123. Engaging Users in Science and Technology Exhibition CoDesign Online and Offline: the Expolab Experience.

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Abstract. We present Expolab, an experiment on user involvement in science and technology exhibition creation, a joint project of the science communication company La Mandarina de Newton, Citilab (Barcelona) and The Tech Museum in San Jose, California. The project explores novel practical methods for science and technology centres and museums, to become active hubs of citizen involvement and engaging people in science and technology. The approach mixes research, communication and design. It also combines methods that work on a face-to-face basis and the utilization of collaborative Web 2.0 technologies and virtual collaborative 3D environments to develop exhibits with users.

Keywords: Museums, Participation, Co-design, Engagement

Introduction

Science and Technology Museums, like many other museums, are posed with important difficulties to engage their audience in the knowledge they treasure and, in that way, be able to become active hubs for knowledge sharing and learning (1).

The arrival of social media was hailed by many museums as an opportunity to relate in a different way to their audiences (2) and as lever of engagement, replicating similar old claims when the arrival of the web impacted the cultural sector (3). In fact, there is a connection between Web 2.0 technologies and active engagement (4). Museum audiences familiar with 2.0 technologies are, for example, more active in the sense that they read and write more online and offline than the average population and regular museum visitors (5). So, these audiences expect from the institutions to be given a more active role than just being recipients of information and are willing to become more involved. This is a great challenge for current museum strategies (6,7).

Web 2.0 technologies have helped museums realize the possibilities of new participatory projects to engage people in museums' goals, contents and activities. Many of these projects turn the museum into a social aggregator of media and content, either provided by users or remixed by themselves from whatever contents the museum opened for free use. Hopefully, these projects result in an increased social interaction between visitors. This may lead to mutual dialogue and reflection on the museum contents. Some authors (8) make this last claim explicitly. However, participation has many levels and it doesn't necessarily need to be done only through technological means alone.

In fact, initiatives that are too directly inspired by the use of Web 2.0 technologies and their underlying philosophy as their only form of participation tend to exploit just one possible way of engagement: that of letting people contribute with contents, ideas and discussion which, nevertheless, is a very valuable result in itself. They also may be biased towards visitors with some technological background.

Looking for an alternative to exploit the collective aspect of participation, museums can also explore a tradition of collective learning by construction and collaboration that speaks to active users too (9). For example, The Tech Museum pioneered this approach in participation by letting users design exhibits in response to a design brief –a call to create a specific sort of exhibit- by the museum. A precise invitation to create a single type of exhibit was done. Tech Virtual (10), as this initiative is called, has been running for several years now and it is a successful way to engage

people in learning about Science and Technology.

Participation as shared learning through construction requires users to become designers. Participation in design and learning is a laddered experience (11). So, one interesting question is what it would be like to go one step further up the ladder and let users co-design a whole exhibition, without an initial exhibit brief, i.e., giving them the chance to decide topics of the exhibition and then co-design it.

The importance of design in Science Communication as a means to improve the presentation and the visualization of Science and Technology communication projects has already been stressed within the Science Communication research community (12). We want to remark here another concept of design where it is not only seen as an ancillary discipline used to improve visual or aesthetic aspects and as a result increase communication effectiveness. Instead, it is taken as a means to draw the users into the actual creation of the object to be designed and, in this way, reach the core of the message the museum is trying to convey. In order to confront such a challenge, it is interesting to resort to user-centric design methods. Design began to involve users long ago. First, as individuals to be observed (13) then, gradually letting them become co-designers (14,15). Slowly, this approach has arrived also to museums (16,17).

We wanted to test user-centric co-design methods, combined with 2.0 virtual platforms (18), and check its use in the definition of a whole exhibition centred on Science and Technology concepts. This is how the exhibition "From contemplation to participation and beyond", came into being within the Expolab project.

