Participatory Design in Museums

Visitor-Oriented Perspectives on Exhibition Design

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Abstract

This thesis is about the design of technology for museum exhibitions. More specifically, it explores different ways in which visitors can contribute to museum exhibition design and how technology can support learning-related activities within museum exhibitions.

Most contemporary museums collect, preserve, and provide access to important cultural and historical artefacts with the explicit intention of educating and informing the general public about those artefacts. For many exhibition designers, the audience’s encounter with the exhibition is of primary concern, and technology is often seen as a means for providing visitors with new experiences and opportunities for learning. However, it appears to be only very recently that researchers have begun to show an interest in how modern technology is actually being used by visitors and many museums are struggling in their efforts to incorporate new technologies in their established exhibition design practices.

Thus, on the one hand, many museums are seeking more visitor-focused ways of carrying out design (with the help of, for example, different forms of evaluation or feedback). On the other hand, many museums seem to have limited experience with designing technology in a user-oriented fashion. Consequently, human-computer interaction, with its long tradition of involving users in design, is in a position to provide museums with new ways for audiences to contribute to exhibitions with their knowledge, experience, opinions, and desires. The papers in this thesis explore this topic through a number of case studies where visitors have been invited to contribute to the design and evaluation of exhibitions. The analysis of the results suggests that visitors can provide relevant contributions in all of the main phases of museum exhibition production.

This thesis also addresses the issue of how technology can support learning-related activities in museums. It appears that many museums base their notion of learning on epistemologies which suggest that activities such as interpretation, communication, and collaboration are fundamental to most museum learning processes. Consequently, the papers in this thesis explore a number of different techniques for supporting and orchestrating such social activities. The result is a set of design approaches that has the ability to encourage collaboration and dialogue between co-present visitors and allow visitors to create dynamic and evolving contexts for existing exhibits.

In summary, the contributions of this thesis explore museum exhibition design from two different, yet interrelated perspectives. From the first perspective, visitors’ desires, wishes, experiences, and knowledge are seen as important contributions to museum exhibition design. From the second perspective, different social activities and relationships between visitors in museums become the focus of the design activities. Together, these two
perspectives outline an approach to museum exhibition design where *visitors are of primary concern*, both with respect to the content presented in exhibitions and with respect to the way exhibitions orchestrate and support different forms of social interaction.
Acknowledgements

The conventions that dictate what a doctoral thesis should be like emphasize personal contribution to a very large extent. That is, the doctoral thesis should be concerned with my work, the knowledge I have developed as a result of the work, and my interpretation of that knowledge. This has made the writing of this thesis a rather tricky business because in my experience, research is not carried out only by individuals. Nor do individuals develop new knowledge on their own. Rather, science appears to be something that evolves from complex (and wonderfully fascinating) social relationships between human beings. Insights and discoveries are rarely (if ever) “made” by any one person, but tend to originate in situations where people communicate, ranging from lively discussions at research conferences to quiet talks over a cup of tea in the lunch room.

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In Memoriam

Sören Lenman (1947-2004)

Inger Isaksson (1946-1984)
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1. Introduction

Museums
The word museum originates from the Greek word mouseion, which translates into "house of the muses", that is, the temple of the nine Greek goddesses who gave artists their inspiration. The first mouseion was built in Alexandria around 300 B.C. and was primarily used as a research institution and knowledge centre where researchers of various disciplines could live, meet, study and work. In Greek and Roman societies, pieces of art and other items were often put on display in public environments such as baths, theatres and forums. However, during the Middle Ages, artefacts were increasingly collected and kept by religious institutions.

In the mid-15th century, Italian nobles began to collect artworks from ancient Greece and Rome and put them on display, mainly in order to rise in social position. As a result, a new interest in these cultures arose (Hooper-Greenhill, 1992). One of the most well-known banker families, the Medici, built a famous palace in Florence. The Medici palace housed not only a treasure in precious metals and stones but also Greek and Roman items that the family had collected. The family also commissioned artwork from architects, painters, and decorators to furnish the building itself. The palace was not open to the public – rather, the merchant prince personally invited visitors.

In the 17th century, collections of items from around the world were rather abundant in Europe. The way of displaying them became different, however: the function of the displays changed from a means of advancing the owner's social position to exhibitions with an encyclopaedic goal. Some collections were kept for teaching purposes by individual researchers at universities, but many were put together to represent the owners’ view of the world (ibid.). A classic example of these kinds of displays is the Wunderkammer or the "cabinets of curiosities". Such cabinets typically had numerous compartments (of which many typically were secret or required a special procedure to open) that held items of varying types. For political reasons, such cabinets evolved into Kunstkammers, that is, large indoor spaces to hold art and curious artefacts, and were sometimes built specifically for the purpose of hosting ambassadors and other important visitors. The development of palace gardens can, in turn, be seen as an extension of the Kunstkammer concept.

In the mid-17th century, the Royal Society was formed in England. One of its aims was to standardise language among tradesmen, scientists, and the
church. To support this process, the Society assembled a collection of items, known as its Repository, to represent this standardised language. By arranging for an institution to own the collection rather than a private individual, it was hoped that the Repository would stand a better chance of surviving and growing than private collections, which tended to disperse at the death of the owner. Because the Repository was formed with the intention of providing opportunities for study, the motivation for assembling complete collections was high. The Royal Society also appointed a curator to manage the laboratory that was made available in connection with the collection (ibid.). Not surprisingly, perhaps, the cataloguing attempt failed. At this time, there was no standardized way of classifying specimens, and the Society lacked the funds necessary for pursuing its goals. Also, the collection was only available to the members of the Society, of which only a few were scholars. Today, the Repository is a part of the British Museum.

In France, after the revolution, the collections of the aristocracy were appropriated in the name of the new Republic, gathered together, reorganized, and transformed. The aim was to make the collections available to all citizens of the Republic. Another reason for organizing this new type of museum was to display the decadence and forms of control of the old regime and to present the democratic values of the new. A similar perspective was gradually adopted throughout the rest of Europe (ibid.).

It is often claimed that the concept of the public museum as we know it today evolved during a period between the late 18th and late 19th centuries. The formation of the modern museum was influenced by a number of other cultural institutions, such as libraries, public parks, and fairs (Bennett, 1995). The onset of the Enlightenment and, later, Modernism prompted the museum to become a part of a larger system of cultural and governmental organisations and schemes for educating the “common man” (ibid., pp. 19–25). The initial aim was to attempt to regulate behaviour, which would allow government to “act at a distance”, so to speak, by endowing the public with capacities for self-regulation and self-monitoring. In particular, museums were charged with providing the means for elevating popular taste and design. This required the museum to become more inviting and less socially exclusive. It also required the content matter to be reoriented from displays that merely evoked wonder and surprise towards displays that provided enlightenment. The design of the physical space of the exhibition was also targeted as a means for regulating aspects of conduct (for example, galleries were designed with the intention of providing calm and quiet spaces for contemplation and observation). This required museum collections to be rearranged according to the principle of representativeness rather than rarity. Displays and exhibitions designed to provide evolutionary and historical accounts became more frequent, and classification gradually became an important organising principle (ibid., pp. 33–35). Although the governmental goals related to regulation would probably be rejected by most museum
institutions today, the museum is still considered an important tool for educating the public.

Museum exhibition design

Thus, most contemporary museums are concerned with collecting, preserving, and providing access to important cultural and historical artefacts with the explicit intention of educating and informing the general public about those artefacts. The curator role remains extremely important. Curators often plan and oversee the arrangement, cataloguing, and exhibition of the museum's collections and, along with technicians and conservators, maintain the collections (Lord & Lord, 2002). They are frequently expected to coordinate educational and public outreach programs, such as tours, workshops, lectures, and classes, and may work with the boards of institutions to administer plans and policies. Additionally, they may research topics or items relevant to their collections.

Historically, the curator often single-handedly designed exhibitions. Today, most museum design teams also include educators, designers, artists, carpenters, technicians, and maintenance staff. New exhibition projects typically begin with a conceptual phase in which a subject and a visitor target group are selected. After the design team has generated a number of ideas, available resources for completing the project are assessed, together with the reservation of a suitable time slot in the exhibition schedule. A development phase follows in which funding is acquired and the physical and educational design of the exhibition is completed. The time period when the exhibition is on display is often referred to as the functional phase. In this phase, educational programs are implemented and the exhibition is typically also presented to the public through pre-scheduled guided tours. It also includes personnel administration and maintenance work, and ends with the dismantling of the exhibition and the balancing of accounts. In the functional phase, evaluation is often used to determine whether the exhibition has met its goals. Many evaluation methodologies exist, including questionnaire surveys, in-depth interviews, structured and semi-structured interviews, and behavioural observation (Binks & Uzzell, 1994). Often, several of these evaluation methodologies are combined to triangulate the findings and strengthen the conclusions of the data analysis. The production cycle ends with an assessment phase where the process itself of developing exhibitions is evaluated. The outcome is a number of suggested improvements to the production process and ideas for future exhibitions.

Learning in museums

During the last few decades, a growing number of researchers within the museum domain have argued for a shift in focus in exhibition design from the curator or the subject specialist towards the educator and the evaluator (e.g., Screven, 1993; Hooper-Greenhill, 1994; Hein, 1998). As a result, learning and evaluation of learning is becoming increasingly more important in the
production of museum exhibitions. This growth in interest in exhibition evaluation is one of the underlying reasons for the formation of the museum visitor studies research area, which builds on theory from sociology, psychology, education, marketing, management, and leisure studies. It covers subjects such as demographics, data on attendance, psychological profiling, patterns of visitor behaviour, and the development of educational assessment methodologies (see, e.g., Hein, 1998 for a more in-depth account).

It appears that many designers of museum exhibitions are influenced by a number of interrelated epistemological philosophies that are collectively referred to as constructivism (Kukla, 2000; Twomey Fosnot, 1996; von Glaserfeld, 1995; Ernest, 1998; Rogoff, 1990; Lave & Wenger, 1991). An overview of two influential epistemologies within constructivism is provided in Paper D. Historically, museum learning has often been thought of as a form of transfer of knowledge, that is, learners were seen as “decoders” of messages that had been “encoded” into the exhibition by the curator or the design team. In other words, if the exhibition was correctly designed and there was no “interference” during the visit, all visitors would, at least in theory, acquire the same knowledge from the exhibition (Hooper-Greenhill, 1994; pp. 28-43).

However, from a constructivist-oriented epistemological perspective, such a view of learning fails to capture the complex ways that knowledge acquired during the visit is shaped by later events (Falk & Dierking, 2000; pp. 3-13). Nor does it take into account the way that previous knowledge, interests, and the museum experience itself – including interaction with other visitors – shape the learning outcome (ibid., Hooper-Greenhill, 1994; Hein, 1998). Indeed, many museum educators are arguing that focusing on individual exhibitions may not be enough to fully account for learning in museums (Hooper-Greenhill, 1994; pp. 40-42). Museums are institutions that are part of society and culture in general. The public image of the museum depends on the experience people have of it, and this image is shaped by numerous factors, including not only the exhibitions and the buildings in which they are situated, but also outreach events, orientation facilities, publications and practical issues like the availability and quality of shops, cafés and toilets. The public image of a museum in turn influences the number of visitors, the number of recurring visits, and by extension, ultimately the learning outcome.

Technology in museums
Many museums experiment with new technologies, ranging from devices for replaying video clips to massively interactive IMAX cinema presentations. These technologies are used to enhance, augment or replace traditional exhibition techniques (e.g., Broadbent and Marti, 1997; Burgard et al., 1999; Aoki et al., 2002; Oberlander et al., 1997), or even to “virtualise” parts of the museum and make them available on the Internet (Cutler, 2000; Rayward and Twidale, 1999). During the last decade, museum-related technology has become an established field with research being promoted in conferences such
as the International Cultural Heritage Informatics Meeting (ICHIM) or Museums and the Web. Well-known journals of museum research also publish scholarly texts on technology (e.g., the special Curator issue on technology, 45(1), 2002). Most of this research, though, appears to be concerned with introducing new information technologies to the museum domain and experimenting with their possibilities and affordances.

**Participatory design**

The roots of the research area Human-Computer Interaction (HCI) can be traced back to the late 1960s, when a growing number of researchers became concerned about the ways in which humans interacted with computer systems. The need for "people-oriented" systems which reflected the needs and behavioural characteristics of users became a matter of major interest to the computing profession. Researchers in HCI studied *human factors in computing systems*, that is, the physical and psychological capabilities of humans, with a special focus on the way such factors come into play when humans interact with computer equipment. The rationale of most such research is that psychological experiments can increase understanding of the underlying principles of interaction between machines and humans (Schneiderman, 1998; pp. 28–29). The outcome is often guidelines for the design of computer interfaces or models of human performance in different task-based situations that involve computers (e.g., Card et al., 1980).

In the early 1970s, a new and partly opposing perspective on computing technology emerged from work within a number of Scandinavian research projects (Greenbaum and Kyng, 1991; Schuler and Namioka, 1993). The Scandinavian researchers tended to see most human factors research as problematic and claimed that it had a limited scope, which could lead to results that de-emphasised people's individual motivation, their membership in different communities of practice, and the importance of their work context. Rather, the Scandinavian researchers focused on the *ways in which new computer technology was being designed* just as much as on the specifics of the human-computer interface.

The first of these so-called *cooperative design* projects are often collectively referred to as the *Scandinavian tradition in computer systems design*. In the 1970s and 1980s, the Scandinavian countries had some distinctive features: they had high living standards, one of the highest educational levels in the world with full literacy, shared political traditions, similar socio-economic institutions, and a history of fairly intense and casual cooperation at all levels of society. In addition, they were open societies with an advanced technical infrastructure (Iivari and Lyytinen, 1998). This led to a lucrative environment for the exploitation of information technology. Furthermore, the level of unionisation was high and the national trade union federations held strong positions, in part because of their close connections to the large social democratic political
parties but also because the relations between trade unions and employers were regulated by laws and central agreements.

For example, the Swedish Joint Regulation Act of 1977 stipulates that employers must negotiate with the local trade union before making major changes in production (Ehn, 1993). The introduction of new computer technologies intended to support the planning of work and make it more efficient often resulted in substantial modifications of the production process. Consequently, the unions became increasingly interested in management issues. However, up until that time, the activities of the unions had mainly involved distribution issues (for example, wages and working hours), and they therefore lacked the necessary competence to initiate discussions. Thus, the support of activity-oriented researchers was requested (ibid.).

When the simulation programming language SIMULA became available in 1965, it was immediately used in a number of companies in Norway and Sweden in the analysis of workplace processes. Kristen Nygaard, who designed SIMULA together with Ole-Johan Dahl, held the view that their tool was used to promote an unfair Tayloristic view of management. Consequently, he contacted the Norwegian Trade Unions with the aim of assisting them in developing an information technology policy (Nygaard, 1992). This led to a research project, initiated in 1972, that involved the Norwegian Computing Centre (where Nygaard worked) and the Norwegian Iron and Metal Workers' Union (NJMF). Initially, the aims of the project included the study of existing computer-based planning and control systems and assessing the goals of the union in areas such as work conditions and organization control. Other goals included the formulation of a set of demands for computer-based systems and the evaluation of the need for knowledge within the Union in areas of planning, control, and data processing (Ehn, 1993).

However, the realization that the outcome of the project, as originally conceived, would not directly benefit the Union necessitated a reformulation of the project goals towards a more action-oriented approach. In the new formulation, the project results were seen as actions carried out by the trade unions at local or national levels (Nygaard, 1992). Consequently, a small number of workplaces were selected, and an investigation group consisting of union members was formed at each of them. These groups were encouraged to accumulate knowledge about process control, to investigate problems of special importance to the local unions, and to take actions directed at management in order to change the way new technology was being introduced. The outcome of the NJMF project was a number of "data agreements" - both local and national - that regulated the design and introduction of computer-based systems and the availability of related information (Ehn, 1993).
The success of the NJMF project inspired a number of similar projects across Scandinavia, such as the four-year Swedish DEMOS project (Trade Unions, Industrial Democracy, and Computers). The project, which was initiated in 1975, aimed at identifying how the unions could influence the design and use of computer-based systems at local company levels (ibid.). However, projects like DEMOS and NJMF could only influence the way technology was being introduced to a certain degree. In particular, the technical limitations of the traditional systems advocated by management made it difficult to develop alternative, union-approved workplace organizations. Thus, a number of projects were initiated to support the design of completely new technologies.

