Collaborative Museums: An Approach to Co-Design

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ABSTRACT
This paper describes a systemic approach to co-design of collaborative museums, using ethnography, co-creation workshops and fast prototyping, amongst other Social Science and Human Centered Design methods. Focused on the creation of immersive and collaborative museum experiences, it provides a rationale for involving carefully selected multidisciplinary teams and users in the entire design cycle, and presents a process that supports this task, from research to development, pointing its value and limitations. In order to bring the discussion into context and exemplify the use of a group of methods that can support collaborative design, it introduces the case of a Brazilian Planetarium and Science Museum.

Author Keywords
Co-creation, ethnography; prototyping; museums.

ACM Classification Keywords

General Terms
Design; Human Factors; Experimentation.

INTRODUCTION
The evolution of group systems research to an increasingly co-creative focus is changing the roles of designers and computer scientists. According to this approach, users’ involvement start as early as the project begins, that is, much before the formulation of any conception of the system to be developed. And users’ role changes from that of an observed subject or source of information, to that of a collaborative creator, working together with a multidisciplinary team of professionals bringing varied points of view, including designers and computer scientists. Converging knowledge and methods from various fields, including Anthropology, Sociology, Psychology, Software Engineering, and User-Centered Design, amongst others, it is possible to take a systemic approach to co-design, while assuring user involvement, as well as the participation of professionals of various fields, from research to brainstorming, prototyping, development and implementation. As a result, more relevant technology systems can be proposed, which, at the same time, can add value to people in the real world and meet the business goals of sponsoring institutions in sustainable ways – socially, economically, environmentally and institutionally.

Focusing on collaborative museums, this article takes a human-centered, participatory approach to design and development of systems that support groups, social interaction and collaboration, presenting the case of a Brazilian Planetarium and Science Museum to demonstrate a process that uses ethnography, co-creation workshops, and fast iterative prototyping. The challenge was to co-create ideas that could transform the current space, exhibits, artifacts, interfaces and services into something exciting and engaging. Such as described in the words of a ten years old boy at one of the workshops, “I want to come here [at the Planetarium] and feel that I am an astronaut […], travelling through space, exploring the planets, stars and black holes.”

COLLABORATIVE MUSEUMS
Modern museums, as educational and recreational institutions, have systematically focused on enhancing the visitor’s experience and understanding of exhibitions.
Supported by ever more complex technologies – such as Mixed Presence Groupware, socialware, Virtual Reality, Augmented environments, smart devices and simulators [1, 2] – they have introduced a wide range of new experiential possibilities for museums, such as visual and sensorial interactions, serious games, collaborative learning, edutainment, sociability and celebratory encounters [3, 4].

Museums like the Boston Museum of Sciences in the United States, for instance, enable visitors to turn into a curious group of explorers who, through social interaction and collaboration, discovers exhibit wonders [5]. Through a game called Mystery at the Museum, students and their parents work as a team of experts to solve fictitious crimes at the museum space. Teammates gather clues as they collaborate through communication and knowledge exchange, using location aware pocket computers.

Another example is the Lunar Surface Navigation System, at the Modern Industrial Science Museum in Japan, which connects co-located collaborators with a combination of tabletop Augmented Reality and virtual environment [6]. Children play the role of astronauts, while parents or teachers act as the mission commanders, who give instructions regarding exploration activities based on real lunar exploration episodes reported by NASA.

Designing systems such as those, and making them truthfully meaningful and intuitive to visitors of various demographic backgrounds is a challenge. Human-centered design [8], together with participatory methods [9, 10], offers a systemic path towards this goal, starting with the contextual understanding of the actual people that visit, work and interact with the particular museum context. Through a process of co-creation, involving people of varied backgrounds, it moves from ethnographic research to design criteria, and to relevant concepts that can respond to the identified problems and opportunities. Next, it prototypes and tests these ideas quickly, cheaply and iteratively, while interacting with those who will use the solutions, in order to continuously learn from them through the development and implementation phases. As a consequence, relevant and innovative solutions can emerge.

A HUMAN-CENTERED PARTICIPATORY APPROACH

Through a partnership between the Pontifical Catholic University of Rio de Janeiro and the Planetarium and Science Museum of Rio de Janeiro City, a research project was initiated, aiming to renovate the museum space and exhibits, combining cross reality systems and enabling groupware and socialware. For the purposes of this study, a human-centered participatory approach was taken to the design of collaborative museums, as illustrated on Figure 1. The process started with ethnographic research, and led to co-creation workshops and prototyping sessions.

The ethnography started with the study of the referred museum staff – including astronomers, market and administration personnel, architects, visitor guides and support workers, amongst others. And it was followed by the study of different types of visitors, in order to identify: patterns of behavior, relevant narratives, areas of interest, human needs and motivations. The protocol included in-depth contextual interviews and shadowing observations, documented through video, photos and notes. During the interviews, focus was given to mapping the different experiences of the referred museum in contrast to other entertainment venues, and collecting vivid stories.

Through bottom-up clustering [11], the collected data was analyzed and synthesized, in order to identify findings, guiding criteria, recurrent themes, and stakeholders’ extreme user and group profiles – including variables such as number of visits, group size, content knowledge and technological expertise. And, from the documentation material of the interviews and observations, relevant narratives and behaviors were highlighted.

