INQUIRY INTO LIBRARIES - A DESIGN APPROACH TO CHILDREN'S INTERACTIVE LIBRARY

Eva Eriksson
IDC | Interaction Design Collegium, Department of Computer science and Engineering
Chalmers University of Technology Göteborg, Sweden
eva.eriksson@chalmers.se

Peter Gall Krogh
Andreas Lykke-Olesen
Department of Design, Aarhus School of Architecture, Aarhus, Denmark
pkrogh@interactivespaces.net, alo@interactivespaces.net

This paper reports on a design process of pervasive computing installations for a children's interactive library. The design process involved a wide range of decisive parties of the domain and the process was designed so that the collectively developed design concepts could suit the needs and interests of the many parties. Narratives and sketches were used for inquiries and communication, and the concepts and their iterations illustrate the process of design and how the physical qualities of the environment and the artefacts played a central role in the development of the concepts.

INTRODUCTION

In a children's library a 9-year-old girl, is making a drawing of a moon-rock working as a search tool in Martian libraries. Upon request from a team of researchers doing user studies she is envisioning and sketching what the library on Mars might be like. Like the majority of the children that were subject to user studies with regard to the development of a children's interactive library she imagined physical magical tools that would enable the various intangible tasks in a library, e.g. doing searches, engage and participate in the book stories, exchanging opinions etc.

The vast research in children's social and search behaviours in a physical library as well as in digital libraries reveal an interesting area. However, little has been done in trying to combine the two, making the physical space and artefacts in the library the interface for digital material, and shifting the desktop computer to pervasive computing systems. There are several examples on how researchers and libraries try to deal with the decreasing interest for books among children and increased interest for new media. These mostly digital services for libraries e.g. web sites, search engines, sociable web services based chat rooms connected to the library web site and digital comments on books; services and developments supporting views of the future library as digital, virtual and distributed (Mackenzie Owen, J).

But children desire for physical spaces in the libraries that are meant for them; spaces supporting them in living out their social life among friends and peers (McIntyre, M. H, 2002). There is also a desire among children to be listened to and offered a chance to have ideas valued with regard to the development of their environment. Young people and children express their wish to hold on to the libraries, but there is a need to add some coolness to them with regard to spatial qualities and appropriate technologies (Meyer, E. 1999). It is generally acknowledged that the physical library has a central cultural and social role in society, democratically accessible to all free of charge and being based on the combination of sociality and collection of information material. What will facilitate and be sufficiently attractive to make children still interested in going to the library?

The current and most prevailing answer to this in many children's libraries has been to set up computers and game consoles in order to make available what presumably is attractive to many children. But little has been done in order to explore and exploit the existing physical information materials in new ways and to emphasize the social qualities of being co-located, promoting the sharing of views and ideas. The latter is the ambition of the library that encouraged our research centre to initiate a project and gather a consortium of interested parties that would stage the ambitions of how the children's library is to develop.

On the basis of this and the experience from user studies it became the purpose of the project to develop pervasive computing concepts and installations that challenge the traditions of the library with regard to how existing materials are presented, and furthermore how the library offers new activities in the physical spaces of the children's library. The design criteria for the installations were to go beyond existing interaction modalities for computer appliances, involving several senses and the whole body when interacting with computers.

THE CHILDREN'S LIBRARY DOMAIN

The children's library is typically seen as a library within the library, a service on its own rights. Though being an institution on its own rights it is very faithful to the fact that it is grown out of the "adult" library with regard to search facilities and the display of materials. The library has introduced both PC's equipped with children appropriate games as well as console games, which both facilitate children in just being there for the entertainment as well as settings for parents playing and aiding their children in PC-based games. Some libraries have established facilities for teenagers. Typically the computers as well as the facilities for the teenagers are separated into rooms and niches in association with the children's library as these activities are still regarded to be side-activities to the traditional functions of the library: borrowing materials and reading books. But there is an increasing awareness and accept of the noisy elements such as game playing and hanging out as teenagers is an important element in what a children's library should offer its users, and that the children's library should build upon values appreciated by children and not just a miniature version of the adults library comprised of children targeted materials. Another initiative taken up by children's libraries reflecting the change of media consumption among children is the many web-based services e.g. forums for Q&A, chat, reviewing and recommending materials that have become available in the last 5 – 10 years contributing to make children aware of the services and many facets of the library.