One of the most influential of these was the UTOPIA project (Training, Technology, and Products from a Quality of Work Perspective) that was begun in 1981. The project was a collaboration between the Nordic Graphics Workers' Union, the Swedish National Institute for Working Life, and the Computer Science departments at Aarhus University and the Royal Institute of Technology in Stockholm. The primary goal of the project was to develop opportunities for workers to influence the design of computer-based workplace technologies, the rationale being that such an influence would have a positive outcome on the design. Thus, the project attempted to investigate how the then recently developed graphical workstation could support common tasks in the newspaper cutting room. The project group consisted of six graphics workers and about 15 researchers (Bodker et al., 1987; Bodker et al., 2000).

One of the main contributions of UTOPIA was its development of a "tools perspective" on computer systems design. From this perspective, new technology should be developed as an extension of the current practical understanding of tools and materials at a given workplace. Users were seen as having knowledge (often tacit) of how they go about their work, while often remaining unaware of the new possibilities offered by the introduction of new technology (Bodker et al., 1991). At the same time, the computer system designers, who do know the technology, often lack important knowledge about the workplace (Ehn, 1993). Consequently, UTOPIA attempted to initiate a process of mutual learning between designers and workers, which involved demonstrating existing state-of-the-art technologies to the workers and visiting workplaces where modern technology was being used. However, communication issues became increasingly problematic when the project moved on to the design of new systems. The reason was that the workers did not share the developers' concepts and language (for example, the use of data and information flow diagrams). As a result, a more concrete "design-by-doing" approach was adopted where the workers carried out hypothetical work scenarios using low-tech prototypes (for example, paper, cardboard boxes, and slide projectors) (Ehn and Kyng, 1991). The ensuing designs were then implemented as a prototype system, which was used for a time at Aftonbladet (a Swedish newspaper). For numerous reasons, the prototype was
never developed into a marketable product (Bødker et al., 2000; Ehn 1993). From a methodological perspective, however, the UTOPIA project was a substantial success and it has spawned a number of similar projects, one of which is KidStory, which is described in Paper A.

During the late 1980s and early 1990s, the Scandinavian projects became more widely known within the field of HCI, which led to numerous attempts at implementing their methodologies under the name participatory design in the United States (Schuler and Namioka, 1993; Muller et al., 1993). However, because of differences in socio-economic structures (for example, the lower level of unionisation in the United States), the political aspects that were central to the original Scandinavian projects have been downplayed in their North American counterparts. Indeed, it is questionable whether the Scandinavian tradition has remained true to its original intentions of democratizing the workplace (e.g., Bansler and Kraft, 1994; Iivari and Lytyinen, 1998; Bødker et al., 2000). Furthermore, it seems that most of the Scandinavian projects have failed to achieve sustainability; when the researchers’ involvement ended, most of the workplaces reverted to previous activities (Clement and Van den Besselaar, 1993). Thus, the most important contribution of the cooperative design movement appears to be the introduction of a number of methodologies for involving users in design. Although democratization is often an underlying philosophical ideal in many ’second generation’ projects, they tend to focus more on the development of efficient prototyping or work analysis techniques rather than on workplace reorganization (e.g., Crane, 1993; Floyd, 1993; Bennett and Karat, 1994; Muller, 1993; Muller, 2001). A notable exception is the UsersAward project, which involves users in the design of tools for organising work (Wallidius et al., 2004).

In summary, cooperative and participatory design research is typically concerned with different issues than traditional human factors research (Bannon, 1991). More specifically, cooperative and participatory design research tends to

- Focus on workplace group dynamics rather than on individuals using the computer in isolation.
- Acquire knowledge about workplace organizations rather than conduct research from within the laboratory.
- Focus on expert users rather than on novices.
- Design new systems through iterative prototyping rather than analyse existing systems.
- Design with users rather than for users.
- Advocate the use of iterative prototyping as an alternative to user requirements specifications.
The work described in this thesis is more concerned with involving users in design than in bringing about sustainable change in organizations. Thus, I see it as a contribution to the field of participatory design rather than cooperative design, which is also reflected in the terminology I use.

**Collaborations with exhibition producers**
This thesis is largely concerned with different kinds of collaboration. Over the course of research the Centre for User-Oriented IT Design (CID), where the research was carried out, has collaborated with three different exhibition producers: the Museum of Science and Technology, the Vasa Museum, and Swedish Travelling Exhibitions. The research has mainly been funded by the Swedish Agency for Innovation Systems (VINNOVA) and the exhibition producers through so-called *industrial partnerships*. The goal of these partnerships is to allow organizations (both governmental and user/union organizations) and companies to collaborate with academia in projects that are of mutual benefit. Each partnership is regulated in a contract that describes the extent of the collaboration and the nature of the resource contribution from CID and the external partner. In this case, the exhibition producers have contributed mainly through work hours and funding, but also through, for example, exhibition space and work materials. CID has contributed with work hours, research results and artefacts in the form of exhibitions and exhibits. The following sections provide further details.

**CID and the Museum of Science and Technology**
The Museum of Science and Technology was founded in 1924 by the Royal Swedish Academy of Engineering Sciences, the Confederation of Swedish Enterprise, The Swedish Inventors' Association, and the Swedish Association of Graduate Engineers as a means for preserving Sweden’s technical and industrial cultural heritage. A building for the museum was inaugurated in 1936, and the collections have remained there ever since. The museum became a foundation in 1947 and has received governmental support since 1964. Today, the museum produces exhibitions that focus on both industrial history and modern and future technologies. It also has a science centre called Teknorama.

The relationship between CID and the museum was initiated in 2000 through work on a production at the Swedish Museum of Natural History, where the current head of Teknorama worked at the time. When she moved back to the Museum of Science and Technology in early 2001, the collaboration with CID continued, mainly through activities within the EU/IST-funded project SHAPE (Situating Hybrid Assemblies in Public Environments). After SHAPE’s public demonstration of an installation called *ToneTable* in January 2001, the museum became interested in hosting a similar exhibit in Teknorama, which initiated work that led to a new installation called the *Well of Inventions*. The *Well of Inventions* opened in May 2001, and at the time of writing (March 2005), it is still on display. *ToneTable* and the *Well of Inventions*
are the focus of Papers C and E. In the summer of 2003, the Museum of Science and Technology signed a CID industrial partnership contract and a number of new activities were spawned, including an exhibit called the Mighty Five (described in Paper F), which opened in Teknorama in November 2004.

CID has produced and designed all the exhibits that have resulted from the collaboration with the museum. Although all of the productions have involved collaboration to a large extent, the main role of the museum has been to act as a host for the exhibits. Also, most of the funding for the activities (materials, technology, time spent, etc.) has been provided by different projects at CID. However, the CID exhibits have been treated by the museum staff as “proper” Teknorama exhibits, even though they are not part of the museum’s general repertoire. The museum’s educators have learned about the exhibits (and also present them on occasion), and they are overhauled regularly by the museum’s maintenance staff.

CID and the Vasa Museum

Vasa is one of the world’s most famous marine archaeological artefacts. In 1625, the Swedish king (Gustav II Adolf) commissioned a number of new warships, of which one was Vasa. The ship set out on her maiden voyage on 10 August 1628. However, because of a number of serious flaws in the design, the ship sank just a few minutes after she set sail. Since it was thought to be impossible to salvage the entire ship at the time (the depth was about 30 meters), she was left more or less as she was until 1956, when she was rediscovered by the shipwreck specialist Anders Franzén. On April 24, 1961, Vasa was salvaged and placed in a temporary building where she was conserved during the following 17 years. The current Vasa Museum was inaugurated in 1990.

During the fall of 2000, sulphate deposits were discovered on the surface of the ship. This led to the discovery that the wood contains a large amount of sulphur (assimilated from the water when the ship was resting on the sea bottom), which has gradually reacted with oxygen to form sulphuric acid. The acid and its deposits threaten to destroy the ship if nothing is done to terminate the process. Today, the reasons behind the problem are well understood, but a satisfactory solution does not yet exist (Sandström et al., 2003). Five different chemistry and conservation research teams have been engaged to study the problem. In addition, a small temporary exhibition has been produced to inform the general public about the condition of the ship. During the spring of 2003, ideas for a new large-scale exhibition were discussed among the museum’s curators. As the new exhibition was to present the complex results of the research to the general public in some way, it was felt that the museum needed to know more about user-oriented design. Consequently, CID was contacted by the person who was head of exhibitions at the time. The National Maritime Museums organization (of which the Vasa
Museum is part) signed a CID industrial partnership contract in the summer of 2003.

Because of the large scope of the production, and because of frequently changing requirements, I suggested that CID focus on the part of the exhibition that seemed to be firmly established: the part where the general public was introduced to the sulphuric acid problem. This led to the research activities described in Paper B. The intention was to allow CID to develop a number of concepts, build a prototype exhibit, and evaluate it. If the exhibit was successful, CID would help to incorporate elements from the prototype into the actual exhibition. Unfortunately, the head of exhibitions left the National Maritime Museums organization during the spring of 2004, which caused the entire project to be postponed. Consequently, CID decided to focus on other activities, and there has been no further collaboration between CID and the Vasa Museum since.

**CID and Swedish Travelling Exhibitions**

Although Swedish Travelling Exhibitions is one of Sweden’s most well-known exhibition producers, it is not a museum. Rather, it is a governmental authority that creates touring exhibitions. It started as a trial activity in 1965 and became an official government authority in 1985. One of the main goals of authority is to make culture (in the form of exhibitions) available to people who do not live in or close to the larger Swedish cities (where museums are abundant). Another important goal is to develop the exhibition medium itself: artistically, educationally, and technically. Many of the early productions consisted of touring collections of objects and works of art lent from different Swedish museums. Today, however, the content of most of the exhibitions is designed and developed by the authority itself. Swedish Travelling Exhibitions has also made use of a number of mobile spaces, that is, vehicles that have been converted into exhibition spaces (or have been built specifically for hosting exhibitions). Examples include boats, trains, buses, and trucks.

CID and Swedish Travelling Exhibitions established contact during the summer of 2003. The authority was in the early stages of producing a new exhibition about children’s storytelling called *Once upon a time...*, which was to be the first to tour in the authority’s new mobile space (a special-purpose truck that can be converted into 90 square meters of exhibition space). Furthermore, the intention was to work together with children to develop the content, and the exhibition would feature computer-based technology to support and encourage storytelling activities. As can be seen from the account in Paper A, such activities clearly matched CID’s competence profile, so after a few meetings it was decided that CID would take part in the project, with two main goals: to assist with technology development and to establish a dialogue with the children. Swedish Travelling Exhibitions signed a CID industrial partnership contract, and I was invited to become a member of the
project team. The first project meetings I attended took place during the fall of 2003.

Initially, the collaboration was fruitful. CID participated in meetings with different kinds of specialists, and also visited one of the schools that would provide access to the project's reference group, that is, a group of children (aged 11-13) who represented the target audience of the production. A few months into the project, a scriptwriter and a set designer were engaged to work with the content. However, as time went by it became increasingly difficult for the producer to find activities for CID to participate in. Clearly, CID had a competence profile that should fit the project but nevertheless, it was difficult for the producer to find a suitable role for the design centre. On August 23, 2004, CID was formally asked to leave the project. From CID's point of view, the reasons for why the collaboration was unsuccessful were puzzling. Consequently, I decided to attempt to analyse the process. The study, analysis, and results, which should be seen as a separate knowledge contribution to this thesis (in addition to the papers), are described in Chapter 3 below.

Research questions, perspectives, and scientific method

This thesis is concerned with the design of technology for museum exhibitions. More specifically, I have been particularly interested in the ways in which visitors can contribute to museum exhibition design and how technology can support learning-related activities within museum exhibitions. The research has been carried out from a visitor-oriented perspective, that is, the research focuses on visitors, visitors' activities within the museum, relationships between visitors, and relationships between visitors and the museum. Thus, the museum is considered to be a context for the work. More specifically, the work focuses on two main issues: participatory design in museums and learning-oriented activities in museums.

As outlined above, the design of exhibitions on cultural heritage is a well-established work practice that has been subject to numerous significant changes over the years. Today, the audience's encounter with the exhibition appears to be an increasingly important concern for many exhibition designers. Technology is often considered a means of providing visitors with new experiences and opportunities for learning. However, it appears that researchers have only recently begun to show an interest in how modern technology is actually being used by visitors (e.g., Falk & Dierking, 2000, pp. 190-191; Heath et al., 2002), and many museums appear to be struggling in their efforts to incorporate new technologies in their established exhibition design practices (vom Lehn & Heath, 2003). Thus, on the one hand, many museums are seeking more visitor-focused ways of carrying out design (with the help of, for example, different forms of evaluation or feedback). On the other hand, many museums seem to have little experience with designing technology in a user-oriented fashion. Thus, HCI, with its long tradition of involving users in
design, was in a position to provide museums with new ways for audiences to contribute to exhibitions with their knowledge, experience, opinions, and desires. Consequently, my first research question was

• How can knowledge of participatory design within HCI be applied in the museum domain to include visitors in the design and evaluation of exhibitions?

The second set of issues with which my thesis is concerned is how technology can be used to support learning-related activities in museums. Education and learning is of primary concern to most museums, and many museums base their notion of learning on constructivist epistemologies. These epistemologies, in turn, suggest that certain types of activities in museums, such as interpretation, communication and collaboration, are more important than others for supporting learning. Thus, my second research question was

• How can technology be used in museum exhibitions to support and orchestrate different social activities related to learning?

The two research questions can be seen as two different, yet interrelated perspectives on museum exhibition design. From the first perspective, the visitor’s desires, wishes, experiences, and knowledge become the focus of the design activities. From the second perspective, different social activities and relationships between visitors in museums become the focus of the design activities. These two perspectives can (and in my opinion, should) be seen as complementary. Together, they outline an approach to museum exhibition design where visitors are of primary concern, both concerning the content presented in exhibitions and concerning the way exhibitions orchestrate and support different forms of social interaction.

The two research questions are largely exploratory in nature, that is, the goal was to learn more about the possibilities (and outcomes) of combining design methodologies with roots in HCI with design methodologies from the museum domain. To generate such knowledge, I have chosen to work in an operational as well as observational manner. The research is – intentionally – organized to cause an effect (with subsequent studies of the outcome) in the sense that I have adapted HCI methodologies for the museum domain and tried to investigate the outcome of applying them there. However, I have tried to do so in a way that respects the design traditions and design practices of the museum. Thus, most of the activities have been carried out with the intention of interfering as little as possible with the museum’s normal activities. As described in Chapter 3, the main exception is the collaboration with Swedish Travelling Exhibitions, where the intent was to integrate participatory design methods within an actual exhibition.
To answer the research questions, it was also necessary to generate other types of knowledge, such as descriptive, explanatory/diagnostic, and historical/reconstructive knowledge. However, it should be noted that the research is not concerned with generating normative knowledge (that is, the development of guidelines and rules), nor is it concerned with generating predictive knowledge. Rather, the contributions should be seen as a foundation from which hypotheses and discussions concerning visitor participation in museum exhibition design could be developed.

To me, the nature of the research questions in combination with the visitor perspective suggested a qualitative approach to knowledge generation. In other words, the research has been concerned with the nature of the relationships between the participants and organizations involved in the case studies, the way the activities were designed and managed (and with what outcomes), how the participants experienced the collaboration, and how the subsequent exhibitions were received and interpreted by visitors. Consequently, the analysis and data collection methodologies used are highly qualitative in nature. Examples of data collection methodologies that appear in the thesis include interviews, contextual inquiry, and ethnography-inspired behavioural observation. The main analysis methodology used is grounded theory (Strauss & Corbin, 1998).

