Designing a Layer for Communication and socialization for Digital Natives within a Digital Library

Thesis Project 2012’

Interaction Design Master at Malmö University, Sweden

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Examination Date: 01, June 2012
I would like to thank:

Simon Niedenthal for his support and guidance in every step of my journey,
Professor Nancy Kaplan for generously giving me access to their research materials and giving me valuable insights to their process,
My loving husband Alexandru Cotoranu for his constructive feedbacks and support,
Ana Cobs, the librarian at Bladins International School, for her help in arranging the workshops and her insights in the subject of libraries,
Erika, Isabelle, Katie, Lisa, Ann, and Matthias for their teamwork and share of ideas,
Martina Uhlig for helping me untie some of the knots during the process,
All my friends and classmates for their feedbacks and supports,
My family for their moral support.
## Table of Content

ABSTRACT.......................................................................................................................... 6

1. INTRODUCTION.............................................................................................................. 7

2. THEORETICAL FRAMEWORK......................................................................................... 9
   2.1. User Requirements..................................................................................................... 9
   2.2. Creating a Digital Library......................................................................................... 9
   2.3. Digital Natives and Digital Immigrants................................................................. 11

3. CONTEXT.......................................................................................................................... 16
   3.1. Physical Libraries...................................................................................................... 16
       3.1.1. Time.................................................................................................................. 16
       3.1.2. Space............................................................................................................... 16
       3.1.3. Content............................................................................................................. 17
       3.1.4. Unique Services Offered by Physical Libraries.............................................. 17
   3.2. Examples of the Most-visited Digital Libraries.................................................... 19
       3.2.1. UNESCO’s World Digital Library................................................................. 19
       3.2.2. Europeana: Europe’s Digital Library............................................................. 20
   3.3. Comparing Europeana and WDL............................................................................. 22
       3.3.1. User Requirements for Europeana................................................................. 22
       3.3.2. User Requirements for WDL.......................................................................... 22
   3.4. International Children’s Digital Library (ICDL)....................................................... 24
       3.4.1. The Initial Project Prior to ICDL..................................................................... 24
       3.4.2. ICDL Project Description................................................................................ 25
       3.4.3. The Design Team............................................................................................. 26
       3.4.4. ICDL Interface Development.......................................................................... 26
           3.4.4.1. Searching in ICDL.................................................................................. 26
           3.4.4.2. Reading Books in ICDL......................................................................... 29
       3.4.5. Content Collection for ICDL........................................................................... 31
       3.4.6. Bookshelf (Saved Search Results).................................................................... 32
       3.4.7. User Requirements in ICDL............................................................................ 32
       3.4.8. Interaction in ICDL........................................................................................ 33
   3.5. Project Alph................................................................................................................. 34
       3.5.1. Project Description.......................................................................................... 34
3.5.2. The Interaction in Alph ................................................................. 36
3.5.3. The Challenges of Having Alph Up and Running .................. 39

4. METHODOLOGY .............................................................................. 40
4.1. User-Centered Design ................................................................. 40
4.2. Communicating Through Prototypes ........................................ 41
4.3. Prototyping ................................................................................. 42
  4.3.1. Prototype 1.0 ........................................................................... 42
    4.3.1.1. Workshop Participant Selection ....................................... 42
    4.3.1.2. Workshop 1.0 ................................................................... 43
    4.3.1.3. The Result of Workshop 1.0 ............................................. 47
  4.3.2. Prototype 2.0 ........................................................................... 48
    4.3.2.1. Preparation for Workshop 2.0 .......................................... 48
    4.3.2.2. Tools for Workshop 2.0 ...................................................... 50
    4.3.2.3. Workshop 2.0 ................................................................. 53
    4.3.2.4. The Outcome of Workshop 2.0 ........................................ 54
  4.3.3. Prototype 3.0 ........................................................................... 57
    4.3.3.1. Workshop 3.0 ................................................................... 63
  4.4. KAIEbook the Layer of Sociability for ICDL ............................. 66

5. DISCUSSION ................................................................................... 69

6. CONCLUSION .................................................................................. 72

7. FUTURE OF THE DESIGN ............................................................ 73
REFERENCES ..................................................................................... 74
ABSTRACT

This thesis is a report of a research and design process for creating a layer for a certain Digital Library; a layer that allows users to communicate and socialize with each other within the environment of the Digital Library. Also, the effects that this layer could have on the users’ behaviors, social lives, and private lives, were evaluated.

In the process, the most-visited Digital Libraries have been introduced and examined. Furthermore, they have been compared with each other using a united framework. In addition, the user group has been chosen, analyzed and categorized. According to that, International Children’s Digital Library has been chosen as the most suitable Digital Library for the target user group.

Through series of prototypes and workshops done with a selection of user group representatives, design decisions were made and tried out. The final outcome of these workshops is a prototype layer for International Children’s Digital Library that allows users to communicate and socialize with one another. As a further matter, the potential effects it could have were explained.
1. INTRODUCTION

Libraries have always been known as the place of knowledge and knowledge is every nation’s treasure. However, for that reason, whenever the goal of attacking a nation was to eliminate their knowledge source the libraries were burnt down. The ancient Persian Library that was burnt down by the order of Alexander the great, the destruction of Alexandria Library, and last but certainly not least, the Bosnia’s National and University Library that was burnet down in 1992 (Riedlmayer, A. 1995), (Macleod, R. et al., 2004); these are just a few examples of great sources of knowledge and national heritage to have been wiped out through out history. Although, the ones who were damaging the libraries were doing so to eliminate that nation’s history and heritage, they were, in fact, creating a blank in the world’s history and knowledge bank, causing pieces of the world’s history to be vanished. Nevertheless, in 2001 a new vision was introduced to the world; a vision that was being supported and made possible by relying on technology. The below declarations were made by The President’s Information Technology Advisory Committee (PITAC):

“All citizens anywhere anytime can use any Internet-connected digital device to search all of human knowledge. Via the Internet, they can access knowledge in digital collections created by traditional libraries, museums, archives, universities, government agencies, specialized organizations, and even individuals around the world.” – (Reddy, R. and Wladawsky-Berger, I. 2001)

This means that distance can no longer play any role in transferring knowledge, neither can time. It has also been acknowledged that due to the large amount of information that is being produced, there is a need for storage and perseverance as well as accessibility. In addition, because of the unity and popularity of the Internet, digital libraries are a quite powerful tool against the challenge of transformation – their full potential has yet to be determined. Furthermore, one of the most important focuses that was recommended in that declaration was:


Undoubtedly, the importance of a digital library is well established; furthermore, a digital library as a place that can be accessed by everyone who is inquiring information should be designed in a way that can communicate with its users. Therefore much needs to be considered when designing it; for example for different audiences, age groups, nationalities, etc. Moreover, in order to design for any group of users, much needs to be considered and taken into account about them.

In this thesis, through a series of prototypes and workshops, I have touched upon the need for a layer that allows users to study a book simultaneously in a Digital Library; additionally, express themselves and communicate with one another using the tools that are provided for them.
**RESEARCH QUESTION**

Online reading, especially amongst children and teenagers, is a subject that has been taken into account in the matter of children’s literacy. As the use of the Internet grows rapidly amongst children and teenagers, so does the focus on the digital libraries that can support this user group’s literacy needs. Currently, in the digital libraries, the focus is more on the contents of the library and presentation of the materials in order for the users to have a quality searching, browsing, and reading experience in the digital libraries.

However, the subject of sociability and interaction between users has yet to be explored in the digital libraries. The question is how can the layer of sociability and interaction between users, be introduced to a digital library; in addition, what effects will this layer have in the users?

For this thesis I have chosen International Children’s Digital Library (ICDL) as the digital library that is going to be analyzed. Furthermore, ICDL will be the platform that carries the sociability layer.
2. THEORETICAL FRAMEWORK

Digital Libraries might have started off as an addition to physical libraries but they have - certainly- made their way into being an individual significant in the world of information (Lesk, M and Lesk, M. 2005). However, the way that each Digital Library (DL) has chosen to present its information to its users differs from one to another. To clarify this point, some of the well-established DLs are going to be explained in this section. In addition, they are going to be compared with each other.

2.1. User Requirements

The objectives and ambitions of a website, portal or service are defined by the user requirements, which defines the set of needs, necessary for any project to be successful. They define what a system should do and how; they are previous to any developments. Three types are identified (Verheul, I., Tammaro, A.M. and Witt, S.W., 2010):

- **Functional requirements**: Functional requirements define the overall objective of the system. In other words, what the user wants the system to do.
- **Non-functional requirements**: Non-functional requirements define the constrains that will condition the way the system will be developed. Non-functional requirements are the restrictions on the types of solutions that will meet the functional requirements.
- **Design objectives**: User friendly or; simple to access, are ways of defining will apprehend the system. Design objectives are the guide to use in selecting a solution.

2.2. Creating a Digital Library

On one hand, the Internet is a multilingual, multicultural and multigenerational environment. In the past, this environment used to be the domain of mostly English-speaking and western, but today that has changed. According to NTIA, by the year 2003, in the United States, children and teenagers use the Internet more than any other age group (Cooper, K. and Gallagher, M. 2004).

On the other hand, digital libraries have brought much to the table with them and have proven themselves to be quite essential and helpful. For instance, teachers can prepare educational materials that address specific needs, resulting into better education for students. Another way that they have proven to be helpful was to open new opportunities to enter the global marketplace. For example, many developing countries such as Philippines, India and Romania had adopted low-level information-processing tasks like data entry and OCR. The vast need for digital library development, such as manual metadata extraction, collection organization, and information presentation, greatly influences and expands the range of tasks the developing world can undertake, creating valuable new export markets (Witten, Ian H. et al., 2001). In other words, there are two main benefits to creating digital libraries. Firstly, by creating digital libraries the spread and disperse of information and cultural awareness is made more possible. Secondly, the creation of digital libraries has opened the opportunity to create tools for empowerment and
strengthening the communities. As a result, the creators of digital libraries have understood the benefits of making the content available online and accessible to users all around the world (Witten, Ian H. et al., 2001).

In order to create an international digital library, two steps need to be taken, localization and internationalization (Hutchinson, H.B. et al. 2005).

Localization is when the interface is customized for specific audience. Localization does not mean the issue of translation; it involves technical, national, and cultural aspect of the platform. Technical details such as different operating systems, fonts, and file format must fit into the need. The differences in language structure, punctuations, number formats, and text direction must be taken into consideration. Finally, and perhaps most challenging part, the cultural differences must be addressed properly (Hutchinson, H.B. et al. 2005).

Internationalization is when the core functionality of the platform is not one with the localized interface details (Hutchinson, H.B. et al. 2005).

For the purpose of this thesis, the definition that is going to be used for “Culture” is the one given by Hofstede (Hofstede, G. and Hofstede, G.J. 2004). Culture is not just a concept, or a fine and distinguishable line that can be used to identify and group people. Hofstede’s explanation of culture is as follows: Every group of category of people carries a set of common mental program that constitutes its culture. As almost everyone belongs to a number of different groups and categories at the same time, we unavoidably carry several layers of mental programming within ourselves. Corresponding to different levels of culture. In particular:

• a national level, according to one’s country (or countries for people who migrated during their lifetime);
• a regional and/ or ethnic and /or religious and/or linguistic affiliation level, as most nations are composed of culturally different regional and/ or religious and/ or language groups;
• a gender level, according to whether a person was born as a girl or a boy;
• a generational level, separating grandparents from parents from children;
• a social class level, associated with educational opportunities and with a person’s occupation or profession;
• for those who are employed, organizational, departmental, and/ or corporate levels, according to the way employees have been socialized by their work organization.

The mental program from these various levels are not necessarily in harmony. In modern society they are often partly conflicting; for example, religious values may have conflicts with generational values or gender values with organizational practices (Hofstede, G. and Hofstede, G.J. 2004).
2.3. Digital Natives and Digital Immigrants

The terms “Digital Native” and “Digital Immigrant” were used by Marc Prensky (Prensky. 2001a) to define and explain the discontinuity and shift of the users’ behavior towards the artifacts that surround them since the last decades of the 20\textsuperscript{th} century. By the year 2001, the high school and college students were presenting the first generation of digital natives. Computer games, emails, the Internet, cellphones, instant massaging, and text messaging play a crucial role in their lives. The result of this ubiquity and the massive volume of their interaction with this environment is that these students think and process information fundamentally different (Prensky. 2001a), (Zimmerman, L and Milligan, A.T., 2008), (Günther, J., 2007). Some refer to these students as Net Generation and some call them the Digital Generation; however, Prensky keyed the term Digital Natives for these people. His explanation as to why he believes that this term is most suitable for these students is: “Our students today are all “native speakers” of the digital language of computers, video games and the Internet.” (Prensky. 2001a)

Now the question is, what about the rest of the people? According to Prensky, there are divided into two groups: The people who were born before the digital world and used other means to communicate or do daily tasks; and the next group consists of the ones who were born during the digital age but did not adopt most or all aspects of the new technologies until later in their lives and always compare these aspects of the new technologies to the ones that they had initially started with. However, no matter which group the user belongs to, they are called Digital Immigrants (Prensky. 2001a), (Zimmerman, L and Milligan, A.T., 2008).