Generally the library as institution is challenged in many ways these years, among others the extensive Internet-based services provided by libraries enable people to do searches, read reviews, make reservations of physical materials from their home computer. Though many of these services are desirable from an ease of use point of view, they also contribute to the depopulation of the physical library. The actual need to go to the library with regard to collecting information materials is disappearing along with the increase of Internet-based services.

MEANS FOR DESIGN

There are many challenges and opportunities to consider when designing for children's library domain. The behaviours, skills and needs of the children, the decreasing number of visitors, the massive free information potential of the libraries, the need of a third place and the existing technologies in the library. With the project presented here, we investigate a stance where we believe there is a hidden potential in seeing such factors as material for design, and be able to join them in design proposals.

We argue that information technology can be viewed as a material for design as it is both software and hardware, it allows for communication, controlled behaviours, as well as adaptation to new or local conditions, and is central to the field of interaction design. However, it is not sufficient on its own, other materials are needed as well, primarily physical, such as plastic, metal, wood, textile. To explore the possibilities of the children's library domain, we also include spatial architectural perspectives to enrich the interaction design. Architecture is about

organizing social relations by means of spatial layout, the control of natural phenomena such as light, temperature etc. It is about facilitating people in being together and enabling them to separate into groups when this is preferable. Most basically architecture consists of places to stay still and areas for movement and traffic. By focusing on and understanding information technology in combination with spatial properties and boundaries as design materials we take advantage of what already is in the library, however the nature of a design material is its ability to take up new forms or relate to other materials in new ways shifting its initial function. The focus on these aspects of the children's library provided the partners of the design team the basis to rethink the existing elements of the library – the physical as well as virtual elements. Adapting architectural understandings of physical space into interaction design may yield new ways of understanding activities and use. Prototypes in interaction design traditionally demonstrate and explore interaction with a focus on functionality, whereas sketches and models in architecture often serve to provide visual overviews and understandings of the entire space in which spatial forms and users will co-exist. Combining the two design perspectives may expand the functional focus of traditional prototypes and serve as vehicles for communication, exploration, inquiry and understanding.

RESEARCH TEAM AND PROJECT SETUP

To meet the challenges experienced in the children's library domain a research consortium was established, comprising competences from the research centre; architecture, interaction design, engineering, and computer science, combined with a set of industrial partners having various interests: a cabinetmaker, a web bureau, a company developing library databases and an architectural office. To facilitate quality and diversity of input from the library domain representatives from five major regional children's libraries were part of the project setup. In order to ensure the relevance of the developed concepts user studies were conducted and the time line and the structure of the project was designed to facilitate several experimental periods involving children in sparking design ideas as well as being test drivers of the installations. Hereby they would provide valuable input for the iterations on the developed prototypes. On the basis of these challenges the local library services and researchers formulated a set of ambitions and facilities to be met in a future interactive children's library:

- The children should be able to engage several senses and even the whole body when experiencing and dealing with information
- Noisy activities are accepted on equal basis with more silent ones as e.g. reading
- Regain the importance of meeting in a physical room emphasizing and staging the social qualities this enable – the library as a social arena
- Work positively with the fact that children see IT services as being a natural and attractive part of a learning environment.
- The target group of children should be those who just started reading (approximately 7 – 8 years) but not exclude older nor younger children

DESIGN PROCESS

In this section we describe the design process that led to a range of different concepts within the domain of the children's library. The design process covers the project initiation, involvement of parties and development of concepts whereas the implementation is reported on elsewhere (Eriksson. et al 2007). Through this description we wish to emphasize the importance of the different partners being part of the project consortium and further show how ideas got informed and changed through the design iterations. The entire process was highly research driven with respect to the other parties in the consortium, which influenced the approach and focus throughout the process.

