:

5. (new to iPad, got help from nephew to use it):
1. Gender: Female
2. Age: 47
3. Name:
4. Studies: aster informatics, Sunnaas Hospital IKT project leader.
5. Project (Inf5261): iPads.
7. What do you use it for: Download articles to read for the master thesis.
8. Doesn’t appreciate the virtual keyboard, difficult to hit the keys.
9. Haven’t seen her in 3 weeks...

Week 12: She doesn’t use it much. She talked about having a camera on it and using it in a communication solution in her work to make things easier for the patients.
Week 13: She uses the iPad for surfing, and reading big articles like the PhD article she has to read for her master thesis, it is easy to search for key words using iPad, the article is 300 pages, it is easier having it on than carrying 300 pages she thinks.
Week 14:
Week 18: She is becoming more dependent on the pad. She uses iBooks to read articles for the thesis, instead of carrying a lot of papers. She wants to buy one.

6. (Used iPad before)
1. Gender: Male
2. Age: 25
3. Name:
5- Project (Inf5261): iPads.
6- What apps do you use frequently: His daughter plays talking Gina, bookman, iAnnotate and plays draw free with his daughter.
7- What do you use it for:
8- Doesn’t like that there is no multitasking.
9- Jail broke his and installed the Terminal window in order to get to the file of iAnnotate, but Steve Jobs was cleverer.

Week 12: he prefers computer because he is a programmer and is so used to the mouse and keyboard, things it is faster like that than using an iPad, but likes the multi-touch games on iPad, prefers paper too.

Week 13: He uses it less and less lately. Because it is less challenging than when he first got, he tried to set it up and make it personal. Afterwards, it wasn’t fun anymore and not very useful.

Week 14: show off!!!

7. (Did not use the iPad before)
1- Gender: Male
2- Age: 33
3- Name:
4- Studies: entrepreneurship and innovation.
5- Project (Inf5261): iPads.
6- What apps do you use frequently: Mail, safari
7- What do you use it for: Reading news and study related articles.
8- Doesn’t like that there is no camera.
9- Starting to get more addicted to it, downloaded news, yahoo mail, Google, the holy bible apps.

Week 12: He searches and reads also master related articles, news and mail, reads also the Holy Bible.

Week 13: Haven’t seen him this week.

Week 14: Surfing, mail, iAnnotate for thesis articles. He thinks it is 4/5. He uses Dropbox.

8. (Used iPad)
1- Gender: Female
2- Age: 23
3- Name:
4- Studies: Design of information systems.
5- Project (Inf5261): e-me.no
6- What apps do you use frequently: Safari
7- What do you use it for: Games, study related articles.
8- Had intention to buy one iPad, now she is having doubts.
9- She is too conservative to talk to me....

Week 12: Difficult to contact her...

Week 13: Haven’t seen her this week, sent her mail.
9. (Used iPad)
1- Gender: Female.
2- Age: 32
3- Name:
4- Studies: Master informatics.
5- Project (Inf5261): Social media.
6- What apps do you use frequently: Safari.
7- What do you use it for: Surfing, she will use it for the project.
8- She uses the browser to surf, read mails, I told her about iBooks and such so she can store articles.
Week 12: Haven't seen her this week.
Week 13: She keeps the pad at home and uses it only for surfing and reading the mail.
Week 14: didn't see her this week.

10. (Doesn't use it every day):
1- Gender: Female
2- Age: ??
3- Name:
4- Studies: Professor.
5- Project (Inf5011)
6- What apps do you use frequently: Notebooks, PDF notes, NRK net TV, Mail, videos and Aljazeera.
7- What do you use it for: Watching TV and checking mail (Wants to read and annotate pdf)
8- She doesn't like apple restrictions, prefers open-source software and don't like the idea of having to connect the device to iTunes.
Week 12: She has it at home, doesn’t use it much, and watches Aljazeera on it.
Week 13: She downloaded iAnnotate but had difficulties opening a scanned article in iAnnotate.
Week 14:

11. (New to apple, old apple user)
1- Gender: Female
2- Age: 68.
3- Name:
4- Studies: Doctor informatics
5- Project (Inf5011).
6- What apps do you use frequently:
7- What do you use it for:
8- She has a battery problem, it takes a long time to charge for just a few percent. She always asks about apps and such. Her son designs apps for iPad.
Week 12: Has trouble charging the iPad takes 10 hours to charge a few percent.
Week 13: Does use it for reading for inf5011. Couldn’t read this week’s article because of the format problem (Maja did scan the article).
Week 14: She just found out that she could open and store articles in other apps like Evernote for reading during her travel to the university which takes about 1.5 (bus, boat and subway). She uses EverNote to take notes but hates the correction utility, I showed her how to disable it or change it to another language. She reads AftenPosten iPad version so long it is for free. This is an app that is between the paper and the network version, according to her.