The Expolab process

The Expolab project was created and coordinated by the Science and Technology communication company La Mandarina de Newton in Barcelona. It received the support of The Tech Museum in San Jose, California, and the civic community innovation center Citilab in Cornellà, Barcelona.

The goals of the project were multiple. In a typical design research approach, it started by devising a design research process centred on a clear artefact. The artefact was to be used as a sandbox to test and learn design and communication methods as well as their relationship to 2.0 technologies.

The artefact to be built was an exhibition. The exhibition, although it is a format or genre under much discussion within the museum community (19), still is the flagship of museums. That is why it became our object of choice to test design-based approaches in Science and Technology in museums. The subject of the exhibition was initially defined very ambiguously so that the participants, actual co-designers of the exhibition, could refine and elaborate by themselves the focus, the content, and the actual exhibits.

The institutions giving support to the project were related to innovation in digital technologies. The Tech Museum is in the heart of Silicon Valley. Citilab's main activity is training citizens in Internet skills. So, the focus of the exhibition was initially vaguely defined as "Internet and what it has brought about".

We also wanted to explore and investigate if users could design in a more complex sense than just giving shape to the physical appearance of objects. Exhibition design incorporates much more than that (20). In this case, it was felt that in order to connect with the Science Communication tradition in museums, it was important to use the exhibition as a metaexhibition. That is, to explore, show and reflect on the different approaches to Science and Technology exhibition design over time.

The current predominant mainstream approach to Science and Technology museums is the "interactive museum". It can be traced back to the influential work of Frank Oppenheimer in creating the Exploratorium (21). This was a significant departure from old "contemplative" museums based on the display of object collections, including scientific apparatuses as objects. Instead, Oppenheimer introduced the important concept of experimentation on the scientific phenomenon as the basis for exhibit design. The interactive exhibits in this type of museums initiated a path towards participation, since they require some action on the part of the visitor, which can be taken as a first level of participation. Nevertheless, these exhibits are not always geared towards actual contribution of content or explicitly shared knowledge by the user with other users in the way that, for example, Web 2.0 technologies allow.

The project team proposed as a general constraint for the citizen co-designers that the actual exhibits should integrate (a) a contemplative, passive display of objects related to the subject of the exhibit (b) some form of interaction to explain the science and technology concepts, phenomena and processes around which the exhibit was built and (c) an invitation to other users to contribute content and knowledge to be shared.

In terms of participatory design methods this bundling of different approaches into a single exhibit also posed a challenge, since it involved co-designers in creating something more than a passive object. In fact, the whole exhibition could be seen as a complex system which included personal and social relationships in its design. It also had some reflexivity: citizen co-designers themselves could become eventual visitors. So, they had to think in very complex terms and engage in some level of organizational design. This is at the cutting edge of co-design methods

(22). An added level of complexity is that was an international project with institutions of different competences, in different cultural backgrounds. With all these considerations in mind, the project team sketched the design process to be initiated and also the important research dimensions to be explored:

1. Can non-experts design a quality exhibition of a science and technology subject? There is evidence in favour of this hypothesis in art (23).
2. Which subjects would people suggest?
3. What are the pros and cons of engaging participants from all over the world?
4. What is the response of the public towards the process? What are their main motivations to participate?
5. How should we change design methods to involve plain citizens in complex system co-design?
6. What are the difficulties and advantages to combine offline and online virtual collaboration design workshops?

This last question was especially important since the collaboration had a necessary online component, given the geographical distribution of the design and user teams. Also, it was one asset of the project, due to the experience of the Tech Museum in exhibit design through its Tech Virtual system. It, however, evolved as an online collaboration platform, without offline design sessions.

The test design process that we devised initially was a variation of a well-proven methodology for design that uses a generative step, where new ideas are created, followed by a design analytic step and finished by a synthesis into precise, implementable proposals. The envisaged result was expected to be a workable design description for a whole exhibition, clear and detailed enough to proceed to the construction phase. It was meant to be offered under an open Creative Commons licence. Any museum in the world, or any other group for that matter, could use it to actually build the corresponding exhibits. In the following we describe in linear fashion the phases of the project.