Intro workshop

The Interactive Children's Library project started out with a kick-off workshop that aimed at letting all partners meet up and present themselves to each other. At this stage no one talked about "what to do", but instead what their background and competences was and why they had chosen to participate in the project. After each participant had presented their perspective on and potential contribution to the project – e.g. furniture manufacturer, interested in new interactive approaches to furniture, contributing with reality checks and know how on production for the specific domain - all participants were divided into smaller workshop groups. In the groups mixed among library, company and research partners we discussed possible ways of progressing the project in such a way that we worked from a common understanding and that every partner could see a useful outcome. The ideas were later presented in plenum and discussed.

User studies

We visited in total three different libraries for field studies; one for observational studies only and two where we did engage the children in activities that would help us understand their perceptions of the current library and what they would like to see happen in the near future. There were four steps in the user studies in the two libraries. Firstly we placed ourselves in the children library department, and started to pack up things that we had brought. The children were curious about us, and approached us to ask what we were doing. We asked them to tell us about the library, what they were doing there, why they were there and what people they would meet there, see figure 1A. We asked the children to make short video films about the library, where they would film each other demonstrating and telling about the library, without us interrupting. Secondly in the middle of the room we had a table which we filled with crayons and papers, and we asked the children coming up or passing by to draw from one of two themes, either how the library will look like in 100 years, or to explain how the library is on the planet Mars.

Figure 1. A member of the research team A) studying children playing a computer game, and B) sketching with a child.

See figure 1B. The idea of taking departure in how the library might be on Mars was inspired by (Dindler, C et al 2005) carrying the ambition of creating a shared narrative in which both the children and the researchers could play with ideas that are out side the narrative space staged by the current library. Furthermore this approach could (and did) bring mythical and mystical aspects into the discussion on what the children's library might be like in the future. This discussion happened between the children and the researchers and later within the research team as such.

Thirdly we placed out questionnaires in different places in the children's department of the libraries, where the children freely could give criticism to the library and suggest changes. Fourthly and last we did unstructured interviews with interested children while they were demonstrating for instance how a computer game was played or how one returns borrowed books.

Findings

Our findings from the user studies can be divided into three categories:

1. Social and spatial
2. Cognitive and emotional
3. Technological and digital

Social and spatial findings are for instance that many children have a hard time finding a physical location to hang out. In two of the children's libraries we have visited one part was dedicated to infants and pre-school children, and one part to teenagers. Many children do not see them selves as belonging to any of these groups. Experiences from one of the visited libraries show that a nuanced and graded division of the space based on the spatial layout of information facilitate children in finding "their space". Perceivable this can be achieved when the materials are ordered in terms of the age group they appeal to; as expressed by one of the kids: "we meet where I find books that interest me".

With regard to the cognitive and emotional aspects, shelves are not the preferred ordering and display of books seen from a child's perspective. The amount of books placed together makes the titles hard to separate, leaving children with little chance of estimating which book might be of interest to them. Librarians know that the children do perceive it as if the all the books turn their back to them. In response to this librarians pick out books for display on special stands so that the cover becomes visible. As soon as the cover is turned towards the children, the number of borrowers of the book will increase dramatically. As candidly noted by a librarian: "this way we can almost decide which books the children should read!" This is of course not fully true, but the covers help the child to visualise if the book might be of their interest along with the note on the back-cover, and furthermore the children expressed interest in having more info on the story in helping them to decide.

In the Scandinavian countries many libraries are adopting digital technologies for library purposes. Increasingly libraries use RFID-technology and robots to replace the praxis of bar-code use for tracking in and out going books. In our studies we found that this technology do not stay strange to children for long, but is quickly adopted as an everyday element in the environment. Rather than being hesitative the children put their curiosity at work and quickly understands and the use and purpose of the technology. On the other hand we found that children do not use computers to search for books. The interface of search engines and browsers available today are perceivably more suitable for adults; the children do not use them.

