LINDA KRONMAN | ANDREAS ZINGERLE

OPENING MUSEUMS NEW INTERACTION METHODS FOR FUTURE MUSEUM EXPERIENCES

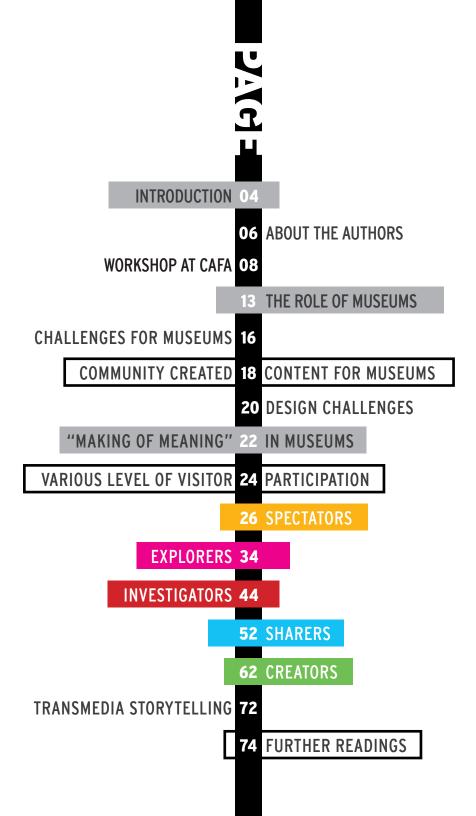


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INTRODUCTION

In this this book we - Linda Kronman and Andreas Zingerle collaborating under the name KairUs - acknowledge that the role of museums are changing, we address visitors as participants rather than passive consumers and recognize that a manifold of visitors need diverse approaches to engage with museums. "Opening Museums" means a number of things; for us, it is about;

ACCESS – to collections, archives and knowledge.

DIALOG – between the museum as an institution and its visitors, discourses around exhibitions and about museum practices.

PARTICIPATION – visitors interacting with exhibited artifacts, museum staff and each other.

EDUCATION – as a participatory practice, in which museums focus on providing environments that offer learning-by-doing opportunities, rather than being the singular voice of authority.

MAKING OF MEANING – visitors co-creating knowledge.

Owing to our backgrounds in interaction design, new media production, digital media art and participatory art & design, we approach the theme of "opening museums" from a point of view where digital technologies can be used as tools to facilitate vistor-museum and visitor-visitor interaction. When exploring "new interaction methods", with the word "new" we refer to emerging practices in museums that encourage openness. On one hand we associate the term "interaction methods" to interactive technologies and suggest how museum visitors as users can intervene in computing processes through various interfaces. On the other hand we look at "interaction methods", as in how to encourage visitors to become interactive participants, following the theory that human communication is based on dialog and exchange. And the last part of the title "for future museum experiences", attributes to the 20 design concepts presented in this book, the aim to enhance openness in museums. All in all this book reflects on how attitudes in museums are changing, how visitor expectations are changing and how we as designers, considering both opportunities and challenges of digital technologies, can design for these opening institutions and their visitors.

THIS BOOK EXTENDS BEYOND ITS COVERS; QR-TAGS LINK EXAMPLES TO PROJECT-WEBPAGES OR VIDEOS ON THE "OPENING MUSEUMS" YOUTUBE-CHANNEL, AND READERS ARE ENCOURAGED TO PARTICIPATE BY SHARING IDEAS OF ALTERNATIVE MUSEUM-MODELS AT: HTTP://OPENINGMUSEUMS.KAIRUS.ORG



his book reflects upon three intensive months of research and design work that took place in Beijing during October-December 2011 as a part of the Artist-in-Residence program at Red Gate Gallery. As a part of the research and working process we organized a workshop for students at the Experimental Media Department, School of City Design at Central Academy of Fine Arts (CAFA). During the "New Interaction Methods For Future Museum Experiences"-workshop at CAFA we collaborated with Today Art Museum in Beijing and the design students to generate ideas and designs for "open museums". A selection of student projects is presented in this book along with KairUs designs adapting ideas that emerged during our research. In addition we present examples of how related projects have been realized by others in various museum environments to bring forth opportunities as well as design challenges to consider when digital technologies meet museums and visitors. The twelve student ideas, eight KairUs designs and nine examples are connected to one of five types of visitor groups - spectators, explorers, investigators, sharers or creators, to which we think they are best suited. And last but not least we suggest that "Transmedia Storytelling" offers various possibilities to engage visitor to interact and participate, while keeping the focus on the theme of an exhibition.

ABOUT THE AUTHORS

LINDA KRONMAN

www.mycupofcoffee.info

- Finnish designer, artist and researcher.
- Since 2000 worked with cross-media productions.
- Since 2008 researched in participatory art and design practices.
- 2010 graduated from Media Lab, Aalto University, School of Art And Design, Helsinki, Finland.



ANDREAS ZINGERLE

www.andreaszingerle.com

- Austrian media artist and researcher.
- Since 2000 working in the field of media technology.
- Since 2004 participating in international exhibitions and conferences.
- 2009 graduated from Interface Cultures department, University of Art and Industrial Design, Linz, Austria.





KAIRUS

www.kairus.org

KairUs is an artist collaboration platform founded by Linda Kronman and Andreas Zingerle. The platform is concerned with Human-Computer and Human-Human Interaction and focuses on media art, bringing together both artists and art enthusiast to work on various projects. KairUs explores participatory and interactive art practices by using various media expressions. Through numerous events like



workshops, exhibitions, talks, presentations and guided tours people are invited to participate and share opportune moments for art collaborations.

WORKSHOP AT CAFA

ORGANIZERS: Linda Kronman & Andreas Zingerle with He Hao, Director of Experimental Media Department at CAFA.

PARTICIPANTS: around 20 3rd and 4th year students from the Experimental Media Department. **COLLABORATOR:** Today Art Museum presented by Deputy Director Alex Gao.

DURATION: 5 workshop sessions in November 2011.

re included a design workshop into our research process to acquire understanding of how young Chinese designers reflect on museums and their possibilities to open up as institutions through more interactive and participatory practices. China, with its continuously changing and developing view on art and cultural heritage, offered us an interesting playground to explore our ideas and attitudes with these young designers. We realized that there are big differences in attitudes to interpretation between authoritative state owned museums and increasingly opening private museums. We collaborated with Today Art Museum, the first private museum in Beijing, to give the students a context to design for. During the first of five workshop sessions we visited the Today Art Museum. There we discussed the role of museums, how visitors can take various roles in their way of interacting in museums, and through examples we looked at ways of encouraging participation through technologies as well as presenting design challenges.

ext the students were presented with a design challenge; *What could be done to make the museum visitors experience more interactive and participatory?* Today Art Museum brought forward two of their challenges; how to reach a younger audience and how to deal with constantly changing exhibits. So we encouraged the students to design for their own age group as a target group and to consider that their designs should be realizable in a museum environment like Today Art Museum. At the end of the first workshop session we visited the exhibitions, the museum's shop and café as well as the surroundings of the museum to get more familiar with the environment we were aiming to design for.