In Order to explain further, who qualifies as a Digital Immigrant, Prensky uses the term “accent”. Having “accent” means to still have some roots in the past or non-digital world (Prensky. 2001b). The first area that Digital Immigrants show their accent is when it comes to information seeking. A Digital Native chooses the digital form or digital world in order to obtain information; however, a digital resource for finding information is the second choice for a Digital Immigrant. Another example of the Digital Immigrants’ accent is when interacting with a program. Digital Immigrants tend to acquire manuals and go through the steps provided in the manual in order to use and interact with the program; whereas Digital Natives start directly with the program under the presumption that the program itself teaches them everything in every step of the way. There are many examples about the Digital Immigrants’ accents; some are “thicker” than the others. Prensky in his paper “Digital Natives, Digital Immigrants” uses the “Did you get my email?” phone calls as an example of a “thicker accent” amongst the Digital Immigrants (Prensky. 2001a).

To many, these examples and so many more are funny; but beyond these differences lies a great issue. As Prensky puts it (Prensky, M., 2001b): “the single biggest problem facing education today is that our Digital Immigrant instructors, who speak an outdated language (that of the pre-digital age), are struggling to teach a population that speaks an entirely new language.” Simply put, our educators today are having a hard time communicating with the students because of the language barriers.
The language that Digital Natives speak is different than the one that Digital Immigrants speak. For the sake of this thesis I will refer to the language that is spoken by Digital Natives as Digish. Amongst the differences, following differences are of great importance (Prensky. 2001b). Digital Natives are used to receiving information fast with minimum details and sub-informations; Digital Immigrants are used to receiving information slow yet complete. They acquire all the details of the information and they study it carefully. Another important difference is that Digital Natives are used to multi-tasking in parallel, but Digital Immigrants take a step-by-step approach towards the same tasks one at a time. Moreover, Digital Natives tend to function best when networked and connected to each other, but Digital Immigrants usually work best individually. Last but not least, Digital Natives require frequent rewards as they finish tasks, also they favor games and “fun” approach rather than serious work; on the contrary, Digital Immigrants are not familiar with the little reward system and finish their tasks individually and seriously.

I would like to take one step back and give an explanation of why these two terms have been chosen and furthermore, what issues have risen. In the case of immigrant families who move to a new country or enter a new culture, the young ones who are grow up and forms in the new culture learn the new language (Digish) easily and faster than others. Due to the great influence of the host environment that is sounding them they resist using the old culture. However, the adult immigrants either accept their lack of knowledge about the new culture and environment and allow their young ones to guide them and help them to learn the new ways and integrate, or spend their time analyzing and comparing the new environment to the old one. In the mentioned case, since the young ones who were born into the new environment are grown up in the new system and have learned the host’s culture as the first one, they are the natives; in addition, the adults – in either cases – are the immigrants because the host’s culture was not the first that they have encountered. In conclusion, an immigrant adult can no longer communicate education to the full extend to the natives (Prensky. 2001c).

With the above explanation of the concept of cultural immigrants and natives, we can better understand where the term came from. In a nutshell, the problem is that in both cases of cultural and digital immigrants and natives, the first language learnt by immigrants and natives are different; they speak different languages. Some might argue that immigrants have eventually learnt the new language, however the new language was not their first. Currently, the issue at hand is that the educators and the ones who are in charge of facilitating and planning the educational resources are mostly amongst the Digital Immigrants and standing on the receiver side of the line – the ones who are receiving the education and using the services and facilities – are Digital Natives (Prensky. 2001c). Digital Natives need to be spoken to in Digish, whereas Digital Immigrants in charge had not been spoken to in Digish when they were receiving their education; ergo, a gap has appeared in education for the Digital Natives. However, we cannot deny the importance of what the immigrants can offer the natives, as Prensky puts it the “Legacy”, which are the traditional curriculum. The “Legacy” is what partially makes the “Future”.

“Future” content is to a large extent, not surprisingly, digital and technological. But while it includes software, hardware, robotics, nanotechnology, genomics, etc. it also includes the ethics, politics, sociology, languages and other things that go with
Educators need to consider both Legacy and Future. Moreover, communicating both Legacy and Future has to be in Digish.

One example of the communicating through the right language is the story of AutoCAD 3D (Prensky. 2001b), (Prensky. 2001c). When the 3D drafting was designed, it was meant to aid the mechanical engineers in their process of visualizing their work. Although, the new software had many advantages but it also required much learning, due to the fact that they had introduced many new functions and buttons to the users; additionally, CAD programs have a steep learning curve and are very complex when the user is learning. In order to communicate this new environment to its user and motivate them to learn it, the creators of CAD designed a “first person shooter” game much like Doom and Quake called The Monkey Wrench Conspiracy. The player is an intergalactic secret agent who has to save a space station from attacks by the evil Dr. Monkey Wrench. In order to defeat the evil doctor, the secret agent – player – has to use CAD software to build tools, fix weapons, and defeat traps (Prensky. 2001c). Monkey Wrench has been successful in getting users interested in using the software and has made the learning fun and enjoyable for them. It is being used by engineering students all around the world. Creating content and designing the game had been easy for the design team because they were Digital Natives; communicating with the content and learning in the game environment has also been easy for the users because they are also Digital Natives. On the other hand, the birth of this game has not been easy for the professors. They are used to a linear lesson plan; they are used to starting with “Lesson 1 - the Interface” and now they had to communicate with their students in a completely new language – in Digish. The solution to this communication problem was for the professors to create scenarios for students to play the game in. In each scenario students needed a set of skills to finish the tasks and defeat Dr. Monkey Wrench. To sum up, in order to communicate and teach the Digital Natives the approach was to speak Digish and the new approach to teach the Digital Natives was extremely successful.

The above-explained example was only one example of using Digital Natives’ language as well as using them in the whole process in order to communicate and educate them. Furthermore, there are many other examples of Digital Immigrants changing their ways in order to communicate with the Digital natives, but the most important thing in all the examples is that Digital immigrants started speaking Digish and had their assistance in the process (Prensky. 2001c).

Now the question rises: “Do Digital Natives really think differently?” Digital Natives today are socializing in a mostly different way than their Digital Immigrant parents. They communicate with each other through playing video games, sending and receiving emails and instant messages, talking on cellphones, watching TV, and socializing online; in other words, they are socializing and communicating in their own native language (Prensky. 2001b). Although we used to believe that the physicality of the brain does not change when stimulated from the outside environment, but now it has been scientifically proven that the structure of the Digital Natives’ brains have changed. In fact, based on the research done in neurobiology, the stimulations have changed the brain structure and consequently have changed the way
Digital Natives think (Prensky. 2001b). Due to the fact that Digital Natives have been raised with computers, cellphones, and the Internet, they have developed hypertext minds. In other words, their brains are wired differently or as Greenfield puts it in her book “Mind and Media: The Effects of Television, Video Games and Computers” (Greenfield, P. M., 1984):

“Thinking skills enhanced by repeated exposure to computer games and other digital media include reading visual images as representations of three-dimensional space (representational competence), multidimensional visual-spatial skills, mental maps, “mental paper folding” (i.e. picturing the results of various origami-like folds in your mind without actually doing them), “inductive discovery” (i.e. making observations, formulating hypotheses and figuring out the rules governing the behavior of a dynamic representation), “attentional deployment” (such as monitoring multiple locations simultaneously), and responding faster to expected and unexpected stimuli.” - (Greenfield, P. M., 1984)

In the digital Natives’ world the feedback is almost instant; it is not because they are eager to get the result; it is because the digital world has taught them that the results and feedbacks are instant. Moreover, the Digital Immigrants admire new ways of communication but at the same time compare them to the familiar means of communication that they initially started to use; however, the Digital Natives do not compare it with anything (Zimmerman, L and Milligan, A.T., 2008). To illustrate, Digital Immigrants interact with email the way they interacted with letter writing; they have the same format for their emails as they did with their letters, also they read the received emails as they would a letter. On the other hand, to Digital Natives emails are nearly instantaneous means of communication; an email’s format depends on the context and the receiver.

To sum up, a new generation is being educated in our schools, and they are slowly taking over the world. They are being raised in an environment that surrounds them with technology, hence changing the way they communicate with the environment as well as with others. They are using a new language called Digish to communicate; a language that was taught to them by all the technology surrounding them. This new generation is called Digital Natives. Meanwhile, the older generation is still in charge. They were not raised in an environment that nearly every means of communication is technological. This generation has learned to adapt itself to the digital world that surrounds them; they are the Digital Immigrants. In order for the Digital Immigrants to educate the Digital Natives, they need to change the system of education to match Digital Natives’ learning system. In addition, in order to have a successful system, there is a need for having Digital Natives on board in the educators’ team so that they can translate and interpret the language spoken by the Digital Natives. In other words, the Digital Immigrants need to have Digital Natives tell them how they want to be educated. Many systems that have been around up till now, do not work for the Digital Natives. Ergo, there is a need for changing the systems; especially systems that Digital Natives use to gain knowledge from and Digital Libraries are amongst those systems. We cannot have a Digital Library designed for Digital Natives that follows the path of physical libraries and expect it to work solely because it can be accessed from anywhere and everywhere. As explained in the above, Digital Natives need to be connected and they function best when in contact with other Digital Natives, therefore a Digital Library that is designed for them needs to support that; it
is essential for such system to allow the users to connect to each other and collaborate with each other.
3. CONTEXT

3.1. Physical Libraries

Libraries of any kind are places for users to gain access to information that they seek – regardless of being a physical place or a digital one. Libraries are different than any commercial institution. In commercial institutions payment of money in exchange for the product or service they are offering is the mode of access, whereas there is no money exchange for the services that are offered in a library; users are presented with a different mode of access in a library (Wagner, G.S., 1992). In this section of the thesis the most important aspects of a physical library are going to be explained. The three most aspects are “Time”, “Space”, and “Content”.

3.1.1. Time

Time is an integral aspect of a library. “Time” is an expression that costumers are constantly facing when in the context of a library; opening time, closing time, librarian’s time, return time, and so on. In most of the libraries in the world at least one day of the week is a maintenance day on which libraries are closed; additionally, libraries are open for half a day on one of the other days of the week (Wagner, G.S., 1992). For a physical library the subject of “openness” is more or less the same as accessibility and availability of resources for the users. On the other hand, time has a slightly different meaning for the librarians. “Time in the library” does not necessarily mean availability of the services to the customers or users, it can mean maintenance and giving order to the materials in the library, therefore they do not have any interactions with the customers (Wagner, G.S., 1992).

On the contrary, the concept of time is much different in a Digital Library. Many of the barriers caused by “Time” do not have a meaning in a Digital Library; however, for every Digital Library time is defined differently when it comes to user interaction with a librarian; in this case, there is a time framework for the interaction.

3.1.2. Space

The internal space of a library is designed according to the age groups; the general sorting of the groups are as follows: children, young adults, adults, and older adults. The libraries that divide their spaces according to this grouping facilitate personal space for the users of each group (Wagner, G.S., 1992). The buildings of many of the libraries are significant in both historical aspect and the harmony they have with the environment (Wagner, G.S., 1992).

However, space is defined differently for Digital Libraries. Of course there is age grouping in some Digital Libraries, but their spaces are divided differently. For instance, the division of space in WDL is different than the one in Europeana – which are going to be explained in the following sections in detail.
3.1.3. Content

What makes a library a library is the collection it has. Having a collection means having permission to give public access to the materials. With public access the issue of copyright rises. When a physical library is making their collection accessible to the public they have to deal with the copyrights in the back stage of their service. Nevertheless, since the publications in a country are working under the same copyright rules and regulations, the channels to go through in order to gain access to the right is – more or less – the same.

Moreover, there is only so much physical content that can fit in a physical space, therefore there is always a limit to how much content a library can have and – consequently – permit access to the public. In addition, there is always the matter of limited number of the needed materials; for instance, there are limited copies of a certain book in a library, hence the limitation of time in which individuals can barrow them so that others can barrow them as well. Ergo, there is always a chance that the material is not available.

Since the size of the space is not relevant to the Digital Libraries, therefore they do not have the restraints of the physical libraries to contain contents. Nevertheless, dealing with the copyrights and legal matters is challenging for Digital Libraries (Lesk, M. and Lesk, M. 2005), (Verheul, I., Tammaro, A.M. and Witt, S.W., 2010). For the creators of a Digital Library to be able to grant access to the content from all around the world, they have to go through all the various legal channels in different countries and make sure that they are not breaking any legal rights.