Invitation to participate

In order to start the co-design and construction process of "From contemplation to participation and beyond", we looked for communities of interest. In our case, we made an open call using social networks such as Facebook, Twitter, blog networks and also newsletters, personal mailing, and the Citilab and the Tech Virtual websites to let people know we were starting a new project and to call for their participation.

Face to face workshops

We organised three workshops answering to a significant question: "How has the Internet changed your life?" The formulation of this question was very important. It was related to the still ambiguous topic of the exhibition but, although it was precise, it still was very open-ended and made a direct appeal to personal day-to-day experience, which is a well-proven strategy in Science Communication to gather attention and initiate engagement in the public (24).

The workshops were generative co-ideation sessions. During a typical three-hour session participants worked hands-on with issues related to the impact of Internet in their lives. The design language tools were a set of cardboard, clay, wool and cotton threads, wooden pieces and LEGO™ bricks. The significant question that we launched helped in focusing the attention of the users and gave them some hint of what the possible areas of the exhibition could be. During the workshops we used different techniques to lead them into divergent, generative thinking and convergent construction. We describe them in the following.

Collage making: This technique consists in creating collages in order to obtain latent knowledge from participants. It was mainly used to warm them up. Depending on the session, groups between 20 and 40 people shared their memories, anecdotes and experiences about a certain topic. Participants were divided into groups of 4 or 5 people. We provided them with a set of images and we asked them to choose between 2 or 3 photos that they could relate to the initial question of how Internet had changed their lives. They were asked to explain their selection of photos to the rest of their team. Each group created a collage with all the selected photos. Finally, all the groups shared their collages with each other. In this way, co-designers revealed very rich information about their daily life.

Low-tech prototyping: Each group was asked to create a 3D representation of the ideas and anecdotes that had emerged from creating their collages. The objects that they created were the basis for further discussion and many new ideas were generated.

Figure 1. Participant explaining Connections

Constructing objects manually stimulates the most creative part of the brain. This technique helps people express thoughts that are hard to explain in words. Moreover, it forces them to be more precise about their ideas. Although some people tend to think that they may have difficulties in creating 3D models, participants built in thirty minutes very expressive prototypes.

Analysis

After the workshops finished, the project team worked hard on the analysis of all the generated data. All workshops were recorded. We had videos, collages, low-tech prototypes, photos and information that collected in situ. To evaluate them, these techniques were used:

1. Video recording: All the videos were transcripted. We were able to evaluate the topics that had been more relevant for the participants.
2. Semantic analysis: The meaning of each dialogue and presentation was analyzed.
3. Affinity diagram: We organized ideas and their expressions to find the correlations and identify valuable categories. This technique made sense of expressions by clustering subjects.
4. Word clouds: To better visualise the results of the topic clusters word clouds were created and analyzed. After a couple of weeks, we came out with 5 topics changed by the Internet: memory, connections, work, travelling through time and space and security.

Design brief

From the analysis of the information provided by users and using the constraints about the integration of contemplative, interactive and participatory aspects in the possible exhibits, we prepared a design brief for each topic. Each brief was had six sections: Inspirational anecdote, Science and Technology concept, a sample proposal for the exhibit (volunteered by the team and inspired by the 3D models coming out the sessions), contemplative aspect, participatory aspect and practical technological support. Visit Tech Virtual to see how all these aspects were bundled together in the briefs.

Virtual design

Design briefs were shared on Tech Virtual with a wide community of users who were encouraged to design their own final exhibits fro them. Construction of the exhibits was done virtually in the Second Life virtual world island that the Tech Museum set up for the project. A design contest was open to users in the entire world. It was not a regular competition where the most important factor is the prize and contestants must keep their work secret until the end. It was based on collaboration between designers, dialogue and multiple contributions.