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A CENTRAL ACADEMY OF FINE ARTS

uring the next five sessions we progressed each student's idea to a design concept. Abstract ideas developed towards realizable designs through presentations and discussions. Although we were from time to time lost in translation, the students learned how to conceptualizes their ideas and we gained a broader understanding of Chinese Social Media (since western equivalents like Facebook, YouTube and Twitter are blocked in China). Most students were eager to design for mobile devices, due to an upcoming competition. Therefore (by the end of January 2012) some of the designs will be further developed to applications or prototypes in collaboration with students from the Communication University of China (CUC), who will help out with coding and technical realization of the designs. For this book we chose to publish ideas that were most developed during the time of writing and fitted the frameworks of the design task set by us and the Today Art Museum.

DESIGN SCH

"A MODERN MUSEUM MUST DRAW FROM OUR COMMON PAST AND CULTURAL HERITAGE TO CREATE A DIVERSE AND GROUNDED FUTURE." HOLDEN & JONES

THE ROLE OF MUSEUMS

E arly types of museums began to emerge out of wealthy individuals' collections of cultural, religious or historical importance. These collections were often kept private and were only accessible witin the wealthy circles of society. Public access was hardly ever granted or it was restricted to small groups or certain times. Since then these collections have been opened up, they are now increasingly available to the general public.

Museums have changed into multifunctional places of study, research, education, enjoyment, identification and preservation. Museums still have a major cul-

tural power, influencing communities as well as confirming and defining ethnic and national identities. Museums possess critical resources in society and can therefore foster through discussion and dialog the ideals of a nation. In times of wars, museums are popular targets of destruc-

tion, since one hit, on a mostly unprotected building, can strike a nation's identity and shake its ideals.

Modern trends in museology call attention to change, encourage development and stimulate openness, allowing the public to get involved in different museum practices on various participation levels. Museums are more and more transforming into recreational experiences rather than just educative ones. Many exhibitions try to encourage interaction and participation and whole museums position themselves as collaborative environments. This opens up a variety of new possibilities for museums to reach out to their audiences.



WHAT IS THE SINGLE MOST IMPORTANT FUNCTION OF MUSEUMS? SEE SOME COMMENTS AND ADD YOURS!



Imagine that all museums in the world would close. What a great opportunity to think over how art could be displayed.

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+7 I

Reesa Greenberg



33% of museum visitors forget the names of artists or artworks they saw.

CHALLENGES FOR MUSEUMS From education towards experience

I is widely recognized that an essential role of museums is to educate. As soon as a private collection opens to the public the museum transforms to an educational institution. This challenges social, moral and political responsibilities of what kind of education model a society values most and how this model is then implemented in a

museum context, empowering citizens to make informed decisions in a democratic society.

n open museum is supported by an non-hierarchal education model. The model of an authoritative teacher or institution depositing data into our brains is old fashioned. Visitors at a museum

50% remember not much of the artworks they saw.

Francesco de Biase

should learn by doing, from each other and through the experience fostered by the museum. By selecting from a variety of educational practices, there is also a range of different digital communication models to choose from, all used by specific target groups with their cultural preferences. Digital media increasingly used to compliment learning experiences and developing collaborative practices like co-creation of knowledge. For museums, positive towards opening dialog with visitors, there exists a number of interaction methods and technologies, that encourage participants to take part in the process of "making of meaning". One out of many challenges is to adapt them to the unique needs of each institution.

COMMUNITY-CREATED CONTENT IN MUSEUMS



e believe that the social role of museums has dramatically changed in the last decade. The artworks are not simply "artists' messages to the audience" compiled together by a curator and presented in a white cube setting. The linkages between the artworks create new meanings, new stories. When audiences themselves can affect or create these links they transform from passive spectators to active explorers. To achieve this, museums have to change their communication methods and design rationales to deliver content and engage with the audience in novel ways. The shift in audience participation calls for new possibilities to share knowledge, both in the museum, and also online before, during and after the museum visit. Complex problems and innovative stratgies can be addressed if museums would engage more with design communities of makers, crafters, hackers, etc. This Community-created content could bring different perspectives on a topic and generate discourse in addition to the well-established informative materials and events that are organized and provided by museums.

"ONE OF THE FUNDAMENTAL OBJECTIVES OF THE MUSEUM IS TO EDUCATE AND IT IS ONLY THE MUSEUMS THAT HAS THE CAPACITY AND ABILITY TO IMPACT CULTURAL EDUCATION EFFECTIVELY AS IT HOUSES THE TOOLS AND MATERIALS FOR DOING SO IN ITS COLLECTIONS."

E.N. ARNIZE

DESIGN CHALLENGES When technology meets museums

T is always a challenge to integrate technology into a space, whatever the format might be (on-site interactive installations, touch screens, use of mobile devices etc.) It is important to remember that the artworks, artifacts and stories around them is what makes an exhibition interesting. Technologies should be facilitative tools, not distracting add-on gadgets as they sometimes are. Though only by trying out new ideas, by developing new interaction methods, can we discover and what kind of solutions work for museum environments.

TECHNOLOGY IN MUSEUMS: USEFUL OR USELESS?



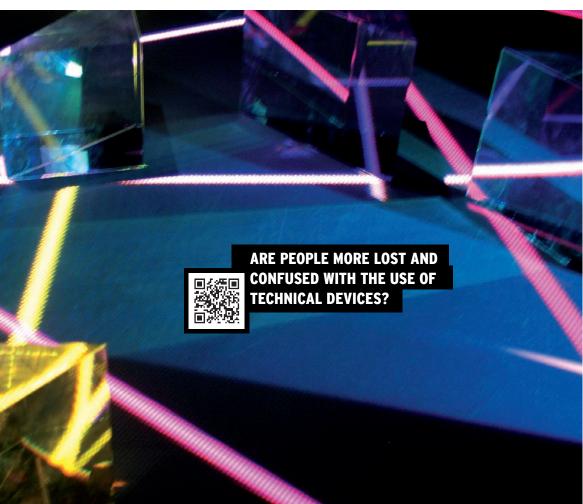
DO PEOPLE PAY MORE ATTENTION TO THE DISPLAY THAN THE EXHIBITION?



"TECHNOLOGY IS EASY; SOCIAL CHANGE IS HARD" PAUL MARTY



E ach museum, each exhibition-project, is unique and will encounter specific design challenges when adapting technologies. There will be technical challenges – how to develop sustainable solutions, where the failures of technologies (out of order installations, reconnecting to networks, error messages) don't affect the experience. On the other hand designers have to consider the social abilities of visitors to cope with technologies and give support to a diversity of users with a variety of technical skills.



"MAKING OF MEANING" IN MUSEUMS

ur world view and self-image are based both on our own experiences and interpretations offered by others. Our human awareness would be very limited if it were only based on our personally experienced facts. Our knowledge is built on a constantly ongoing dialog between our selves and our surroundings, and museums as institutions play a significant role in confirming and defining our world views and identities.

WHY INVOLVE VISITORS IN THE "MAKING OF MEANING" PROCESS?