3.1.4. Unique Services Offered by Physical Libraries

There are many examples of unique services that libraries are offering around the world in order to reach out to people and encourage people to go to libraries. Due to the relevance of the following service to this thesis I have chosen it as one of the most interesting ones, which is called “Borrow a Living Book” (City of Malmo, n.d.), (Current TV, 2006). Malmo Stadsbibliotek (Malmo City Library) in Sweden is offering this service. “Borrow a Living Book” or “Living Library” is a service that allows users to talk to a person with certain expertise or experiences. The question may rise to why would such service be interesting? According to a report done by Current Media (Current TV, 2006): “Malmo City Library actually loans out humans of all shapes and sizes as a means of promoting tolerance and understanding.” Ronni Abregel, founder of the Living Library project gives an explanation why this project started: “The thing about a book is that everything has been written in advance. You cannot change what you are being told. When you meet a person you are able to stop them and say, wait, that is not the information I want; I want some other information. You get the personal impressions, you shake their hands, and you have a human experience. The living Library is not about building an exhibition of rare species, it’s not about putting together bizarre collection of people; it’s about showing the other dimensions of perception that we have. It’s about showing that the world is not black and white and there are so many shades of gray.” “Living Library” is one of the many different unique services, which libraries around the world are offering to their
costumers. However, for the scope of this thesis I will not dig deeper in to these services.
3.2. Examples of the Most-visited Digital Libraries

3.2.1. UNESCO’s World Digital Library

The World Digital Library (WDL) is an information portal created by UNESCO. WDL is proud to claim that its focus is on quality of the information that it contains. UNESCO describes the objectives of the WDL as promoting international and intercultural understanding and awareness, as well as a provision of resources to educators and scholarly research (Verheul, I., Tammaro, A.M. and Witt, S.W., 2010). Additionally, they have the goal of expanding non-English and non-Western content through their portal into the Internet. Their approach to multilingualism has been developed through publishing the library in Arabic, Chinese, English, French, Portuguese, Russian, and Spanish (Verheul, I., Tammaro, A.M. and Witt, S.W., 2010), (World Digital Library, n.d.). While the WDL is searchable in the above mention languages, it includes content in more than 40 languages from over 20 countries: Brazil, Egypt, China, France, Iraq, Israel, Japan, Mali, Mexico, Morocco, the Netherlands, Qatar, the Russian Federation, Saudi Arabia, Serbia, Slovakia, South Africa, Sweden, Uganda, the U.K., and the U.S. According to WDL website (World Digital Library, n.d.) the governing board of WDL noted that the amount of cultural content that was being digitalized in many countries are not significant. Developing countries in particular lacked the capacity to digitize and display their cultural treasures. These websites and portals often had poorly developed search and display that results into poor user-interaction. Moreover, the multilingual access is not very well developed. In order to remedy these perceived inadequacies, the WDL, developed by a team at the Library of Congress, with technical assistance provided by the bibliotheca Alexandrina of Alexandrina in Egypt, was designed to identify, retrieve and present quality cultural content from all over the world (Verheul, I., Tammaro, A.M. and Witt, S.W., 2010).

Currently, the collection that WDL is presenting is an example of high quality, primary materials, available from cultures around the world. The collection includes: manuscripts, maps, rare books, musical scores, recordings, films, prints, photographs, architectural drawings, and other significant cultural materials (Verheul, I., Tammaro, A.M. and Witt, S.W., 2010).

In addition to a free text search, users are able to browse the WDL by place, time, topic, type of items and institutions. As a result, each kind of search provides a distinct and unique pathway across the data, resulting in a display that is at the same time intuitive, effective and strikingly beautiful and promises a highly satisfying result on every kind of search (Verheul, I., Tammaro, A.M. and Witt, S.W., 2010).

The WDL is the result of the evolution of UNESCO’s Memory of the World (UNESCO: Who We Are, n.d.), (Memories of the World: Programme Objective, n.d.). Memory of the World lists documentary heritage, recommended by the International Advisory Committee, and endorsed by the Director-General of UNESCO, as corresponding to the selection criteria regarding world significance, and outstanding universal value (Verheul, I., Tammaro, A.M. and Witt, S.W., 2010). The program was launched in 1992 and its mission has been to:
A) **Facilitate preservation, by the most appropriate techniques, of the world's documentary heritage.** This may be done by direct practical assistance, by the dissemination of advice and information and the encouragement of training, or by linking sponsors with timely and appropriate projects.

B) **Assist universal access to documentary heritage.** This will include encouragement to make digitized copies and catalogues available on the Internet, as well as the publication and distribution of books, CDs, DVDs, and other products, as widely and equitably as possible. Where access has implication for custodians, these are respected. Legislative and other limitations on the accessibility of archives are recognized. Cultural sensitivities, including indigenous communities' custodianship of their materials, and their guardianship of access will be honored. Private property rights are guaranteed in law.

C) **Increase awareness worldwide of the existence and significance of documentary heritage.** Means include, but are not limited to, developing the Memory of the World registers, the media, and promotional and information publications. Preservation and access, of themselves, not only complement each other - but also raise awareness, as access demand stimulates preservation work. The making of access copies, to relieve pressure on the use of preservation materials, is encouraged (Memories of the World: Programme Objective, n.d.).

To bring the mentioned cultural treasures together in this way, and making them available to public, has already made a generous contribution towards unveiling the world’s hidden treasures. As WDL continues to evolve and grow wider and also deeper into a centralized resource, it can contribute more rich cultural content to the public (Verheul, I., Tammaro, A.M. and Witt, S.W., 2010).

### 3.2.2. Europeana: Europe’s Digital Library

Europeana is Europe’s multimedia digital library that allows users to have access to the cultural holding of Europe’s twenty-seven member states. Europeana includes books, maps, recordings, photographs, archival documents, paintings and films from national libraries, museums and galleries, archives, libraries, audio-visual collections, and cultural institutions (Verheul, I., Tammaro, A.M. and Witt, S.W., 2010). The goal for creating Europeana is to create new ways of exploring Europe’s heritage through free access to Europe’s greatest collection that is presented to public use in all EU languages through a web portal (Verheul, I., Tammaro, A.M. and Witt, S.W., 2010). The objective for creating Europeana was to create a platform that is accessible in all the European languages, but even more important, that its content should be fully embedded in Europe’s cultural identity; ergo, not only reflected in language but also as an expression of the cultural heritage of each European country, as a result, an expression of each ethnic community (Verheul, I., Tammaro, A.M. and Witt, S.W., 2010).

As mentioned in the above, access to a vast amount of data on European heritage is being granted through Europeana web portal. As a result, Europeana has become a multicultural and multilingual environment (Verheul, I., Tammaro, A.M. and Witt, S.W., 2010).
Although the technical information on the website is solely in English, due to the fact that it is the working language of Europeana, top level pages, i.e.: “search”, “retrieval” and “display” interfaces are available in the following languages: Bulgarian, Catalonian, Czech, Danish, Dutch, English, Estonian, Finnish, French, German, Greek, Hungarian, Icelandic, Irish, Italian, Latvian, Lithuanian, Maltese, Norwegian, Polish, Portuguese, Romanian, Slovakian, Slovenian, Spanish, and Swedish. When a user searches in one of the mentioned languages, the search links to data that can be viewed in their original context (Verheul, I., Tammaro, A.M. and Witt, S.W., 2010).

For instance, if the word *Hamlet* is searched, the result that the user will get is 204 texts, 2196 images, 48 videos and 50 sounds. User can then use the language filter and choose the preferred language. For instance in the *Hamlet* example, after filtering the search to only show results in Swedish, the result was all the data on Hamlet that was in Swedish language, which in the case of this search it was 5 text documents (Europeana, n.d.). This kind multilingual access allows members of European community to be able to search in their own language that can result into discovering and access to resources that have been fully embedded in their original cultural heritage.

Individual institutions have provided all the materials that are gathered together in order to create Europeana. These institutions are clearly identified; granting national, professional, and cultural distinctiveness of the content that makes up European identity, drawing in all cultures and all nationalities into the coherent whole (Verheul, I., Tammaro, A.M. and Witt, S.W., 2010).
3.3. Comparing Europeana and WDL

Undoubtedly, Europeana and WDL are both exemplary Digital Libraries. However, clearly there are differences between these two DLs. In this section, the differences are going to be explained. In order to see a better picture of this comparison, they are going to be compared according to the way they each have defined their user requirements. Firstly, for the scope of this thesis I would like to define what user requirements are.

3.3.1. User Requirements for Europeana

According to the above explained definition and categorization of user requirement, the user requirements for Europeana have been defined as follows:

- **Functional requirements:** A multilingual portal to access European cultural content from 4 domains: Libraries, Archives, Audiovisual Collections and Museums.
- **Non-functional requirements:** The portal should be capable of containing up to 10 million objects, permit multiple access, not contain the content but metadata, previews and representations permitting access to content in their original environment, respect publishing and author rights.
- **Design objective:** Should be user friendly and permit different categories of user users to make the best out of it. It should contain a certain number of user-oriented functionalities such as: My Europeana, which make it possible for users to save and archive their search results for future visits. Send to a friend, which allows the users to share their findings with others via email. Communities, which enables users to communicate and socialize with others within Europeana.

3.3.2. User Requirements for WDL

- **Functional requirements:** A place to save the world’s significance, and outstanding universal value against total or partial loss. The main goal of this DL is to protect and guard the world’s heritage, specially the heritage that is rare and endangered against amnesia. Moreover, to play the role of a facilitator of access to the mentioned heritage.
- **Non-functional requirements:** To create a multilingual platform for expanding non-English and non-western content on the web due to the fact that according to their research many developing countries either have not digitized their cultural treasures or have very little content digitized.
- **Design objectives:** To promote intercultural, international and multilingual understanding, as well as providing reliable resources to educators and academic research.

As explained in detail in the above, WDL and Europeana share many goals and vision, although each one has chosen a slightly different approach to get to the
envisioned goals. Nevertheless, by examining their functional requirements, non-
functional requirements and design objectives, we can also see some differences.

It is essential to note that for WDL to achieve its design objective, it draws the highly
reliable content directly into its architecture. By taking this step, it is responsible for
consistent metadata; therefore, it can guaranty the persistent identifiers that are
embedded with in its system (Verheul, I., Tammaro, A.M. and Witt, S.W., 2010).
3.4. International Children’s Digital Library (ICDL)

3.4.1. The Initial Project Prior to ICDL

Prior to creating ICDL, the team, now known as the core of the design team for ICDL, started a project called “SearchKids” (Human-Computer Interaction Lab, 2006). The objective of the project was to create a collaborative interface for digital libraries. SearchKids is an interface where two kids can use multiple mice on a single computer to access multimedia information in the subject of animals. This project is a follow up project after a project called “Collaborative zoomable interfaces for young children” which was done by the same research team (Druin, A. et al., 2002). Digital Native children need to have access to pictures, videos, or sounds of their favorite animals, and so much more; however, they are being forced to use interfaces that are often labeled “Appropriate for K-12 Use”. On the other hand, there is no denying that some effort had been put in the creation of interfaces that are also appropriate for children (Druin, A. et al., 2002). Nevertheless, when it comes to creating a platform that promises to nourish and develop knowledge, there cannot be a “one size fits all”. One of the key aspects in creating a platform that promises to deliver information and help develop the minds of children is to create an environment that is graphically suitable and easily navigable for the targeted user group.

The computers today are designed for individual user interaction, hence the one mouse, one keyboard and screen. The majority of software applications allow collaboration only when users take turn using the mouse or keyboard. Undoubtedly, if under certain conditions and for certain goals, team working or working together in order to achieve a common goal has been proven to have greater productivity than working individually. According to the research studies, that compared the outcome of group learning and individual learning, subjects who worked in groups towards achieving a learning goal had significantly more positive outcome than the ones who were working individually towards the same learning goal (Lou, Y., Abrami, P.C. and D’Apollonia, S., 2001). Much research has been done in order to establish that group learning and collaboration amongst learners (in most cases the learners were children) has significant impact on the learning and the outcome of the process (Lou, Y., Abrami, P.C. and D’Apollonia, S., 2001), (Berg, K.F. 1992), (Chambers, B. and Abrami., P.C. 1991), (Johnson, D. W. and Johnson, R. T, 1999). Nevertheless, the technologies that can support the collaborative group work are not – at least- out for public use. In order to achieve the ultimate goal of applying the above mentioned research to the design of technologies that enable users to collaborate with each other the design criteria that are listed in the below were found critical by the design team at the University of Maryland (Druin, A. et al., 2002).

- supporting shared goals
- structuring interactions between collaborators
- enabling discussions about the goals
- supporting achievement outcomes
To start, they began the development of a digital library for children that allowed two or more children interacting simultaneously now known as SearchKids. According to the research and design team of SearchKids (Druin, A. et al., 2002): “SearchKids uses a custom Microsoft Access database that contains the hierarchical metadata with pointers to local files containing the animal-domain content.” SearchKids had three areas that users could explore: the world, the zoo, and the search area. In the world area, users can browse geographically. There is a globe that users can spin and zoom in to find the animals in each geographical area. Clearly the world was what inspired Location Search in ICDL (section 3.4.4.1); for instance, children could spin the globe to Australia and zoom in and click on the representation of a Kangaroo. The zoo area contains the familiar virtual animal houses for children to zoom into; for example, in order to access media about lizards, users can zoom into the reptile house and there they can see a representation of lizards. As for the search area, it allows users to graphically choose and adjust the search in question. In addition, search area provides users with a visually presented overview of the search made as well as its results (Druin, A. et al., 2002).

Users are presented with two choices for interacting with in the environment of SearchKids; they can have “independent collaboration”, which enables them to be fully independent and have complete control over the interface and activate or inactivate any of the icons at any time. The second way of interacting with SearchKids is through “confirmation collaboration”; in this form of interaction there is an inquiry of confirmation from the other user(s). Therefore, unlike the “independent collaboration” that allows users to change the screen view by mouse click, in “confirmation collaboration” each mouse click requires confirmation from other party – which is indicated by the other mouse click – in order to activate the icon and change the view of the screen (Druin, A. et al., 2002).

All in all, starting the process and creating SearchKids gathered much needed insights. SearchKids is a project that involved children not only as users but also as part of the design team. Creators and children worked side by side in every step of the project (Druin, A. et al., 2002), therefore SearchKids managed to be an answer to many of children’s needs when it comes to Digital Libraries for kids. Moreover, the insights and the experience gathered during the time of this project was the steppingstone for ICDL. As it will be explained in the next sections the methods that the team has chosen to use when creating and designing ICDL are mostly the same as the ones they used in SearchKids.

