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Challenges of Supporting Self-Guided Exhibitions through Non-idiomatic Technologies

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Integrating Smart Objects into Self-Guided Exhibitions: Challenges of Supporting Self-Guided Exhibitions through Non-idiomatic Technologies

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Abstract
This position paper presents key challenges that have been identified in the early stages of designing interactive digital, self-guided, exhibition sites through the use of low-cost context aware technologies. The next wave of smart technologies, such as context aware objects and devices, enable new opportunities for facilitating self-guided exhibitions through digital experience layers. However, these technologies often fail to gain traction when the user does not understand how to operate or interact with these systems, due to new or unfamiliar interaction modes. The purpose of this paper is to present work-in-progress of implementing two app prototypes: 1) a mixed reality game for smartphones and 2) a digital guide, that uses Bluetooth beacons at a fully automated exhibition in Northern Denmark. Two of key challenges that this research projects revolves around is how to on-board new users and how to transfer experiential knowledge from other systems that the user is familiar with to a system that is unknown to the user. Through an iterative design process, two prototypes are being developed to investigate these challenges.

Author Keywords
exhibition sites; mobile user experience; design idioms; emerging technology; self-guided; context aware technologies;

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous;

Introduction

The world has never been more mobile than today. A steady flux of smart technologies has infiltrated nearly every aspect of everyday life. Context aware technologies are increasing in computing power as well as in numbers and they are getting embedded into objects and environments all around us. Researchers as well as practitioners are tapping into the potential of wireless interconnected devices, spawning research agendas and service ecologies around them. The paradigm shift that emerged with ubiquitous and pervasive technologies, have forever changed the way people think about and use computers.

A natural part of emerging paradigms are novel applications that probe the technologies' potential and limitations in different situations and context. Thus, as a natural part of the development, the next wave of context aware technologies has also found their way into research projects and testbeds in the exhibition[1] context. Exhibitions have been the playground for analog as well as digital technologies, due to the problematic nature of engaging with the visitor. Text labels and showcases have proved difficult to connect with the audience; children and young visitors in particular. Thus, exhibitions have a long history of being testbeds for experiments to investigate the potential of engaging the visitor through interactivity and digital experience layers.

Background

The number of exhibitions have doubled between 1992-2012 [15] globally, and are known to serve as international symbols for tourism [9] and for local and national culture. The significance of exhibitions is well documented in studies that attribute positive aspects to the existence of exhibitions with labels such as 'agents of well-being' [10], 'forums for cultural and democratic foundation', 'supporting sustainable social networks', etc. In other words, exhibitions can be the engines of society and catalysts for the good life.

However, in recent times, many cultural heritage sites and landmarks, that are rooted to their physical location, have come under 'severe long-term challenges [5], due to economic and political reasons [11]. This has led to centralization strategies and efficiency measures, that are forcing challenged exhibition sites to shut down operations. One alternative is to create exhibitions that are self-guided, as opposed to on-site curation and custodians. In other words, the complete removal of manual labor and replacing all personnel with automation. This poses an interesting design challenge: (how) can emerging technologies facilitate the visiting experience at a self-guided exhibition site? The aim here is to move beyond the typical 'number

[1] The use of *exhibition sites* or *exhibition(s)* refer to the same inclusive definition of museums by Falk and Dierking (1992). These are *"historical homes and sites; science and technology and nature centers; aquarium, zoos, and botanical gardens; as well as traditional art, history, and natural history museums."* [3]

and text labels for facilitating the communication' solution.

This position paper sets out to investigate the use of low-cost context aware technologies paired with modern mobile phones, i.e. smartphones and smart objects, in exhibitions to facilitate a self-guided visit. The investigation stems from a research agenda set forth to explore digital technologies' potential to facilitate engaging experiences through interactive digital technologies, rather than conventional posters, texts and numbers for pathfinding.

Self-guided Exhibition Site for In Situ Experiments
Hals Museum [16] in Denmark is currently undergoing the transition from being a typical exhibition with a custodian and curator present, to being a fully automated site. This transformation is the first of several sites that will transition from staffed sites to fully automated, self-guided exhibitions. The entrance is being fitted with time-locks and the exhibits are placed under surveillance and in showcases. The exhibition will be a typical 'text labels with showcases' site. Apart from a monitor with a video looping every 15 minutes, no other installations or digital technologies are being implemented in this overhaul of the exhibition site. The museum itself is located in a small entrenchment in which the remnants of an old fort is contained. The actual exhibition is contained and secured inside a building, but there is also a large area surrounding that building which is not directly a part of the exhibition, but is a part of the historical site.