- The contents of museums become more accessible for visitors.
- Participation can extend the engagement with the exhibited material, and an active involvement supports learning.
- Memories and artifacts of participating visitors can bring valuable complementary documentation into an exhibition.
- Personal narratives bring forth diverse voices, that are in contrast to the official tone of well-established interpretative museum materials like audio-guides.
- Enthusiastic participants can create own interpretative material inspired and coupled with exhibition artifacts.
- Through the various viewpoints of visitors multiple perspectives can be explored and discussed, and past can be connected with the present in meaningful ways.
- Visitors can strengthen their identities when their opinions and thoughts are considered valid.

"The way meaning or signification is formed in and by an exhibited object in a museum is dependent on a complicated connection between the object and its physical shape and condition, its original context, its museum context, i.e., the way it is displayed and curated, the way it is displayed and curated, as well as the museum's architecture, and finally its dialogue with the and finally its dialogue with the system of the system of the system JØRGEN RIBER CHRISTENSEN

> "(...) understanding the range of ways that people make meaning of objects and using that broadened spectrum as the basis for museum programs and exhibits can open the door to more democratic practices in museums"

LOIS H. SILVERMAN

VARIOUS LEVELS OF VISITOR PARTICIPATION

hen we recognize that "making of meaning" is an important component in learning, that a significant role of museums is to educate, we also realize the need to create interaction between museums and their visitors as well as amongst visitors in museums. Museums could be places where we become inspired, where we have time to reflect, an opportunity to create our own interpretations and to share them. So how should museums facilitate these processes that strive for visitor interpretations and active "making of meaning" processes? First we have to recognize that visitors are diverse. They seek for various levels of involvement and participation. Some feel comfortable in just discovering things by looking around, other seek for knowledge and some want to share opinions or even create their own interpretations inspired by exhibitions at museums. In different situations visitors take various roles in their engagement to participate. In this book we chose to name them spectator, explorer, investigator, sharer and creator.



NINA SIMONS EXECUTIVE DIRECTOR OF THE MUSEUM OF ART & HISTORY IN SANTA CRUZ, AUTHOR OF "THE PARTICIPATORY MUSEUM" BOOK AND BLOGGER ON MUSEUMS 2.0, POINTS OUT INTERESTING THOUGHTS ABOUT VISITORS AS PARTICIPANTS.

ROLES OF VISITORS

CREATOR - GETS INSPIRED TO CREATE SHARER - LIKES TO SHARE THOUGHTS AND OPINIONS INVESTIGATOR - SEARCHES FOR KNOWLEDGE EXPLORER - TRIES OUT NEW THINGS SPECTATOR - LOOKS AROUND PARTICIPATION LEVEL LOW

Let is important to develop interaction models for all these visitor groups. As individuals we might fit into different roles depending on when and what kind of museum we visit. Thus by witnessing others engaging in "making of meaning" this encourages us as well to discover, to share and to create. Connected to these roles of participation engagement, we look at approaches of visitor-museum and visitor-visitor interaction. How collaborative "making of meaning" can be facilitated by technology in museums as well as what challenges are to be considered. We use examples to illustrate what kind of engagement each group of visitors are comfortable with. Hence we present concepts developed by the KairUs team as well as ideas that the Experimental Media Department students at CAFA generated during the "New Interaction Methods For Future Museum Experiences" workshop. Each example, concept and idea is connected to one visitor group, yet in their complexity could fit others as well.

<u>SPECTATORS</u>

SPECTATORS FEEL COMFORTABLE TO DISCOVER NEW THINGS BY LOOKING AROUND AT THE EXHIBITION. THEY SHOULD BE ENCOURAGED TO ENTER A DIALOG WITH THE MUSEUM AND THE EXHIBITED COLLECTION.

²⁶ SPECTATORS INTRODUCTION

hen exhibition items are juxtaposed across time and space, it affects how we interpret the meaning of objects. Visitors in museums interpret works of art or design, and in this way they enact a dialog with a collection. **Fred Wilson's** "*Mining the Museum*" is a great example of how traditional curatorial methods can open our eyes to see exhibited artifacts from new perspectives. Augmented Reality (AR), the phenomenon of adding virtual elements into our physical reality, like in the example of "*Augmented Reality Paintings*" at the **Sukiennice Museum**, enables us to juxtapose the exhibition objects with multimedia elements affording new levels of storytelling. Animated paintings serve as another way to introduce stories into e.g. historical artworks. Stories attached to artworks or artifacts offer visitors new knowledge and add new layers to their interpretations of the work. Another interesting approach

to encourage discourse around an exhibition theme is to visualize hidden information, like museum practices, visitor statistics or our behavior in museums. Questions as: who is chosen to exhibit in a museum or not? look critically upon

"...TWO MAJOR WAYS MUSEUMS CAN ENGAGE IN SOCIAL ACTION. ONE IS TO TAKE UP CHALLENGING TOPICS IN SOCIETY, THE OTHER IS TO CHALLENGE THEIR OWN PRACTICES AS MUSEUMS." GEORGE E. HEIN

museum practices. A group of artists were asking this question at the **MOMA** in New York. They used AR technologies to curate their own exhibition in MOMA, without the museum being aware of it. Through new interaction methods museums can also create discourse around challenging topics or challenge their own museum practices, both ways of engaging the visitor into a dialog with the exhibited collection.

DESIGN CHALLENGES

To consider that visitors have diverse background knowledge about a curated exhibition's theme. This affects their ability to make new interpretations. A spectator looks for easy access to information, new technologies should be presented with clear interaction guidelines.

MINING THE MUSEUM



Museums are also places where politics are carried out, in the sense of how people make decisions about their identity now and in the future. People enter museums some with the attitude of faith others very skeptical. Certain kinds of art plays with these attitudes, a good example of this was Fred Wilson's "Mining the Museum" exhibition at Maryland Historical Society, considered one of the most conservative environments in the city. "Mining the museum" raised questions about racism and politically challenged the visitor by its way of displaying and connecting objects to a specific site. An example of this was when Fred combined slave shackles with beautiful silver artifacts and labeling the juxtaposed artifacts as "Metalwork 1793-1880". The juxtaposing suggested the connection, that the production of beauty was made possible by the enslavement, and quite possibly they could have been produced by the same person. Fred also changed the labels of paintings and objects, that originally were untitled and often assigned by the curators. Just by rearranging artifacts and relabeling items "Mining the museum" raised questions putting our world views to a test. At the same time the exhibiton managed to both deal with an important topic and to question a number of museum practices.



Photo: Jeroen Fossaert (CC BY-SA 2.0)



Photo: Tony the Misfit (CC BY 2.0)



AUGMENTED REALITY PAINTINGS AT THE SUKIENNICE MUSEUM



In the **Sukiennice Museum** 19th century Polish paintings were juxtaposed with short videos using Augmented Reality technologies. The videos were visible through smartphones and "brought the paintings alive". Besides attracting bigger crowds to the museum, the technology afforded new ways of attaching stories to the paintings. This offered visitors new understanding about the historical context of the painting and at the same time initiated a dialog for new interpretations.