Sketching

The findings, design statements and proposals made by the children during the field study was brought back into the research studio and analyzed. We went through the video footage and saw the library presented from the children's own perspective. Together with the children's design ideas for a future library we refined and developed the concepts and visualized them through conceptual drawings.
The purpose of this stage was to be able to present and pass on the most dominant and interesting findings to the rest of the project group making it work as a shared basis for understanding the children's library that we were to design for.
Apart from the ideas directly inspired by children and the existing technology we created a range of drawings, meant to rock all participants' understanding of the children's library. We deliberately added a physical approach as the starting point to provoke a discussion on the social aspects of the library space. This was done through 3D computer models of twisted shelves becoming tables, elaborate floors becoming landscapes of secret caves and ponds for knowledge that due to changed scale of furniture would only gain access for children in certain parts of the library. (See figure 2).

Company workshop

The next step in the process was a workshop with the company and research partners. The idea of separating the industrial partners from the library partners at this stage was to have the industrial partners go beyond what might be pleasing to the potential buyers of their products, but also to avoid that a rigid understanding of what the companies were capable of would lock the process. The workshop was lead by a group of researchers and started out with a presentation of the findings and initial concepts, (see figure 2, 3B, 4 and 5 below).
After the presentation all participants were divided into groups doing brainstorms on one or more of the concepts presented earlier. The aim of the workshop was to have the industrial partners to work, contribute to and mould the ideas together with the researchers so that everyone could agree on an interesting way for further development of the concepts. The brainstorm was recorded on post-its and in sketches on regular paper that in the end of the workshop was presented and discussed in plenum.

Sketching

The workshop with industrial partners led to the development of initial concepts as well as a new idea for a piece of interactive furniture called LibBox (see figure 3A). All ideas in this phase were sketched up for presentation at the upcoming workshop with the librarians. All concepts were brought to the same level of completion to be equally treated and evaluated.

Library workshop

The next step in the project was to involve and inform the librarians on the concept developments, challenging their work practice and preconceptions. By excluding the companies from the workshop we hoped for unrestrained ideas that could be blue-sky ideas pointing toward a new children's library despite possible problems in realization. A workshop with librarians from the five participating libraries and the group of researchers was carried out in much the same way as the earlier workshop with the companies, presenting and discussing the new concepts and rated which ones should be developed further for the next plenum meeting.

Sketching

In the weeks after the library workshop we developed the concepts further. We made sure that the design ideas we took further contained the most possible challenges and potentials for all parties in the project team. This was done to assure that the level of engagement and commitment in the later prototyping and implementation phase would be high which the entire project team would benefit from. We narrowed the number of concepts down to six before the next workshop session. Small video sketches were made out of them, to visualize the interactive potentials or problems in use.

Common workshop

The purpose of this common workshop which included all project participants was to come down to two or three concepts that we all could agree on should be subject to further development, prototyping and implementation tests in a real children's library environment. The design concepts was presented through sketches and video prototypes as had been the general communication method in the process so far. After a quick round of commenting on the concepts we divided into groups of four-five people all groups having at least one representative from each party. The purpose of this session was to add new aspects and ideas to the presented concepts but most of all it was to rate the design concepts from a personal interest point-of-view being a librarian, researcher or industrial partner. Three different colored post-its represented the three interest groups and each

participant had to write pros and cons in relation to each concept. All concepts were displayed on a large white board and added with the colored post-it notes revealing strengths and weaknesses in the concepts in respect to all participants. In plenum we discussed the possibilities for all concepts and it was obvious that everyone had to kill a darling or two if we wanted to proceed with a realistic number of concepts to realize; concepts that contained potential and interest for all participants. We came down to two concepts namely the LibPhone and CubeSearch, (see figure 7). These were to be developed further by a smaller group representing all parties and then later evaluated in plenum. In the following the concepts developed in the design process are presented.

DESIGN CONCEPTS

Here we will present some of the many concepts that came out of the design process. The concepts are described in order of ideation chronology, the initial provocative concepts first and the refined and altered concepts last. Some design concepts have been left out but the intention is still that these concepts show the development from being thought from one perspective (e.g. information technology) to concepts coupling spatial, social and technological aspects in a children's library environment.

Twisted Shelves

The shelves of the library are rounded to enable the creation of private spaces. This concept was used to inspire the participants in the aforementioned workshops. The images question what a shelf is and in particular they should serve to help the participants to go beyond what they knew would work. Furthermore the concept was to encourage daring ideas even if they might seem foolish at a first glance. See figure 2A.