As we shall see, the activities described in the papers do not make a clear distinction between the design of technology and the design of exhibitions. The reason is that in museums, the technology and its corresponding user interfaces cannot be considered in isolation – the way the technology is designed influences, shapes, and even orchestrates people’s activities (see, e.g., Hindmarsh et al., 2002). Thus, designing technology for the museum is not simply a matter of designing an appropriate user interface. Rather, it is about how technology can be integrated into exhibits and exhibitions and about how technology can support and suggest different activities and behaviours.

**Stakeholders**

The work reported on in this thesis addresses several communities. One important group is persons involved in museum exhibition design: producers, project leaders, exhibition designers, educational staff, technicians, and so on. For such persons, the work should be considered a smörgåsbord of techniques and technologies with two main functions: 1) supporting and facilitating dialogue between production teams and visitors and 2) supporting and orchestrating learning-related activities in exhibits and exhibitions.

Another important stakeholder group is persons involved in HCI who are interested in how participatory design methodologies can be applied within new domains. Such readers may be particularly interested in the way I have modified (and built on) existing methodologies within HCI, how the new methodologies have been received within the new domain, and the designs
resulting from their use. Furthermore, the techniques and technologies for supporting learning-oriented activities in museums may very well be useful in HCI as well.

However, the most important stakeholder group is museum visitors. The main goal of the work reported on in this thesis is to provide new ways for the general public to communicate their wishes, desires, experiences and knowledge to museum exhibition designers. In other words, empowering “ordinary” people in order to provide them with new opportunities for shaping and influencing museum exhibition design is the core idea behind this thesis. Thus, the spirit in which my work has been carried out is that of increasing opportunities for democracy, that is, providing new ways for the general public to have a direct influence over how their own cultural heritage is exhibited and portrayed.

**Thesis disposition**

Figure 1 illustrates how the thesis is organized and how the research questions cut across the different papers.

![Diagram](image)

**Figure 1. Thesis overview.**

The rest of this thesis is organized as follows: Chapter 2 provides an overview of the papers that constitute the core of the thesis. As mentioned above, Chapter 3 contains an analysis of a breakdown of the collaboration between CID and Swedish Travelling Exhibitions. Chapter 4 discusses the knowledge contributions from the papers and Chapter 3 from a number of different
perspectives. Chapter 5 draws a number of general conclusions from the work and suggests directions for future research.
2. Paper overview

This chapter contains an overview of the six papers on which this thesis is based.

Paper A: KidStory: A Technology Design Partnership with Children

Gustav Taxén, Allison Druin, Carina Fast, and Marita Kjellin


The roots of my work can be traced back to the EU-funded KidStory project (1998–2001), which was concerned with how children could work together with technology designers and educators to create storytelling tools. One outcome of the project's activities in Stockholm was a design methodology that made such collaboration easier. The methodology, which I designed together with other participants in the project, is summarized in Paper A. It is a variation of cooperative inquiry (Druin, 1999) and makes use of three different types of workshops:

- Education workshops, where the goal is to assist the children in constructing knowledge about design and technology.
- Evaluation workshops, where the goal is to assist the children in evaluating technology products and prototypes.
- Brainstorming workshops, where adults and children work together using low-tech prototyping to generate new technology ideas.

When KidStory began, the project differed from previous work in several important respects:

- The work was carried out in the school rather than in the laboratory.
- KidStory worked with younger children than previously (5–7 years old when the project started).
- KidStory worked with larger groups of children than previously (roughly 30 children participated throughout all three years of the project).

The KidStory work is, as far as I know, still unique in that it engaged such a large and heterogeneous group of young children in design for such a long
time period. The design methodology worked very well and led to a number of interesting prototypes, some of which are described in Paper A. Although they were not thought of as such at the time they were developed, many of these prototypes can be seen as interactive exhibits or installations. Examples include a “story owl” that would tell you stories from around the world, a “magic sofa” that would transport its users to exciting places, and a “technology fair” where some of the prototypes were integrated and exhibited to the children’s parents and relatives. Indeed, one of the more successful of the prototypes, a drawing application called KidPad (which was developed by Juan-Pablo Hourcade, Benjamin Bederson, me, and Allison Druin) has been featured in several exhibitions at the Museum of Science and Technology. This, in conjunction with the fact that the design methodology worked very well with such young participants, made the KidStory approach a suitable candidate for adaptation for the museum domain.

**Paper B: Introducing Participatory Design in Museums**

Gustav Taxén


The work described in Paper B addresses the conceptual phase of museum exhibition production. In the summer of 2003, CID was contacted by the director of exhibitions at the Vasa Museum in Stockholm, who was in the early stages of organizing a new production. Since it was very likely that the new exhibition would feature both advanced computer-based technology and provide visitors with complex information, she wanted to draw upon CID’s usability expertise. At the time, it was known that the exhibition would contain a section with background information and a section with information that would be modified and developed over time. Because the background section seemed easiest to begin with, it was decided that the collaboration between CID and the Vasa Museum should focus on that.

Paper B describes how I designed, organized, and hosted a series of workshops where a number of the museum’s educators and curators worked together with representatives of one of the target groups of the exhibition – high school students – to create concepts for providing visitors with background information. The workshops were based upon the KidStory methodology (although, as it turned out, no educational sessions were necessary). The students first evaluated the current exhibitions at the Vasa Museum, which resulted in a set of “design sensitivities” that guided the rest of the work. Two sessions followed in which the students worked together with members of the museum’s staff to develop and refine concepts for the new exhibition. The final session was devoted to feedback: I provided the students with an overview of how their concepts related to current trends within museum research, and the students provided me with their opinions on the work methodology itself. The outcome of the design activities was
three detailed exhibition concepts with a number of interesting technological and pedagogical features. As described in the paper, these features were also relevant in the sense that they addressed current issues within museum technology research.

**Paper C: The Well of Inventions - Learning, Interaction, and Participatory Design in Museum Installations**

Gustav Taxén, Sten-Olof Hellström, Helena Tobiasson, Mariana Back, and John Bowers


A large amount of my work has been carried out as part of the EU-funded SHAPE project (2001–2004). One of the main goals of SHAPE was to investigate how assemblies of technology could provide new forms of public experiences, with a particular focus on public experiences in museums. As described in Paper C, *ToneTable*, one of the first demonstrators of the project (designed and developed by John Bowers, Sten-Olof Hellström, and me in February 2001) was extended and redesigned by me, Sten-Olof Hellström, and Helena Tobiasson to become the *Well of Inventions*, a small exhibition that opened at the Museum of Science and Technology in Stockholm on 22 May 2001.

Similar to many other museum exhibitions, the *Well of Inventions* was evaluated through behavioural observation and interviews with visitors and museum staff (carried out by me, Sten-Olof Hellström, and Helena Tobiasson). However, the exhibition was also evaluated in a series of workshops, which I designed, organized and hosted. The main goal of these workshops was to provide an opportunity for visitors to provide direct feedback, with a particular focus on generating ideas for improving the exhibition. In terms of participatory design, the *Well of Inventions* was a prototype, and the workshops were designed to provide ideas for refinement.

When I compared the data that resulted from the workshops with the data generated by the behavioural observation and interviews, it became clear that, to a very large extent, the issues raised in workshops were similar to those raised by the other forms of evaluation. Thus, the workshops provided relevant evaluation data. But in addition, the workshops also provided numerous design ideas for improving the exhibition.

Paper C also describes how constructivist models of learning motivated the design of the *Well of Inventions*. As described in Paper D, one of the core notions within constructivism is that learning is, to a large extent, supported and aided by discussion and dialogue between people. Thus, one of the main goals of the *Well of Inventions* was to augment the basic interaction principles present in *ToneTable* with new content to encourage such discussion and
dialogue, in particular concerning topics related to basic principles of mechanics (to which a large portion of the Museum of Science and Technology is devoted). A more detailed overview of the design of the Well of Inventions and the evaluation workshops can be found in my licentiate thesis (Taxén, 2003).

**Paper D: Teaching Computer Graphics Constructively**

Gustav Taxén  

A central issue in this thesis is that of learning, and Paper D provides an account of the epistemology and philosophy of learning that has been most influential in my work, that of constructivism. The central notion of constructivism is that we construct our own individual understanding of what we experience and that we are constantly renegotiating this understanding through communication with others. Thus, for constructivists there can be no transfer of knowledge. In other words, knowledge cannot be directly “transmitted” from one person to another. Rather, constructivists tend to see the development of a shared understanding as a social negotiation that is mediated through, say, spoken language or written text. Paper D reviews two influential constructivist epistemologies and outlines a number of corresponding pedagogical and didactical approaches. The paper also describes how I attempted to introduce such a didactical approach in university education.

It is important to note that I am in no position to argue that constructivist epistemologies represent the truth of how learning takes place; neither in museums nor elsewhere. Just like many museums do today, I tend rather to view constructivism as an interesting philosophy for guiding the design of exhibitions. In other words, the learning-related contributions of this thesis are not primarily concerned with the outcome of the learning processes that occur in museums. Rather, the contributions should be seen as examples of how constructivist philosophies and epistemologies can provide novel approaches towards the design of exhibition technology.

**Paper E: Designing Mixed Media Artefacts for Public Settings**

Gustav Taxén, John Bowers, Sten-Olof Hellström, and Helena Tobiasson  

Paper E provides additional details of the relationship between *ToneTable* and the *Well of Inventions*. As described in Paper C, one goal of the *Well of Inventions* was to encourage discussions and dialogue between museum visitors. Another important goal was to retain many of the desirable features in *ToneTable*. The most important of these was *ToneTable’s* ability to encourage
collaboration and coordination between users. Paper E describes how a set of
*design sensitivities* (developed by John Bowers, Sten-Olof Hellström and me)
inspired the design of *ToneTable*, how these sensitivities were evaluated, and
how they were incorporated in the *Well of Inventions*.

**Paper F: The Extended Museum Visit: Documenting and Exhibiting
Post-Visit Learning Experiences**

Gustav Taxén and Emmanuel Frécon

In J. Trant and D. Bearman (eds.), *Museums and the Web 2005: Proceedings*,

Paper F describes an attempt at allowing visitors to contribute with content
for an exhibit in its functional phase, that is, when it is on display. The exhibit,
which I conceptualized, was hosted by the Museum of Science and
Technology and was designed and implemented in collaboration with
Emmanuel Frécon and Anders Wallberg at the Swedish Institute of Computer
Science. The intention was to support a group of exhibits in the museum’s
science centre called the *Mighty Five*, which illustrate five mechanical
principles: the screw, the plane slope, the lever, the wheel, and the wedge.
The main inspiration for the new exhibit was constructivist-oriented research
on post-visit experiences (e.g., Falk & Dierking, 2000), which suggests that the
learning processes that take place in the museum do not end when visitors
leave. Rather, it seems that many people draw fundamental conclusions that
are related to their visit *outside* the museum, after the visit, when they
encounter a situation that allows them to “make a connection”. Documenting
and exhibiting such situations was the main goal of the new exhibit, which
was designed as a virtual logbook where visitors could record their museum-
related experiences through cell phone SMS and MMS messaging or through
e-mail.

As it turned out, it was very hard to encourage visitors to contribute from
outside the museum. The evaluation of the exhibit suggested that this was
partly due to problems with the design and location of the exhibit itself. It also
appears that for many people, the museum visit ends when they leave the
building, that is, it has no conscious post-visit phase where the experiences of
the visit are developed and elaborated upon. Thus, even if a situation is
recognized as a museum-related learning experience, it may be difficult to
remember the *Mighty Five* exhibits. More importantly, however, there is no
immediate “reward” for contributing from outside the museum – it is
impossible to see how the contribution appears in the exhibit unless one
returns to the museum later.

Nevertheless, I collaborated with the museum to organize a set of
paedagogical activities in the museum that involved the logbook. For
example, we developed and organized a “treasure hunt” where children
would search the museum for machinery that implemented the mechanical
principles depicted in the *Mighty Five* exhibits. The children would then use a
digital camera to send pictures back to the logbook. This was a successful
activity, and the museum has subsequently repeated it with a number of
groups of children of different ages.

**Summary of personal contributions**

<table>
<thead>
<tr>
<th>Paper</th>
<th>Contributions</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Wrote paper. Co-authors contributed with paragraphs, comments, suggestions, and took part in the work described in the paper. Methodology development: preparatory work, methodology design, session design, session facilitation, data collection, collaboration with children. Programming: wrote code for <em>KidPad</em> and other prototypes.</td>
</tr>
<tr>
<td>B</td>
<td>Wrote paper. Methodology development: preparatory work, methodology design, session design, session facilitation, data collection, analysis of session outcomes.</td>
</tr>
<tr>
<td>C</td>
<td>Wrote paper. Co-authors contributed with comments, suggestions, and took part in the work described in the paper. <em>ToneTable</em>: co-designer, designed and implemented the graphics and input device support, technical integration, session facilitation, data collection. <em>Well of Inventions</em>: project leader, concept designer, designed and implemented the graphics and input device support, technical integration. Evaluation methodology development: preparatory work, led the summative evaluation work, summative data collection, designed and facilitated workshop data collection, data analysis, triangulation.</td>
</tr>
<tr>
<td>D</td>
<td>Wrote paper. Methodology development: preparatory work, methodology design, session design, session facilitation, data collection, analysis of session outcomes.</td>
</tr>
<tr>
<td>E</td>
<td>Wrote paper with John Bowers. Edited the paper. Other co-authors contributed with comments, suggestions, and took part in the work described in the paper. Co-designer of the “design principles”, adapted the principles for the <em>Well of Inventions</em>, data collection (<em>Well of Inventions</em>), data analysis (<em>Well of Inventions</em>).</td>
</tr>
<tr>
<td>F</td>
<td>Wrote paper. Co-author contributed with paragraphs, comments, suggestions, and took part in the work described in the paper. Project leader, concept designer, designed and implemented the graphics and the client software, data collection, data analysis, initiated pedagogical activities, co-facilitated pedagogical activities.</td>
</tr>
</tbody>
</table>
3. When design traditions clash

Gustav Taxén  
March 2005

As described in the Introduction, Swedish Travelling Exhibitions and CID initiated collaboration on a new exhibition called *Once upon a time...* during the fall of 2003. Although the collaboration was fruitful initially, it became increasingly difficult for the producer to find activities for CID to participate in as the project proceeded, and in the fall of 2004 the collaboration broke down. From CID’s perspective, the reasons behind the breakdown were unclear, so I decided to attempt to analyse the situation. This chapter contains a description of the analysis and the results and should be seen as a separate knowledge contribution to this thesis (in addition to the papers).

The analysis was carried out using the Grounded Theory methodology (see, e.g., Strauss & Corbin, 1998), and it is based upon two open interviews (conducted on 17 September 2004, and 18 January 2005) with the producer. The basic set of concepts and relations in the analysis were abstracted from the first interview. The second interview provided further detail, a few corrections, and additional data for a few unclear concepts and relations. After the analysis was complete, it was sent back to the producer for verification. Appendix A contains the coding of the concepts and relations.

Note that the analysis does not constitute a theory in the sense of Strauss and Corbin. The goal here was not to build theory but rather to understand the relationships between the actors involved and the complex chain of events that led to the breakdown.

**Project timeline**

The production of *Once upon a time...* is summarized in the *project timeline* diagram (Figure 2, overleaf). This diagram features the most significant project contributors and illustrates in which phase of the production they are most important. Note that most projects at Swedish Travelling Exhibitions (STE) are different from one another, and it is not at all certain that all projects are carried out in the same way as *Once upon a time...* Most productions, however, seem to go through the same general phases as productions at other
exhibition producers (that is, conception, development, a functional phase, and assessment).

The production process (which is laid out horizontally in the centre of the diagram, from left to right) begins with a project proposal. All proposals are screened by the U.T.E. group. The abbreviation (in Swedish) refers to the three main members of the group, which are the director of exhibitions, the head of technology, and the head of Expooneteket (which is STE’s library and archive of previous productions). Other participants in the group are the deputy director of exhibitions, and the exhibition assistant. STE’s commission from the Ministry of Education, Research, and Culture is freely interpreted by STE, which results in a number of priorities. These priorities are one of the tools that the U.T.E. group uses to determine whether or not a project proposal should be accepted. Projects that pass the screening process are also subjected to an additional selection, which is carried out by the director of exhibitions. Here, important factors include the artistic potential of the proposal and whether it fits STE’s current repertoire. If the proposal is accepted, it becomes the foundation for a feasibility study, and a person responsible for the study is selected. This person may be a producer at STE or someone else. In Once upon a time..., the person responsible for the feasibility study was the person who then became producer of the exhibition.