AUGMENTED REALITY EXHIBITION AT MOMA, NEW YORK



In October 2010, a group of artists arranged an Augmented Reality exhibition at MOMA, New York. By using mobile technology, visitors could see a virtual exhibition within the museum. There was also a 7th floor added to the museum. The exhibition was realized as a guerrilla intervention, the artists were not invited or did not collaborate with the museum when producing the augmented exhibition. Anyhow the intervention became so popular that the museum added it to their virtual art collection.

VISUALVISIT

Keywords: Mobile Media, Social Media, museum's shop, visualization, sharing, dialog, product design.

Aim: to encourage visitors to share their exhibition experience by visualizing their museum visit. An easy and playful approach to enhance dialog about exhibitions through Social Media. **Targeted museums:** any.

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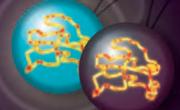
30 SPECTATORS KAIRUS DESIGNS



VISUALIZE YOUR MUSEUM VISIT



Download the VisualVisit application to your smart phone and record your museum visit in a visual way. How long did you spend time at each painting? What was interesting for you, what not? Share the animated 3D visualization with your friends and comment on it.



HOP

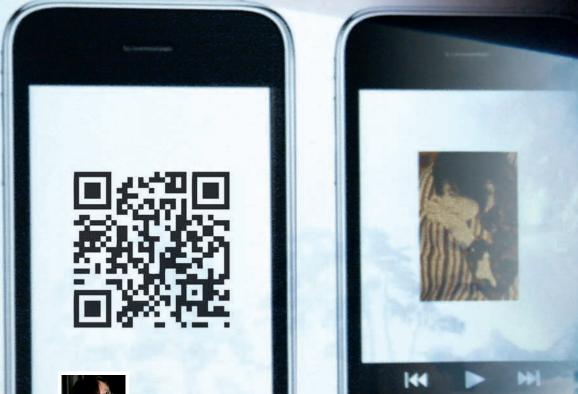
or on the museum's online shop you can easily design jewelry with your personal museum visit visualization.

or on the museum's on-line snor-jewelry with your personal museum visit vis-

isualVisit is a smartphone application that visualizes ones museum visit. The application can be used to record a visitor's movements in the museum, how much time is spent with the artworks or in other spaces. The recording is rendered to an animated 3D visualization that can be viewed from various perspectives with the help of a rotation function. A discussion around the museum experience can be initiated by sharing the VisualVisit image. The visualizations are easy to share over Social Media applications. The visualizations can also be brought to a physical form as jewelry that can be purchased in the museum's shop. This gives the visitors an opportunity to create personalized souvenirs, allowing the visit at the museum to be extended at the shop.



Anami Nice pic... so what was by those red spots whe spent the most time? fburg My favorite was Frida's *Broken Colur



QR-360° - MULTIMEDIA GUIDE by Yang Ru

Yang Ru design uses QR codes to give visitors access to simulated replications of the artworks, that can be zoomed and rotated. This gives visitors an opportunity to examine exhibited items in detail from all perspectives. Her proposal is a complimentary multimedia feature to traditional audioguides.



32 SPECTATORS STUDENT IDEAS

AR CHINESE PAINTING by Chaisheng Quan



Chaisheng Quan's proposal merges traditional Chinese paintings with new technologies, utilizing the opportunities of Mobile Media and Augmented Reality. Chinese paintings are rich in symbolism and have embedded story-worlds that are hard to understand for the museum visitor who is unaware of the cultural undertones. With the use of Augmented Reality tags that can be explored with smartphones, Chaisheng Quan strives to open up the symbolism of the paintings. The service offers visitors an opportunity to explore a painting and its hidden symbolism through animated elements, complemented by a biography of the painter and further related stories.

HEAVENLY CREATIONS by Hong Tiangi

The *"Heavenly Creations"* is a part of the book *"Seventeenth Century Chinese Technology Encyclopedia"*, created by the famous scientist **Song Yingxing**



during the Ming Dynasty. The book chronicles various technological achievements of that time. Hong Tianqi proposes a multi-touch table, that allows visitors to browse through an animated map. By zooming in and activating different technical apparatus the user can learn more about their functions.

EXPLORERS

EXPLORERS LIKE TO TRY OUT THINGS AND TO UNCOVER NEW KNOWLEDGE THROUGH INTERACTION. THEY SHOULD BE ENCOURAGED TO DISCOVER AND REFLECT THROUGH PLAYFUL INTERFACES.

陈波秀

对半衣

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³⁴ EXPLORERS INTRODUCTION

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注:发表在新书年的文章

his group of visitors, as the name suggests, make meaning of the world by exploring their surroundings. They learn by doing. The explorer likes to interact, he/she tries out new things, yet is not willing to invest too much time in it. Innovative interfaces catch the attention of the explorer, the playful action enables new ways of seeing and thinking. Consequently this helps an explorer to interpret exhibited artworks and artifacts in new ways. AR technologies, as the **"Touch history"** example shows, enables us to play around with simulated 3D imitations of artifacts, allowing us to see them from diverse angles, which often is impossible in cases when the real physical items are too valuable to touch. Small games, interactive installations and entertaining applications add up to an explorers museums experience. An explorer's museum experience can be extended outside the exhibition hall by adding things to be discovered as well in the museum's shop, café or in the surrounding areas of the museum.



DESIGN CHALLENGES

To embed meaningful stories or interesting points of view into playful interfaces, that support either exhibition themes or values and practices that museums are willing to communicate. Consider that digital technologies should be used as facilitative tools. Their wow-effect disappears soon, and in the end the content and topic of the exhibition should be the most important factors that draws the interest of visitors rather than the use of technologies.



36 EXPLORERS EXAMPLES



TOUCH HISTORY

In this short demo, developed by a company called *Armes*, Augmented Reality is used to explore a simulated artifact. As the example suggests it can be a 3D imitation of a historical item, that can be observed and examined from diverse perspectives. This is not possible with most of the fragile and valuable physical items in museums. A simulated replica of the item offers therefore an extended access to investigate 3-Dimensional artworks exhibited in a museum. An alternative could be to exhibit virtually reconstructed items when only parts of the artifact has survived over times.



INNOVATIVE USER INTERFACES



Nobel Peace Center in Oslo, Norway presents a number of interfaces that enables to explore historical content. For example a virtual book that helps visitors to brows trough exhibited and archived material. When visitors find something interesting they can touch the items in the book to find detailed information. Another example are the physical slide bars that assist visitors to brows through documented material on a video wall.



SONIFICATION OF ARTWORKS

Keywords: Mobile Media, playful, audio, creative experience. **Aim:** explore artworks in a new way - find art everywhere. Converting one art form to another. **Targeted museums:** open to all museums.

his sonification application enriches one's visual experience of artworks by combining it with an auditive playful exploration. The mobile application tracks the color of an artwork as well as the movement in front of the artwork translating it into sound collages. This image-tosound mapping uses a visitor's mobile music collection and generates personalized sound collages, that can be shared with others.