The aim is to design an engaging experience, that guides the visitor around the exhibition inside the main building, as well as support pathfinding outside in the open area that is a part of the old fort. One major design constraint imposed by the Hals Museum case is that the user has to bring their own device due to limited resources for developing as well as maintaining equipment. Everything inside the exhibition building will be secured out of reach for the visitor with cameras, alarms and glass cages. Thus, this paper aims to investigate the use of low-cost Bluetooth beacons, with smartphones in mixed reality (MR) settings, in order to guide the visitor, both inside and outside in the physical setting, and create an engaging experience that transcends text-labels and showcases.

Digital Experience Layers for Exhibitions

Interactive installations and digital experience layers are increasingly becoming a part of exhibition communication. In this context, there are many design situations where the user experience happens on the move, utilizing mobile technologies combined with contextual information (time, location, etc.), which makes it difficult to rely on known repertoires of experiential knowledge of how to use new technology [4,7]. The utilization of new technologies, such as smart objects, in the exhibition context provides a case where the majority of users lack experiential knowledge [13]. What is lacking can be described as design idioms - the conventions that are learnt, rather than analogically or metaphorically transferred [2].

Design situations where the lack of idioms to support the user's understanding of how to interface and interact with new technologies, have been subsequently been labelled as 'non-idiomatic' [13] following the terminology developed by e.g. Löwgren [6,8] and Vistisen [12].

Idiomatic to non-idiomatic - the transfer of experiential knowledge
An example of transferring experiential knowledge to new interaction modes is when users of smartphones adjust to the interaction design patterns of the operating system's interface. Developers of applications generally adhere to the conventions recommended or determined by the manufacturers of the phones, in order to deliver a frictionless user experience. Examples can be swiping in certain directions. Over time, the user has familiarized with this pattern, and when two-finger interactions are introduced, the user can build on the existing knowledge of basic interaction with the device to incorporate advanced patterns. If the phone is replaced with a larger device, say a tablet, the user has a reference point to the type of technology, i.e. touchscreen for input, and can leverage the known idioms to an unknown technology. Or, transfer knowledge from idiomatic to non-idiomatic technology.

When few or no idioms exist, as it often is with emerging technology types [7,12], the user cannot transfer experiential knowledge to figure out how to interact with the new technology, making it difficult to understand the utility, usability, and desirability of what Buchanan [1] labels the ontological synthesis of what the designed 'product' is.

This paper is working from the assumption that the user does not have the prerequisite reference points to use the smart objects with their smartphones in an exhibition context. The challenge of implementing new technologies increases in complexity, when there are no longer any personnel to ask for help, as it is the case with fully automated sites. This assumption is based on a previous study that the author has collaborated on, where an aqua zoo tested out a marker-less augmented reality app for personal mobile devices (tablets, smartphones), to guide visitors to 'dead zones' in the exhibition. Here, the majority of visitors did not understand how to use the app, even though it was relying on the same design idioms as taking a picture or shooting a video with a smartphone. However, having personnel on-site to assist users with the on-boarding (first-use), by explaining what it does, improved the number of active users significantly.

In a period where new users were assisted by personnel, there were approximately 3000 users [13]. When the personnel were removed, the numbers dropped to around 300-500 users. Then a trial period with signs, posters and monitors with instructional videos looping were implemented, but that had little to no effect as the numbers remained the same as when there were when the personnel was removed [13]. There was however a change when potential visitors were informed through social media, that there would be a competition with rewards (free passes to the exhibition all year), for using the application. Users had preinstalled the application before the visit and had already familiarized with it [14]. This revealed that incentivizing with rewards provided an extrinsic motivation to on-board, raising the question, could it be possible to turn that extrinsic motivation into intrinsic desire?

The Next Step

Drawing from the lessons learned through previous studies, two prototype applications for smartphones are being developed to be tested at Hals Museum. Common for the two prototypes is that they both rely on the interaction between personal smart devices such as

phones and tablets and the backbone for interacting with the environment is through Bluetooth beacons at points of interests (POI). Some of the beacons will be placed in very close proximity of artefacts and objects that have been secured inside showcases, while others are embedded into props, such as a World War 2 era rifle and fishing equipment. There will also be POIs outside, to guide the visitor around in the area around the fort.