The purpose of the feasibility study is to turn the project proposal into a description of an exhibition project. This description includes a goal description, a budget, and an outline of a tour plan. The goals of the exhibition are formulated by the person responsible for the feasibility study, and they are shaped by a number of factors, including planned external activities, meetings with specialists and contributions from external partners. When the feasibility study is complete, it is sent back to the director of exhibitions who decides whether or not the project should be carried out.

This leads to a design process where the content of the exhibition is created. The project leader and the producer are important during this phase. The project leader is responsible for keeping the budget and time plan of the project, while the producer has the artistic responsibility (more on this later). In Once upon a time..., the same person was both producer and project leader. The project team, that is, the team responsible for designing and implementing the exhibition and its tour, also included a technician, an exhibition coordinator, and three external partners. They were the scriptor, who was responsible for the textual/linguistic content of the exhibition, the set designer, who was responsible for the physical shape of the content, and myself.
Figure 2. Project timeline.
When the content of the exhibition has been fully developed, an implementation phase follows. The goal of this phase is to use technology to turn the description of the content into a (physical) exhibition and prepare it for its tour. The exhibition is received by arrangers, for example, museums, libraries, or art galleries. Some arrangers are invited to arrange seminars (hosted by STE) where they can give feedback on existing exhibitions and provide suggestions for future productions.

Typically, each production is also evaluated, both concerning the way the exhibition is received by its audience and concerning the design process.

**Design process**

The design process diagram (Figure 3) illustrates how I have interpreted the design phase of *Once upon a time...*, that is, how the different actors and the most important concepts relate to one another. Again, it should be noted that all of STE’s productions are different and that it is not at all certain that all design processes work in the same way as in *Once upon a time...* Nor is it certain that the design process continued in the way described here after CID was asked to leave the project.

There are five types of actors in the diagram: producer, external partners, the inner creative group, the reference group, and the recipients. Each type of actor is represented by a grey box which surrounds the concepts that “belong” to the actor. Two central/fundamental concepts are marked in bold: introduction process and project phase. As described below, these concepts are likely to be the key to the reason why the producer decided to interrupt the collaboration with CID.

STE’s commission entails a number of goals and directives, including the requirement of reporting back to the Ministry of Education, Research, and Culture. STE interprets these goals relatively freely, which leads to a number of priorities, which in turn shapes the feasibility study, which in turn provides the overall goals for the exhibition. One of STE’s priorities is children and adolescents, which is one of the reasons why *Once upon a time...* was given the go-ahead. The goals of the feasibility study are those goals against which the content of the exhibition is compared and interpreted.

Each potential external project partner has a set of work skills, and a prerequisite for being able to participate in the project is that these work skills “match” whatever the producer feels is required at the time of introduction. Work skills include, among other things, experience, openness (that is, that one allows oneself to be influenced by others), values and opinions, knowledge, and interests. When the existence of a potential project partner becomes known to the producer, an introduction process may be initiated. During this process, the producer acquires knowledge (which may or may not be correct) about the
partner's work skills. This knowledge determines whether the partner is suitable for the project.

In *Once upon a time...*, the inner creative group was responsible for the design process that produces the content of the exhibition. A number of factors shape the content. First, the high-level goals from the feasibility study are
continuously interpreted by the members of the project team according to their knowledge and interests. Second, the producer takes part in the discussions of the inner creative group and, if necessary, exercises control over the content if it fails to meet the goals of the feasibility study. Third, the content is shaped by the experience of each external partner. For example, at an early stage during the production of *Once upon a time...*, it was decided that the content should be based upon features from the scriptwriter's previously published books and CD-ROMs for children. Experience appears to be a fundamental part of the partners' work skills; if a partner has experience that is suitable for the project, that partner is also assumed to be able to develop a strategy for accomplishing the goals of the project.

Thus, experience motivates one or several work methods, which shape the design process and the meetings with the reference group. It was felt to be necessary for the inner creative group to have some sort of idea for the content of the exhibition before they could meet with the reference group. Such ideas were influenced by the goals in the feasibility study, but above all, they were defined by the work of the inner creative group. The ideas could be unclear and vague, but some form of foundation for the discussion with the children was definitely considered necessary.

The content of the exhibition is shaped by the design process, but the design process is itself shaped by the content. For example, in *Once upon a time...*, the scriptwriter created a “map” of potential themes for the linguistic content of the exhibition, and the inner creative group then selected a subset of these themes for refinement (which is an activity that is different from selection). Thus, the design process is not static, but changes and evolves together with the content.

During its tour, the exhibition is visited by recipients. If the exhibition is designed “correctly”, each visit has the potential to become successful. What constitutes a successful visit is partly described in the goals for the exhibition, but it is also assumed that the external partners that are invited to participate in the project have knowledge that allows them to design for successful visits. In other words, it is the work skills of the participants that are the foundation for a successful exhibition design.

**Interpretation**

In *Once upon a time...*, the inner creative group was the catalyst that would help define the linguistic and physical content of the project. Clearly, the interests and knowledge of the entire project team were important and taken into account, but only the inner creative group had a direct influence over the content. The work methods chosen by the inner creative group shaped the meetings with the reference group and defined the purpose of each meeting.
There was no detailed plan for the content when the director of exhibitions at STE decided to accept the proposal for *Once upon a time...* The goals in the feasibility study were (deliberately) rather abstract and relatively vague with respect to content. One reason for this was that, during the feasibility study before CID joined the project, the producer had decided to engage a scriptwriter and a set designer to create the content. These two persons would be inspired by the children and learn more about them during the reference group meetings. Exactly how this was to be accomplished was not described in the feasibility study. Rather, the scriptwriter and set designer would be free to formulate an appropriate work method themselves, although the aim was to let the reference group meetings and content develop together in interplay. Still, it was vital that the experiences of the scriptwriter and the set designer became the foundation of the content. The artistic ability and creativity of these persons—that is, their work skills—guaranteed quality. The role of the reference group was mainly to provide inspiration and knowledge and, to some extent, to act as a focus group for testing ideas. This approach towards design was well-known to the producer and was felt to be natural, and she knew that it had been used successfully in other contexts.

CID, on the other hand, advocated an approach where the content would be shaped directly by the opinions, points of view, and wishes of the reference group. CID represented a perspective where the recipients of the exhibition are seen as the most important persons to consult if one wants to create inspiring and motivating content. Thus, the main purpose of the reference group meetings would be not to provide inspiration and knowledge but rather to allow the children to participate directly in the creation of the content. CID had used such an approach successfully in previous projects (for example, in KidStory), and were very much interested in using the approach again. Thus, CID strongly believed that the children’s experiences (rather than those of the scriptwriter and set designer) should become the basis for the content of the exhibition. The work methods that CID had used in previous projects would guarantee quality. From CID’s point of view, the scriptwriter and set designer should have met the reference group before they began to develop the content. This did not happen, however. Rather, the scriptwriter started the design activities by creating a “map” of themes and approaches for the exhibition. These themes and approaches were largely put together from the content of his previously published books and CD-ROMs for children. The “map” became the foundation from which the content of the exhibition was developed and became the focus of the reference group meetings.

These two perspectives on design are obviously quite difficult to unite. Consequently, it was hard for CID to arouse enthusiasm for their proposals. During the feasibility study, the project had been designed with a specific focus on the scriptwriter and set designer. Therefore, it became impossible to allow the reference group to provide the foundational themes of the content during the design phase since such an activity would conflict with the
assignments and roles already given to the scriptwriter and set designer. CID also failed to provide STE with suitable information about their user-oriented perspective and the work methods they had used in previous projects. The way CID reasoned with respect to design was unknown to the producer, which made communication even more difficult. Consequently, the process that introduced CID to STE failed. If CID had been introduced earlier during the feasibility study (before the overall approach had been decided upon) it might have been possible to integrate CID’s user-orientation focus with the producer’s focus on the work skills of the scriptwriter and set designer.

In summary, the introduction process and the project phase are central concepts in the analysis. The conclusion is that for Once upon a time..., the project participants were not introduced in an appropriate way and the actual introduction took place at an inappropriate time.

These results are discussed further in the next chapter.
4. Discussion

This chapter discusses the knowledge contributions provided in the six papers and in Chapter 3 above. It is important to note that this summary should not be seen as a separate knowledge contribution. Rather, it should be seen as a restructuring of the contributions provided in the papers and Chapter 3 with the goal of making it clear how the contributions match the research questions. Thus, the chapter focuses on a number of perspectives that are related to each of the research questions and describes how these cut across the different papers. Figure 4 illustrates how the chapter is organized.

![Diagram of research questions and perspectives]

**Research question 1: Participatory design and evaluation methodologies in museum exhibition design**

My first research question is concerned with how visitors can be involved in the design and evaluation of museum exhibitions. For the purposes of this discussion, I have chosen to explore the knowledge contributions related to participatory design work in museums from four main perspectives:

1) Approaches towards involving visitors in the conceptual, functional and evaluation phases of museum exhibition design.
2) The practicalities of hosting design and evaluation sessions with visitors within the museum context.
3) The challenges of managing power structures between visitors and “professionals” in museum exhibition design.
4) The challenges of using participatory design within established exhibition design practices.
The following sections describe these perspectives in further detail.

**Perspective 1: Approaches towards involving visitors in museum exhibition design**

As described in Chapter 2, the background for my work on visitor participation in museum design is the KidStory design methodology (Paper A). The KidStory design methodology made use of *educational sessions, evaluation sessions, and brainstorming sessions*, each with a special emphasis on *generating new design ideas*. Paper A provides the underlying motivation for each type of session and illustrates how the different motivations have been carried out in practice. The KidStory project had a number of positive outcomes, including:

- A design methodology that was able to involve young children in iterative design and evaluation of technology.
- A large number of novel design ideas, both with respect to existing products and prototypes (suggestions for refinement) and with respect to new concepts.

It was mainly these capabilities that I wanted to retain when I began experimenting with involving visitors in exhibition design.

As described in the Introduction, many museums are seeking more visitor-focused ways of carrying out design. Thus, an important goal was to determine whether participatory design methodologies could facilitate a dialogue between visitors and museum staff during the exhibition production process. Most museum exhibition design projects consist of four main phases: *concept development, exhibition development, a functional phase, and an assessment phase*. During the exhibition development phase (when the exhibition is constructed), it is not uncommon to invite visitor representatives to provide feedback on mock-ups or early versions of exhibits, so called *formative evaluation* (see, e.g., Caulton, 1996, pp. 39–43). Because formative evaluation appears to be a rather well-developed practice, I chose to focus on the other three phases of exhibition design, for which there appears to be substantially fewer methodologies available.

**Concept development**

Paper B describes how visitors can contribute during the conceptual phase of museum exhibition design. Because the visitors I chose to work with already knew the background of the exhibition (through educational activities at the museum), there was no need for initial educational sessions. Thus, the session activities consisted of evaluating existing exhibitions and of brainstorming to develop new exhibition concepts.

The evaluation session was different from the sessions used in KidStcry in that it did not involve contextual inquiry. I avoided using contextual inquiry
because I thought it might be awkward to use in the crowded (and often noisy) environment of museum exhibitions and because I wanted to experiment with methodologies that allowed a more "quick-and-dirty" collection of opinions. Furthermore, I wanted to see whether an exhibition evaluation activity could provide a starting point for the concept discussions (as was done in KidStory). Because the visitors were to be the primary providers of ideas for the new concepts, I felt that it was important that the visitors evaluate the exhibitions themselves (rather than, say, providing them with a pre-written list of "guidelines"). Another reason was to encourage them to become familiar with the details of the museum's exhibitions.

Although Allison Druin has successfully taught users how to use different variations of contextual inquiry (see, e.g., Druin, 1999), I felt that a less formal methodology might be more useful in the museum context. As part of an experience exchange effort within KidStory, I worked three months at the Human-Computer Interaction Lab at the University of Maryland. There, I encountered a variation of the future workshop (Kensing and Halskov Madsen, 1991, Bødker et al., 1993) that was designed to allow children to quickly evaluate existing technologies. It proceeded as follows: First, the children were allowed to interact with the technology. Then, they were asked to write down three good aspects and three bad aspects of the technology on Post-It notes and bring them to the workshop facilitator. The facilitator would then group notes with similar content on a whiteboard. When all notes had been put on the whiteboard, the facilitator would summarize the content of each group by adding an appropriate heading. These headings were then used as the basis for small-group discussions on possible modifications of the technology. The methodology appeared to work very well and seemed to be suitable for a museum context. However, I felt that it was important that it was the visitors who chose how to group and summarize the Post-It notes rather than the session facilitator, and modified the methodology accordingly. The result is described in detail in Paper C (see also Taxén, 2003).

The brainstorming sessions were carried out as in KidStory to a large extent, and were primarily concerned with low-tech prototyping. Just as in KidStory, they also involved selection by researchers, but rather than isolating a number of ideas for implementation, the choice aimed at highlighting interesting features that were felt to have potential for elaboration. Thus, the selection process was more about suggesting a focus for the following brainstorming session than choosing one (or a few) ideas for further development. Another difference was the addition of an activity where the participants story boarded and videotaped different usage scenarios. The main reason for including these was to encourage the session participants to shift their focus from appearance and content towards usage and accessibility (c.f., Mackay et al., 2000).
As reported in Paper B, the museum brainstorming sessions had a number of outcomes that were similar to the outcomes of the KidStory methodology, including:

- The museum design sessions were able to involve “non-professionals” in the design of exhibition technology.
- The sessions generated numerous design ideas.
- These design ideas were also relevant in the sense that they addressed issues that are currently being discussed within contemporary museum technology research.

**Functional phase**

It is not uncommon for visitors to be invited to contribute with content for museum exhibitions, either through material collected by the design team during the conceptual and development phases of exhibition design (an example is provided in Chapter 3) or while the exhibition is on display (for example, the voting exhibits in the In Future gallery of the London Science Museum’s Wellcome Wing).

The work described in Paper F provides an additional approach towards using technology to provide opportunities for visitors to shape the content of exhibitions. The paper describes how contemporary communications technology can be used to allow visitors to contribute to an exhibition from an unspecified location (both inside and outside the museum). The exhibit had two main goals: 1) to see whether it was possible to document and exhibit learning processes that take place outside the museum and 2) to provide a “real-world” context for an existing set of exhibits (see below for a more detailed discussion of these goals).

It should be noted that it is not the concept of allowing visitors to contribute to the content of exhibitions that is novel here. Rather, I am of the opinion that the novelty lies in the primary function of the visitor contributions, that is, the very essence of the exhibit is the visitors’ own interpretation of different museum artefacts they have encountered during their visit (and elsewhere), and this collective interpretation is allowed to change and evolve while the exhibition is on display. In a sense, the visitors are creating the exhibit as they interact with it (c.f., Samis, 2001).

I have been involved in another exhibition, Re-Tracing the Past at the Hunt Museum in Limerick, Ireland, that takes this idea even further (Fraser et al., 2004). The focus of the exhibition was four “mystery objects”; that is, four objects that the museum had been unable to classify, and visitors were encouraged to propose their own interpretation of one or more of these objects through interaction with a number of different exhibits. These exhibits provided opportunities for visitors to access information related to the origin of the objects, the circumstances of their discovery, and their material
qualities. One of the most important assemblies of technology in the 
exhibition was a combination of a recording station, an animated 
visualization, and an old radio. This assembly allowed visitors to record their 
interpretation of the four objects, and to listen to recordings other visitors had 
made. Thus, the visitors were not only shaping the exhibition as it was on 
display, they also acted as curators.