38 EXPLORERS KAIRUS DESIGNS





Keywords: online game, playfulness

Aim: the game targets a young audience willing to experience a museum visit in an adventurous way.

Targeted museums: open to all museums with changing exhibitions.

he online game aims to raise awareness and awake interest about current exhibitions that are on display at the museum. The game targets young audiences in a playful and immersing way. It takes place inside the museum where the player navigates through a 3D environment. The player is assigned the role of an museum security guard. By exploring the game environment the player is virtually visiting the ongoing exhibitions in the museum. The player is kept busy by fulfilling the duty of the museum staff: keeping the museum up and running and the artwork safe from the hands of naughty visitors. It's a tricky challenge against the clock and depending on the featured exhibition, game levels and obstacles can be changed.

FLOATING MESSAGES by Sun Qi Meng

Gift shot

6

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Sun Qi Meng believes that the museum's café is the last "room" of every exhibition. Once there, visitors should be able to relax, reflect and discuss about their museum experience. To transform the café into an extensively collective environment, Sun Qi Meng proposes an interactive touchscreen, enabling visitors to exchange comments and learn more about current exhibitions. The playful interface, of sound generating bottles with "messages" (stories connected with current exhibitions), invites people to both leave comments and motivates to explore additional information.



8 111

DESIGN THE MUSEUM SHOP by Liang Hong Yu

Museum shops often sell well designed and crafted objects for daily use. Liang Hong Yu wants to give the designers a larger platform to showcase their designs and production processes. She proposes an interactive table where people can place shop-items that trigger videos, introducing the artist and their designs. By doing so the buyer attains a more personal insight on how the objects where produced, something that easily gets overlooked in today's culture of mass consumption.

EXPLORERS STUDENT IDEAS

PUSS 統計「一機 POLC EXHIBITION OF MOLIONG H. 説明: 2011年1月2月2012年1日1日 説氏: 1号作2篇 Curation Decem: *29:2011-January 11:2012



展示的礼品.

服制转行品他们为

INTERACTIVE FISHTANK by Jia Ranran

Jia Ranran's design is an interactive fish tank, that projects visitor comments and general information related to upcoming museum activities. The guestbook part of the fish tank is projected on a wall. Visitors can send messages to the wall by making specific fishing movements with their smartphone. The sizes of the fish on the projected wall vary according to the age of the comment. Through the lively movement of the fish, the visual design should evoke pleasant aesthetics for visitors to enjoy as well as make them curious to interact with it. The upcoming museum activities are visible through an AR layer on a smartphone. The augmented fishes can be snatched into the smartphone with a quick wrist movement. When a fish is caught into the smartphone it turns into detailed information about an upcoming museum activity.

INVESTIGATORS SEEK FOR KNOWLEDGE, THEY ARE EAGER TO LEARN MORE AND READY TO DIG DEEPER INTO INTERESTING THEMES. INVESTIGATORS SHOULD BE PROVIDED WITH USER FRIENDLY ON-SITE AND ONLINE ENVIRONMENTS THAT HELP THEM TO FILTER AND FIND INTERESTING INFORMATION.

INVESTIGATORS

"DIGITAL MUSEUM COMMUNICATION HEIGHTENS THE ACCESSIBILITY OF VARIOUS TYPES OF OBJECTS, KNOWLEDGE AND RESEARCH RESULTS CONSIDERABLY, BOTH INSIDE AND OUTSIDE THE MUSEUM AS WELL AS OFFLINE AND ONLINE." NANNA HOLDGAARD & CELIA EKELUND SIMONSEN

44 INVESTIGATORS INTRODUCTION

or investigators the label besides the artwork is far from satisfying their hunger for knowledge. They crave more information to understand the context of the artwork. Knowledge about the artist, an artwork, the concept, or historical context, adds to an investigator's interpretation of an exhibited item. Investigators prefer to build their world view on multiple sources of information and museums as institutions are considered a reliable source of knowledge. The exhibition catalog is the traditional way of feeding an investigator's appetite for knowledge. On the other hand new interactive technologies provide greater accessibility and afford larger archives of data. With user friendly interfaces and search functions, individuals can easily filter these databases to find information that is relevant for them. Many museums are in the process of opening their collections and archives, making them available online. "Google Art Project" is a great example of how collections of major museums are made more accessible outside the museum. New technologies can also set the exhibited artifacts free from their museum context to other contexts, perhaps their original ones, such as in cases of virtual reconstructions of historical sites. Storytelling in historical museums could be accessed from AR technologies on mobile devices, to give historical context to artifacts. In these cases it is important to consider how information is logically categorized and accessed through user friendly interfaces. Investigators are ready to invest time in learning, so their museum experiences tends to drag out into long and exhausting visits in the exhibition area. Online and mobile technologies enables the museum experience to extend into more comfortable environments. With the help of these technologies investigators can continue their research in the museum's café, where they can sit down, or even more comfortably at home from their own computer.

DESIGN CHALLENGES

To handle large amounts of data and manage it on various platforms. To design applications to be used on various platforms (web browsers, smart phones, on-site guides and installations). To design effective and logical ways to label and organize data and user friendly solutions to search and filter it.





4



The "Google Art Project" gives remote visitors a possibility to explore museums from all around the world. You can virtually visit the galleries of *Tate Britain* in London, U^{-} zi Gallery in Florence, the Metropolitan Museum of Art in New York or the State Hermitage Museum in St. Petersburg, etc. Through the online application visitors can access, discover and view hundreds of artworks. They can use advanced zoom functions to investigate the artworks on very detailed levels. The service also allows users to create and share own collections of masterpieces.



FRIDA KAHLO

cann

10:14 AM

Frida Kahlo de Rivera (July 6, 1907 – July 13, 1954; bo Carmen Frieda Kahlo y Calderón)[2][3] was a Mexica in Coyoacán,[4] and perhaps best known for her self-

Kahlo's life began and ended in Mexico City, in her ho the Blue House. She gave her birth date as July 7, 19 birth certificate shows July 6, 1907. Kahlo had alleged year of her birth to coincide with the year of the begin Mexican revolution so that her life would begin with th modern Mexico. At the age of six, Frida developed po caused her right leg to appear much thinner than the

48 INVESTIGATORS KAIRUS DESIGNS

3D-ART-AR

Keywords: onsite mobile device application, Augmented Reality, 3D, playful.

Aim: to present artists and their work through a user friendly and playful interface.

Targeted museums: art museums, best suitable for permanent collections.

nformation about artists, their techniques and artworks can be browsed on a mobile device during the exhibition. The Augmented Reality (AR) layer on the mobile device, is a playful interface that imitates a futuristic game-like environment. Visitors scan the exhibition hall with their devices, this to find information hidden in the physical space, yet visible virtually through the application installed on their mobile devices. For some chosen artworks, the interface presents 3D models of artists, tools and paintings in combination with short texts and optional voice-over functions. Using 3D models has certain benefits besides building a game like environment. All artist can be modeled and represented in a uniform way and 3-Dimensional artworks like sculptures can be viewed 360°, independent of their physical placement in the exhibition space. Through a graphical user interface the amount of information can be adjusted, offering an overview of each chosen artwork, yet giving the opportunity for visitors to dig deeper into details when they find the topic specially interesting. In a transmedia storytelling context, the 3D-Art-AR application can offer entrance points or hide clues that advance a story, engaging visitors to a wider museum experience.