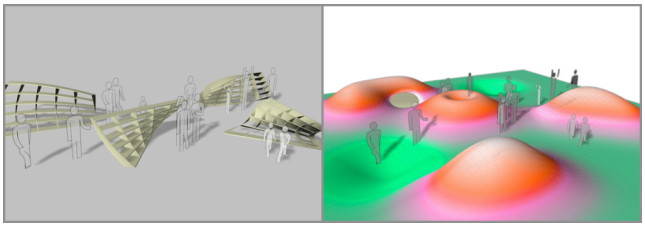

Figure 2. A) Twisted shelves. B) Caves

Caves

The library is turned into a landscape of mountains and caves. This idea supports the children in finding a space for themselves or for them with friends, where they are invisible to others, and takes one step away from today's library. Along with the twisted shelves images these were to promote the blur the potential preconception of what might be realisable within the frame of the project. See figure 2B.

The Egg

This is an interactive 1-4 person room responding to the information material that children bring into it. For instance if a book about Antarctic is brought into the Egg, the ambient will be Antarctic-like, with wind, polar bear roars, and a lowered temperature. The concepts originated from the library wanting to provide unique high-quality experiences and installations that children would not find in their private homes. See figure 3B.

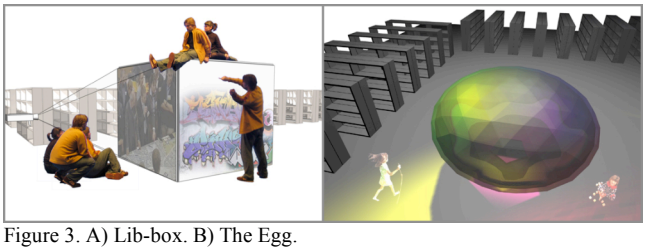

Figure 3. A) Lib-box. B) The Egg.

Lib-Box

The concept consists of a large multi-purpose box. This idea is based on the design intention that the library should be a place for large-scale interactive experiences, and where gadgets are more than welcome to be big and roomy. The box can be used for projections, theatres, games, rooms, stage, SMS, or play ground. Furthermore the concept is thought as touring from one library to the other added with new content that expands the use of the lib-box. See figure 3A.

Searching

In this concept a stack of books is read by an RFID-reader. The scanned books can be searched and categorized by attributes not usually available when searching books; for instance most popular, amount of pictures, size of letters, number of pages, and so on. The reader becomes a dissection tool to rate physical attributes related to the books but still encouraging the children to pick books from the shelves but then compare and look at them in new ways. The concept originated from our findings that children do not search for books, and that they choose books based on alternative factors not described in the search system as it is.

Tangible Chat

The concept is to connect the emoticons used in chat-rooms to an actuator-enhanced chair translating the emoticons to physical movement. The concept was derived from children's intense use of chat rooms, and

the assumption that physically mediated response helps the children in feeling closer connected than what can be experienced in ordinary chat rooms. See figure 4B.

Harry and Superman

The idea is based on children's creativity and fantasy, where the children can be their favourite character, as for instance Superman and Harry Potter. By using a tracking technology, the child's movements are direct mapped to the movements of the character on the screen. In this fashion all types of stories can be created, mixing all types of characters. This concept originated from the children's dream to be their hero. See figure 4A.

The Moon-Rock

This is a type of magic large ball-shaped interactive device revealing the content of a book in an explorative way. When putting a selected book into a slot in the "moon-rock", the book is visualised in a peephole manner on small-sized screens showing: the plot, the bad guy, the hero, the main character, the setting, etc. The children get a glimpse of the story inspiring for exploration, the "rock" thereby being a supplement to the narratives about the book to be found on the back cover of the book. The concept originated from children wanting to have explorative glimpses, get snippets of the story to help judge its attractiveness. See figure 5B.

Figure 5. A) The search helmet. B) The moon rock.

The Search-Helmet

This is a large umbrella shaped helmet-like thing that the child holds above the head while moving around in the library. The child can adjust different search criteria focusing the system in relation to the child. When strolling in the library, information derived from the preferences of the child will be displayed on the see-through material of the helmet. Information on books, such as film, info from the web etc. is displayed in relation to the view on the real world books. The concept originated from the observation that children find little interest in the back of the book; to them the attractive part of the book is the cover. Furthermore children do not search for books through the available systems, they browse along the shelves to find material of interest. See figure 5A.

Critique Collector

Here children return their books in the positive or the negative box, and thereby express opinions about the book. Both input and output are instant, and is connected to an act the children will have to do anyway, namely returning the library material. The idea originated from having children informing other children on what to read. Children are reluctant in doing traditional reviews, as these are time consuming. The installation should provide a swift indicative rating of the borrowed material. See figure 6A.

Figure 6. A) Critique Collector. B) Shelf-slider.

Shelf-Slider

This concept supports the children in that they prefer book covers instead of the back of the books. By steering a physical slider along a traditional shelf lined up with the back of the books, the covers of the books are displayed on a display next to the user. The interaction should be highly tangible moving the magical section tool through the shelf revealing the must-reads in the otherwise blurry mass of book backs. The idea originated from the fact that shelves are a spatially efficient way of storing books, but inappropriate for children when they browse for books to read. The concept supports the sociality of finding books together as several children can watch simultaneously. See figure 6B.

bibPhone

The bibPhone (Lykke-Olesen 2007) concept enables children to annotate physical material with digital recordings; children are able to add oral comments to books by placing the Lib-phone over a RFID tag on the book; putting an ear to the book enables hearing the comments recorded by others. Along with the "Critique collector" the concept originated from children's reluctance toward doing written reviews, and the fact that more and more libraries are adopting RFID technology on information material. The lib-phone can be used for "treasure hunting" for messages in books or enabling children to have a secret information layer attached to selected books can also be imagined. Furthermore the concept is not restrained to information materials but could also be used with regard to adding RFID tags to

specific elements in the physical environment, enabling new forms of play and information exchange. See figure 7A.

Figure 7. A) bibPhone. B) CubeSearch

CubeSearch

The CubeSearch concept is a physical search engine for multiple children. A range of physical cubes represent different keywords or search criteria; by moving the tracked cubes on a floor the connected wall display will visualize book covers matching the position of the different cubes on the floor, e.g. medium horror, some love and large type set. Using the print and location cube the resulting book covers can be printed for the child to remember what the book looked like along with instructions on how to find it. See figure 7B.

DISCUSSION

Based on the presented work we raise two discussions in the following namely: the role of children in the design process, and how the design concepts and process meet the challenges for the children's interactive library as defined by the project team.

The role of the children in the design process

There is a growing acceptance of the stance that new technology for children should be developed according to children's existing practices, and while participatory design is becoming generally accepted, the roles of the children during the design process are ranging from active co-designers (Druin (ed.) 1999, Westerlund, B, et al 2003) to less active informants as advocated in (Scaife, M et al 1997). These different conceptions of children's role in design have a heavy impact on the way user requirements are gathered during design (Druin, A. 2002).

Druin (Druin A 1999) has developed a cooperative inquiry framework based on participatory envisioning, contextual inquiry and lab observations to involve children as legitimate co-designers in the design process. During the design process, the children's practice is reflected in their design contributions.

In our process, the children were involved while performing the initial user studies and design inquiries. After that, the children's views were involved by reference to the collected data, and by means of the unrecorded experiences from the people involved in doing the user studies. Based on this the design discussions always took point of departure in our understanding of the children. Furthermore, the children would be the final judges on the design concepts when involved in the prototyping phase and again in the practical tests and tasks.

We chose to exclude the active participation of children in some parts of the design process, as we regarded our approach to the domain too complex and detached from the real children's library environment in order for it to be meaningful to bring them into our lab. The children's views and wishes are of course the basis for the development but the adult and professional interpretations of these needs to come into play too in order to address intentions beyond the view of the children e.g. "a database is seen as a great potential for a game". We think that the capability of the children to imagine these new types of systems in the context of the library, were not realistic.