Assessment and evaluation
Many museums evaluate their exhibitions, often through methods such as 
questionnaires, behavioural observation, and interviews (Binks and Uzzell, 
1994). I was interested in whether visitors and museum staff could become 
involved in a less formal dialogue on evaluation, and in particular whether 
visitors could contribute with suggestions for improvement as part of an 
iterative design process. The experiment is described in Paper C (see also 
Taxén, 2003). In an attempt to establish relevance, I also compared the 
outcome of the workshop-based evaluation with “traditional” museum 
evaluation. From a research perspective, the comparison can be seen as a form 
of triangulation, since it juxtaposed and interrelated data acquired from 
different sources and through different activities. The data sources were:

- The workshop Post-It notes (and their organization into groups) and 
  notes taken during the large-group discussions.
- Notes from behavioural observation of visitors interacting with the 
  exhibit in question.
- Structured short interviews with museum visitors.
- Semi-structured deep interviews with members of the museum staff.

The comparison loosely followed the initial steps of the grounded theory 
method (Strauss & Corbin, 1998). A coding of the Post-It notes and discussion 
notes provided a number of initial concepts, which were compared to a 
similar coding of the observation notes and interviews. As described in Paper 
C, the resulting concepts can be grouped under five themes (education, audio-
visual aspects, engagement, collaboration, and physical design). The main 
difference between the data from the workshops and the data from the 
summative evaluation is that the workshop data also contained a large 
number of design suggestions. Thus,

- The evaluation workshops were able to involve “ordinary people” in 
  the evaluation of museum exhibitions in the sense that the activities 
  facilitated a dialogue between visitors and exhibition designers.
- Even though the workshops required a relatively small amount of 
  resources, they generated a large amount of qualitative data, much of 
  which were in the form of design suggestions.
- The workshop data were relevant in the sense that it emphasized 
  largely the same issues as the summative evaluation.
Perspective 2: Design of sessions

Another perspective on involving visitors in museum exhibition design is the practicalities of the design activities: how can they be managed and carried out? In the reporting of my research, I have chosen to follow Allison Druin, Michael Muller, and others in that I tend to describe the practicalities of the activities in detail. The reason is that it appears that the practical circumstances of a session – for example, how participants are prepared (if at all), how activities are ordered and carried out, how much time is spent on each activity, the kinds of work materials available – can have a substantial effect on the outcome (see Alborzi et al., 2000; Druin, 1999; Muller, 1993; or Muller, 2001 for examples).

However, it is important to remember that such descriptions of context and its effects may not necessarily be generalizable to other domains. For example, I believe that it would be problematic to claim that a given set of activities in combination with a certain set of work materials will always have similar design outcomes, regardless of who the participants are. Rather, I believe that it is the combination of the participants’ background, knowledge, and interests and the way in which the activities are orchestrated that shape the results. Consequently, I have tried to be sensitive to the interplay between the circumstances of the activities and the participants in my accounts of the design and evaluation sessions (see Dourish, 2003, for a detailed discussion of different interpretations of context and the interplay between context and individuality).

As described in Paper A, the KidStory project devoted a large amount of time to design sessions, and the nature of these sessions evolved constantly as children and adults became more used to each other and to the project. Almost all the sessions during the first six months of the project consisted of educational exercises (of which the “inventing a sandwich” activity described in Paper A was one). The project gradually introduced sessions with evaluation activities (mainly testing and discussions of different kinds of software), and the first brainstorming activities appeared at the beginning of the second year.

As described in Sundblad et al., 2000, each KidStory session was unique. The reasons included:

- Children and adults were learning how to become design partners as they went along: some sessions were more successful than others, which prompted the adults to explore different approaches and activities.
- As the children became more familiar with the project and its goals (and the technology prototypes became more flexible and mature), it was possible to introduce more design-oriented activities into the sessions.
As the project proceeded, the adults got to know the children, their habits, their preferences, and their interests, which made it easier to plan the session activities.

However, working with the children always seemed to lead to unexpected situations and problems, which required the adults to improvise to a large extent.

Most sessions, however, where quite informal, and every session (with very few exceptions) had an introductory activity (for example, sit in a ring on the floor and discuss the goals of the session) and a final activity (for example, reconvene on the floor and discuss the outcome of the session).

Thus, the main lesson learned from KidStory with respect to the facilitation of design activities was that although a general session structure for framing the activities and creating an informal atmosphere was important, it was essential that the activities themselves were flexible and allowed for improvisation. This general approach towards orchestrating sessions was something I tried to follow in my museum work.

As described in Paper B, the four concept development sessions followed the general themes of "requirements" → brainstorming → refinement → feedback. The main goals of the sessions were:

- The first workshop would produce a number of design sensitivities that would guide the three following sessions.
- The brainstorming workshop would produce a number of initial concepts. These concepts would then be evaluated by both researchers and participants, and the design features that seemed most viable would be highlighted for refinement.
- The refinement workshop would provide additional concept details and also a number of usage scenarios.
- The final session would be used for feedback and evaluation. The outcome of the sessions would be presented to the participants, and the participants would be given an opportunity to provide feedback on the session activities.

This approach appeared to provide the necessary structure, but also allowed for improvisation. As in KidStory, an introductory and a final activity were used to outline the activities of each session and to create an "allowing" and informal atmosphere. Because the number of sessions was small compared to KidStory, there was little time to develop a "shared language". However, most of the participants had met each other before during the educational activities at the museum. Also, several members of the museum staff were educators and were used to working with children and young adults. As described in Paper B, the coffee breaks that separated the different session activities appeared to be important. Not only did they provide for rest and
relaxation but they also allowed the participants to get to know one another better, which most probably made the communication between the participants less challenging.

Group processes also appeared to shape the content. For example, two of the three groups formulated a set of design tasks and divided the work between them. However, this division of labour also excluded some of the group members from the general design discussions, since they were busy elsewhere. The way the work materials were made available to the groups also appeared to influence the outcome of the brainstorming session. For example, one of the three groups chose to work exclusively with pen and paper, and the reason appears to be that the group was sitting at a table that was far from the boxes that contained the work material.

The evaluation workshops described in Paper C were also shaped by the practical circumstances of the sessions. As described in Taxén (2003), the Well of Inventions did not work properly when it was presented to the first group of participants: due to a programming bug, the motion of the cursors in the table projection was “inverted” with respect to the motion of the user interface devices. This inconsistency was one of the most frequently mentioned problems of the exhibition during the discussions and also appeared in several of the Post-It notes.

**Perspective 3: Managing power structures between visitor and designer**

The third perspective on user involvement in museum exhibition design I wish to address is concerned with power structures between visitors and “professionals”.

One of the most important challenges for any participatory design methodology is how to encourage the development of “appropriate” social structures between users and the other members of the design team so that neither users nor “professionals” are completely in charge of the design (see, e.g., Alborzi et al., 2000). As described in Paper A, KidStory spent a relatively long time negotiating such a power structure between children, teachers, and researchers. One of the reasons for this was that the children were young, which made the development of a “shared language” between children and adults difficult and time consuming. Another reason was that the children had never been given an opportunity to influence the design of technology directly. Differences in the researchers’ interpretations of the goals of the project also led to difficulties with managing power structures. For example, a continuing debate among the researchers concerned how much the children should be allowed to influence the choice of technologies for the prototypes, since the children’s preferences did not always match the technical goals of the project. In these situations, it was necessary to attempt to value the
knowledge contributions related to design methodology in relation to the knowledge contributions related to technology.

The visitor participants in my museum exhibition concept workshops were much older, and they had already been involved in educational activities with museum staff. Thus, the development of a “shared language” appeared to be less of a problem than in KidStory. However, a central challenge was that there was very little time available for negotiating a power structure between visitors and museum staff members. As reported in Paper B, this lack of time resulted in a tendency of the museum staff members to exert too much control over the general direction of the work. Consequently, it was necessary for the session facilitators to intervene on several occasions during the brainstorming. This appeared to be less of a problem in the refinement session, however.

A related issue is how visitors see the relationship between themselves and “professionals” (including researchers). An important goal of the final feedback session described in Paper B was to begin to address this issue. I chose to approach the issue by focusing on how the visitors felt about their participation in the design activities. Thus, I asked them to evaluate the sessions in the same way as they evaluated the exhibition at the Vasa Museum. The comments were then coded and organized into concept categories. Interestingly, the data contained information not only about the sessions themselves but also about the way the design activities “meshed” with activities in other domains (in this case, the school).

**Perspective 4: Using participatory design within established exhibition design practices**

The final perspective emphasizes the way in which the participatory design activities presented in this thesis have been combined with “standard” exhibition production activities.

As described in the introduction, CID’s collaboration with the Museum of Science and Technology, the Vasa Museum, and Swedish Travelling Exhibitions has been very different. CID was introduced to the Museum of Science and Technology through a rather long process that involved joint work on several different productions. A common feature of all of these productions, however, is that CID was able to work freely with respect to technology, design, and design methodology. One reason why this was possible was probably because CID provided its own economical resources for each production. Furthermore, the museum appears to be of the general opinion that most (if not all) examples of interesting modern technology are suitable for exhibiting at Teknorama. Thus, *exhibiting the technology itself* was always an interest, in addition to the explicit goals of each exhibit.

CID’s collaboration with the Vasa Museum and Swedish Travelling Exhibitions involved exhibitions that were in the early stages of production,
and the overall goals and production methods of these exhibitions were already determined to a large extent. The difference between the two collaborations, however, was that in the case of the Vasa Museum, CID was able to find a “subset” of the exhibition to work with, a “subset” where the producer felt that CID clearly would be able to contribute, and where it was possible to allow CID to choose their own work methods. Furthermore, the time scale and the budgetary circumstances of the project was such that CID’s efforts could be treated as a trial; that is, from the museum’s perspective, it did not really matter whether the outcome of CID’s work was useful to the project or not. In the case of Swedish Travelling Exhibitions, however, the production was designed in such a way that it became impossible for CID to contribute; the work methods that CID advocated were incompatible with the work methods already chosen for the production. Because of the difficulties of communication between me and the producer, it also became impossible to find a “subset” that CID could work with independently.

To summarize, it appears that the collaboration between CID and the three industrial partners worked best when the means were available for organizing the projects so that CID’s work was “safe”; that is, that CID’s experiments did not risk threatening any “regular” productions or the way such productions were developed. Another factor that appears to have been important is dissemination; that is, whether the industrial partners were able to assimilate the information they received that described previous results from CID’s work. It is interesting to note that in most participatory design methodologies, activities devoted to building confidence and developing a shared language appear to be essential (e.g., Muller, 2003). Here, however, the focus is not on an artefact or a product, but rather on the collaboration between organizations. The challenge, it seems, is how to negotiate a shared understanding of what the purposes of the participatory methodologies are, and how the methodologies could be support the existing activities of the organization in question (see Balka, 1995, or Merkel et al., 2004, for similar lines of reasoning). How such activities should be managed within the museum context is a possible subject for future studies.

**Research question 2: Supporting and orchestrating learning-related social activities in museum exhibitions**

My second research question is concerned with how technology can be used in museum exhibitions to support and orchestrate different social activities related to learning. I have chosen to view the contributions related to learning in museums from two perspectives:

1. Learning as a foundation for the design of museum technology.
2. Technologies for supporting and orchestrating learning-related activities.

The following sections describe these perspectives in further detail.
Perspective 1: Learning as a foundation for the design of museum technology

As discussed in the Introduction, it appears that many museum exhibition designers are influenced by different constructivist epistemologies. Constructivists, as described in Paper D, tend to see learning as a process of active individual construction that occurs when the learner is engaged in a social practice, frequently while interacting with others. For museum exhibition design, such a view of learning has important consequences. Hein (1998) described the traditional view of learning in museums as the tendency to see knowledge as something which is independent of learners, that is, learning is an incremental activity that adds facts incrementally to the minds of learners. Exhibitions inspired by such epistemologies, according to Hein, are typically sequential with panels and labels that describe what is to be learned from each exhibit. They also tend to reward “appropriate” learner activities, for example, through positive responses (“Yes, that’s right!”) when the learner has made the “correct” choice in an interactive exhibit.

However, museum learning research has shown that even if an exhibition is given a specific theme and is organized along the principles outlined above, visitors tend to interpret what they encounter differently, often in ways that are in direct conflict with the exhibition theme (ibid., p. 35). According to Hein, constructivists tend to argue that the reason is that learners will always construct personal knowledge and interpret their experiences individually, regardless of the “constraints” that may have been designed into such exhibitions. Consequently, exhibitions inspired by constructivist views of learning typically attempts to provide visitors with ways of validating their personal conclusions, regardless of whether these conclusions match the theme of the exhibition or not. Often, such exhibitions have several entry points (that is, they are not ordered according to the principle of beginning-middle-end); offer a range of activities, present a number of different (often opposing) perspectives of the content; and provide opportunities for creativity, experimentation, and discovery. In particular, exhibitions designed according to constructivist principles are likely to provide opportunities for interpreting objects and exhibits in different ways and provide a range of different “truths” about the content.

From a pedagogical perspective, the exhibitions and exhibits described in this thesis can be seen as being designed with constructivist-oriented principles in mind. It is important to note that I am in no position to argue that constructivist epistemologies represent the truth of how learning takes place in museums (in the ontological sense). I rather tend to view constructivism as an interesting philosophy for guiding the design of exhibitions. In other words, the learning-related contributions of this thesis should not be seen as an assessment of the nature of learning that takes place in museum exhibitions. Nor should they be seen as the “correct” way of designing technology for supporting learning in museums. Rather, they
should be seen as examples of how constructivist philosophies and epistemologies can provide novel approaches to exhibition technology.

The papers discuss two different such approaches to exhibition design. The first approach, which is described in Papers C and E, is an attempt at using technology to encourage collaboration and dialogue between co-present visitors. The second approach, which is described in Paper F, is an attempt at using technology to provide opportunities for visitors to create a dynamic and evolving context for a set of existing exhibits.

Encouraging collaboration and dialogue

Papers C and E are concerned with the relationship between two exhibits, *ToneTable* and the *Well of Inventions*. As described in Paper E, *ToneTable* is an attempt at responding to two design sensitivities: 1) multiple forms of participation, and 2) interaction and co-participation. From a constructivist point of view, these two sensitivities are important concerns for museum exhibition design. As outlined above and in Paper D, visitors employ different strategies in interpretation and interaction. Designing for multiple forms of participation in museums allows for visitors to employ several different such strategies. Furthermore, constructivists tend to see personal knowledge *corroborated by others* as fundamental for learning. In museums, learning through observation and imitation appears to be very frequent, especially in connection with interactive exhibits (Falk and Dierking, 2000, p. 49-50; Hindmarsh et al., 2002). The outcomes of learning may also differ significantly depending upon whether the motivation to learn is *extrinsic* (that is, anticipated benefits are external to the activity) or *intrinsic* (that is, an action is done for its own sake). For example, the work of psychologist Mihaly Csikszentmihalyi suggests that most people exhibit a common set of behaviours and outcomes when they are engaged in free-choice tasks. They typically state that what keeps them involved is an inherent quality of the experience that Csikszentmihalyi calls *flow*. It is characterized by clear goals and immediate unambiguous feedback and tends to occur when the opportunities for action in a situation are in balance with the person’s abilities (Csikszentmihalyi, 1990: Csikszentmihalyi and Hermanson, 1994).

As described in Papers C and E, the design of *ToneTable* responds to these design sensitivities by incorporating a number of features. Different *layers of noticeability, varieties of behaviour, and structures of motivation* were used to make the exploration of *ToneTable* an open-ended affair and allow the installation to be explored over various time-scales. Collaboration and coordination between visitors were supported by providing opportunities for interacting through a *shared virtual medium* (in this case an animated water-like surface) and were encouraged through *emergent collaborative value*. Furthermore, by designing *ToneTable* to be “*abstract, yet suggestive*”, the installation did not impose any particular pedagogy or approach towards interpretation.
As described in Paper E, I tried to retain these features when ToneTable was subsequently redesigned to become the Well of Inventions. However, because of its intended location in the Museum of Science and Technology – the Teknorama science centre – I felt that it was important that the content of the new installation be less abstract. Consequently, I let the nature of the museum inspire a theme (that of dynamics, machinery, and conversion of energy) and tried to incorporate it into the design. As described in Papers C and E, the result was an installation that appeared to encourage similar types of behaviour as those in ToneTable, including collaboration and coordination.