954; born Magdalena lexican painter, born r self-portraits.[5]

her home known as 7, 1910, but her illegedly wanted the beginning of the with the birth of ed polio, which an the other.

1111

MY MASCOT GUIDE by Liu Yuan

Liu Yuan suggests museums rent mobile devices for visitors to use in the museum's café. There she believes that the visitor has more time to absorb detailed information about the recently visited exhibition. In Liu Yuan's application a helping mascot guides the user and shows how to dig deeper into detailed information about artist, concepts, artworks and critics. Artist talks or related documents would be best presented in video format. The user can collect favorites that are then packaged to a multimedia presentation and sent by the mascot to one's smartphone or e-mail to one's computer.





LIFE INTO PAINTINGS by Lin Jie

Lin Jie proposes an Augmented Reality application for mobile devices, that enables visitors to look at historical paintings coming alive through video documentation or animations. The idea is to narrate the history of the painting and complement the

service by including opportunities to browse through comments left both by art critics and visitors.





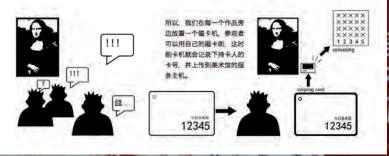






Wang Yuanyuan's design endows museum tickets with an additional use. Every museum ticket has an unique barcode. By using the barcode he wants to provide the visitor with an additional service. Next to the artworks he wants to install a device (barcode reader, camera), that can capture the tickets' barcode. If a visitor likes an artwork and wants to 'remember' it for later, he/she can hold the ticket to the device. By doing so a personalized bookmark list is created. Later the list of bookmarks can be accessed online for further investigation of one's favorite artworks.

公田美林



3

SHARERS

SHARERS LIKE TO CONTRIBUTE WITH THOUGHTS, OPINIONS, REFLECTIONS AND PERSONAL MEMORIES. SHARERS ARE ALSO OPEN TO PROVIDE EXHIBITIONS WITH PHYSICAL INDIVIDUAL OBJECTS LIKE; TOYS, TOOLS, EVERYDAY DESIGNS ETC. OR DIGITALLY CONTRIBUTE WITH TEXT, IMAGES, VIDEO OR AUDIO CLIPS. MUSEUMS SHOULD OFFER COLLABORATIVE MEANING MAKING AND SOCIAL MEDIA ENVIRONMENTS FOR SHARERS.

he contribution of visitors can become a central part, or the whole concept, of an exhibition. Shared artifacts, physical or digital, can also become complementary documentation for an exhibition. An exhibition can concentrate on a specific community e.g. veterans, ethnic groups, visually impaired etc., their contribution can offer new ways to understand various meanings of the exhibited artifacts. Social media provide web technologies that enables sharing, commenting and co-creation of knowledge. "Technology is easy", the challenge is to facilitate and moderate new social behavior in museums that encourage visitors to reflect upon exhibition experiences. The application can function as a tool for creating new meaning formed by the voices of multiple visitors. Owing to the social media culture we are now used to like, vote, rate and comment. When the same kind of behavior is adapted to museum environments, visitors can build on an dialog with others, without necessarily being in the same space at the same time. Sharers and other visitor groups can strengthen their identities when their opinion is considered valid. On the other hand polls and differing opinions e.g. in taste can raise interesting questions about how diversely we interpret the world. By using key words and combining them with artwork, as the "TweetCaption" example demonstrates, we can discover new and surprising connections between things. Museums remain slow to recognize their users as active participants in "making of meaning" and social media have yet to make a significant impact on museum-visitor interaction. It has to

be recognized that the museum has to offer resources to facilitate social media platforms both to encourage dialog and to provide interesting content that provokes reflection and discussion.

"WHEN SOCIAL MEDIA ARE USED TO CREATE CULTURAL LEARNING EXPERIENCES IN MUSEUMS, THEY AFFECT THE WAYS IN WHICH AUDIENCES PARTICIPATE IN KNOWLEDGE SHARING, COMMUNICATE WITH EACH OTHER AND MAINTAIN INCENTIVE TO ENGAGE IN THE LONGER TERM." ANGELINA RUSSO

DESIGN CHALLENGES

Choosing, filtering, moderating – presenting visitor generated material in interesting ways, without minimizing the importance of individuals' own opinions or the validity of their memories. Maintaining the role of museums as reliable sources of knowledge. Designing relevant intuitive symbolism for rating or expressing opinions that fits the museum' environment.

54 SHARERS EXAMPLE

TWEETCAPTION



"TweetCaption" by Irene Posch and Jona Hoier is an example of how social media, in this case Twitter feeds - can be implemented into an exhibition setup. According to the creators: "TweetCaption is a small screen integrated into the museum signage system, which displays live Twitter messages filtered according to the exhibit: showing ongoing global discussions about the art piece, the artist, or contextual relevant information."

TITLE THE UNTITLED

Keywords: Mobile Media, comment & share, open collection.

Aim: to give interested visitors an opportunity to comment and reflect on an artwork.

Targeted museums: fits to any museum with a permanent exhibition of their collection.

A museum's permanent collection often holds many untitled objects, either because they are unnamed artifacts or the artists choose not to name their artwork. This smartphone application allows museum visitors to create their own titles for these untitled objects and rate titles suggested by other visitors. Giving titles to untitled objects is a way of engaging with the artwork. Creative titles can easily change the way we understand the work, subsequent visitors will be able to affect each others' interpretations of art and artifacts.



56 SHARERS KAIRUS DESIGNS



THERMO RATING



Keywords: Mobile Media, visualization, sharing, rating. **Aim:** Provide a tool that enables visitors to express their interest in various artworks and to share their opinions in a collective way trough an AR visualization on a smartphone.

Targeted museums: art museum.

58 SHARERS KAIRUS DESIGNS

hrough the "ThermoRating" smartphone application visitors can rate how interesting they find various artworks in an exhibition. The visitor can choose between three colors: red-interesting, yellow-moderately interesting, blue-not interesting, to rate the artwork. The ratings of all visitors can be seen through an Augmented Reality layer on the mobile phone screen. The visualization is shown in the form of human vignettes in front of the artwork. The amount of vignettes as well as the color of them indicate how popular the artwork is. A single, mostly blue-colored vignette indicates low interest levels whereas multiple human figures in red tones speaks for popularity. The landscapes of human figures and blue-yellow-red color gradients resembles a view of a thermal camera, functioning as a metaphoric interface. The act of voting for artwork is an easy way with low threshold to interact and participate. The application serves as an entrance point to dialog. How come no one likes this work? Why is this artwork so popular? In an advanced version of the application various filters could be added allowing visitors to see opinions of special age groups or votes given in a specific time frame.