For the purpose of gathering user requirements for this project, we tried alternative ways of inquiry to establish a common ground, by the mean of narratives. In recent design projects some of the authors have experimented with shared narrative spaces in various participatory design contexts e.g. (Dindler, C. et al 2005). We define a shared narrative space as a social constructed environment in which conventional cultural expectations are temporarily bypassed, and we believe that the potential of a shared narrative environment might be fruitful when designing with children.

In this project, narratives have been used in two ways, children creating video stories and during sketching what the Martian library might be like. While sketching, the researchers and children sat together in the public library and drew visions, told stories and fantasising on how the library looks like on Mars and how the library looks like in 100 years. Being in the actual environment instead of a lab made it possible for the children to imagine how things could be different – "look at all the shelves, imagine if they all were placed on top of each other – the library as a shelf tower". This method proved to be a highly successful complement to existing methods for gathering user requirement – a sort of on-site informal brainstorms.

During the initial user studies, we also gave approaching groups of children a video camera to create their own stories about their library. The children shifted between filming and being filmed, and they directed each other to tell an interesting story of what you do where in the library, why they do so and so and what it means to

them. We consider this creative study to be a mean for the children to use narratives to make us understand as well as create a common ground. Both in the case of sketching and in video stories, the outcome of the narratives is a straightforward and multi-coloured exploration of user habits and needs.
Instead of establishing an intergenerational design team proposed by (Druin A. (ed.) 1999), we have established a design consortium with various interests, backgrounds and practice from children. By using informal input from children at an early stage of the design process and in the original context of use, we believe we have been able to create a multi-facetted understanding of the domain, its users and their needs. The time and effort to create an intergenerational design team, and include children in all parts of the design process, could perhaps have been well invested and perhaps result in different types of concepts. We have chosen to take another approach than (Druin A. (ed.) 1999) in this design process, since we are not convinced that we would profit from that. As it is now, we consider the results to be domain specific and in line with our findings.

REFLECTION ON THE DESIGN CONCEPTS AND PROCESS

As described above the developed concepts were designed on the basis of recordings of children's ideas, wishes and associations in context and affected by the members of project team. We will now discuss how the developed concepts correspond to the initial framing of the children's library domain and how a research project consisting of many different partners can work in shared projects with multiple and diverse goals.
To initiate the design process we used blue-sky concepts physical installations for the children's library. Through the workshop sessions all partners improved their understanding of the many aspects and perspectives on the domain, which resulted in increasingly complex concepts that took advantage of the spatial possibilities, the gathered user requirements as well as the expert knowledge of each partner. The Lib-box was initially intended as a piece of furniture supposed to change the physical space but during later discussions it transformed into a multi-functional media box that supported our focus on social activity in physical space as well as containing potentials for both media and furniture partners.
Another example of a progression in the concept development pushed and framed by the project team is the Moon-rock, Search-helmet and Lib-phone. The Moon-rock sketched by a child had the ability to dissect and present relevant and additional information from a book. As this concept was related to the library on Mars and in many ways very abstract the idea of an augmented reality-like helmet came up as a more concrete proposal using the existing physical structures but adding new visual layers to the books. Later this concept developed through a discussion on the physical space as interface and the ambition that parts of the children's library can be noisy. This resulted in the bibPhone concept exploiting the spatially structured books as the interface for sound interaction while being an invisible system to engage children in exploring the materials in the library.
The guiding principals in the development of the concepts described above have been the findings in the user studies balanced with the ambitions expressed by the participating research parties. Therefore none of the concepts reported on here are associated with computers in a traditional sense. They all explore new ways of taking advantage of the physical environment, children sensor-motor skills and the social qualities in children being co-located. They all try to activate digital information in relation to physical materials, and habits in the physical realm. The concepts presented here focus on supporting existing activities and beyond in the children's library but materialise the ambition to change the children's library through new opportunities for the exchange of information that responds to the interests of the children.
The approach taken and the concepts developed during the initial phase of the interactive children's library project, differs from the stance of other research projects in the domain of children's library. In (Kaplan, N et al 2004) findings from studies on digital libraries are presented, but some of their findings are directly valid also for physical libraries. For instance that children will not use libraries that is uninviting or that do not support their search and retrieval strategies, which is in line with our findings, and mirrored in the furniture concepts e.g. the Egg, the Caves, as well as the physical search concepts, e.g the Shelf-Slider and CubeSearch.
The vast research in children's social and search behaviours in a physical library as well as in digital libraries reveals that it is a highly interesting area. However, so far not much have been done in order to combine the two, making the physical space in the library the interface for digital material, and shifting the desktop computer to ubiquitous computing systems. When Reuter et al (Reuter, K et al) claim that new tools such as online library catalogues, electronic encyclopaedias, online databases, and digital libraries, bring together children and information, we in the