However, while it was quite clear that visitors discussed the exhibition and constructed their own interpretations of it (for example, young children would be fascinated by the virtual water surface while older children would treat the installation as an interactive game), these interpretations did not match the kinds of interpretations I had envisioned when designing the installation. Interestingly, although many visitors appeared to enjoy interacting with the installation, many also appeared to express a frustration over not understanding its purpose, something which appeared to be less of a concern for users of ToneTable. In my interpretation, this is due to the context in which the Well of Inventions was exhibited. Teknorama, as most science centres, is designed to encourage a “paedagogical” approach towards interpretation and does so through a number of different design conventions. For example, most exhibits are “experimental” in nature (that is, they pose a question and invite visitors to experiment to find the answer), different groups of exhibits relate to different themes from the natural sciences, many labels contain both usage instructions and background information, and so on. I believe that because the Well of Inventions followed very few of these conventions, the exhibition came across as “strange”. ToneTable, on the other hand, was exhibited in locations that did not frame visitors’ expectations in this way. Consequently, one of the important results of the ToneTable/Well of Inventions experiment is that although the approach towards encouraging collaboration and dialogue between visitors appeared to work quite well, the nature of the context in which the exhibits were situated had a fundamental impact on the way they were interpreted by visitors.

**Evolving context**

Paper F describes an attempt at using technology to allow visitors to interactively create a dynamic and evolving context for a set of existing exhibits in Teknorama called the Mighty Five. These exhibits illustrate five mechanical principles: the screw, the plane slope, the lever, the wheel, and the wedge. The museum’s own evaluation of these exhibits suggests that many visitors fail to grasp the way they relate to one another (that is, that they constitute a set of different, yet interrelated mechanical principles). Consequently, an important goal for the project was to see whether exhibiting examples of how the Mighty Five principles have been embodied in different
artefacts outside the museum had the ability to support the conceptual integration of the existing exhibits.

Another goal for the project was to see whether it was possible to use modern communications technology to document the nature in which visitors relate their museum experiences to experiences of similar principles outside the museum. According to Falk and Dierking (2000), it appears that many people draw conclusions that are related to their visit later, outside the museum, when they encounter a situation that allows them to “make a connection” with something they have experienced in the exhibitions. Documenting these situations is, naturally, quite difficult. Falk and Dierking mention a number of studies where researchers have telephoned visitors some time after the visit and asked them to recall the museum visit and how it has shaped later encounters and experiences. Although important and valid, these data consists of the learners’ recollection of their experiences and there are typically no data from the actual situation itself.

As described in Paper F, the exhibit was partially successful. There is evidence that it indeed provided opportunities for visitors to interrelate the different Mighty Five exhibits. However, all attempts at encouraging visitors to contribute with data for the exhibit from outside the museum failed, which prompted me to look for ways in which to encourage visitors in the museum to contribute. The outcome was a set of different “treasure hunts”, that is, didactical activities (largely designed by a member of the museum’s pedagogical staff). At the time of writing, these “treasure hunts” have been carried out successfully with a number of children between 8 and 12 years old.

From a learning perspective, I believe the project described in Paper F had two important outcomes. The first is that the approach towards using technology to provide a context for the Mighty Five appeared to be largely successful in the sense that there is evidence that visitors used the new exhibit to relate to the other Mighty Five exhibits. The second is an account of how different activities in museums can be used to appropriate technology for educational purposes it was not initially designed for. For example, I have used the wooden block user interface of the exhibit to illustrate the concept of Radio Frequency Identification (RFID) tagging to visitors. Another example is how the “treasure hunt” activities made use of the book roll.

**Perspective 2: Technologies for supporting learning-related activities in museums**

The second perspective is concerned with the technology itself – which technologies can be used to support learning-related activities, and how?

Many of the technologies described in this thesis are examples of *mixed-reality technologies*. Within HCI, mixed reality is often seen as the “gap” between
virtual reality and ubiquitous computing, that is, the goal is not merely to embed technology in everyday physical objects (as it is in much of ubiquitous computing) or to construct digital environments of different sorts (as in virtual reality). Rather, mixed-reality is concerned with hybridized digital presentations, that is, digital presentations that are overlaid and juxtaposed with physical-digital objects.

For example, Paper E describes how both ToneTable and the Well of Inventions explored different interrelationships between table-based projections and sound environments, while Paper F describes how wooden blocks with digital properties can be used as an interface for a “digital book roll”.

Another general approach towards technology design that underpins much of the work in this thesis is the support of multiple co-present participants. For example, the KidPad drawing tool described in Paper A was based upon the notion of multiple co-present users. This notion was also a fundamental design concern for both ToneTable and the Well of Inventions, which allowed multiple visitors to interact simultaneously through the use of trackballs (indeed, KidPad and the two installations made use of the same programming library for supporting multiple input devices). Furthermore, as described in Paper E, orchestrating the activities around a table (or a “digital book roll” in the case of the Mighty Five) naturally allowed for gesturing, coordination, and turn-taking.

My personal contribution to the technology presented in the papers is largely related to different kinds of graphical presentations. For example, I programmed a substantial number of the KidPad tools and provided the graphics for ToneTable, the Well of Inventions, and the Mighty Five book roll. Furthermore, I have also been involved in providing underlying systems support. For example, the Well of Inventions and the Mighty Five exhibits are built upon a toolkit I wrote called Wasa. As described in Paper D, the toolkit has also been used in other circumstances, such as education and virtual reality research. As indicated in Paper C, the toolkit also contains implementations of a number of simulation algorithms. Examples include the rigid body dynamics and fluid flow algorithms used in the Well of Inventions.

Summary
The first of the two research questions raised in this thesis is:

- How can knowledge of participatory design within HCI be applied in the museum domain to include visitors in the design and evaluation of exhibitions?

In the account above, I have approached this question from four different perspectives. The first perspective focused on issues such as:
• Why should visitors contribute to museum exhibition design?
• How can they contribute?
• When can they contribute?
• Who should participate?

The second perspective focused on issues such as:

• How can the visitor contribution be managed?
• How can design and evaluation sessions be orchestrated?

The third perspective focused on issues such as:

• How can a fruitful dialogue between visitors and exhibition designers be facilitated?

The fourth perspective focused on issues such as:

• What consequences does involving visitors have with respect to the exhibition producers’ current design practices?

I believe the papers on which this thesis is based provide a starting point for a discussion of these issues. I would argue that my work suggests that involving visitors in exhibition design can indeed be fruitful: the experiments with concept development and evaluation described in Papers B and C provided relevant information from visitors that I believe may have been difficult to obtain through “standard” museum design and evaluation activities alone. I also believe that it is clear that visitors can contribute to all four phases of museum exhibition design.

Papers A, B, and C also provide a number of examples of how visitor participation can be managed and orchestrated. Papers B, C, and F also suggest different ways in which visitor contributions can be incorporated into an exhibition production.

The issue of how to assess the outcomes of visitor participation in museum design is also an issue that is partly addressed by my work. In Papers B and C, the outcome of the design process is evaluated with respect to relevance, that is, whether the sessions provided information that might be useful to the museum. However, Paper B also argues that assessment should not only be carried out from the researcher’s perspective: determining whether the participants believe that the design activities are fruitful or not is important too. Paper B also provides an example of how such a “participatory” assessment can be made.

Chapter 3 raises the question of how to introduce the concept of user-oriented design within exhibition-producing organizations. In my opinion, the analysis
suggests that the manner in which such methodologies are advocated is of primary importance. If this is not done in an appropriate way, it may be impossible to develop a shared understanding of how and when the methodologies are to be applied. It is also important that such discussions are held at the appropriate time – if a general approach towards design has already been established within a project, it may be difficult (or even impossible) to introduce user-oriented methodologies later if they do not “match” the project’s approach.

The second of the two research questions raised in this thesis is:

- How can technology be used in museum exhibitions to support and orchestrate different social activities related to learning?

In the account above, I have approached this question from two different perspectives. The first perspective focused on issues such as:

- Why should learning be used as a foundation of museum exhibition design?
- How can it be done?

The second perspective focused on issues such as:

- Which technologies could be used to support and orchestrate learning activities in museums?
- How can they be used?

I believe the papers included in the thesis provide several examples of how constructivist perspectives of learning can inspire novel designs of museum exhibition technology. All of these exhibition designs have proven to be rather flexible and support multiple forms of interpretations. From a constructivist point of view, the “story” of exhibitions is seen as having less importance than it would have had from more “traditional” perspectives. Rather, the primary concern is the way visitors encounter artefacts in museums and the different ways in which these artefacts can be interpreted and understood, both in isolation and in relation to other artefacts. I would argue that this thesis provides a number of novel ways in which technology can be used to support and encourage such activities.

I am also of the opinion that, when taken together, the different projects described in this thesis suggest that mixed-reality technology holds great potential for museum exhibitions. Clearly, the technology can be used to support open-ended experiences with many opportunities for personal interpretation. Furthermore, as described in Fraser et al. (2004), the technology also holds the potential to allow visitors to focus on the museum.
artefacts rather than on the technology itself, which is of primary concern to many museums today (e.g., vom Lehn & Heath, 2003).

However, the “failures” described in Papers C, E, and F also raises a number of concerns. First of all, constructivism is not an uncontroversial philosophy of learning. Indeed, as described in Paper D, it has been heavily criticized, both with respect to its philosophical (e.g., Weinberg, 1998) and epistemological and psychological (e.g., Anderson et al., 1996) roots. The critics’ main concern is the tendency among many constructivist-oriented pedagogical practitioners to overemphasize aspects of the constructivist stance. Within the museum domain, such an overemphasis might, for example, lead to cultural heritage exhibitions that refrain from providing any factual information at all, that is, where everything is open to interpretation. Clearly, such exhibitions would be in conflict with the basic pedagogical goals of most museums. Another issue is how visitors relate to constructivism-inspired exhibitions, especially in situations where they appear to be in conflict with the way other exhibitions in the same museum have been designed.
5. Conclusions

This thesis is concerned with the design of technology for museum exhibitions. More specifically, it explores different ways in which visitors can contribute to museum exhibition design (including technology) and how technology can support learning-related activities within museum exhibitions. This chapter summarizes the results and provides some directions for future research.

Participatory design of museum exhibitions

Most contemporary museums collect, preserve, and provide access to important cultural and historical artefacts with the explicit intention of educating and informing the general public about those artefacts. For many exhibition designers, the audience’s encounter with the exhibition is of primary concern, and technology is often seen as a means for providing visitors with new experiences and opportunities for learning. However, it appears to be only recently that researchers have begun to show an interest in how modern technology is actually being used by visitors and many museums are struggling in their efforts to take new technologies into account in their established exhibition design practices. As argued in the introduction, HCI has the opportunity to provide museums with new ways for audiences to contribute to exhibitions with their knowledge, experience, opinions, and desires. Consequently, the first research question I have attempted to answer is:

- How can knowledge of participatory design within HCI be applied in the museum domain to include visitors in the design and evaluation of exhibitions?

Papers A, B, and C provide examples of how participatory design methodologies developed within HCI can be adapted for museums and how these adapted methodologies can be used to involve visitors in the design and evaluation of exhibitions.

Most exhibition projects have four phases: 1) a conceptual phase where ideas for the exhibition are developed into some sort of description, 2) a development phase where the description is implemented, 3) a functional phase when the exhibition is on display, and 4) an assessment phase when the exhibition and the production are evaluated. The work presented in this thesis targets the
conceptual, functional, and assessment phases (user involvement during the development phase appears to be well-covered by existing practices).

**Conceptual phase: participatory exhibition concept development**

I have designed, organized, and hosted a series of workshops where a number of museum educators and curators worked together with representatives of one of the target groups of a new exhibition. First, the representatives evaluated the current exhibitions at the museum, which resulted in a set of “design sensitivities” that guided the rest of the work. Two sessions followed in which the participants worked together to develop and refine concepts for the new exhibition. The final session was devoted to feedback: I provided the participants with an overview of how their concepts related to current trends within museum research, and the participants provided me with their opinions on the work methodology itself. The outcome of the design activities was three detailed exhibition concepts with a number of interesting technological and pedagogical features. These features were also relevant in the sense that they addressed current issues within museum technology research.

**Functional phase: visitor contributions to museum exhibitions**

It is not uncommon that visitors are invited to provide content for museum exhibitions, either through material collected by the design team during the conceptual and development phases of exhibition design or while the exhibition is on display. The thesis provides a new approach towards collecting material from visitors, an approach that allows contributions from unspecified locations both inside and outside the museum. The approach has been implemented in an exhibition where the primary function is to present the visitors’ own interpretation of the different museum artefacts they encountered during their visit (and elsewhere). Thus, the exhibition represents a collective interpretation that is allowed to change and evolve while the exhibition is on display.

**Assessment phase: participatory evaluation of exhibitions**

Most museum exhibitions are evaluated in some way, and a number of established methodologies are available. The thesis contains a description of how data from such an evaluation were compared to data generated through a series of workshops, which I designed, organized, and hosted. The main goal for these workshops was to provide an opportunity for visitors to provide direct feedback to the exhibition designers with a particular focus on generating ideas for improving the exhibition. In terms of participatory design, the exhibition was seen as a prototype, and the workshops were designed to provide ideas for refinement. The data comparison suggests that, to a large extent, the workshops raised the same issues as did the other forms of evaluation. Thus, the workshops were able to provide relevant evaluation data. But in addition, the workshops also provided numerous design ideas for improving the exhibition.
Technology for supporting learning-related activities in museums

Another line of questioning I have followed is concerned with how technology can be used to support learning-related activities in museums. Education and learning is of primary concern to most museums, and many museums base their notion of learning on constructivist epistemologies. These epistemologies, in turn, suggest certain types of activities in museums as more important than others for supporting learning, such as interpretation, communication, and collaboration. Thus, the second research question I have attempted to address in this thesis is:

- How can technology be used in museum exhibitions to support and orchestrate different social activities related to learning?

Papers D, E, and F provide examples of how mixed-reality technologies can be used to encourage collaboration and dialogue and to provide opportunities for shaping the context of museum exhibits.

Encouraging collaboration and dialogue in museum exhibitions

The part of this thesis that is concerned with learning examines the relationship between two exhibits, ToneTable and the Well of Inventions, in some detail. ToneTable is an attempt at responding to two design sensitivities: 1) multiple forms of participation and 2) interaction and co-participation. From a constructivist point of view, these two sensitivities are important concerns for museum exhibition design. Visitors employ different strategies towards interpretation and interaction, and designing for multiple forms of participation in museums allows for visitors to employ several different such strategies. Furthermore, constructivists tend to see personal knowledge corroborated by others as fundamental for learning. In museums, learning through observation and imitation appears to be frequent, especially in connection with interactive exhibits.

The design of ToneTable responds to these design sensitivities by incorporating a number of features. Different layers of noticeability, varieties of behaviour, and structures of motivation were used to make the exploration of ToneTable an open-ended affair and allow the installation to be explored over various timescales. Collaboration and coordination between visitors were supported by providing opportunities for interacting through a shared virtual medium (in this case an animated, water-like surface) and was encouraged through emergent collaborative value. Furthermore, by designing ToneTable to be “abstract, yet suggestive”, the installation did not impose any particular pedagogy or approach towards interpretation.

When ToneTable was subsequently redesigned to become the Well of Inventions, the intention was to retain these features. However, because of the intended location of the new exhibition (a science centre), the content was modified to become less abstract. The nature of the museum inspired a theme
(that of dynamics, machinery, and conversion of energy) which was incorporated into the design. The result was an installation that encouraged similar types of behaviour as ToneTable, including collaboration and coordination.

However, while it was quite clear that visitors discussed the exhibition and constructed their own interpretations of it, these interpretations did not match those originally expected. Although many visitors appeared to enjoy interacting with the installation, many also appeared to express a frustration over not understanding its purpose, something which appeared to be less of a concern for users of ToneTable. One reason for this is probably the context in which the Well of Inventions was exhibited. The science centre is built around a “paedagogical” approach towards interpretation, and because the Well of Inventions followed very few of the conventions associated with this approach, the exhibition came across as “strange”. ToneTable, on the other hand, was exhibited in locations that did not frame visitors’ expectations in such a way. Consequently, one of the important results of the ToneTable/Well of Inventions experiment is that although the approach towards encouraging collaboration and dialogue between visitors appeared to work quite well, the nature of the context in which the exhibits were situated had a fundamental impact on the way they were interpreted by visitors.