BLOW THE DANDELION a virtual guestbook by Lingyun Gao

As in the traditional guestbook visitors can both reflect on their exhibition experience as well as read comments left by others'. To make



the interaction with the guestbook more playful, Lingyun Gao uses the dandelion parachuteseed as a metaphor for the userinterface. To display a message in the dandelion guestbook, the visitor can write a comment on a mobile device. By blowing over the display surface the internal microphone of the device is triggered and like blowing a real dandelion seed, the parachute is animated and flies off to a projection on the museum's wall where it is displayed for other visitors.





SUN & RAIN by Lui Qianli

Lui Qianli has a similar idea to Han Dan, both of them try to enhance the possibilities of visitors to share and comment on artworks. Lui uses well known symbols from weather forecasts to indicate if a visitor likes an artwork or not. Comments become visible by clicking on the symbols, new symbols with comments can be added as well.



60 SHARERS STUDENT IDEAS



RATE & COMMENT by Han Dan

Han Dan's design aims to encourage visitors to rate and comment on artworks in the exhibition through the use of their mobile phones. Visitors can see which artworks are often discussed, see their popularity, post their own comments and share it with the other users. The aim of the design is to enhance opportunities for dialog in museums.





CREATORS

CREATORS FIND MUSEUMS AS INSPIRING ENVIRONMENTS AND LIKE TO EXPRESS OPINIONS, FEELINGS, INTERPRETATIONS IN CREATIVE WAYS. THEY SHOULD BE OFFERED OPPORTUNITIES TO BOTH LEARN AND SHARE THROUGH METHODS OF CREATIVE EXPRESSION.

62 CREATORS INTRODUCTION

ne way to offer creators opportunities to express themselves is to introduce participatory design concepts into exhibition design. This can lead

to interesting outcomes: Communities (e.g. youth, elderly, local habitants, etc.) can share their interpretations of exhibited artifacts in creative ways (e.g. visually, through music, poems, etc.). As in the example "*The Secret Life of Objects*", community

"CAN OBJECTS THAT WERE MEANINGFUL TO SOME PEOPLE (THEIR PREVIOUS OWNERS, THE CURATORS WHO ACQUIRED THEM) EVOKE MEANING FOR OTHERS, AND SO HELP THEM CONSTRUCT NEW IDEAS ABOUT THE WORLD, NEW KNOWLEDGE? MARIANA SALGADO

produced interpretations can then be exhibited in connection with the artifacts they drew inspiration from (e.g. with the help of digital technologies). A participatory focus on an exhibition's content can also be the key to encourage other visitors to reflect and comment on art and artifacts. Virtual museum environments, where visitors can curate their own exhibitions from museum collections, can be very educational in terms of understanding museum practices and how "making of meaning" is an important part of a successful exhibition. On the "Make History" website by the National September 11 Memorial and Museum, participants are given tools to visually create their stories of the 9/11 happenings. Memorials like this, devoted to events in recent history, can entirely focus on collecting memories and experiences from the public, allowing multiple voices as well as offering a collaborative way of dealing with hard memories. On the other hand everyday things like the city we live in ("VÆGGEN" example), food or traditions can be used as exhibition themes. This inspires visitors to look at art and history from yet another more personal perspective, revealing reasons why art and history are playing an important role in our everyday life.

DESIGN CHALLENGES

Co-created content varies in quality. A challenge is to develop tools to create content that frames the work enough to make it understandable and quality wise acceptable, yet giving the visitors enough freedom to actually be creative in the given frame work. Co-created exhibition often requires extra resources to coordinate the participating parties. Questions of ownership and copyrights needs to be clearly stated in museum projects or exhibitions where visitors contribute with creative input.

THE SECRET LIFE OF OBJECTS

The Systems of Representation research group at Media Lab (Aalto University, School of Art and Design Helsinki) in collaboration with the **Design Museum in Helsinki** carried out a highly participatory project, that became the main focus of *"The Secret Life of Objects"* exhibition about Finnish design artifacts. Young workshop participants were encouraged to express their interpretations of everyday design objects like furniture, kitchenware, etc. in forms of poems and music. During the exhibition of the Finnish design artifacts the poems and music were coupled with the object they were inspired by. This was done through an interactive map, that allowed visitors to comment on the designs. The outcome of the project shows that community created content, facilitated and presented in a smart way, can both express new perspectives to everyday items as well as encourage other visitors to a creative output.

64 CREATORS EXAMPLES

VAEGGEN - MUSEUM ON THE STREETS

The Museum of Copenhagen has constructed a 12 meter long and 2 meter high mobile interactive touchscreen called *"VÆGGEN"*, that shows the history of Copenhagen. It was first displayed in April 2010 at Kongens Nytorv, a popular place around the city center of Copenhagen. The installation can be placed in different locations in the city, taking the museum out to the people. The wall features many functions mixing both old and new pictures of the city. Using materials from the museum collection as well as visitor created content, it invites uploading comments, stories, pictures and even videomessages. A real time online version of *"VÆGGEN"* can be accessed from a home computer as well as from mobile devices. *"VÆGGEN"* is a great example how the past and present can be connected when visitors get an opportunity to take part in the meaning making process, in this case reflecting on a city that everyone experiences in their individual way.



"MAKE HISTORY" BY THE NATIONAL 9-11 MEMORIAL

The "Make History" website is a collection of stories in form of text, photos and videos submitted by the people who experienced 9/11. When museums or memorials reflect upon recent history it makes sense to collect material from various sources, letting multiple voices form our understanding of what happened. The inputs of participants become in this example a very important complementary documentation for the National September 11 Memorial and Museum, yet the museum makes it clear that despite regular reviews it cannot verify the accuracy of all submitted content, demonstrating one of the challenges of participatory created content.

TASTY ART

Keywords: online, Social Media, museum's café, museum's shop, taste, food, recipes, interpretations, experience, participatory.

Aim: looking at art from new perspectives and bringing the sense of taste into the art experience. Connecting the exhibition to other parts of the museum experience, in this case to the museum's café and shop.

Targeted museums: art and historical museum.

Mao Suite by Sui Jianguo Photos: suite by Steve F, stencil by Steelsnarl, mango by Asit K. Gbosh Thaumaturgist (all CC BY-S.A 2.0)



his proposal consists of two parts: The first step takes place online, where chosen artworks are presented with a story e.g. about their historical context, about the artist who made them, about the person or situation portrayed in the artwork. Each artwork is linked to one or several food ingredients. Online participants are challenged to create recipes containing the ingredient(s) of the painting and to share them through Social Media channels. Online the visitors vote for the most interesting recipes.

he second step of the proposal takes place in various spaces of the museum: the exhibition hall, the museum's shop and the museum's café. In the exhibition hall most voted recipes are coupled with the artwork they drew inspiration from. In the museum's shop, the visitors can find postcards with the artwork, the story and the recipe. The postcards are also linked to an online video where the preparation of the food is presented in a cooking show like manner. For the visitors who desire to "get a taste of

KAIRUS DESIGNS

66

the art", the museum's café chooses a number of the recipes that fits their menu and serves the food in a nicely designed package offer.

he role of the museum's café could be to a greater extent integrated into the museum experience. This by offering e-books or movies connected to exhibited work or by linking parts of the café-menu to the exhibition e.g. serving an artist's favorite dish. Through this approach the storyworld of artworks or exhibition themes can be extended outside the exhibition hall, providing new channels for visitors to engage with art.