3.4.2. ICDL Project Description

The University of Maryland officially keyed ICDL in 2002. University of Maryland partnered with Internet Archive and the project was funded from National Science Foundation (NSF) and the Institute of Museum and Library Services (IMLS) (Hutchinson, H.B. et al. 2005). Currently, the University of Maryland is continuing with the project. The goals of the project are as follows:

- creating a collection of ten thousand children’s books in one hundred languages;
• having children in the design team as design partners in order to create new interfaces for the tasks done in ICDL, such as searching, browsing, reading, and sharing books in the library;
• evaluation of the impact of access to multicultural materials on the users, schools, and physical libraries.

Using design methods, such as brainstorming, low-tech prototyping, observational note taking, participatory design, and high-tech prototyping, the ICDL design team has researched, designed, and built the library structure. Further on, in this section, these methods and how they have been used are going to be explained.

3.4.3. The Design Team

The ICDL project has four audience groups: children between three to thirteen years of age; parents and guardians of the mentioned children; school authorities such as librarians, teachers and the dean of the school; and the international scholars who study children's literature (Hutchinson, H.B. et al. 2005).

This project gathered together a multidisciplinary and multilingual team. The multidisciplinary design and research team contained computer science, computer engineering, library science, education, interaction design, and art background as well as a team of six to eleven year-old children who helped to design, test and evaluate the software (Hutchinson, H.B. et al. 2005), (Hutchinson, H.B. et al., 2001).

The children played an essential role in the research and design phases. In the research phase, they visited libraries and conducted interviews with other children who were using library services. In the design phase, they helped to select, organize, and design the categories for the browser. Moreover, through workshops, they helped design and test the interfaces for finding and reading books (Hutchinson, H.B. et al., 2001), (Hutchinson, H.B, Bederson. B.B., and Druin, A. 2006)

In addition, two guest teams of children were involved in the process of the design. After the first prototype was ready, a group of children from a local pre-school and a group of elementary-age children did the usability testing on the prototype (Hutchinson, H.B. et al., 2001).

3.4.4. ICDL Interface Development

During the first two development phases, the design team visited physical libraries in order to closely study how children use books, browse for them, and find them, which resulted into the creation of the content of ICDL. The interfaces that were designed according to the research use HTML and JavaScript on the users’ end and can run on 56K modem (Hutchinson, H.B. et al. 2005).

3.4.4.1. Searching in ICDL

There are four ways designed to search for books in ICDL: Simple Search, Advanced Search, Location Search, and Keyword Search.
Simple Search

In the Simple Search mode, there are buttons on the right, left, top, and bottom of the page (Figure 1). Each set of buttons represent a category and by choosing them, the users can search for books. On the left side buttons represent the age groups, which are: Three to Five, Six to Nine, Ten to Thirteen. Also on the left side, we have Make Believe Books and True Books. On the right side, the categories are based on the characters of the books and the categories are as follows: Kid Characters, Real Animal Characters, and Imaginary Creature Character. The other two categories on this side are: Picture Books and Chapter Books. On the top side, the books are categorized based on their covers’ colour: Red Covers, Orange Covers, Yellow Covers, Green Covers, Blue Covers, and Rainbow Covers – which are the book covers that do not have a specific colour and have all the colours. On the bottom side, the books are categorized based on their physical size: Short Books, Medium Books, and Long Books. Also, users can choose from Recently Added Books, Award Winning Books, and Fairy Tales and Folk Tales categories (Hutchinson, H.B. et al. 2005), (Hutchinson, H.B. et al., 2001), (International Children’s Digital Library). It should be mentioned that multi categories can be chosen at the same time to make the search more specific (Figure 2).

**Figure 1: The simple search**

**Figure 2: Using multiple categories for elimination the search results**
Advanced Search
The search options for the Advanced Search are as follows: Audience, Appearance, Content, Type, and Subject. Furthermore, for each of the search options there are sub-search options and they are as follows: Audience: Age, Language, Publication Date, Date Added to Library, and Collections. Appearance: Cover Colours, Format, Length, And Shape. Content: My Tags, Continents, Countries, Other Places, Characters, and Time Periods (When). Type: True vs. Make Believe, Feeling, Rating, and Genre. Subject: Culture and Society, Entertainment, History, People and Relationships, Places, Science and Nature, Tools and Machines, and Animals (International Children’s Digital Library, n.d.). By clicking on any of the sub-search option the choices appear giving the user the chance to choose form the list. To illustrate, in Figure 3 search option Content and the sub-search option Time Period has been chosen; in this example, the user can see how many books there are in each of the sub-search options. The Advanced Search allows users to search and browse for books in a compact and text-based search interface in order to get more accurate searching results (Hutchinson, H.B. et al. 2005), (Hutchinson, H.B. et al., 2001), (International Children’s Digital Library, n.d.).

![Figure 3: Searching for books in the sub-search option of Time Period](image)

Location Search
Location Search or Search by Countries comes in two interfaces. Users have the option to choose the text search, which gives the list of continents, or the globe search, which allows the users to turn a globe and choose their target continent (Figure 4). In this form of search the user finds access to the target collection of books in 2 clicks. Since the result is a large collection of books from one continent, the users have the choice of choosing a country on the result page for Location Search to narrow their search result to books from one country (Hutchinson, H.B. et al. 2005), (International Children’s Digital Library, n.d.)

![Figure 4: Location Search](image)
Keyword Search

The Keyword Search allows users to type the keyword in their desired language and choose the language and search for a collection of books that contains that keyword. In Figure 5 the word “Rostam” - a Persian hero and a fictional character - has been searched in Persian and in Figure 6 the result of the search is presented (Hutchinson, H.B. et al. 2005), (International Children’s Digital Library, n.d.).

3.4.4.2. Reading Books in ICDL

After finding the desired book through any of the four mentioned search methods, the user can read the books using a variety of book readers including HTMS pages or Java-based tools developed by the ICDL team. The Java-based ones present the books in two layouts. To illustrate, in Figure 7 it is shown how the simple HTML layout for reading a book is used. In many of the books, the user has the ability to enlarge the text part of the page on the book for a better read, however some books do not have this option yet. The simple HTML layout is referred to as the Standard Book Reader (Hutchinson. et al. 2005).
On the other hand, the Java-based layouts are designed for better user interaction (Hutchinson. et al. 2005), (Druin, A. Weeks, A. Massey, S. and Bederson, B.B. 2007). After choosing to read a book, the book automatically opens in the HTML layout, however the options for choosing between the two Java-based layouts are given in the bottom left corner of each page. The two Java-based layouts are: Comic Book Reader and Spiral Book Reader (Hutchinson. et al. 2005) (Figure 8, 9).
3.4.5. Content Collection for ICDL

When it comes to creating and gathering content for a Digital Library or a web portal, a set of challenges appears which are mostly legal and ICDL was not an exception; especially, due to the fact that the major and essential goals for creating this digital library was to create a multilingual, multicultural, and multigenerational digital library (Hutchinson. et al. 2005), (Druin, A. Bederson, B.B., and Quinn, A. 2009), (Bilal, D. Sarangthem, S. and Bachir, I. 2008). Gathering data from national libraries, publications, national archives, and many other sources is one of the first steps for creating the targeted collection for all Digital Libraries and web portals (Verheul, I., Tammaro, A.M. and Witt, S.W., 2010), (Hutchinson, H.B. et al. 2005). Consequently, when pieces of this collection are from all around the world and from different sources, the creators of the Digital Library are faced with different rules regarding copyrights. One of the goals for the creators of ICDL was “To identify and obtain award-winning children’s books from sources around the world.” (Hutchinson. et al. 2005); for instance, books from the White Ravens list (Internationale Jugendbibliothek Munchen: International Youth Library, n.d.) are now also in the ICDL collection of books under the category of “Award-winning Books” (International Children’s Digital Library, n.d.). Moreover, new books are being introduced to the system form all around the world in different languages; in some cases the team cannot read them. As a result, members of the advisory team along side with different children’s literature organizations in different countries have been trusted to review these books. These groups help by advising whether the content of a book is culturally appropriate in their respectable culture or not; in addition, they determine which age group a book belongs to (Hutchinson. et al. 2005). These groups play an integral role in the shaping of ICDL and achieving the ultimate goal of creating a true multilingual and multicultural Digital Library. In addition to collecting and making the books presentable and readable for users, Bibliographical metadata in the native language of the book such as: title, creator(s), publisher, abstract, etc. are
also collected through the web-based metadata form which is filled out by the one who has contributed the book (Hutchinson. et al. 2005). For the non-specialists as well as specialists to be able to understand the metadata specifications, also because of the possibilities to extend its basic elements to meet the specific need of ICDL, ICDL’s metadata specification was based on the Dublin Core (Dublin Core Metadata Initiative, n.d.), (Hutchinson. et al. 2005). Of course, the fact that Dublin Core has an international background was one of the reasons based on which it was chosen. The book contributors who provide metadata can translate the metadata to English if they wish to do so; furthermore, they can also translate them to Latin characters, that is if the original language does not have Latin characters. All in all, the collection of data for such international and multilingual Digital Library requires a great deal of resources and effort.

3.4.6. Bookshelf (Saved Search Results)

Bookshelf is the name of one of the services that is being offered to the members of the ICDL (Figure 10). The soul function of Bookshelf is the same as My Europeana in Europeana Digital Library (section 3.2.2). Bookshelf is designed to help users manage their search results and save them for future references. In a way, every user’s Bookshelf is their private corner of the library.

![Figure 10: The saved search results in My Bookshelf](image)

3.4.7. User Requirements in ICDL

- **Functional requirements**: a multilingual and multicultural digital library for children who are 3-13 years of age. Accessibility from all around the world. Content collection from: National Libraries, Archives, Publications, etc. as well as volunteer contribution of content (Hutchinson. et al. 2005), (Kaplan, Chisik, 2005).

- **Non-functional requirements**: creating a collection of ten thousand children’s books in one hundred different languages. Collaborating with children as design partners for designing the most suitable interface for reading, browsing, and searching books. Evaluating the impact of having
access to such large collection in international scale on children, schools, and libraries (Hutchinson. et al. 2005).

- **Design objective:** ability to access form all around the world. A digital library appropriate for children (Druin, A. et al., 2003). Providing the ability to save the search results, or books of interest in *My Bookshelf* for further visits and references. Being visually attractive and acceptable for the users. Providing permission to volunteers from all around the world to contribute books to ICDL.

### 3.4.8. Interaction in ICDL

Unlike SearchKids that the focus of the project was more on collaboration between users, the concentration of the interaction in ICDL is more on book reading itself. As mentioned in the above, much effort and research as been put on the creation of the variety of ways in which the books in ICDL are read. As a result, at the time of this report, there are three ways to read the books in ICDL: Standard Reader, Comic Strip Reader, and Spiral Reader. Although it might appear that SearchKids and ICDL have different focuses, but the interactions created in SearchKids were brought into ICDL project and was, in fact, the base for ICDL; hens, all the zoom functions within ICDL. Nevertheless, ICDL was created to offer more that what was being offered by others Digital Libraries designed for children or, in most cases, were not specifically designed for children, but they have sections for children as well. Nevertheless, there has been Digital Libraries that were designed more specifically and had responds to users’ needs. For instance, Greenstone, which is an open-source Digital Library software, was designed in New Zealand. Greenstone enables users to create online Digital Libraries in any language; therefore, the created online Digital Libraries can be altered to suit any culture (Witten, Ian H. et al., 2000).
3.5. Project Alph

As mentioned before, the present generation is the generation known as Digital Natives. Digital Natives have different perception of many subjects. Terms such as “books”, “reading”, or “libraries” appear to be undergoing fundamental changes. Consequently, the interaction between the Digital Natives as users and the product has changed (Kaplan, N. et al., 2004). In other words, Digital Natives’ expectations – in this case children’s expectation – have evolved as have their behaviors were changed by the introduction of technology from the early age. As a result, when developing a Digital Library for children, the designers need to take in account that the reading behaviors and interactions with a Digital Library are different when the main users are Digital Natives.

Project Sociable Literacy (Sociable Reading) was a project that was keyed in the University of Baltimore. The goal of this project was to introduce the sociability aspect to ICDL, which resulted into the creation of Alph. Alph is the fruit of the research done on creating sociability within ICDL. Further on in this section I will explain about Alph and how it came to be.

3.5.1. Project Description

“We argue that the conditions and practices of literacy for today’s tweens and young teens reveal significant changes form even the recent past. These changes have important implications for the development of digital libraries serving young adults and may have equally important implications for the development of digital libraries designed to serve the adults they will soon become... They want online services to support both reading and writing activities and they expect both reading and writing to take place in a sociable space...” - (Kaplan, N. et al., 2004)

Above statement is taken from one of the early reports on Alph project. With this statement, the design team established the reason as to why they started the project.

Due to the technology developments that have occurred, tweens and teens (children 10-14 years old) expect different forms of interaction with many aspects of their world, including reading. The first “dynamic” text became available to children in the 19th century, in the form of pop-up books (Kaplan, N. et al., 2004). Since the 20th century much effort has been put to augment children’s experience with books by introducing sounds and even animations. Today, children and young adults spend much time online for both school and non-school related purposes it is only natural that children want online services to support both reading and writing activities. Also, they expect both experiences to take place in a sociable environment with people their age as well as adults (Kaplan, N. et al., 2004).