Evolving contexts
The thesis also describes an attempt at using mixed-reality technology to allow visitors to interactively create a dynamic and evolving context for a set of existing museum exhibits called the Mighty Five. These exhibits illustrate five mechanical principles: the screw, the plane slope, the lever, the wheel and the wedge. The museum’s own evaluation of these exhibits suggests that many visitors fail to grasp the way they relate to one another (that is, that they constitute a set of different, yet interrelated mechanical principles). Consequently, an important goal was to see whether exhibiting examples of how the Mighty Five principles have been embodied in different artefacts outside the museum had the ability to support the conceptual integration of the existing exhibits.

Another goal was to see whether it was possible to use modern communications technology to document the nature in which visitors relate their museum experiences to experiences of a similar nature outside the museum. Many people draw conclusions that are related to their visit outside the museum, after the visit, when they encounter a situation that allows them to “make a connection”. Documenting these situations is, naturally, quite difficult. Obviously, it is possible to telephone visitors some time after their visit and ask them to recall how the visit shaped later encounters and experiences. However, these data consist of the learners’ recollection of their experiences and there are typically no data from the actual situation itself.
The experiment was partially successful. There is evidence that the new mixed-reality technology indeed provided opportunities for visitors to interrelate the different *Mighty Five* exhibits. However, all attempts at encouraging visitors to contribute data for the exhibit from outside the museum failed, which prompted me to look for ways in which to encourage visitors *in* the museum to contribute. The outcome was a set of different “treasure hunts”, that is, didactical activities where visitors would search the museum for machinery that embodies the principles of the *Mighty Five* exhibits.

From a learning perspective, the experiment had two important outcomes. The first is that the approach towards using technology to provide a context for the *Mighty Five* appeared to be largely successful in the sense that there is evidence that visitors used the new technology to relate to the other exhibits. The second is an account of how different activities in museums can be used to appropriate technology for educational purposes it was not initially designed for.

**A visitor-oriented perspective on exhibition design**

As mentioned in the Introduction, my research questions can be seen as representing two different, yet interrelated perspectives on museum exhibition design. From the first perspective, visitors’ desires, wishes, experiences, and knowledge are seen as important contributions to museum exhibition design. From the second perspective, different social activities and relationships between visitors in museums become the focus of the design activities. Together, these two perspectives outline an approach to museum exhibition design where *visitors are of primary concern*, both with respect to the content presented in exhibitions and with respect to the way exhibitions orchestrate and support different forms of social interaction.

**Future work**

The knowledge contributions in this thesis are exploratory and (to a certain extent) explanatory in nature. In other words, the results should not be seen as normative or predictive. Nor are the results generalizable in the statistical sense. Whether they are *transferable* to other situations, however, is an issue that would be interesting to consider in future research. I would argue that the general methodology and approaches to technology design presented in the papers are *repeatable*, which makes them possible to study in other contexts. For example, it would be interesting to analyse the outcome of applying a visitor-oriented perspective throughout all four phases of an exhibition production.

Another interesting set of issues concerns the combination and integration of design methodologies from different communities of practice. Within HCI, such integrations have been shown to be fruitful in the past. Indeed, the entire user-oriented design movement is founded upon the assumption that
collaboration between users and computer system designers has the ability to produce “better” systems than those developed by computer system designers alone. The question is whether this is the case for the museum domain as well.

This obviously raises questions related to quality and the assessment of quality. That is, how should one assess whether an exhibition is successful or not? An exhibition that is groundbreaking from, say, an artistic or technical perspective may be rejected completely by its audience. Conversely, a highly popular exhibition may be totally unsuitable from, say, a pedagogical point of view.

Furthermore, is the concept of usability transferable to museum technology? Surely, a user interface for a piece of technology in a museum may be more or less easy or pleasant to use, but what about usefulness? Is there a corresponding term for museum exhibition design? If so, how does one measure it? Today, many museums measure quantitative data such as visitor attendance figures and dwell times, but the question is whether such data provide all the relevant details (c.f., Dicks, 2002 for a similar line of reasoning from an HCI perspective).

**Final thoughts**

As mentioned in the Introduction, many cultural heritage museums (both in Sweden and abroad) are questioning their “traditional” task of providing the public with unquestionable historical “truths”. Instead, they tend to work towards more multifaceted and open-ended exhibition design ideals that challenge the more authoritative, structured pedagogical conventions of the past. One aspect of this trend is that many museum exhibition producers have begun to shift their focus from content to physical form. Unlike the director in theatre or cinema who uses written text as a foundation for his or her work, many exhibition producers now appear to consider the exhibition’s visual (and auditory) expression in physical space before considering the content (Persson, 1999). In other words, the “story” is less of a priority than the “shape”. As a result, many cultural heritage museums have begun to commission interpretations of their collections from professional artists or exhibit contemporary art outright. Examples range from Fred Wilson’s controversial treatments of existing museum collections, to the provocative exhibitions of cultural history at the Musée d’ethnographie in Neuchâtel. Some museums, such as the Hedmark Museum in Hamar, have chosen to go so far as to remove most (or even all) written information from their exhibitions and let the form, shape, and material of the artefacts become the focus of attention.

Obviously, this raises the question of what role a visitor-oriented perspective can play in contemporary exhibition design. When an exhibition design project is built around one or several artists, direct contributions from
“ordinary people” may simply not be relevant (as illustrated by the analysis in Chapter 3 above).

A common misunderstanding of user-oriented design is that it advocates that users should “dictate everything”. This is simply not true. Rather, it is about allowing users’ opinions to influence the outcome of the design project. The question is to what extent and in what way this should be done. Consequently, I am not of the opinion that “ordinary people” should replace the work of professional designers or artists in museum exhibition design. Rather, I’m raising the question of whether artistry is the only way in which the traditional, authoritative way of making exhibitions can be challenged. In my opinion, shifting the precedence of interpretation from the curator, educationalist, or subject specialist to a professional artist does not necessarily result in a multifaceted, open-ended exhibition simply because artists are typically commissioned to provide their personal interpretation of the material at hand. Clearly, such a personal interpretation has the potential to illustrate that it is possible to see the material from other perspectives than those offered by a “traditional” exhibition (and artists are indeed normally very good at providing alternative perspectives). But it does not automatically follow that the artist’s rendition allows for other interpretations than his or her own.

Ultimately, I believe that the issue is what role the cultural heritage museum should play in today’s society. In what ways should our cultural heritage be collected, researched, interpreted and exhibited? For me, it is obvious that this is a discussion in which everyone should be allowed to participate, regardless of whether one is an exhibition producer, an artist, a subject specialist, or an “ordinary person”. Unfortunately, “non-professionals” are rarely invited to take part in the cultural debate on museums. A visitor-oriented perspective on exhibition design could be one way of facilitating such participation.

The original aim of the cooperative design projects in Scandinavia was to democratize the workplace. It is my hope that the work presented in this thesis can be the starting point of a discussion of the democratization of the museum.

G.T.
2005-04-02
References


## Appendix A – Concepts and relations

This appendix contains the concepts and relations described in Chapter 3.

### List of concepts

Words in *italic* in the descriptions denote concepts that can be found elsewhere in the list. In the *Grounded in* column, I1 denotes interview 1 and I2 denotes interview 2. The time indicates the position in the sound file where the dialogue about the concept begins. (The interviewee did not allow me to use quotes.) Some concepts are grounded in other forms of data, for example, implied by the organization of the project, things said at meetings, things said during my visits to Swedish Travelling Exhibitions (STE), the STE website, and formal documents, and this is indicated where applicable.

<table>
<thead>
<tr>
<th>Concept</th>
<th>Description</th>
<th>Grounded in</th>
</tr>
</thead>
<tbody>
<tr>
<td>Artistic leadership</td>
<td>To make sure that STE’s exhibitions are coherent, respond to current important societal issues.</td>
<td>I2: 33:29</td>
</tr>
<tr>
<td>Artistic responsibility</td>
<td>To keep the exhibition together with respect to content, to have an overall view. The artistic responsibility is shaped by the goals for the exhibition, but also by STE’s priorities.</td>
<td>I1: 18:46</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I2: 15:53</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I2: 17:43</td>
</tr>
<tr>
<td>Arranger</td>
<td>An organization or an administration of some sort that receives the exhibition during its tour.</td>
<td>I1: 3:40</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I2: 56:04</td>
</tr>
<tr>
<td>Budget</td>
<td>The economical plan for the project.</td>
<td>I2: 17:19</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I2: 9:53</td>
</tr>
<tr>
<td>Commission</td>
<td>The commission STE has from the Ministry of Education: 1) to produce touring exhibitions and 2) to develop the exhibition media artistically, pedagogically and technically.</td>
<td>I1: 9:39</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I2: 9:24</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Documents</td>
</tr>
<tr>
<td>Contacts</td>
<td>Contacts that an external partner may have that are considered useful to the project.</td>
<td>I1: 15:08</td>
</tr>
<tr>
<td>Content</td>
<td>The textual (linguistic) content and physical shape/form of the exhibition. The content is developed by the inner creative group, and is “converted” into an</td>
<td>I1: 30:02</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I1: 35:09</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I1: 37:50</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I1: 40:00</td>
</tr>
</tbody>
</table>
| Contribution                                                                 | I1: 48:53  
|                                                                             | I2: 53:4  
|                                                                             | I2: 25:30  
|                                                                             | I1: 15:08  
| The contributions of an external partner to the project. Contributions may include active participation in the design process, consultation, guidance, etc. External partners may also contribute with objects, their knowledge, and contacts. |
| Control                                                                     | I1: 41:51  
|                                                                             | I2: 17:21  
| The producer has the ability to exercise control over the activities of the project team and the inner creative group if the results of the work fail meet the exhibition’s goals. |
| Create visualization                                                        | I1: 37:50  
| Create a description of the physical shape/form of the content of the exhibition. |
| Decision                                                                    | I1: 10:57  
|                                                                             | I2: 20:24  
|                                                                             | I2: 54:50  
| If the director of exhibitions is happy with a feasibility study, he may decide to give the go-ahead for the project. |
| Deputy director of exhibitions                                              | I1: 7:27  
| [The role is mentioned in the data, but not described.]                     | Projec: org.  
|                                                                             | I2: 17:43  
|                                                                             | I2: 25:30  
| The process that shapes and develops the content of the exhibition. The result of the design process is a design which can be “converted” into an exhibition during the project’s implementation phase. |
| Design process                                                              | I1: 10:20  
|                                                                             | I2: 7:27  
|                                                                             | I2: 33:29  
| The person at STE that is responsible for its exhibitions. The director of exhibitions provides artistic leadership for STE and is responsible for STE’s repertoire. |
| Director of exhibitions                                                      | I1: 40:40  
| Most of STE’s productions are evaluated in different ways. The evaluation may focus on the exhibition itself, project management, and/or the development process. |
| Exhibition                                                                  | I2: 7:27  
| The outcome of the project.                                                 | Projec: org.  
| Exhibition assistant                                                        | I1: 3:40  
| [The role is mentioned in the data, but not described.]                     | I2: 12:02  
|                                                                             | Projec: org.  
|                                                                             | Meetings  
| The person responsible for tour planning.                                   | I1: 35:09  
|                                                                             | I1: 37:50  
|                                                                             | I2: 21:38  
| The experience a person brings to the project team in general; and to the inner creative group in particular. |
| **External partner** | A person or a group of persons that are not normally employees of STE, which have the potential to become members of the project team. During the time CID was involved in “Once upon a time...”, the scriptwriter, the set designer and CID were external partners. | 11: 37:34  
12: 13:45  
12: 17:43  
Project org. |
| **Feasibility study** | A feasibility study is a preparation for an exhibition project. Formally, such a study should contain a number of items, including a background, goals that respond to STE’s priorities, delimitations, a description of the project group, a work plan, a description of work methods, a time plan, a budget, a list of potential external partners, tour prerequisites, and a marketing plan. | Project org.  
12: 9:53  
12: 39:48  
12: 52:46 |
| **Financier** | Organization or person that provides the financial resources for a project. In the case of “Once upon a time...”, the financier was STE itself. | 12: 7:10  
12: 9:53 |
| **Full view** | If the producer is to be able to fulfill his/her artistic responsibility, he/she must have a full view of the design process. It is especially important that the producer has a full view of the activities of the inner creative group. | 12: 20:03  
12: 17:14 |
| **Goals** | In the interview data, three main types of goals can be discriminated: 1) the goals of STE in general, which are interpreted as priorities; 2) the goals of a particular exhibition project, which are formulated in the feasibility study, and 3) the goals that are motivated (and shaped) by the design process (for example, the goals a certain member of the project team may have at a certain point during the development of the content of the exhibition). | 11: 0:18  
11: 36:09  
12: 8:55  
12: 29:23 |
| **Head of Expoteket** | The person at STE that is responsible for Expoteket. Expoteket is both a library and an archive of previous exhibitions. | 12: 7:27  
Visits  
WWW |
| **Head of technology** | The person at STE that is responsible for technology. | 12: 7:27  
Meetings |
<p>| <strong>Idea provider</strong> | A person or a group of persons that provide STE with an initiative for an exhibition. The idea provider is not | 11: 11:34 |</p>
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Implementation</td>
<td>The process by which a finished exhibition design is, through technology, “converted” into a finished exhibition that can be sent on tour.</td>
<td>Projec. org, 12: 15:40</td>
</tr>
<tr>
<td>Initiative</td>
<td>An initiative for an exhibition from an idea provider.</td>
<td>12: 11:34</td>
</tr>
<tr>
<td>Inner creative group</td>
<td>A subset of the project team that is responsible for developing the content of the exhibition. The producer, scriptwriter and set designer were members of the inner creative group during the time CID was involved in the project.</td>
<td>12: 35:09, 17:43, 20:31</td>
</tr>
<tr>
<td>Interests</td>
<td>Interests that persons that are part of the project have.</td>
<td>12: 36:09, 19:00</td>
</tr>
<tr>
<td>Introduction process</td>
<td>Processes where potential external partners are introduced to the project leader and the producer.</td>
<td>12: 28:48, 43:58, 21:50</td>
</tr>
<tr>
<td>Knowledge</td>
<td>In the data, three different kinds of knowledge can be distinguished: 1) knowledge that is part of the work skills of a member of the inner creative group. 2) Knowledge that the project team develops during the project, for example, through meetings with specialists or the reference group. 3) The producer’s knowledge about the work skills of a potential partner, developed as the result of an introduction process.</td>
<td>12: 32:1, 40:00, 22:0, 26:5</td>
</tr>
<tr>
<td>Material</td>
<td>Different sorts of (physical) material gathered during the reference group meetings, for inclusion in the exhibition. This material shapes the content of the exhibition.</td>
<td>12: 32:1, 26:5</td>
</tr>
<tr>
<td>Meetings with specialists</td>
<td>Meetings with specialists that take place either during the feasibility study phase or the design phase of the project. The main goal of these meetings is to draw upon the specialists’ knowledge.</td>
<td>12: 40:00, 11:00, 54:2</td>
</tr>
<tr>
<td>Ministry of Education</td>
<td>A ministry that is part of the Swedish government that provides a commission for STE.</td>
<td>12: 9:39, 8:55</td>
</tr>
<tr>
<td>Mobile space</td>
<td>A large truck made especially for transporting and hosting touring exhibitions. When arriving at a site, the truck bed is converted into a room</td>
<td>Projec. org, Meetings, E-mails, Documents</td>
</tr>
<tr>
<td><strong>Objects</strong></td>
<td>The objects that are exhibited in an exhibition.</td>
<td>I1: 15:08</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td><strong>&quot;Once upon a time...&quot;</strong></td>
<td>The exhibition project CID was involved in.</td>
<td>Project org.</td>
</tr>
<tr>
<td><strong>Openness</strong></td>
<td>The extent to which a person allows other peoples’ opinions and suggestions to influence him/her.</td>
<td>I1: 49:34</td>
</tr>
<tr>
<td><strong>Participation</strong></td>
<td>The extent to which an external partner is being allowed to participate in the design process.</td>
<td>I1: 20:03 I2: 21:18</td>
</tr>
<tr>
<td><strong>Planned external activities</strong></td>
<td>Activities that planned in conjunction with an exhibition’s arrival/visit at a certain site.</td>
<td>I2: 10:23 Documents</td>
</tr>
<tr>
<td><strong>Priorities</strong></td>
<td>The directives in STE’s commission are interpreted by STE, which results in a number of priorities, for example, children and teenagers.</td>
<td>I2: 8:55 I2: 29:23</td>
</tr>
<tr>
<td><strong>Producer</strong></td>
<td>The person (an employee at STE) that has the artistic responsibility for the exhibition.</td>
<td>I1: 17:37 I2: 15:53 I2: 17:43</td>
</tr>
<tr>
<td><strong>Project leader</strong></td>
<td>The person (an employee at STE) responsible for meeting the project’s budget and time plan.</td>
<td>I1: 16:46 I2: 12:17</td>
</tr>
<tr>
<td><strong>Project management</strong></td>
<td>The activity whereby a project leader guides the project, and makes sure that it meets its budget, and finishes on time.</td>
<td>I1: 16:46 I2: 12:17</td>
</tr>
<tr>
<td><strong>Project phase</strong></td>
<td>The phase the project is in when a potential external partner is being introduced.</td>
<td>I1: 33:29 I2: 22:10 I2: 39:48 I2: 46:42</td>
</tr>
<tr>
<td><strong>Project team</strong></td>
<td>The group of persons that design the exhibition together and make sure that it is implemented and sent on tour. The project leader, producer, exhibition coordinator, scriptwriter, set designer and technician were members of the project group during the time CID was involved in the project. Gustav Taxén from CID was also a member of the project team during this</td>
<td>I1: 19:39 I2: 20:28 Project org.</td>
</tr>
<tr>
<td><strong>Proposal</strong></td>
<td>A document that proposes a theme for an exhibition.</td>
<td>II: 11:34</td>
</tr>
<tr>
<td><strong>Recipient</strong></td>
<td>A person that visits the exhibition.</td>
<td>II: 41:07, II: 57:25, II: 59:05</td>
</tr>
<tr>
<td><strong>Reference group</strong></td>
<td>A subset of the target group of the exhibition. In “Once upon a time...”, the target group were children, 11-13 years old, that live in Swedish cities where many different languages are spoken.</td>
<td>II: 30:27, I2: 26:15</td>
</tr>
<tr>
<td><strong>Reference group meeting</strong></td>
<td>Occasions when persons in the inner creative group meet the reference group. The goal of these meetings is mainly to acquire knowledge about the reference group, but the meetings could also be used to gather material for the exhibition, or for testing ideas and concepts developed by the inner creative group.</td>
<td>II: 32:1, I2: 26:5, I2: 41:21</td>
</tr>
<tr>
<td><strong>Repertoire</strong></td>
<td>The set of exhibitions that STE have to “offer” at a given time.</td>
<td>II: 10:20</td>
</tr>
<tr>
<td><strong>Report back</strong></td>
<td>The commission STE has from the Ministry of Education requires STE to report back on how STE has dealt with equal opportunities, environmental issues, availability, etc.</td>
<td>II: 9:39, I2: 29:41</td>
</tr>
<tr>
<td><strong>Resources</strong></td>
<td>The economical means used to finance an exhibition.</td>
<td>II: 7:10, I2: 9:53</td>
</tr>
<tr>
<td><strong>Responsible for feasibility study</strong></td>
<td>The person that is responsible for the feasibility study. This may or may not be the same person that becomes project leader if the project is given the go-ahead.</td>
<td>I2: 52:46</td>
</tr>
<tr>
<td><strong>Role</strong></td>
<td>To be responsible for something in the project. In the data, two different types of role can be distinguished: “administrative” roles such as the project leader, and “creative” roles such as the scriptwriter.</td>
<td>II: 20:03, II: 30:02, I2: 22:45</td>
</tr>
<tr>
<td><strong>Screening</strong></td>
<td>An initial selection process where those proposals that do not address STE’s general goals, are not feasible, or otherwise unsuitable are rejected.</td>
<td>II: 10:57, I2: 8:14</td>
</tr>
<tr>
<td><strong>Scriptwriter</strong></td>
<td>The person responsible for developing the textual/linguistic content of the exhibition.</td>
<td>II: 37:50, I2: 54:55</td>
</tr>
<tr>
<td><strong>Security</strong></td>
<td>Whether or not the producer feels secure</td>
<td>II: 20:03</td>
</tr>
<tr>
<td>Role</td>
<td>Description</td>
<td>Time</td>
</tr>
<tr>
<td>--------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>Selection</td>
<td>The <em>director of exhibitions</em> makes a selection of projects based upon whether they address STE’s <em>priorities</em>, whether they have artistic merit, and whether they fit STE’s <em>repertoire</em>.</td>
<td>I1:10:20</td>
</tr>
<tr>
<td>Set designer</td>
<td>The person responsible for developing the physical shape/form of the content of <em>Once upon a time</em>...</td>
<td>I1:37:50</td>
</tr>
<tr>
<td>Specialist</td>
<td>A person or a group of persons that are not employees of STE, nor members of the <em>project team</em>, but are nevertheless consulted at different occasions, especially during the <em>feasibility study</em>.</td>
<td>I1:40:00 I2:11:00 I2:54:12</td>
</tr>
<tr>
<td>Successful visit</td>
<td>A successful visit entails a number of aspects, including that the recipient should feel motivated, feel that the <em>exhibition</em> concerns him/her, and that the <em>exhibition</em> is emotionally moving.</td>
<td>I1:57:25</td>
</tr>
<tr>
<td>Suitability</td>
<td>Whether or not a potential <em>external partner</em> has the ability to contribute to the project. Suitability is something that the <em>producer</em> ultimately decides upon.</td>
<td>I1:20:03 I1:25:53 I2:22:10</td>
</tr>
<tr>
<td>Technician</td>
<td>A person that knows technology and/or builds technology for <em>exhibitions</em>. Examples of technologies include video, audio, mechanics, and lighting.</td>
<td>Project org. Meetings Visits</td>
</tr>
<tr>
<td>Testing</td>
<td>A possible activity during <em>reference group meetings</em>, where the <em>inner creative group</em> test ideas and/or concepts that they have developed.</td>
<td>I1:32:11</td>
</tr>
<tr>
<td>Tour</td>
<td>STE has no stationary or permanent exhibition space; all <em>exhibitions</em> are sent on tour. Some <em>exhibitions</em> are packaged and transported from site to site (for example, museums or libraries), whereas others are installed in <em>mobile spaces</em>, for example, converted train cars or trucks.</td>
<td>I1:3:40 I1:5:38 I2:10:53 I2:12:02 I2:56:10</td>
</tr>
<tr>
<td>Tour planning</td>
<td>The activity that determines to which sites an <em>exhibition</em> is to be sent, and when.</td>
<td>I1:3:40 I2:12:02</td>
</tr>
<tr>
<td>Trust</td>
<td>Whether or not the <em>producer</em> feels confident enough with a partner to allow him/her/it to be given a <em>role</em> in the</td>
<td>I1:20:03</td>
</tr>
</tbody>
</table>
| U.T.E. group | The group of persons at STE that is responsible for screening exhibition proposals. | I1: 10:57  
I2: 7:27 |
|-------------|---------------------------------------------------------------------------------|_________|
| Values      | The values and frames of reference that a person acts according to.              | I1: 20:03  
I2: 21:30 |
| Visit       | To visit the exhibition.                                                        | I1: 57:25 |
| Work method | The work methods preferred by members of the inner creative group.              | I1: 53:53  
I2: 19:42  
I2: 25:30  
I2: 41:21 |
| Work skills | The work skills of a potential external partner. Work skills embody experiences, openness, values and opinions, knowledge, and interests. | I1: 20:03  
I1: 35:09  
I1: 37:50  
I2: 21:30 |
| Write manuscript | What a scriptwriter does.                                         | I1: 37:50  
I2: 54:55 |