ONLINE CURATOR

Firefox

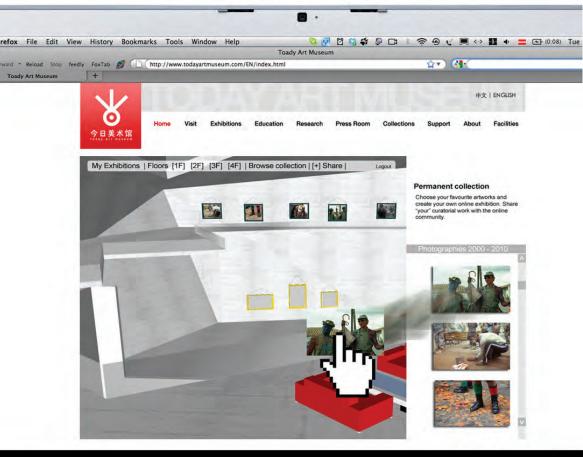
Keywords: 3D, online, open collection, co-curation.

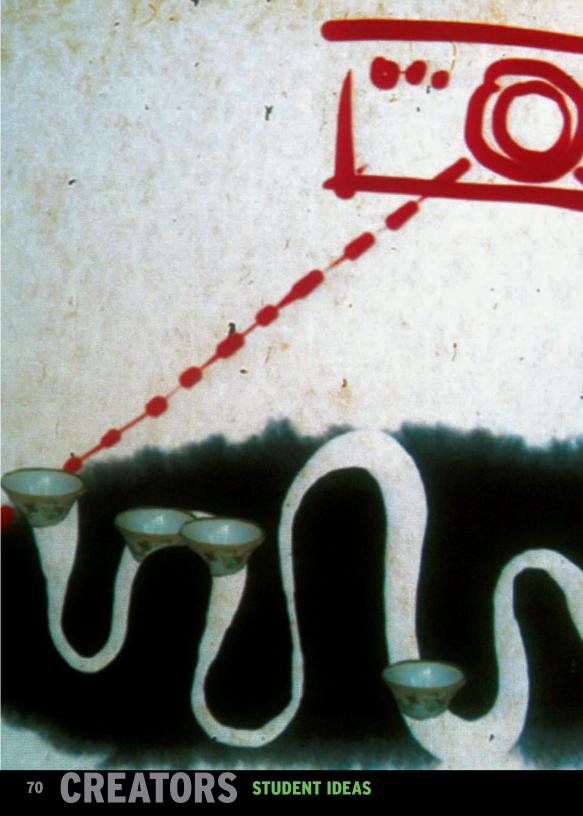
Aim: to open the collection of a museum and give interested participants an opportunity to co-create and co-curate an exhibition.

Targeted museums: museums with a big collection and an ongoing exhibition of their collection.

he online curator gives users an opportunity to explore the permanent collection and archives of the museum that are currently not on display. A simple online interface offers the possibility to dig through the archive and design an own exhibition with one's most favorite artworks. This virtual museum environment can be used as an educational tool creating a context to understand museum practices. It also allows users to take part in the meaning making process that takes place in a museum.









TEA POT POEMS by Chen Runbo

Chen Runbo designed an interactive table for the museum's café that relates to the Chinese and Japanese tea ceremonies. She proposes a virtual river where visitors leave floating teacups containing poems inspired by the exhibitions. Poems created in workshops could be a key to inspire other visitors to express their emotions of the museum experience in more creative ways.

TRANSMEDIA STORY-TELLING IN MUSEUMS





hroughout the book we see various examples and design-concepts of how museums can become more open and engage in different ways with their visitors and local communities. Most of the designconcepts are kept on a very general level to be as flexible as possible, fitting into various museum settings and environments. What all the design concepts have in common is that they serve an unique purpose targeting one of the visitor groups presented in this book. Each student was designing for their own target audience, aiming for applications attractive for their age group. Furthermore the design concepts have to be adjusted and coordinated to fit the overall experience of the exhibition or museum environment they are applied to.

suggest that museums should integrate "Transmedia Storytelling" practices into their communication strategies. "Transmedia Storytelling" consist of synced narrations unfolding across multiple forms of media, on multiple channels each delivering unique pieces of content. When applied to a museum experience the variety of media channels offer each visitor group engaging forms of participation. "Transmedia Storytelling" methods are ideal to provide each visitor with a satisfactory level of involvement in a story world around the exhibition. The mix of different media forms creates a personal and unique museum experiences. If this transmedia mix is well orchestrated, visitors are more immersed into the exhibition, have the choice of becomeing active contributers in the 'meaning making' process and are more eager to further engage with museum-related events.



DESIGN CHALLENGES

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The 2014 commemorations of 100 years World War I will be an experimental field for global cultural exchange and online museum communication practices. It is one of the subjects that transcends cultures, societies or demographics. It will be interesting to observe how these global event will be represented in various exhibitions and if crosslinks to to other exhibitions will occur.

a.co

"...IN THE IDEAL FORM OF TRANSMEDIA STORYTELLING, EACH MEDIUM DOES, WHAT IT DOES BEST." HENRY JENKINS

hile "Transmedia Storytelling" content is spread over diverse media channels it also offers multiple entrance points to the storyworld. For example a visitor can unfold an interesting storyline created by a number of video clips on YouTube, this followed by discussions with simulated historical characters on Facebook reveals that the story continues in a special exhibition at the local museum, where interactive live performances are arranged once a week. Another visitor might see the exhibition first, there pick-up a mysterious letter, that leads her to follow a correspondence between two artist online and ends up back at the museum at a workshop creating visual video collages inspired by the correspondence, that are later screened for other visitors and shared on YouTube.

FURTHER READINGS

Four steps in the history of museum technologies and visitors' digital participation

by Jørgen Riber Christensen in MedieKultur 2011, 50, (p. 7-29)

The Participatory Museum by Nina Simon, 2010

also as online version: <u>http://www.participatorymuseum.org/read/</u>

Navigating E-culture by VIRTUEEL PLATFORM, 2009 editors: Cathy Brickwood and Annet Dekker

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An Exploration of Content Creation and Sharing through Interactive Pieces by Mariana Salgado, 2009

Social media and cultural interactive experiences in museums in Nordisk Museologi 2007, vol 1, (p. 19-29) by Angelina Russo, Jerry Watkins, Lynda Kelly and Sebastian Chan

Convergence Culture: Where Old and New Media Collide by Henry Jenkins, 2006

The Role of Museums in Society: Education and Social Action by George E. Hein, 2005

Thinking about exhibitions

by Reesa Greenberg, Bruce W. Ferguson, Sandy Nairne (Eds.), first printed 1996 (reprinted 1999, 2000, 2002, 2003, 2004, 2005 twice) Specially chapter: "Constructing the spectacle of culture in Museums" by Ivan Karp and Fred Wilson

PROJECT SUPPORTED BY:



