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CONTEXTUAL ENABLERS AND CONSTRAINTS OF USER ACCEPTANCE OF INTERACTIVE TECHNOLOGIES IN ART MUSEUMS– A FIELD STUDY

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Abstract

Art museums are currently discovering the power of mobile apps. This leads to a growing variety of available apps for museums and galleries. The artistic environment of these institutions necessitates an in-depth analysis of contextual factors that affect acceptance of such apps. In this paper, an iterative approach to develop well-accepted apps for interaction of visitors and artworks is presented. The first iteration includes a field study in a museum of modern arts. In the course of this study, a multiple method approach was applied to detect contextual enablers and constraints for acceptance of interactive tags that were implemented at the museum. The results of the field study indicate a need for further iterations in the development process that is conducted on the basis of early insitu and incontext user involvement.

Keywords: mobile app acceptance, modern art museum, interactive artworks, contextual effects.

1 Introduction

The increasing diffusion of smart phones made many museums and art galleries create their own smart phone apps. This recent development lead to a variety of available apps, ranging from information guides and interactive catalogues to more creative apps that are artworks themselves. Some of them are very successful and highly-praised while others fail at convincing the audience. Art museums are very specific environments that require special consideration when it comes to technology-enhanced interaction between visitors and artworks. In order to bring forth the development of mobile apps for art museums it will be necessary to gain in-depth knowledge on the specific acceptance factors in this environment in order to improve the offered apps according to user requirements.

The main research question addressed by this paper is, thus, Which contextual factors influence the acceptance of interactive tags within art museums and how do they influence their acceptance?

Recent research suggests emphasizing value-in-context as to say integrating potential customers in the development of services by means of insitu and incontext contributions (Edvardson et al. 2013). This concept necessitates capturing value information in the use context in order to obtain relevant information. We, thus, chose an iterative approach for the development of a mobile technology supported interaction application for a modern art museum. In a first iteration of the design process, it is necessary to find out, which tool will be accepted in the specific context. The inclusion of potential users from the very beginning should enable the development of a well-accepted tool in the end. A multiple method approach is used to gain in-depth knowledge on context issues in the environment of interest with regard to mobile technology supported interaction between visitors and artworks. The co-creation process was initiated as a field study within the museum to ensure that real-world context factors are considered. The first prototype of an interactive tool was implemented in a very unobtrusive way in order to keep design issues on a low level and to enable basic analysis of contextual effects.

The remainder of the paper is organized as follows. In section 2, a state of the art analysis of context measurement and contextual effects on user acceptance is presented. The setting of the field study in terms of the interactive exhibition at the “Kunsthauus” is described in detail in section 3. The methodology that was used is presented in section 4, followed by the results and their discussion. The paper concludes an outlook on future iterations of the design process.

2 State of the art

There are different approaches to provision of interactive mobile technologies in art museums. A prototypical implementation of interactive museum guides in a science museum made use of RFID technology to support education in science museums (Hsi 2004). In the course of this project, another prototype was developed that aimed at enhancing museum experience of the visitors by means of dynamically changing webpages and a registration kiosk (Hsi and Fait 2005). The application was implemented by means of hardware attached to exhibits, and RFID tags applied to cards that were worn around the neck by visitors of the museum. Another approach is merging technology and art in the course of tangible interfaces, such as visual storytelling installations (Oh 2012).

In practice, there are two main approaches to providing further information on artworks and exhibits by means of mobile technology. The first approach is providing visitors with multimedia guides based on smart phone technology during their visit. These devices have become very popular and are available in many museums, e.g. the “British Museum” in London or the “Technisches Museum” in Vienna.

The second approach is to offer specific applications for the visitors’ own smart phones. These can be categorized into offline and online solutions. Offline applications are similar to audio and multimedia

guides, extended by additional information for the visit, such as background knowledge of the artworks, area maps, opening hours, or tour planning (e.g. “Louvre Top100”, “Museum of Acropolis Audio Guide”). Some of these applications also provide quizzes and games that are related to available tour programmes (e.g. The McManus Art Gallery & Museum Quiz Trail). Information is updated only after the application itself has been updated and dynamic updates based on the user’s location or time of visit are not possible.

Other types of museum applications offer several further functions in addition to these basic set of information by means of connection to the internet. Possible types are location based services (floor maps including actual position, e.g. “Canadian Museum of Civilization”), information retrieved by QR codes or via NFC tags (e.g. the application presented in this paper or “WO Smart Museum” by “Wolfsonian museum” in Genoa) social media aspects (e.g. sharing scores of museum-quizzes on Facebook by “My Museum Le Louvre”), and the like. Main advantage of online applications is the dynamic adaptation of content from the backend.

3 Research design

The “Kunsthhaus” is a museum of modern art in a medium-sized city in Austria. The focus is on modern and very often also interactive art. The interactive exhibition “Cittadellarte” was chosen due to its inherent interactive character.

Interactivation of the artworks was enabled by unobtrusive interactive tags. Each “tag” provided three channels of communication: QR code, shortlink or NFC. Main requirement to use the interactive tags was, thus, a mobile phone with internet access.

Two different kinds of information could be accessed during the five weeks of the survey period:

- At the beginning of the research period, one could “like” the artist on Facebook.
- In the second period, the tags led to the online glossary entry regarding the artwork on the exhibitions website.