12. (New to iPad)
1- Gender: Male
2- Age: 58.
3- Name:
4- Studies: Master informatics
5- Project (Inf5011).
6- What apps do you use frequently:
7- What do you use it for: Reads articles, mail, surfs the web.

Week 13: He didn’t get to the point of downloading apps, he is not getting used to it. He finds it hard to get used it, not comfortable with it. He prefers laptop and would rather buy a new laptop than an iPad.

Week 14: He asked me this week on how to create an apple account.

13. (New to iPad, have iPhone)
1- Gender: Male
2- Age: 28.
3- Name:
4- Studies: Master informatics
5- Project (Inf5011).
6- What apps do you use frequently:
7- What do you use it for: Read articles, writing using iAwriter, Wants an app for take mathematical notes, i did little research and suggested some apps, he is going to look upon them and give me feedback. He enjoys iPad.

Week 12: He tries to take notes during the lectures, but finds it slower than using the paper. Tried a mathematical annotation app but it wasn't as effective as he wanted, cant follow up the lecture and annotate at the same time, the symbols are not organized as it should be..

Week 13: He uses it for reading, he reads on iBook at home, but sometimes it freezes, still annotates on paper during other course lectures.

Week 14: Haven’t used it a lot this week, have plans to use it for reading during the easter holidays.

Week 15, 16, 17, 18: He uses it all the time at home to read articles and books, tried vg+ and AftenPosten but wasn’t satisfied with the apps, not clear overview.

14. Had iPad since November 2010, a windows user)
1- Gender: Female
2- Age: 23
3- Name:
4. Studies: Informatics
5. Project (Inf5011).
6. What apps do you use frequently: Facebook, Quran, Trafikanten, Mail iBooks, Download pdfs on web browser (safari, Not satisfied with safari, slow and freezes often)
7. What do you use it for: Reading and checking mail.
8. Haven’t seen her in weeks.

Week 13: I met her at the library, she was studying and using the iPad, she still hesitates to invest in more advanced apps like iAnnotate, pages and such, i tried to perceive her into buying at least iAnnotate since it is a basic app for students using iPad. After all, she owns the iPad, not like the others who have to return it back.

Week 14: She uses it to read, she downloaded many apps, some of i suggested, but kept only these, iBrainstorm, iCardsort, ideaSketch og QuickVoice.

15. (Doesn’t use it):
1. Gender: Female
2. Age:
3. Name:
4. Studies: Head of the Library
5. Project (Library)
6. What apps do you use frequently:
7. What do you use it for: Doesn’t use the iPad.

Appendix 2: Prototype interviews
The storyboard
Participant 1:
He is a master student in design, doesn’t use iPad.
• He thinks that it is good to rate.
• Cool idea.
• Nice to have IFI app.
• Follow others.
• He like circles, follow and share happenings.
• It is internal.
• He like the concept.
• He wants the GUI to be changed.
• He wants to hide windows.
• He likes rating and sharing own annotations.

Participant 2:
She is a master student, she has her own iPad.
• She was talking about a secret group but changed her mind.
• She wanted to know how search works.
• Don’t want the hack option but touch.
• Save options, private or public after annotating.
• Having the readings in a database.
• Chatting within a circle.

Participant 3:
He is master student in design from India, he uses Samsung Galaxy.
• He wants the graphical representation to iPad friendly, not web look alike.
• A dynamic interface, more than just an rss reader.
• We should focus on the article page, left and right menu.
• Auto save my private annotations, publish it optionally, sync. After offline mode.
• A new view for pdfs for a group.
• Focus on articles and sharing, the visualization is important, not the socialization, don’t make it Facebook look alike.

The first prototype
These are the interviews done after prototyping the first time:
Participant 1
He is an iPad researcher:
• He was asking about what is the motivation for designing this!!
• We should look at websites that implement comment rating like stackoverflow.com etc.
• Method: “React, curate, create”.
• He thinks immediate feedback could make the app interesting.
• Comment voting.
• Something like “this article contradicts this one…”.
• He wants us to focus on limited and finite work/search.
• He likes the idea.

Participant 2
He is also an iPad researcher:
• He talked about interactive notes like in the http://www.inkling.com/ video.
• He wants more functionality on the left side menu on the Article page.
• He likes the idea.