As of March 2004, English was the native language of only 35 percent of the total world online population. As of March 2004, Asia, Europe, and North America each make up roughly 30 percent of Internet usage worldwide. In the United States, women and men now use the Internet in approximately equal numbers, and children and teenagers use the Internet more than any other age group (Hutchinson. H.B. et al. 2005). Unfortunately, even with such a large age group depending on online services
for reading and writing most of the research done on digital libraries, computer support for collaborative work, and computer support for active reading and writing have focused on adults. Children have been less prominent as research subjects, let alone as research and design partners (Hutchinson, H.B. et al. 2005), (Kaplan, N. et al., 2004), (Abbas, J. Norris, C. and Soloway, E. 2002), (Summers, K. et al., 2003), (Martinez, M., Roser, N. and Dooley, C., 2003), (Knudtzon, K. et al., 2003).

Obviously, traditional libraries acknowledge that in order to satisfy the need of teens and tweens (children 10-14 years old) they need to alter their services to support their interests. In addition, Creators of online digital libraries have recognized the benefit of making their content available to users around the world, not only for the obvious benefits of broader dissemination of information and cultural awareness, but also as tools for empowerment and strengthening community. The creators of The International Children’s Digital Library (ICDL) project tried to address the needs of both international and intergenerational users (Hutchinson, H.B. et al. 2005). In the current implementation of ICDL, reading the books is either a solitary activity or one that takes place with others who are co-present with the reader: a younger child together with a parent or perhaps an older sibling sitting together in front of a computer screen (Kaplan, N. Chisik, Y. 2005).

Through studying and examining the research done in projects such as Greenstone project in New Zealand researchers have realized beyond accessibility, digital libraries have enormous potential for empowerment and building community, especially in developing countries (Hutchinson, H.B. et al. 2005).

**The Intergenerational Design Team (IDT)**

As I have mentioned earlier, most of the research on digital libraries, computer support for collaborative work, and computer support for active reading and writing has focused on adults. However, at the university of Baltimore researchers have undertaken participatory design work with an intergenerational team consist of six to eight children between the ages of 10 and 14 working along side researchers. This approach has made it possible to for them to explore many dimensions of children’s literate lives (Kaplan, N. Chisik, Y. and Levy, D 2006) This research has not only addressed children’s different needs, but also has used teens’ and tweens’ collaboration in the project (Kaplan, N. et al., 2004). The intergenerational design team at university of Baltimore started off by observing children engaged in the following tasks:

- Locating reading materials in public libraries
- Reading for pleasure at home
- Doing reading assignments at home
- Doing reading assignments as part of class work in a public library

Through individual reflection, sticky note sessions, group brainstorming and low-tech prototyping, the IDT began to create a shared understanding of how young adults enact reading, what motivates them to read, when and where they read, and what they imagine a digital library could offer them (Kaplan, N. et al., 2004), (Summers, K. et al., 2003). Because their work is built on ICDL, its functions and interfaces supplied the starting point for their work with young adults. The current ICDL supports browsing, searching, retrieving, and reading materials but does not support user-initiated additions to the collection such as annotations, reviews, or tools for
collaborative work (Kaplan, N. et al., 2004). It exists in two forms. The Enhanced ICDL uses the Jazz toolkit for Zoomable User Interface. The basic ICDL is delivered via standard HTML technologies. Both versions represent books as scanned page images, primarily as unencrypted JPEG images. In accordance with the publishers’ requests, a few are encrypted and served with Adobe Content Server. Although there are differences between the two forms, the developers have tried to provide similar user experience in both (Kaplan, N. et al., 2004). One of the first steps IDT took was to introduce different skins for the library targeting different age groups. Working on the appearance of the DL with children of different age groups has shown that while one skin might be appropriate and appealing to one age group, not only it was not interesting to another age group but also have been categorized as childish and plain to them. However, only the introduction of new skins would not be sufficient if they do not have functionality and fit the daily life of the user (Kaplan, N. et al., 2004). One of the results from IDT work on digital libraries was that there is a desire for a more dynamic and sociable functions when users are using digital libraries, especially for young adults (Kaplan, N. et al., 2004).

3.5.2. The Interaction in Alph

As children become more literate, practices that maintain and nurture social relations continue and are exemplified by activities like reading and writing notes to family members and friends (Kaplan, N. and Chisik, Y. 2005). Children use different means of communication when they are online. They use instant messages and chat sites while accomplishing other tasks on their computers. Nevertheless, instant messages and chat, as synchronous technologies, do not completely support sociable literacy practices. With this background IDT went further on towards the target of sociable reading. Even though instant messages and chat do not help children to complete the task of reading in a sociable and collaborative way, threaded discussion lists (bulletin boards), though asynchronous, divorce talk about the book from the book itself. Using an annotation on sticky notes metaphor instead of chat or bulletin board metaphors offered key advantages. The advantage of it was that it kept the book as the central focus and context on the conversation. It also allowed users to have two sets of notes, private ones for their own purposes and shared ones for constructing social relationships around sharing the experience (Kaplan, N. and Chisik, Y. 2005). The responses of the reading groups supported the notion that sociable reading introduces a new dimension of fun and excitement to reading books (Kaplan, N and Chisik, Y. 2005). One outcome of the experiment with the annotation on sticky notes was that children wanted ways to engage in more active, and more social reading (Kaplan, N. Chisik and Levy, 2006). Adding the sticky notes as a medium for users to interact with each other and also creating a sociable environment has made this experiment closer to the sociable literacy. The field study and workshops suggest (Kaplan, N. and Chisik, Y. 2005), (Summers, K. et al., 2003):

- Teens and tweens agree that sociable reading can be attractive for them and their families
- A sociable digital library book can encourage (or at least permit) a variety of conversations and interactions among readers
- Expressive icons may well have been very noticeable in this context
- Reading with and writing to others for pleasure requires a different set of tools than other annotation systems developed for collaborative work among adults
Furthermore, the book pages were scanned as jpg files to follow the design philosophy of the ICDL, which desires to preserve the general appearance of the original physical book. The prototype was made mostly in Flash. The prototype was named Alph and was uploaded on the university Web server. In order to ensure security, users were given user names and passwords. Each user needed to be registered with the system. The access to Alph was granted the members of IDT, their families, and in a few cases to some of the close friends of the children.

Nevertheless, for this thesis, I have been granted a username and password by Professor Nancy Kaplan to have a first hand experience and close interaction with the prototype (Figure 11). Alph allows users to annotate on the jpg files; users can share their notes with each other, in other words notes are shared amongst the users allowing them to leave notes addressing other notes. In Addition, initially notes appear as one of the four provided icons and by moussing over them the note appears. Moreover, the users have control over how visible the icons appear on their screens; the visibility of the icons is controlled by a vertical bar that users can adjust it to their desire visibility (Figure 12).

![Figure 11: Start up page for Alph, the prototype for sociable literacy](image1)

![Figure 12: Alph platform with the annotations from the last workshop with IDT](image2)
The Alph interface provides three tools to the users for managing their annotations.

- A selector arrow
- A hand for moving the annotations
- An eraser to clear/delete the annotations made

In addition to the three tools provided for selecting and editing the annotations, there are five icons (stamps) with which users can mark their annotations. The four icons are:

- Puzzled Face: This icon has two question marks flouting on it, which is used when the note contains questions or confusions.
- Happy Face: This icon is used when the user is writing a positive note.
- Sad Face: This icon is used when the user desires to note something that is not to his/her liking.
- Angry Face: This icon allows users to show discomfort, disagreement, or simply anger in their notes.

Of course the first Alph had some differences with the one that has been explained in the above. The above explanations are on the last Alph prototype that I was granted the access to by Professor Nancy Kaplan who is one of the lead researchers in the project.

The previous version of Alph contained five icons: Puzzle Face, Happy Face, Sad Face, Light bulb for notes that contained ideas, Large Eye for notes that need more careful consideration or closer reading (Kaplan, Chisik, 2005).

When the users want to annotate in Alph they click on either the text or the margin of the page and a virtual sticky note opens next to the icon where they can annotate; the user can leave the icon without adding any annotations leaving the icon alone just to show that they are happy, unhappy, not satisfied, or just puzzled. The users can also create private notes. For creating a private note there is a lock icon in the upper left corner of the virtual sticky note that shows that the icon and the annotation made are private and not visible to the rest of the users. In order to make an annotation public the users have to click on the lock icon on the virtual sticky note and unlock it. Readers from the same group can see all the public annotations. However, once an annotation has made public it cannot be deleted or changed by the other users and the user who made it is the only one who can delete or edit it (Kaplan, Chisik, 2005).
3.5.3. The Challenges of Having Alph Up and Running

Undoubtedly, a project such as Alph that a large number of individuals as well as researchers have worked on for several years was not meant to be only on paper or stacked up somewhere in the university server. Therefore, after digging deeper on the subject and especially this particular project, the question was raised: The researchers in University of Maryland had a dream to create a Digital Library with certain functionalities and specifications. They made it happen and then the project Sociable Literacy was keyed and the team included many of the team members form ICDL project. The question was, why is Alph not accessible to users of ICDL? I raised the questions in one of my conversations with Professor Kaplan and she explained:

“The ICDL project was developed by the Human-Computer Interaction Lab (HCIL) at the University of Maryland, College Park (together with collaborators from various national libraries around the world). Although Dr. Druin and her team at the HCIL assisted my group at the University of Baltimore to build our intergenerational design team, there was no formal relationship between the group I led at the University of Baltimore and the ICDL project. So, while the team developing and maintaining the ICDL at UMCP were kept apprised of what the group at UB were developing and saw the Alph project at several points along the way, the ICDL did not incorporate the social features we developed. The reasons are no doubt complex and have to do in part with how access could be managed. The Alph development requires log in information and privacy protections for children and the ICDL had no mechanism in place to provide security.” – (Kaplan, N 2012, email 02 February, <nkaplan@ubalt.edu>)

There is no doubt that security and privacy are critical subjects, especially when the user groups are teens and tweens. Obviously, this subject has had its share of influence in the Alph project. Moreover, there is no denying that much effort and research has been done on the subject of creating a secure and clean online environment for teens and tweens to work in. Nevertheless, due to the limited time and for the scope of this thesis I will not go into that subject; additionally, the experiments are going to be under the assumption that the environment in which users are working is secure and safe.

In conclusion, Alph is the fruit of much research side by side many experiments and workshops to create a platform for teens and tweens to socialize and communicate with each other. As a result the users were able to communicate with each other in a reading group using annotations and four icons. All in all, Alph was eventually a layer that enables users of reading groups to annotate. In order to take it closer to a layer that not only allows users to annotate but also provides users with a variety of tools that enables them to socialize and communicate with each other, I have made a series of prototypes that were used in workshops. Each prototype has been altered according to the needs and ideas that were resulted from the workshop with the previous prototype. They will be explained in detail on section 4.
4. METHODOLOGY

4.1. User-Centered Design

The core ideology behind user-centered design is that users know best. The target group, as the ones having the interaction with the product or service know what they need, what and how they are going to interact, and what the preferences are. Therefore, a designer’s job is to investigate them and design accordingly. User-centered design is not a new subject. In fact, industrial designers have been amongst those who believe that products should be made for accommodating users not the other way around (Saffer, 2009). User-centered design has been practiced as one of the design methods by many designers including industrial designers. As a matter of fact, some claim that the design approach that Henry Dreyfuss chose to take, resulted into the method to become popular and known amongst others (Saffer, 2009), (Carroll, 1993).

“Dreyfuss’ approach institutionalized an accommodation to designers’ propensity for concrete, incremental reasoning and testing. It incorporates four central ideas: early prototyping, the involvement of real users, introduction of new functions through familiar ‘survival forms’, many cycles of design interaction.” - (Carroll, 1993)

According to Carroll, much of user-centered design that is being practiced by designers is the result of Dreyfuss’ approach when designing.

Whilst industrial designers carried the legacy Dreyfuss left for them, software engineers were either unaware of it or were ignoring it for decades. As a result, they were creating software that made sense in terms of the way computers worked but not in terms of the way that people work and interact. Although, considering the limitations of processing speed and memory of computers back in the day, perhaps not much could have been done. Eventually, in the 1980s with the new processing speed and memory of computers as well as the coloured monitors, it was high time for designers and computer scientists to work on the interfaces. This movement is known as user-centered design (Saffer, 2009).

“Goals are really important in user-centered design; designers focus on what the user ultimately wants to accomplish. The designer then determines the tasks and means necessary to achieve those goals, but always with the users’ needs and preferences in mind.” – (Saffer, 2009)

Although some might argue that the phrase “goals are really important”, is not specific to user-centered design and it can imply any other methods of design; however, when Saffer mentions “goals” he refers to the goals of the users. Users are involved in every stage of the design. In a way users become consultants for designer. As the designer develops the design, they consult with the users through interviews, questionnaires, workshops and so on. In other words, user data input determines the design decisions. (Saffer, 2009)

The main reason why the briefly explained method was used in the process of this thesis project is that the user group for this project is Digital Natives. As mentioned in
section 2.3, Digital Natives communicate using Digish. In other words, the primary language that they speak is different than the one spoken by other generations known as Digital Immigrants. Digital Immigrants either do not speak Digish, or speak it with a thick accent, or speak it fine but it was not the first language they used to communicate; in any case, to Digital Immigrants, Digish is the secondary language and they had to learn it and substitute their own primary language with it. In order to facilitate Digital Natives with the right means to socialize and communicate within ICDL, their consultancy was needed; because who knows better about the needs to accomplish the deed than the users who speak the same language (Digish).

In order to create the layer that allows sociability and interaction amongst users I have created a series of prototypes and each was used in a workshop. The first two prototypes were paper prototypes and the second ones were digital prototypes. For each workshop a series of questions were addressed and the results were tested out on the following workshop.