Using shared boards and socialware to facilitate the collaborative process, these items were then clustered, leading to patterns, correlations, and recurrences, as illustrated on Figure 2, as well as to insights and design criteria, seen on Figure 3. For instance, to: activate imagination before museum visit; provide tour options according to profile; support authorship; make the museum experience tangible; and attend to special needs.

As a result, problems related to the museum experience cycle, and spaces of opportunity for new solutions to emerge were mapped. A few examples of these emergent areas are: connection prior to visit, personalized tours, intergenerational edutainment, inclusive exhibits, easy-to-use technologies and tangible memories.

Importantly, the workshop gathered a selected group of participants with diverse profiles and demographics, including: children, teenagers, private and public school teachers, designers, computer scientists, and astronomers.
participants generated 81 relevant ideas, including:

Next, participants worked in pairs and exchanged journals. After reading and analyzing what the other one wrote and asking probing questions, they presented their findings to the entire group. During the presentation, the participants profiles were represented on poster size graphs; relevant narratives were documented on a white board; and emerging guiding criteria were synthesized to the group on posters. These criteria were, then, discussed with participants, leading to refinement and new additions.

Based on the reviewed criteria, a brainstorming session was initiated, where each sentence guided the ideation of innumerable solutions by the participants. These ideas were written down on note size papers and handed to the moderator, who read them aloud to the whole group. In response, the participants wrote down complementary ideas or new concepts inspired by them. In 20 minutes, the 14 participants generated 81 relevant ideas, including: museum-school portal, 2nd Life Planetarium, online check-in, tour guide totem, iPad museum navigator, Augmented Reality space mission, planet hunt collaborative game, space wiki, visitor footprints, and outdoor exhibits.

After the ideation session, the resultant ideas were grouped according to guiding criteria, as partially demonstrated on Figure 3, using cloud format, where the font size of each word or expression represents the number of correspondent ideas that were created. According to the participants’ point of view, the top criteria were: ‘Create an immersive experience’, with 26 correlated ideas, ‘Provide interactivity’, with 18, and ‘Provide specific tours according to visitors’ interests, with 15. In addition, these ideas were classified according to subjacent theme.

Following the workshop, selected participants – including architects, computer scientists and designers – were invited for a prototyping session. The method used was Blank Model Prototyping [13], which requires the participation of potential users, and design and technology professionals. Blank Model Prototyping is a rapid role-playing technique that uses readily available art and craft materials to construct rough physical representations of a technological concept, according to a predetermined scenario. The method was used with the intent to collect potential user impressions and detailed ideas about a new technological solution for collaborative museums.

During the prototyping session, participants read and discussed the idea cards and guiding criteria poster in order to select one or a combination of concepts, or even find inspiration for creating a new one. Next, they were asked to prototype their ideas, evolving the original concept and rationale into a systemic solution, or providing guidelines and design specifications.

The participants chose ‘To create an immersive experience’ as the main guiding criteria. And, as a result, they prototyped a trip to different planet environments – which could be shared on different social networks through pictures and short movies. The ‘Provide interactivity’ criteria was also addressed as they created a spacecraft to travel through a panel equipped with a multitouch device, in which visitors could interact with each other for the purpose of planning a trip and learning about the planets.

The prototype took into account the use of group and socialware to support interaction amongst visitors. For that purpose, they designed their interfaces within the rooms, and some of their functionalities – like identification cards with QR codes for social network sharing, and touch screen interfaces for selecting planets – shown on Figure 4.

Finally, the participants tested their prototype, reflected upon the results and re-designed the solution accordingly. The session was concluded with a discussion and presentation of the prototype, using the designed objects as a support for dramatizing a scenario that illustrated the simulation rooms.

Some of the lessons learned were: a) computer scientists should join social researchers in the ethnographic study and personally learn visitors points of view, leading to a shift in perception about the user and, consequently, more human centered technological solutions; b) workshop participants need prior time to be immersed in the ethnography findings to make optimal use of the material; c) group composition
within co-creation workshops should consider complementary profiles, so that each can have an equal voice; d) Blank Model Prototyping sessions, in order to be successful, need careful selection of extreme users and important players, such as museum personnel, besides the typical computer scientists and designers – otherwise the solutions might easily fail to keep on track with the various identified needs of visitors and institution; e) building simple prototypes and testing them in real contexts leads to fast learning about users mental models, which helps to quickly refine and detail groupware interfaces, as well as review functionalities and requirements; and f) developing twin prototypes in the physical and virtual worlds leads to different but complimentary findings about collaboration, such as behavioral and motivational.

CONCLUSION

In the present research, the use of a human centered and participatory approach to design supported the fast generation and prototyping of numerous meaningful ideas for mixed presence collaboration and social interaction in the context of a Brazilian Planetarium and Science Museum. The involvement of multidisciplinary teams on different phases of the project and careful selection of varied user profiles – from ethnography to fast prototyping – helped bringing different points of views to the design cycle, resulting on the co-creation of group and socialware solutions that can potentially appeal to various visitor profiles, and fit the contextual dynamics of the museum.

A systemic process of co-design was adopted, starting with ethnography and followed by structured analysis and synthesis of research data. The resultant insights and design criteria helped mapping user profile polarities, problems with the museum experience and spaces of opportunity for new solutions to emerge. Based on these findings, co-creation workshops and Blank Model Prototyping sessions were conducted, leading to numerous innovative exhibits, artifacts, interfaces and services that can support collaboration and social interaction.

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