**Relations between concepts**

Relations marked with an asterisk (*) are relations that, even though they are not addressed directly in the data, still follow logically from other relations and concepts. I1 denotes interview 1 and I2 denotes interview 2. The time indicates the position in the sound file where the dialogue about the concept begins. (The interviewee did not allow me to use quotes.)

**Relations related to the producer**

*STE’s commission provides priorities for the feasibility study*

STE’s commission from the Ministry of Education is (according to the STE website): 1) to produce touring exhibitions and 2) to develop the exhibition media artistically, pedagogically and technically. The commission requires STE to report back to the Ministry of Education on issues such as equal opportunities and availability (I2: 29:41). However, the Ministry does not directly dictate the goals of STE. Rather, STE are free to interpret its commission (I1: 9:39). The interpretation leads to a number of priorities, against which all exhibition proposals are judged (I2: 8:55, I2: 29:23). Feasibility studies that have goals that address the priorities are more likely to pass the screening process and given the go-ahead (I2: 8:14). Thus, STE’s commission shapes the exhibitions indirectly.

*The feasibility study provides goals*

In the feasibility study, one of the required components is a goal description (I2: 52:46).
Goals are a prerequisite for artistic responsibility
Artistic responsibility entails keeping the exhibition together with respect to content (linguistic/text and shape/form), that is, to have an overall view. In order to have something to orient to and work towards, the project must have goals.

Goals shape the content of the exhibition
The foundational principle of the design process in “Once upon a time...” was to work towards an exhibition that meets the goals in the feasibility study. (Whether the exhibition actually meets the goals is another matter.)

Artistic responsibility requires a full view and a full view is a prerequisite for control
The artistic responsibility would not be possible to fulfil if the producer had no view (or could not participate) in the activities that develop the content for the exhibition (II: 20:03, I: 2: 36:07).

Control is a prerequisite for security
If the producer is able to control the work (if it is about to lose focus or fail to address the goals of the exhibition), this can lead to a sense of security (I: 2: 36:07).

Control have an effect on the degree of participation
One way for the producer to exercise control over the project is to control the extent to which an external partner participates in the project. In some cases, the producer may terminate the collaboration. This happened in “Once upon a time...” with respect to CID, but it has also happened in other projects (II: 20:52). It is also possible for the producer to dictate how a member of the project team should work, although there is no indication that this ever happened in “Once upon a time...”.

Control can shape the content of the exhibition
A logic consequence of the fact that the producer has an artistic responsibility and that such a responsibility requires a full view of the design processes and the possibility to control is that the producer also has the ability to directly shape the content if he/she feels that it fails to “come together”. There is no indication in the data that this ever happened in “Once upon a time...”.

Relations related to the external partners
The introduction process generates knowledge about work skills
When a potential partner becomes known to the producer, an introduction process can commence. During this process, the producer acquires knowledge about the work skills of the potential partner (II: 25:53). Obviously, the knowledge may be incorrect or insufficient, a in the case with CID (II: 28:48).
Knowledge about work skills is a prerequisite for determining suitability
The judgment of whether a potential partner is suitable for the project is based on the knowledge the producer has of that partner’s work skills, in combination with the needs that the project may have at the time the introduction process occurs (I1: 25:53, I1: 26:49, I2: 39:01).

Project phase is a prerequisite for determining suitability
The project has different needs in different production phases: it is not certain that a potential partner can contribute throughout the entirety of the project. If there is no need for the work skills represented by a potential partner in the current phase of the project, then that partner can not be invited to participate. The producer must determine the right time for introducing new external partners (I1: 33:06, I1: 37:50, I2: 39:48, I2: 46:38).

Work skill is a prerequisite for suitability
The producer has no need for a partner that “does not fit” the project. A partner is able to participate if he/she has suitable experiences, values, interests, and is open to other people’s opinions (I1: 20:03, I2: 22:10).

Work skill is a prerequisite for experience
A consequence of having a suitable work skill for the project is that the partner has experience that they can draw upon when contributing. In other words, the experience and knowledge the partner has gives him/her the ability to determine which types of content that has the potential to meet the project’s goals (and how to work to create that content) (I1: 35:09, I1: 57:25, I2: 19:00). Obviously, it is perfectly possible to acquire new experience and knowledge during the project, for example, through meetings with the reference group (I2: 26:15).

Experience shapes the content of the exhibition
Sometimes, the experiences and work skills of a project team member provides ideas for what the content of the exhibition should be. In “Once upon a time...”, for example, the scriptwriter worked according to the same approach that he has used in a number of his books for children, which resulted in a “map” of proposed themes for the linguistic content of the exhibition (I1: 53:54).

Experience motivates a work method and work method shapes the reference group meetings
The experience of the persons in the inner creative group does not only motivate an approach towards dealing with the content, it also motivates a ways of working to create the content (I1: 53:54). This experience also shapes the meetings with the reference group and the goals for those meetings (I2: 26:13, I2: 50:06).
Suitability is a prerequisite for security
If an external partner has work skills that are suitable for the project and “represents” what the producer wants the exhibition to be, the producer can feel secure with that person (I1: 20:03).

Relations related to the inner creative group

Security is a prerequisite for trust and trust is a prerequisite for receiving a role*
These two relations are never mentioned explicitly in the data, but follows logically from the security concept. It is probably very difficult for a producer to delegate a role to a person if he/she does not feel comfortable with that person. Delegation of a role requires trust, that is, the producer has to be certain that the person is able to participate in a useful way.

Receiving a role is a prerequisite for participation
If a partner has no role in the project, that partner can not contribute. This is what happened to CID in “Once upon a time...” (I2: 39:11).

Participation provides the opportunity to shape the content of the exhibition*
If one is not part of the project team, one obviously has no direct influence over the content of the exhibition. Note: In the case of “Once upon a time...”, only persons in the inner creative group had direct influence over the content (I2: 20:43).

Participation provides the opportunity to shape the design process*
If one is not part of the project team, one obviously has no direct influence over the design process.

The interests of the project team shapes the content of the exhibition
The interests of the persons that are part of the project shapes the content of the exhibition (I1: 36:09).

The knowledge of the project team shapes the content of the exhibition
The knowledge of the persons that are part of the project shapes the content of the exhibition (I2: 47:33).

The design process shapes the content of the exhibition*
The foundational principle of the design process in “Once upon a time...” was to work towards an exhibition that meets the goals in the feasibility study. Obviously, the way the project team decides to work shapes what the content becomes.

The content of the exhibition shapes the design process*
The design process appears to be directed towards shaping an image of what the content of the exhibition is to be. Therefore, it is logical to conclude that the image one has of the content at a particular moment partially suggests
how to move forward. For example, in “Once upon a time...”, the scriptwriter worked according to the same approach that he has used in a number of his books for children, which resulted in a “map” of proposed themes for the linguistic content of the exhibition. The inner creative group then selected a number of these themes and rejected the others (I1: 53:54). It is reasonable to assume that this led to a slightly different work method where the selected concepts were refined and developed.

Relations related to the reference group

Having a notion of what the content of the exhibition is to be is a prerequisite for meeting the reference group

According to the producer, it was necessary to have some sort of idea for the content of the exhibition before the inner creative group could meet the children in the reference group. This idea was influenced by the goals in the feasibility study, but above all by the work of the inner creative group. The idea can be very unclear and vague, but some form of foundation for the discussion was definitely felt to be necessary (I1: 49:58, I2: 1:05:25).

The reference group meetings provide knowledge and material

The reference group meetings have the potential to provide the inner creative group with new knowledge and material. In the case of “Once upon a time...”, it could be knowledge about how the children think about storytelling, or whether an idea that the inner creative group has developed “works” or not, or other forms of (physical) material created by the children (I1: 31:44).

Knowledge and material from the reference group meetings shapes the content of the exhibition

The main purpose of the meetings with the reference group is for the inner creative group to be influenced by them, so that they shape the content of the exhibition (I1: 48:53).

Relations related to the recipients

A visit has the potential to be successful

A successful visit entails a number of aspects, including that the recipient should feel motivated, feel that the exhibition concerns him/her, and that the exhibition is emotionally moving (I1: 36:09, I1: 57:25). According to the producer of “Once upon a time...”, it was mainly the members of the inner creative group that had the ability to determine how to create a design to meet these criteria (I1: 57:25).