Participant 3
She is a graduate information design student.
• She liked the concept and the current design to the point where changes wouldn’t do much
• She thought you would have to be rewarded for sharing annotations by either:
  o Getting feedback from other users on your annotations
Having an algorithm produce a comparability score with all other students who you follow, who have annotated the same article.

The second prototype

Interviews:

Participant 1
- She wants that when touches the slice for rating, a little shadow showing “rate”.
- What does “add comment mean”, she wants the buttons to be self-described.
- Make 3 article views, 3 different rating options, numbers, slice and like/not like.
- Make different Home views with different backgrounds.

Participant 2
- He wants a search function on the articles, if he is reading 500 pages he wants to locate a word easily.
- The slice (rating) is not self-described. It should be +1 -1 for exe.
- Likes the GUI and the colors, change color of table view don’t make darker because the text is dark.

Participant 3
- Change the colors, make it readable

Appendix 3: Workshop

Workshop 1
Questions about the iPad use during the semester:
  1- Tell us what you think about iPad as a device?
  2- What did you like most about it?
  3- What did you hate most about it?
  4- Did you benefit from iPad in general? In your studies?
  5- What apps did you use most, for fun, for education, for socializing?
  6- What is the best app for reading books and articles?
  7- Tell us about the annotation tool of iAnnotate! Is it easier to annotate and highlight on it than on paper?
  8- Are you considering using iPad further in your education/work?

Questions about the Prototype of the app:
  11-What is your first impression?
  12-Do you find concepts and symbols understandable? Are there any confusing concepts?
  13-Is it easy to navigate? How should the navigation system be?
  14-Could you think of better ideas for structuring the navigation?
15-How do you find the comment system? Do you want to sort the comments? Do you want your comments visible to everyone that reads the article or only within the specific the group? Do you want your name stamped on the comment? Do you want to rate comments/ your comments rated?

16-How do you find the library structure?
17-Do you want more functions on the group custom system?
18-Do you want your groups visible to others? Do you want your friends visible to others?
19-How much and what kind of info do you want visible to others on your profile? How would you like to be emailed by anyone on the network or should it be done only by friends/group members?
20-Will you use the app in your studies? Will you tell your friends about it?

Audio transcript

Phase 1: Two participants
Participant 2 and Participant 1 clicked on an article, they commented, the other participant read the comment. They used the rating function and rated the article. Participant 2 added Participant 1 as a friend. Participant 1 sent a mail to Participant 2. They created a new group. Participant 2 joined one of the groups Participant 1 is already member of.
Participant 1 wants the custom group option to be in the Circles view.
Question: What was your first impression?
Participant 1: Cool to look at. It takes time to understand the buttons.
Question: Are button names understandable? Do you want symbols or name on the buttons?
Participant 1: I like the names, especially the “Home”, symbols is ok if I learn them. It is easier with the buttons than the dropdown list.
Question: How did you find the comment system?
Participant 1: it is good to see latest updates. It is good to have a résumé of the article.
Question: Do you want to sort the comments?
Participant 1: If there are many yes, I want to go back and find a comment I read earlier.
Question: Do you want your name stamped on the comment?
Participant 1: Inside the group, Ok, but for the whole university, it is better to use initials.
Question: Do you want to rate the comments?
 Participant 1: Yes if they are useful.
Participant 1: I want to have a resume of every article in the library. It makes it easier to choose among a bunch of articles, and rate them. I want also to see the tlf number of every student.
Question: Do you want others to see your groups?
Participant 1: Yes and No, I want to choose.
Question: Do you want others to see your friends?
Participant 1: I don’t know.

Question: What info do you want on your profile?
Participant 1: Tlf, Email.

Question: Do you like that anyone in the network can email you?
Participant 1: So long there is no problem, Ok, if I get spam, not Ok. Better for only my groups.

Question: Would you use the app in your studies?
Participant 1: Yes I would very benefit from it since I am using a lot of articles in my master thesis.

Phase 2: Two participants

Participant 3: It is very simple. Maybe it should be a logo down on the views, university logo. Lighter skin and dark writing I think is better than darker skin and darker writing. I like the like and don’t like rating. Should rating be anonymous?

Participant 3 commented an article and asked questions about annotations.

Participant 3: It would be nice to use another student’s annotation on my article. I want to follow this student because he is good at annotating. I want to see the rating of the article before going to it. I like the layout of the button. The application user interface looks nice. Maybe the color should be slightly changed. It would be nice to save your work on your profile.

Participant 4: I want to look at the abstract of the article before reading it. There are many buttons on the top, maybe some should be on the bottom.