We organised regular weekly virtual meetings in Second Life. Every Thursday we met at 7pm Spanish time, 10am California time, and waited for user avatars to show up in the design space. There were around 10-20 avatars. Participants discussed how exhibition proposals could be improved or the work that had been done during the previous week. Other days, we saw how a new exhibit was created in real time and there was a general interchange of comments

on what the co-designers thought about it and the hows and whys of some details were also asked.

Selection

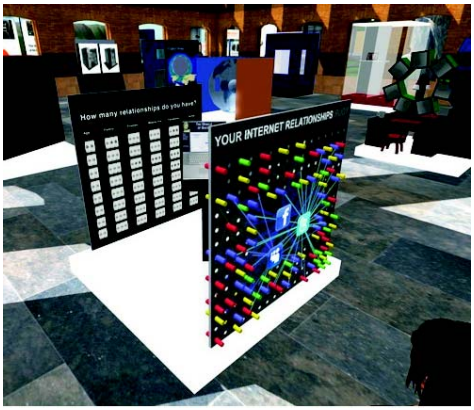

Figure 2. Connexions, the winning exhibit

Up to this point the process had gone through three phases: a first, generative phase, were co-designers explored ideas and used metaphorical 3D prototypes to express what exhibits were to be about and how they could look like; a second, synthesis, convergent phase where design briefs were elicited and, then, a third phase where, again, divergent thinking was expressed by co-designers in the creation of several proposals for each single design brief. There were 15 proposals from people all over the world: USA, England, Vietnam, Spain, etc. After the contest closing date, on April 2010 7th and 8th, there was an on-line and off-line poll. People all over the world could vote for their favourite proposals. The first prize was for Maria Bobes for her "Connexions" proposal. There were four more selected exhibit designs. These were taken as the ones to be used for the final exhibition.

Final exhibit blueprints

The project management team took the virtual design and then it checked it for design requisites. Last final steps to ensure visual coherence of the whole exhibition, that is, design in its more aesthetic sense. A final translation from Second Life structures into actual feasible exhibit blueprints was performed. That required some decisions about materials, colours, and some solutions that would work in a virtual setting but not in a physical one in a real museum. The virtual blueprints were complemented with measures to make it easier to actually build them. All this was compiled into a document that can be find at the Co-Creating Cultures website (25).

Discussion and Further Work

The first question we posed ourselves was if it were possible for non-experts to design a quality exhibition about Science and Technology subject. The process showed that it is actually possible for people to create such an exhibition. As to quality, measurement is always difficult and subjective but experts on exhibition design were surprised about the quality of the designs created by participants. Also, the project was one of the reasons for the Tech Virtual receiving the 2010 Linden Prize, which may be a hint of quality.

Interestingly enough, the subjects selected in several sessions by people from very different backgrounds were almost always the same: social relationships (connexions), memory (photography), time and space (instantaneity), work patterns, and security. These were in most cases associated to technology and science. Social relationships and its expression in network science were consistently chosen in all sessions offline and online. Users were actively and enthusiastically involved in the process. From qualitative research based on interviews we saw that their most cited reason to participate was "doing something different with people" and "learning new things".

Multiculturalism seems not to have been a problem, but added to diversity and creativity in mixing different points of view. One could also see a high variance in aesthetic renderings of the same design brief.

The methods that we used from design and co-design strategies were useful to a point and had to be adapted in later workshops in order to make easier for participants to reflect on the involvement and reaction to the overall design by other users. The combination of online and offline collaboration workshops resulted in different publics involved, with some overlapping. Online publics were more global and more technology oriented than the ones attending face

to face sessions. One can get local involvement and global reach in this way. The combination of online and offline approaches also pointed to further work on replicating design methods online, so that you can get similar dynamics to face to face sessions but with larger groups online. This, however, requires extensive research on the translation of collaborative design sessions and it will involve further technological and interface design research projects, which are currently being defined.

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