### 4.2. Communicating Through Prototypes

Prototypes are a medium to communicate ideas and scenarios with users as well as a way to test out ideas and designs (Preece, Rogers, Sharp, 2002, pp. 239-246). Paper prototypes and Digital prototypes were each designed for a set of goals.

**Paper prototypes:**
- ask questions
- find out about the tools needed
- communicate ideas

**Digital Prototypes:**
- communicate design ideas
- implement design decisions
- test out design decisions
- proof of concept
4.3. Prototyping

4.3.1. Prototype 1.0 (First Paper Prototype)

For the workshop 1.0 I have decided to print out one of the stories. I covered the table with white blank paper to play the role of a platform in the workshop. There were post-it papers in three different sizes for the first three parts of the workshop. Also, there were six different colours of pen for the workshop attendees to write with so that I could identify which of the participants of the workshop has done which part.

4.3.1.1. Workshop Participant Selection

The first step towards identifying the tools users need to socialize and collaborate with each other within a DL (Digital Library) was to carefully select a group of users who shared some cultural backgrounds as well as having some differences in their cultural backgrounds (Figure 13). The group consists of five people between the ages of 26 and 36. One of the users is female and other four are male. They all come from Iran, but from different cities. Adel is a self-employed with a BA in performance arts, Alemeh Studies English Literature, Ali and Nasser study Human Rights, and Sina studies International Relations. The mentioned group has been chosen according to their differences and similarities in cultural levels according to Hofstede (Hofstede, G. and Hofstede, G.J. 2004). The group shares the same nationality, however they come from three different parts of the country. They are all from the academically educated class, however in three different fields of art, linguistics, and humanities. The reason for choosing users from different fields is to see how each person with a different mind set than others communicates with the others and the group also what tools each of these individuals need in order to communicate with each other and with the group. Workshop 1.0 was held to identify how users with different cultures react towards the idea of reading a book together. Also, whether these differences in background have any effect on the tools they need to communicate with each other.

Figure 13: Cultural backgrounds and relations of the chosen group for the workshop
4.3.1.2. Workshop 1.0

The workshop was held in October 2011 as the date and time was convenient for the participants. The participants were briefed about the workshop and all the details of the project. The workshop had four parts. The story that they were going to work on was divided into three equal parts and each part of the story was given to the participants during the first three parts of the workshop. The fourth part of the workshop was a reflection part in the form of a conversation between the participants and I about their experiments and challenges. After the briefing about the project, the participants were given the instructions to each of the four parts of the workshop. As mentioned before, the table on which they were going to work on was covered with white papers allowing them to use the entire surface. They were provided with coloured pen and asked to choose one and use that through the workshop.

Part One

Before the start of part one of the workshop, the participants were told the rules of the first part. The rules were as follows:

- Annotations of ideas, thoughts, comments, arguments, etc. on individual post it papers and the post it papers used in part one were to be private and they were not allowed to share any of their information.
- They were not allowed to talk to each other during this part of the workshop.
- They were allowed to use the white surface as they pleased.

After being told the rules they decided to choose one amongst them as the narrator. They chose Sina to be the narrator. As Sina was reading the story all other participants were listening and chose not to look at the text. They were taking notes and Adel and Ali were making some illustrations and writing notes on the white paper as well as taking notes on the post it papers (Figure 14).

Some of the notes from the first part:
- Ali: “I bet Nasser wanted to be that prince.”
- Sina: “I think every guy wants to be that prince. I think all the guys here tonight are thinking about it.”
- Alemeh: “The king’s selfishness reminds me of all the parents who only want to see their children achieve what they couldn’t.”
- Adel continued the story and gave it a twist to his liking.
Part Two

In this part of the workshop, some rules were changed. The rules for this part of the workshop were as follows:

- Annotations of ideas, thoughts, comments, arguments, etc. on shared post it papers and the post it papers used in part two were to be used as a shared platform for all of the participants.

- They were not allowed to talk to each other during this part of the workshop as well as the previous part, however they could communicate with each other through the shared post it notes.

- They could take private notes on post it papers.

The participants chose to have a narrator for the second part as well as the first part. They chose Sina as the narrator. With the ability to share notes they started creating a thread of comments rather than writing separately. And instead of using post it papers for their private annotations, they chose to write on the white paper. They used cross sign to show that they disagree with a comment and used check mark to agree with a comment. On several cases a number of different coloured check mars appeared in front of a comment. As Sina was reading the story to them he made minor mistakes in reading some words and he had trouble reading two of the words. In those cases other participants left comments about them. The content of the shared annotations were different than the private ones. In the shared notes participants were trying to create their own endings and giving reasons to support their endings. Below is a note and the comments that followed it:

- The note: Sina: “The story is a bit of a cliché! There is always a dad who terrorizes the plan.”

- The Comments: Nasser: “well, the father could not just agree with their marriage.”
• Alemeh: “But he could investigate everything himself instead of sending people to do it.”

• Adel: “After that he could find out that the boy is a real prince and a war hero.”

• Sina: “That can solve everything between both countries and everyone can be happy.”

**Part Three**

In this part of the workshop participants were given the new set of rules. The rules were as follows:

• Annotations of ideas, thoughts, comments, arguments, etc. on shared post it papers and the post it papers used in part three were to be used as a shared platform for all of the participants.

• In addition to annotation, participants could freely talk while reading the story.

Even with the restriction of no talking lifted from the experience, participants voted Sina to be the narrator. In this part of the workshop, they started a conversation after the first person wrote the first note. As Sina was reading through others were creating alternate endings and sub-stories. Sina himself started to take the story to – as he described it later – a more interesting direction. He started to bring in other characters that seemed more exciting to him and others – knowing that – were encouraging him with creating sub-stories according to the new characters he created. In this part, when the narrator made mistakes in pronouncing a word others helped him by both mentioning it on the notes and telling him. Moreover, they continued to use the white paper as a private note and made some notes private between two of them. As the story ended the discussion over the sub-stories they made started. Some of the verbal and written notes are as follows:

• Written: Sina: “If they had ogre guards, they could stop the attach.”

• Written: Adel: “I agree, then they could have a counterattack and everyone would have a happy ending.”

• Verbal: Alemeh: “Ogres are good but what if they would let the princess decide for her own life and… you know what! This story is a bad story for children because they need to be taught that women and men are equal. The princes should have defended herself with a sword and faced her father herself.”

• Verbal: Nasser: “I like your idea. There aren’t enough stories like that.”

• Written: Ali: “The princess has a sword and also a flying carpet that she uses to sneak out of the castle and…”
Part Four

In this part of the workshop the participants were asked about their experiences and challenges in the three previous parts. In addition, they were asked what tools could have been of their assistant during their experience of reading. Moreover, why they find those tools helpful in their experience of reading a story with their friends.

Experiences

According to the participants, the experience of not being able to talk to the people that you are sharing the experience of reading a story with is not unfamiliar to them. Because they have that experience in the social medias like Facebook, YouTube, and Yahoo! 360 and they are comfortable with that. However, when they are given the choice and the equipment, they prefer to be able to have a voice or video conversations. The example that they provided for such software was Skype. Skype is a Voice over Internet Protocol (VoIP) that allows users to have group video and text conversations (Skype, n.d.).

Additionally, they liked to have the option of using different colours and fonts when they are taking notes or commenting on the story or other people’s comments. They used Yahoo! Messenger and MSN Messenger as an example of the VoIPs that gives the option of customizing the font, its colour, and size. They mentioned that VoIPs that gives them the option of changing the fonts, font size and colour are better for chatting with friends because they can communicate what they mean and feel better and easier.

- Alemeh: “I feel like I can express myself better when I can change the font size and colour.”
- Sina: “I used to use the colour red to type in when I was angry and I think I could communicate that.”
- Nasser: “Even though there were only a few fonts but the collection was good enough

Challenges

The first challenge they mentioned was that since the verbal comments and written ones in the third part complete each other, the verbal ones need to be saved and placed in their right spot.

The example that that Alemeh gives is the way she can leave a comment in the form of video or audio as well as text in platforms such as Facebook and YouTube.

The second challenge they faced was expressing their take on the story through the story’s illustrations. They explained that often they come across stories that they feel that the illustrations are not right for the story or do not match the story.
• Sina: “If there were a pool of images that were categorized and I could choose illustrations or pictures from them and replace the old ones, I could communicate better with the story.”

• Adel: “But I want to be able to do my own illustrations and add them to the story.”

4.3.1.3. The Result of Workshop 1.0

The workshop suggests that users need a variety of tools to support their needs and to enable them to socialize with one another. They need to be able to write and customize their text. They need to be able to record videos or use recorded videos. Moreover, they would like to have the option of using images of their choice. In addition, they require being able to customize privacy for their conversations.

In order to create a platform for users of Digital Libraries to be able to socialize with each other, the platform needs to provide customizable text. The text that users use to communicate with each other needs to give them the ability to express their feeling.

• Alemeh: “I would like to use Comic Sanc MS font when I’m having a casual conversation and I’m agreeing with the person I’m chatting with.”

• Ali: “I used to change the font size to indicate that I’m whispering.”

Having the ability to record a conversation or add videos is another option that the platform should provide the users with. Because according to the participants, many important ideas can only be communicated through videos or voice recordings.

• Sina: “Sometimes I can show what I feel better than writing it, or I find YouTube videos that can communicate what I want much better than text alone can.”

To substitute the stories illustrations or add to them was another inquiry of the users. The participants of the workshop required a tool with in the platform that they can upload their chosen images into the conversation or embed them into the story. Also in addition to that, they imagined a pool of images that they could choose from.
4.3.2. Prototype 2.0 (Second Paper Prototype)

In order to discover what is needed to create a sociability layer for Digital Libraries, specifically for ICDL, a book was printed out on a 1x3 meter sheet of paper (figure 15). All 14 pages of the book and the cover page were printed in two rows on the sheet. The space between each page and also the space between the two rows is a place for the workshop attendees to annotate, write, draw, attach stickers, put on post-it notes, attach envelopes, and interact with in other forms.

Figure 15: Pages of the book on a 1x3 meter paper sheet.

4.3.2.1. Preparation for Workshop 2.0

For the workshops I needed to work with a group of children who shared some cultural aspects such as: being in the same age group, language group, and from the same organization (which in here is the same school and the same class). In order to see and observe interactions and communications between the group members better, the group was also chosen based on their differences in cultures (Hofstede, G. and Hofstede, G.J. 2004).

For this workshop and the ones that follow after, a specific school was chosen as the case study. Consequently, the design decisions are made for this school and its students. Needless to say that the main use scenario for the prototypes is the book reading course that the students of Bladins middle school have throughout the school year; the prototypes are to aid students in their book reading course.

Three books were chosen from the collection available in the ICDL for the workshops. And in order to motivate children to volunteer for the workshops, I decided to advertise for the workshop by making a poster that invites children to join the design team (figure 16).
The chosen books are:

“Don’t Do That! A Child’s Guide to Bad Manners, Ridiculous Rules, and Inadequate Etiquette”
Summery: A funny guide that uses absurd examples to introduce kids to manners.

“The Hunted House Party”
Summery: The story of a boy who hosts a Halloween party that is invaded by real ghosts and goblins.

“The Ugly Princess”
Summery: This is the story of a princess who was born ugly, but finds a prince who can see her beauty and kindness.
4.3.2.2. Tools for Workshop 2.0

The tools that were provided for the workshop were: different post-it papers, coloured pens, envelopes, star stickers, predesigned emotional icons (figure 17).

![Figure 17: The tools used in the workshop](image)

Post-it papers: The post-it papers were in two sizes; small yellow ones and medium size blue ones. The reason for choosing two sizes was that the small one was for creating icons that can be used to express the opinion much similar to the “Stamps” in Alph (Kaplan, N. Chisik, Y. and Levy, D. 2006); or the “Like” button on social medias such as Facebook and YouTube. The medium ones were for taking notes and writing comments on.

Coloured pens: The different colours were provided to see if different colours have any effect on the experience and if they do, what effect they have and why do users feel the need to use them.

Envelopes: Envelopes were available for creating private notes and comments. The access to the content of each envelope is granted to the people that the admin – the creator of the note - has their names on the envelope (figure 18).
Creating a private comment, the access is granted to the people mentioned on the envelope.

Predesigned emotional icons: The workshop participants were given four different kinds of emotional icons to use in order to express themselves. The four icons were: smile, wink, sad, laughter (Figure 19).
Star sticker: The star stickers are to rate the comments that users make. The idea is inspired from “Best Answer” function in Yahoo! Answers (Yahoo! Answers, n.d.). Voting a user as the best answerer is one of the functions of this service. As explained in (Table 1) the more answerers get votes the more is being offered to them by Yahoo! Answers (Yahoo! Answers, n.d.).

<table>
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<th>Level</th>
<th>Points</th>
<th>Questions</th>
<th>Answers</th>
<th>Comments</th>
<th>Stars</th>
<th>Ratings</th>
<th>Votes</th>
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<td>* unlimited *</td>
<td>100</td>
<td>unlimited</td>
<td>200</td>
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</tr>
<tr>
<td>6</td>
<td>10,000 - 24,999</td>
<td>* unlimited *</td>
<td>100</td>
<td>unlimited</td>
<td>150</td>
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<tr>
<td>5</td>
<td>5,000 - 9,999</td>
<td>* unlimited *</td>
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<td>unlimited</td>
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<tr>
<td>4</td>
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<td>20</td>
<td>80</td>
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<td>100</td>
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<td>1,000 - 2,499</td>
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* All limitations are per day

Table 1: The scoring system in Yahoo! Answers.
Source: Yahoo! Answers team

According to the table above the answers are rated and scored. In every category there is a list of voted best answerers displayed on the right side of the page (Figure 20). By knowing the best answerer in each category, users and visitors can contact them directly with their questions. In this workshop I have decided to you this system of rating or star giving as a way for users to reward each other.