Question: What about the social part, would like to chat with other?

Participant 3: It would be good to have a communication way, but how?

Participant 4: You can look at Google Docs you can see who is on and editing.

Participant 3: If we annotate on the same time, it can be messy! Would be nice if any time someone comment, you get a pop up, and you have to push Ok. Maybe not a pop up! But some way to notice when a new comment is submitted.

Participant 4: What about an option of chatting? Facebook you can see who is online.

Participant 3: You can see who is reading the article I am reading and who is reading what article.

Participant 4: It is not like Facebook, not many will read the same article at the same time. Maybe you are working and want to chat with a friend, ask him a question.

Participant 3: I clicked on Participant 1, I could see her circles, I like that. So I can follow her.

Participant 4: How many steps did you click to get there?

Participant 3: I just press friends and I am there, that is good stuff! When I have a lot of friends so I see a lot of contributions…

Participant 4: You want to have prior friends?
Participant 3: Not that, but add a button to the friends “follow”, so I can have friends but I choose to follow. Then his updates will come up.

Participant 4: There is lot of space that could be used especially on the friends view. Maybe courses. What about updates from the course or the teacher?

Participant 3: The background looks like a club. Maybe a logo and something lighter. A background that is white and have books.

Participant 4: This background sends you to sleep. It should be lighter.

Participant 4: Maybe I want to follow projects! Then creating a project circle. You can also have an overview over ongoing courses…spring courses…what do you mean by circles? You can use a common word among students. group, course, events and seminars...

Participant 3: I want to have updates of what and when seminars are held.

**Workshop 2**

It has the same questions as the first workshop. There are two participants. They know the app from before. I interviewed them for earlier prototypes. Although I had to explain the new user interfaces a bit. Both of them tested the app on one iPad and performed specified tasks first.

Participant 1: I want a back button on every view.

Question: What was your first impression?

Participant 1: I like it! It looks very academic. Fancy.

Participant 2: I think it is gray.

Question: Do you want it in rose?

Participant 2: Maybe like Fronter, blue.

Participant 1: You could use skins, it is not that important.

Question: Do you find concepts and symbols understandable?

Participant 1: There are a lot of buttons. It is not clear what button is what. Sometimes it is enough with back button.

Participant 2: You could integrate view, for ex. Click on circles within the notes view and see the list of circles.

Participant 1: it is confusing with many buttons and many views.

Participant 2: You couldn’t have it more overviewed.

Participant 2 & Participant 1: Search, new on notes. Share notes with friends and groups. Delete notes.

Participant 2: I want to feel organized when I use the app.

Participant 1: I want to use it after my studies and share with other students in the world. What about chat? I want to chat with my group instead of mailing each other.

Question: Do want rating on comments?

Participant 1: rate the most useful comment. Make the comment system effective.
Question: Do you want your name stamped on the comment or initials?
Participant 2: It is academic, a name would be suitable. Have a choice when you comment.
Participant 1: Do it in the profile, customize the profile.

Question: Do you want your mail address visible to everyone?
Participant 1: I have no problem sharing my school mail because I have an other private mail. I want the possibility to block members if they bother me.

Question: Do you want your friends to be able to see your groups?
Participant 2: It can make it easy to find interesting groups.
Participant 2 & Participant 1: What about personal messages instead of chat, then you need a private inbox for everyone.

Question: Do you want picture on your profile?
Participant 1: ha ha no.

Appendix 4: Final interview questions to all participants
Questions
1 - What would you use the iPad for in your education (reading and sharing)?
2 - How often do you share academic work?
3 - Which programs do you use for your academic work/Research? (Dropbox/Google Doc etc.)
4 - Do you use social networks for academic work?
5 - What is your first impression?
6 - Is it easy to navigate?
7 - Which theme do you prefer?
8 - What functionalities would like on the app?
9 - Which rating systems do you prefer?
10 - Would you use the app? Would you recommend it to a friend?

Appendix 5: Head of the Digital Services interview questions
1 - What is the role of Digital Services?
2 - Are there any measures to provide access off-campus?
3 - Has the library lost some of their roles in the transformation from paper to digital resources?
4 - Why are there not more of the social?
5 - Is it acceptable to get the opinion of others on the articles or books?
6 - Is there an increasing number of users that use digital services rather than paper?
7 - BISYS is an old system, is there anything new?
8 - Can you tell me about UIO project which is based on the similar Ireland project?
9 - What is the difference between it and the idea I'm working with? What do you think could be the best?
10 - Do you think students will use the iPad and tablets if there was such an application that I am working on?