The two prototypes differentiate in that on is designed to be a mixed reality game while the other is an information seeking tool and guide. The game is primarily targeting youth, while the guide application is primarily for mature audiences. However, both prototypes will be tested on different age groups and segments.

The aim with the two prototypes is to tackle the challenge of having first-time users on-boarded so they understand how to use the application and the interactions with it around the exhibition. I.e. can a user be eased in through games? Another aim is to ensure that the system integrates with the exhibition, to make the objects a part of the digital experience. I.e. can smart objects be embedded into the exhibit to make the artefacts a key part of the digital layer, and does the visitor understand how to interact with it?

Workshop Goals

The agenda with participating in the workshop is to present the results and findings of a number of previous studies and how they have guided in designing the two prototype applications, and subsequently discuss the features and how they take aim at the challenges described in this position paper. The mission is then to bring back valuable knowledge and streamline the two applications before launching them. This study is part of a thesis under the 'Our Museum' research program which is a large national research program that consists of a total of 13 Ph.D. projects in a collaboration between 5 of Denmark's largest universities, and a host of exhibitions as partners and investors in a 4-year project. The thesis that this position paper is a part of is one of 13 projects, that has technology as key driver for designing self-guided exhibitions. This focus is currently on smartphones and (low-cost) context aware technologies, to create digital experiences that augment the physical sites with digital layers [17].

References

1. Richard Buchanan. 2001. Design research and the new learning. *Design issues* 17, 4: 3–23.

2. Alan Cooper. 2014. *About face: the essentials of interaction design, 4th edition*. John Wiley and Sons, Indianapolis, IN.

3. John Howard Falk and Lynn Diane Dierking. 1992. *The Museum Experience*. Howells House.

4. Daniel Fallman. 2003. Design-oriented Human-computer Interaction. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems*, ACM, 225–232.

5. Katja Lindqvist. 2012. Museum finances: challenges beyond economic crises. *Museum Management and Curatorship* 27, 1: 1–15.

6. Jonas Löwgren. 2016. On the Significance of Making in Interaction Design Research. *interactions* 23, 3: 26–33.

7. Jonas Löwgren and Erik Stolterman. 2004. *Thoughtful Interaction Design: A Design Perspective on Information Technology*. The MIT Press.

8. Medea. 2012. Exploring, sketching and other designerly ways of working (keynote from Interaction ´12). *Medea*. Retrieved February 2, 2018 from http://medea.mah.se/2012/04/exploring-sketching-designerly-working-keynote-interaction-2012/.

9. Hannu Piekkola, Otto Suojanen, and Arttu Vainio. 2014. *Economic impact of museums*. University of Vaasa LEVON INSTITUTE.

10. Lois H. Silverman. 2010. *The Social Work of Museums*. Routledge, London; New York.

11. Dorte Skot-Hansen. 2008. *Museerne i den danske oplevelsesøkonomi*. Samfundslitteratur.

12. Peter Vistisen. 2016. *Animation-based Sketching: An explorative study of how animation-based sketching can support the concept design of non-idiomatic digital technologies*. Aalborg Universitetsforlag.

13. Peter Vistisen, Claus Møller Østergaard, and Rameshnath Kala Krishnasamy. 2017. Adopting the Unknown through the Known: Supporting user interaction of non-idiomatic technologies in exhibitions through known idioms of conventional technologies. *The Design Journal*, Routledge, S3696–S3706.

14. Peter Vistisen, Vashanth Selvadurai, and Rameshnath Kala Krishnasamy. 2018. Applied Gamification in Self-guided Exhibitions: Lessons learned from theory and praxis. Aalborg Universitetsforlag.

15. Temples of delight - Museums. Retrieved January 8, 2018 from https://www.economist.com/news/special-report/21591707-museums-world-over-are-doing-amazingly-well-says-fiammetta-rocco-can-they-keep.

16. Hals Museum - Nordjyllands Historiske Museum. Retrieved March 9, 2018 from http://nordmus.dk/hals-museum.

17. Our Museum. Retrieved January 8, 2018 from http://ourmuseum.dk/.