Figure 20: The list of the voted best answerers in the category of “Homework Help” from Yahoo! Answers
4.3.2.3. The Workshop 2.0

The workshop had three participants: Erika. J who is a 13 year-old girl from Latvia; Katie. C who is 12 and from London, England; and Isabelle. M who is 13 years old from Bristol, England. All three participants go to Bladins International School of malmö and they are all in the same class and library group.

Prior to the start of the workshop, the paper prototype was put up on the wall, and the tools were put on the table. The workshop attendees were briefed about the project and to the goal of the workshop. Furthermore, they were asked the following questions:

1. How do you read books:
Katie. C: “I too read physical books, but if I’m reading for pleasure, I read from my tablet or home computer.”
Isabelle. M: “Me too. I read real books for school and stuff, but I also read on my computer.”

2. Why do you choose to read like that?
Erika. J: “Because for school work I need to highlight lines, write notes, and sometimes mark a part of the text.”
Katie. C: “Yeah, same here.”
Isabelle. M: “Underlining is important.”

Due to the fact that the goal is to design with the group, I did not play the role of the coordinator and did not have the role of the leader; I was one of the designers. Since the book that I had chosen was not a story and was a guidebook we decided that we do not want to work on it in a linear way. We decided that we are going to start with the parts that the title seems more interesting and go back and forth (figure 21). This part of the workshop took approximately 40 minutes.

Figure 21: The design team working on the paper prototype
In order to get better results from the workshop, also to pretend that we are online and not in the same physical space, we decided not to talk to each other and only communicate with each other by using the tools. In addition, if the tools were not enough or the mean that we needed was not amongst the provided tools, we created it by drawing or writing of what we need.

4.3.2.4. The Outcome of Workshop 2.0

For the last 15 minutes of the workshop we gathered around the table and talked about our experiences and expectation of the sociability layer. The new ideas and expectations about each part are as follows:

**Rating**

The idea of rating users by giving them stars was thought to be a good idea. In addition, users need to be able to give stars to parts of the book as well. In this way they can express their appreciation of the literature and the content. However, the stars that are given to users’ reviews or comments should differ from the ones that are used to rate the paragraphs or sentences in the book.

Katie. C: “I would like to know where the best parts of a book is in my friends’ opinion.”

Erika. J: “It can be a bit confusing if the colours of the stars are the same. I think they should be – like – in silver and gold.”

**Leaving Comments**

During the session some comments were directly written on the pages, some were written on the small post-it papers, and some on the medium size post-it papers. According to the team, writing on post-it papers is good for more serious annotation, for instance for adding to the existing text. Furthermore, when I asked them why they chose different sizes of post-it papers, they reply was: Katie. C: “Small one seems to be good for small comments like adding a few words or a sentence. But the bigger one is good for more detailed writing.” Also, the idea of using different colours was welcomed. They sometimes pondered when they wanted to choose a colour. When we discussed about our experience with the different colours, they mentioned that using different colours enables them to express themselves better.

Erika. J: “If I’m serious I use black, dark blue, or dark green but if I’m angry I write in red and when I’m happy, maybe pink or purple.”

Isabelle. M: “I’d like to have the option to change font colour to express myself.”

They also mentioned that they would require a selection of fonts to choose from.

Katie. C: “There isn’t much we can do right now for example on Facebook. We can use caps lock but that’s about it. I want to be able to show that I’m leaving a funny comment by using Comic Sans MS font or use a Handwriting font for when I want to just write a short note.”
Highlighting and Underlining

They mentioned that either highlighting or underlining is much needed when it comes to interacting with a book, especially when it is for schoolwork. Although, there seems to be no difference in using either of them, but they prefer the colour used for highlighting or underlining matches the colour of the text relevant to it.

Katie. C: “Highlighting the text is just a way of marking the important section and if I only have a red dot or any other mark next to that part, I can’t relate to it and it does not get my attention when I visit it later.”

Icons

The icons that I had made were all used, however they need other ones as well. The ones that they said they will need when they are to communicate with each other online are as follows: Agree, LOL (Lough Out Loud), Angry, and Question. All the new icons need to be added to the icon selection for the next prototype to use and examine if they are enough or more is needed.

Visibility of the Added Materials

The team decided that they want to be able to control the visibility of the added materials. In other words, they want to control how clear everything is viewed on the book pages itself. For example, if they need to read the book they want to be able to either turn off the layer, or make it 50% visible if their primary focus is on the book and their secondary focus is on the added context.

Changing the Illustrations of the Book

After talking about the book illustrations they said that in many occasions they feel that perhaps another illustration is a better fit for that part of the book. What they expect our layer to offer is a chance to add pictures and put them to vote. When a picture gathers a certain number of votes, it replaces the original illustration. However, the added picture should appear under the original picture in the form of thumbnails and by clicking on their thumbnails they replace the picture temporarily and users can vote for it (Figure 22).
Other Forms of Communication

Other forms of communicating were considered and requested. The ability to add videos and recording was one of the forms that we all decided that it is necessary.

In conclusion, we have decided to have rating for three parts: for the information that users post, for the parts of the book itself, and for the pictures that other users contribute. Also, we found out that highlighting or underlining is an important tool that this layer needs. Moreover, the text that users add includes: annotations, comments, comment threads, and adding to the existing text. The features that all the text-adding functions need to have are to let users choose the font and font colour. In other words, there is a need for a collection of fonts and colours. In addition, some emotional icons need to be implemented. All in all, the above-mentioned functions need to be embedded into the sociability layer in order to allow users to communicate with each other.
4.3.3. Prototype 3.0 (Digital Prototype)

Almost all the design decisions made during the second workshop were implemented into the Prototype 3.0. Of course, some minor changes were also made. Prototype 3.0 was designed to be used in workshop with the same group from workshop 2.0 in order to test the design ideas and decisions made during workshop 2.0. During workshop 2.0, the need for many tools were mentioned; some of which are offered in Alph, even though they assist users in annotating and communicating but there are no tools that can enable users to express themselves further than through annotating alone.

After examining ICDL, I decided to allow the access to the layer through Bookshelf. In the current design of ICDL’s Bookshelf users are give access to preview of the book, can read the book, or remove the book from their Bookshelf (Figure 10). For this prototype, a fourth function was added for the books in the Bookshelf (Figure 23), which allows users to enter the sociability layer for each book.

![Figure 23: What the entrance of sociability layer could look like](image)

![Figure 24: Users can create their groups](image)
After entering “Socializing”, Users can create a new group and send invitations to their friends, classmates, teachers, and etc. (Figure 24, 25). There is a summary of the book, the name of the author(s), and the cover picture of the book.

![Form for creating a new group and inviting others to the group](image)

**Figure 25:** The forms for creating a new group and inviting others to the group

After creating a group, the user has to sign in using the username and password that he/ she has set (Figure 26).
Users can add illustrations to the book and also can rate each of the illustrations. The one that has the highest rate stays up; to view or rate the other illustrations users can use the drop list below the illustration. They can also add to the existing collection of illustrations by clicking on the “add image” button below the drop list and enter/paste the URL of the picture they want to add (Figure 27).
Figure 27: (Left) Rating illustrations. (Right) Adding illustrations to the collection
There is a list of icons that users can choose from. The icons that were implemented in this prototype were the result of the previous workshop (workshop 2.0). When an icon is dragged and dropped, a text panel opens outside the boarders of the text. Users can choose from a list of fonts, font colours, and font style (Figure 28). After they finish writing they click on the “Done” button to save and close the panel. Each panel reopens when its icon is clicked on the text.

![Figure 28: writing panel](image)

Each writing panel has a rating bar that allows users to rate the notes (Figure 29). Each books is categorized under a specific category; and other students can refer to the users who get the most rating in each category if they have any questions. Unfortunately, due to the limit of time, this aspect of the prototype was not studied in depth; in addition, as mentioned before, when the users are of certain age group one has to consider the privacy issues of allowing any kind of input from them on the Internet.

Users can choose to highlight the text if they want to emphasize on a certain part of the text. In Figure 29 there are three notes and one of them has a highlighted section (the panel that is visible is for the highlighted section and ‘Wink’ icon).
On the corner of each panel there is a lock icon that allows users to set the note to be private for themselves, or between a set of users (Figure 30). They can invite other users to this private note by sending them a notification via email.

Icons that were implemented into this prototype are: Smile, Sad, Angry, Wink, Agree, Disagree, and Laugh Out Loud (LOL). For Smile, Sad, Angry, and Wink a panel opens that allows users to write and customize their note; however, for Agree, Disagree, and LOL there is no panel. They are only to show the attitude of the user towards the text or the illustrations of the book.
4.3.3.1. Workshop 3.0

The workshop was held in the library area in Bladins School. Initially, the previous group were planned to be there for the workshop, but three other students asked to join the workshop. They were told about the previous workshop and the subject of the thesis; in addition, they were asked to use ICDL since the time it was introduced to the group. The workshop attendants were: Erika from Latvia, Katie from England, Isabelle from England, Ann from United States, Matthias from Belgium, and Lisa from Sweden.

Participants started off by creating a group. The first issue that was discussed was inviting friends to join the group. They explained that when they receive emails - regardless of who the sender is – they do not open the emails that have no subject or seem automatically generated. They also mentioned that usually when they are inviting people to use a certain service, there is a text panel that they can write a personalized message and send it with their invitation.

The participants were much concerned about why there are no rules and regulations available anywhere. They explained that since they see this layer having much use for students and school work, the existence of a set of rules that the user must be aware of and except is essential. They expressed much concern about bullying and usage of bad language, and they could see it becoming a major issue if no precautions have been taken. They were so concerned about this issue that they demanded to pause the user testing of the prototype and create a sample set of rules that needs to be read and agreed to when the user wants to create a group and when he/she is responding to a group invite.

- The Librarian and/or the teacher is aware of the real identity of the users
- No bullying
- No use of offensive language
- Respect the others and their opinions
• In case of the use of bad language, the user’s information is sent to the librarian/teacher. The phrase or word they have used is automatically turned into symbols (so that it is no longer readable)
• The first time of use of bad language is a warning, the second time is two weeks suspension, and the third time the user is banned from using the system. In all cases the information is sent to the librarian/teacher
• In case of bullying, the first time is suspension of two weeks and the second time the user is banned. Also they are reported to the librarian/teacher
• If either cases of bullying or use of offensive language is used in private notes, the note is reported to the librarian/teacher and they are granted access to all of that person’s private notes even if they were set by the user not to

After discussing the main rules that need to be implanted at the beginning, we resumed user testing of the prototype. As I was explaining the drop list and how to change images, much to my surprise all the participants disagreed to the drop list.

Matthias.B: “Drop lists are so last year. I mean, drop list is something Yahoo! would use.”

Ann.C: “I’m just thinking that it’s a hassle opening the drop list 10 times and going through all the pictures to find the one that you want.”

Isabelle.M: “Drop list could make sense if it were 10 years ago and we were only thinking in terms of personal computers. But now, most people have ipads and drop lists just don’t make sense.”

Katie.C: “Drop list could work if we wanted people to choose from a list of countries or states, but when we have images it won’t work. Actually, the only option I think is the thumbnail list of the images in one row and guiding arrows that when you tap or click on them you see more thumbnails. Then you can click on a thumbnail – already knowing which image it is – to enlarge it.”

Matthias.B: “I agree with Katie. The problem is that what you made here has only three other images to substitute with the original one. Think of it this way, there are seven of us here; what happens when each one of us adds only three images?! It takes forever to go through all of them if we have the drop list.”

The discussion went on to conclude that although the ability to change the illustrations of the book is the most interesting feature and, in addition, is the feature that opens a new way to communicate, but in reality it is not understandable for Digital Natives if they cannot have instant visual access to all the images.

Even though, as I was making the prototype I decided to not have a note panel for three of the icon (Agree, Disagree and LOL), according to the participants it is necessary to have a panel for them as well. Because they see this layer to be used for their schoolwork as well as leisure readings; although, they expressed the need for Agree and Disagree icons for their schoolwork but they mentioned that they need to have an explanation to why they are agreeing or disagreeing with something.
Lisa.P: “Imagine this book to be one of my school books; I can’t just say I ‘Disagree’ with this. I have to have a reason for it. And if I am to use this to communicate with my classmates and teachers, I need to be able to put up a nice argument.”

Katie.C: “Actually I think, at least Agree and Disagree icons are the most important ones and they need to let you write.”

Furthermore, we discussed the design of the note panels. Although, because the panel allows them to choose different fonts, font colours, and other customizations, they found them to be exactly want they want, but they pointed out that after they are done with the text there is no longer a need to have instant access to all the editing features. Instead, it is preferred if the already done notes appeared in the form of a speech bubble next to the icon once moused over or clicked. Additionally, instead of all the editing features, the speech bubble can have a button for editing, which changes the speech bubble to the initial text panel for editing.

One more result that came out of the discussion was that, more often there is one or a series of responds to a comment. The participants agreed that the best way to have that is like the replies in the email. To illustrate, when an email is sent to a number of people, as we look at all the replies it is set by the order of time, moreover the replier is distinguishable by their names that appear next to the reply. In the case of our speech bubbles, the participants decided that it is best if the name of each user appears before their comment and the comments appear in the order they were posted.

The last subject that we discussed was the name of the layer. As I mentioned before, I used the phrase ‘Socialize’ to indicate the functionality of the layer. However, the participants stated that the word ‘Socialize’ at the beginning does not communicate at all. They said that it has to be some thing that can imply what it relates to (in this case, books). They choose the name KAIEbook. KAIE was chosen because it is made of the first letter of the names of the initial design team. Furthermore, they explained that KAIEbook is a good name for the layer because it is clear that it is about the book but still has that mysteriousness to it that makes people curious about it. In other words, it makes it stand out.

Matthias.B: “It can even become a real word like a verb or something. For example, I can see my teacher saying: for next session, KAIEbook this book in groups of 5.”

Erika.J: “You see, we are used to seeing facebook, tweeter and other social pages’ links on most pages. It makes sense that KAIEbook becomes that for ICDL. Maybe later for other libraries or even our school library.”

To sum up, this workshop once again illustrated the fact that Digital Native communicate differently and use a different language to communicate. Moreover, when it comes to a digital environment, Digital Natives know exactly what they need and can support their requirements with an argument.
4.4. KAIEbook the Layer of Sociability for ICDL

KAIEbook is a layer of sociability that has been designed by a group of 11-13 year olds and I, in order to facilitate users to socialize and communicate with each other when they are in the ICDL environment. KAIEbook is the modified version of Prototype 3.0.

As users enter their Bookshelf on ICDL they are presented with a fourth option (Figure 31).

![Figure 31: KAIEbook accessible through Bookshelf](image)

After entering the needed information to create a new group, when users click on the ‘create group’ button, a popup window appears that contains terms and conditions for using KAIEbook (Figure 32). The user needs to agree with them in order to complete the process.

- The Librarian and/or the teacher is aware of the real identity of the users
- No bullying
- No use of offensive language
- Respect the others and their opinions
- In case of the use of bad language, the user’s information is sent to the librarian/ teacher. The phrase or word they have used is automatically turned into symbols (so that it is no longer readable)
- The first time of use of bad language is a warning, the second time is two weeks suspension, and the third time the user is banned from using the system. In all cases the information is sent to the librarian/ teacher
- In case of bullying, the first time is suspension of two weeks and the second time the user is banned. Also they are reported to the librarian/ teacher
- If either cases of bullying or use of offensive language is used in private notes, the note is reported to the librarian/ teacher and they are granted access to all of that person’s private notes even if they were set by the user not to
Of course, these are the main issues that were discussed during the workshop session and they are not the final terms and conditions for KAIEbook. They are merely suggestions.

Furthermore, in the case of use of offensive or inappropriate words, the word will automatically appear as symbols rather than the word that was typed, making it unable to read; in addition, the user will receive a popup notification which reminds the user of the rules and informs him/her that his/her act has been reported and according to the rules what consequences his/her act has.

Moreover, in the case of bullying, users can report the case to the teachers or the librarians and a message is sent to the user, informing him/her about the report.

![Figure 32: Terms and Conditions for using KAIEbook](image)

KAIEbook allows users to express themselves through images, customizable text, a variety of icons, and the chance to rate each other’s suggested images and ideas (Figure 28, 29).

There are seven icons: Smile, Sad, Angry, Wink, Agree, Disagree, LOL. By dragging and dropping each icon, a text panel opens outside the boarders of the text and the illustrations. In this text panel, users can customize their text by choosing amongst different fonts and font colours; they can also write in bold font, italic, and bulleted list. After the user is done writing and closes the panel, a speech bubble pops open next to its corresponding icon as users click on the icon. As shown in Figure 33, there is an edit button on each speech bubble that allows access to the customizable text panel for any changes desired. Additionally, as each note gets replies from other users, they appear under the first note. The name (username) of the writers appears before their notes to identify who they are (Figure 33).

In addition to customization tools on the initial text panel, users can rate each other’s notes. As mentioned in section 4.3.2.2, librarians or teachers can refer other students to the top rates students in each category or book genre for advise or help.
Users can choose to create private notes if they desire. These private notes can be for one user, or amongst several users (Figure 30).

Users can add images to substitute the original image. By clicking ‘add image’ button users can choose to enter the URL for the image or simply add an image that is stored in their computer (Figure 34). All the images that have been added appear as thumbnails under the original illustration; by clicking on each one of them users can replace the displayed image with their choice (Figure 34). Furthermore, users can rate images and the image that got the most rating replaces the original image for that KAIEbook group.
5. DISCUSSION

Many of the designers, regardless of what kind of design they are practicing, have been using user input in their designs; Whether by observing them to see their habits in order to draw out a need they have and design for that need - for instance, the design of Walkman by SONY company (McDermott, C., 1997) – or by having them as part of the design group and designing with them every step of the way – for example, the design of ICDL (Hutchinson, H.B. et al. 2005).

The question may rise: how does a designer decide the degree of user input and involvement? Of course the answer to this question depends on whom the designer is designing for and what the design is. Nevertheless, even when we know out users, who do we determine the amount of their involvement in the process? Needless to say that there is a great number of categorizations of users proposed and designers can choose to categorize their users using any of them, but one of the categorizations of users is the one proposed by Prensky in 2001. Undoubtedly, I am not suggesting that Prensky’s categorization is the best categorization of users, however for the scope of this thesis and due to the nature of this thesis Prensky’s categorization of users suites best.

The reason why I chose Digital Libraries is that, libraries have long been the prior targets when nations wanted to harm or erase a nation’s culture. The logic behind these attacks has always been that libraries are the heart and soul of every nation’s culture. Now that the content of national libraries, archives, museums, and other cultural resources are being digitized, the national, international and future access to these materials has been secured. Digital Libraries along side the Digital Immigrants play a valuable role in educating Digital Natives. Currently, much of the educational materials and tools are being either digitized or replaced with a form of technology that is compatible with the digitized materials. According to Günther Digital Native students have specific characteristics. Amongst these characteristics he mentions that technology has been embedded in their private and social lives as well as their education; their strategic thinking has developed and they need direct control over some aspects of their educational process, also they prefer a more hands-on problem solving. (Günther, J., 2007). Reading, amongst other things, has also changed. Digital Natives read much faster but at the same time they do not read linear; in fact, depending on the material, they read to gather the necessary information or skim the text. As a result the reading can potentially be broken but the information that the user needs is obtained. As a result, Digital Natives use time more effectively (Günther, J., 2007). In Addition, it has been proven that Digital Natives find it easier to work in teams since they do not need to first learn to be team player. They have been taught to work in teams by all the technology that surrounds them (Günther, J., 2007).

If we add their quality of being a team player to the fact that technology is embedded in all their aspects of life and education, we can conclude that Digital Natives respond best to an education system that requires them to work in teams in a digital environment. However, this statement should not be understood as Digital Immigrants have no say in Natives education and that they do not understand them therefore they should vanish from the picture. Earlier, in section 2.3, I have touched on two important subjects: “Legacy” and “Future”. Much of the Legacy content such as
logical thinking and understanding the writings and ideas of the past are of a great value. As for Future content, although it includes software, hardware, robotics, etc. but it also includes the ethics, politics, sociology, languages and other things that go with them (Prensky, M., 2001a). When we look at the situation from Prensky’s point of view, we can see the valuable role Digital Immigrants play in Digital Natives’ lives. Simply put, Digital Immigrants the valuable source of the Legacy content, and together with Digital Natives they are the source of the Future content for the generations to come. Which answers the question, why we need to consider Digital Natives in the process of design.

When designing for Digital Natives we need them on the design team because of two main reasons: 1. They speak the same language as the rest of the Digital Natives they are representing and they share specific characteristics that are crucial to the design decisions. 2. They hold the key to part of the Future content. Furthermore, we need Digital Immigrants on the design team as well because they provide the Legacy Content and they hold the key to the other part of the Future content.

During the period of five months I have tried designing for Digital Native. This design process has been full of surprises. One of them was that even though I always saw myself a Digital Native, but through the design process I have understood that I am, in fact, merely a Digital Immigrant who although speaks Digish almost fluently, but is still a Digital Immigrant. In several occasions I was faced with the situation that proved to me that when designing for Digital Natives, my ability to speak Digish could only help me understand what the Digital Natives need when having a conversation with them, but I could not have understood had it not been explained to me.

Addressing the Research Question

The prototypes I made, were designed to ask a question: What tools do users need to communicate with each other when in a Digital Library’s environment? The workshops were to ask the question: How can the layer of sociability and interaction between users be introduced to a digital library; in addition, what effect will this layer have on the users?

Each prototype was base on the one that came before it and the user input it gathered during the workshop it was used in. a team of Digital Natives, as part of the design team, were always on the other end of the prototype. Through discussions we had during each workshop, they were able to come up with a list of tools they need as well as the kind of interaction they expect to have when using those tools. At the end, a set of tools was decided for aiding the communication and sociability with in ICDL.

During the workshops, I discovered that by creating a layer that allows Digital Natives to communicate and socialize with each other in a Digital Library, a new way of reading, communicating, and doing school work is created. The new scenario that we created, is potentially going to give birth to a new culture of reading for pleasure and doing school work.

The fruit of this research and design process is KAIEbook. Using KAIEbook, users can express themselves through images as well as text. It has the capability to be used
for both schoolwork and pleasure reading. According to the workshops, if the safety of the environment is ensured, it can be the platform that users need in order to express themselves through books, and this self-expression can be archives for future references. The participants of the workshops categorized the rating system as a rewarding system. They believe that this new system allows the students to get recognized for their work and knowledge; also, it will encourage students to better themselves in order to get noticed by others. Surely, many of the elements of KAIEdbook are the same as other serviced that are provided online. For instance, the way that the text bubbles are designed is the same way that emails are, or the rating system is the same as rating system of Yahoo!Answers; the reason for these resemblances is that they are all part of a bigger system of communication that the technology has presented for us; they are all part of a language that technology has created. This language, just like any other alive languages, will evolve, and its components – vocabularies- will change in time, but for now KAIEdbook speaks the present Digish.

Undoubtedly, there are a number of issues that were not discussed and taken into consideration in this thesis. Issues such as privacy of the users on the web, support and maintenance of the purposed system, and supervision on the system are but a few of the issues that must be considered for this system. Nevertheless, due to the limited time and for the scope of this thesis they have not played a significant role in the decisions made.
6. CONCLUSION

As I started my research I had little knowledge of digital libraries and how widely they are being used. I started by looking into the most famous and commonly used Digital Libraries in the world. During my research, I discovered that not much has been designed specifically for children. Realizing that, I sought to find the differences between designing Digital Libraries for adults and for children; that was when I was introduced to the theory of Digital Immigrants and Digital Natives. By studying the most famous Digital Library for children (ICDL), I understood how designing with Digital Natives as well as for them in practice can result into. Of course, because of the close relation between the designers and researchers who brought ICDL and the researchers and design team who worked on creating a sociability layer for ICDL, Alph was introduced to me. As I have mentioned earlier, Alph is the final prototype of a project that aimed to create a layer that allows sociability in ICDL; however, due to the issues that I have stated earlier the project was unfortunately stopped and as a result Alph was a prototype of a layer that allowed annotation and a few limited interactions.

Although I am not proposing that I have resolved the issues that the team who created Alph faced. In fact, I have barely touched upon them in this thesis. However, the research that led to KAIEbook was in line with the research that led to Alph. In fact, with the extra guidance I received from Professor Kaplan, I tried to take the same path in this thesis and build up KAIEbook base on Alph. Surely, the same as any other design, KAIEbook could have taken many other shapes. It could have looked otherwise and brought other kinds of interactions if I or any other ones in the team made other decisions, or if I had taken a different route in any part of the research. Moreover, any other design decisions or solutions had the potential to be addressing the same research question; additionally, those design decisions or solutions that targeted the same research question could both be successful and unsuccessful at the same time. To illustrate, according to Schrödinger’s thought experiment (Wikipedia, 2012a), when a cat is placed in a closed container with a poison releasing mechanism, until the container is opened, both chances of the cat being alive and dead exist equally. According to the Copenhagen Interpretation of Schrödinger’s thought experiment (Wikipedia, 2012b) “A system stops being a superposition of states and becomes either one or the other when an observation takes place.” By applying this to the case of this thesis, we can see that the closed container is the subject of designing for Digital Natives and the cat and the contents of the box are the design and research process; until each process is examined and observed, we cannot determine the outcomes to see the best result.

In the end, the subject of designing for Digital Natives is a wide subject that is still in need of much studying. In this thesis I have tried to scratch the surface of designing for Digital Natives by designing a layer that allows sociability in a Digital Library. Unfortunately, because of the time limitation I could not dig deeper into the subject of designing for Digital Natives, but through my research I discovered the big picture and it’s importance in both our present and future.
7. FUTURE OF THE DESIGN

If we consider KAIEbook to be a layer with certain tools that allows users of ICDL to communicate and interact with each other, then perhaps the next immediate step is to create the security needed for such system so that the users can interact in a safe environment and only after creating security for this system, we can expect users along with their parents/ guardians and educators to use the system. Furthermore, as users start using the system they can help the evolution of it by their feedbacks.
REFERENCES


PRENSKY, M., 2001b. Do They Really Think Differently? *On the Horizon, 9*(6),


CARROLL, M., JOHN, 1993. Creating a design science of human- computer


Kaplan, N., nkaplan@ubalt.edu, 2012. The Alph project. [email] Message to Avissa Bigdelli (Avissa.bigdelli@gmail.com) Sent Thursday 2 February 2012, 21:07.