Interactive Children's Library project take another approach. We believe that it is true to a certain extent, but we strive to discover if there is a hidden potential in building physical interfaces to explore both physical and digital material in the children's libraries. Our concepts are the result of an effort to try to make a difference, and when finalising the prototyping phase, the judges; meaning the children, will show if we were right or wrong, and if the concepts have the potential to stay sufficiently interesting for continuous use.

CONCLUSION

In this paper, we have presented the initial findings and the design process from the Children's Interactive Library project. The user studies done with children in the context of children's library has led to the design of numerous concepts that exploit the library of today by enhancing the physical and social space with digital properties and resources. Furthermore we suggest that multiple partners should be involved in designing these interactive concepts for the children's library to avoid a narrow perspective on the potentials of the existing elements to form future library environments.
The contribution in this paper is foremost to present the grounding of this project, and establish the ambition of bringing together children and books, digital material together with physical material, in the context of the physical library.

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References:

Dindler, C. Eriksson, E. Iversen, O.S., Ludvigsen, M., Lykke-Olesen, A Mission from Mars – A Method for Exploring User Requirements for Children in a Narrative Space. In Proceedings of IDC 2005 Boulder, Colorado USA.

Druin (ed.) (1999) The design of children's technology. San Francisco, CA: Morgan Kaufmann, 1999

Druin, A. (1999). Cooperative Inquiry: Developing New Technologies for Children with Children, in Proceedings of CHI '99 (Pittsburgh, PA, May 1999), ACM Press, 592-599.

Druin, A. (2002). The Role of Children in the Design of New Technology. Behaviour and Information Technology, 21, 1 (2002), 1-25.

Eriksson, E. and Lykke-Olesen, A. 2007. StorySurfer - A Playful Book Browsing Installation for Children's Libraries. To appear in Proceedings of the 2007 Conference on interaction Design and Children (Aalborg, Denmark, June 06 - 08, 2007). IDC '07. ACM Press.

Lykke-Olesen, A. 2007. BibPhone – Adding Sound to the Children's Library. (submitted for review).

Mackenzie Owen, J.S. Key factors in the development of digital libraries. Paper presented at the 7th National Conference of Greek Libraries, Volos, 4-6 November.

Kaplan, N., Chisik, Y., Knudtzon, K., Kulkarni, R., Moulthrop, S., Summers, K., Weeks, H. Supporting Sociable Literacy in the International Children´s Digital Library. In proceedings of ACM IDC 2004, June 1-3, 2004, College park, Maryland, USA.

McIntyre, M. H. Start with the children: The needs and motivation of young people. A report commissioned by Resource and CILIP, 2002 (www.resource.gov.uk).

Meyer, E. (1999). The coolness factor: Ten libraries listen to youth. American Libraries, 30(10), Retrieved Jan. 12, 2006: http://www.urbanlibraries.org/showcase/cool.html.

Reuter, K., Druin, A. "Bringing together children and books: an initial descriptive study of children's book searching and selection behaviour in a digital library". In the 67th Annual Meeting of the American Society for Information science and Technology, 339-348.

Scaife, M, Rogers, Y, Aldrich, and Davies, M (1997): Designing for or designing with? Informant design for interactive learning environments. Proceedings of ACM CHI 97 Conference, pp.343-350

Westerlund, B., Lindqvist, S., Mackay, W., Sundblad, Y. (2003) Co-designing methods for designing with and for families. In proceedings for 5th European Academy of Design Conference in Barcelona, 28, 29 & 30 April 20