The linkage of information was changed in the applications backend without having to exchange the actual tags in the exhibition.

Traditional methods of technology acceptance research und usage research are interviews or online surveys. These are able to provide rich data on the user, but often neglect information on usage context. Some recent survey-based research on technology acceptance did integrate context information in their research models, e.g. Mallat et al. (Mallat et al. 2009) in the course of analysing the use of a mobile ticketing service, Venkatesh et al. in their extended Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al. 2012), and de Reuvers et al. (de Reuver et al. 2013) in a recent study on users’ switching behavior between fixed internet and mobile internet. All of these questionnaire-based studies have in common that the range of included context items was limited. Due to the research design, the results for contextual factors were self-reported perceptions, which limit the explanatory power.

In most situations, participants of a study are not completely aware of the influence of context on their behaviour and thus, do not provide interviewers with this additional information. To get actual insights, contextual inquiries are conducted. In the course of these inquiries, the researcher interviews the user directly on the place where the usage takes place while the user is performing tasks. The researcher collects additional data, i.e. the missing data about the usual context and setting (de Sa et al. 2008). Application of this method on mobile applications is usually challenging.

A multiple method approach was chosen for this project to enable a comprehensive understanding of contextual factors that influence the acceptance of the interactive tags within the “Kunsthhaus”. Tracking of usage data, personal interviews with visitors of the museum, participatory observation in

the foyer and focus-groups with lead users were conducted in order to collect data from different perspectives and sources.

Interaction with the interactive tags was automatically recorded in the backend of the application. User-based information could be retrieved by automated creation of cookies per device in the course of the first interaction with one of the tags. The cookie was saved and recognized in the following interactions, so that finally a data-matrix was obtained, showing the total amount of interactions per user and per channel.

The main goal of the interviews was the stepwise identification of usage boundaries. The instruments were based on the Multidisciplinary Model of Context (Bradley and Dunlop 2005). The model considered differences between focal and contextual aspects of the user and the application that was used. In order to track all possible dimensions which were relevant for the specific test-setting, a semi-structured questionnaire was designed, consisting of quantitative items as well as qualitative ones.

Questions related to the information poster in the foyer (recall, usage, reasons for non-usage) and second, questions related to the interactive tags in the exhibition, represented the main part of the questionnaire. In the final section of the interview, personal data was recorded, including technological affinity and socio-demographic data.

The interviewer team consisted of three persons. Two of them were conducting web-based interviews on tablets and one was conducting the participatory observation in the foyer. Observation was focused on the information poster in the foyer. Main task for the observer was counting the number of visitors who walked across the very centrally located poster and observing people with regard to their company and actions which were taken (or not taken) after reading the poster.

The observation also was implemented on tablet computers by a web-based questionnaire. Main reason for conducting the observation was to gain thorough information on usage of the interactive tags, which should not only be dependent on the visitors' self-reported statements as they were expected to be slightly influenced by social desirability.

Subsequently, members of the interviewer and observation team were invited to join a focus group, trying to identify the main context factors that had the most obvious influence on (non-)usage of the interactive tags during the survey period.

4 Results and Discussion

Based on the cookies which were created when at least one of the tags was used, individual IDs had been created. This enabled a total count of users. Throughout the whole period of 33 monitoring days, 75 interactions in total could be counted. As this number was very low, we concentrated on the analysis of data from the other sources.

In total, 257 persons were interviewed during the survey period (response rate: 18.9%). Respondents were educated above average, younger than average and technologically interested. They were asked for their reasons for not using one of the information channels available. The reasons for non-usage were based on different contextual pre-conditions. Referring to Bradley and Dunlop (2005), the next step of the analysis is a systematic structure of these reasons in order to identify those factors in the context of the usage, that had the highest influence on not using the interactive tags. Clustering of the statements for non-usage indicated that the context of the interactive tags themselves has had the highest influence as outlined in table 1:

	Percentage		Percentage
Context of the interactive tags	41.3	Phone does not fulfil the technical requirements	27.2
		Not enough information about how to use the tags	6.5

		Did not want to download an app	5.4
		Technical problems, low battery	2.2
Cognitive context	31.5	No interest	10.9
		Interactive services are not used at all	5.4
		Have never tried it before	5.4
		Afraid of costs	2.2
		Do not own a phone	2.2
		Additional value in using the tags not clear	2.2
		Health: Have to use crutches	1.1
		Too much effort needed	1.1
		Should not be recorded on the history of my app	1.1
Physical context	14.1	Device has not been brought to the exhibition	14.1
Task context	8.7	Not appropriate to use a smart phone during the visit of an exhibition	3.3
		Already enough information available	3.3
		Do not want to be "active" in any form when visiting an exhibition	2.2
Temporal context	4.3	No time for usage	4.3

Table 1 Structure of reasons for non-usage according to the context dimensions (n=92).

A total of 1.239 persons were counted passing by the information poster in the foyer. The majority of 92.2% did not pay attention to the poster. Out of 92 persons who did pay attention, 10.9% tried to use one of the interactive channels on the information poster.

Compared to the results from the personal interviews, the observation provides a further hint regarding reasons for non-usage. Using the tags was not possible because the device did not fulfil the technical requirements, could be partly a socially desired answer, as a majority of exhibition visitors could be observed to have not even tried to use their phones or find the appropriate functionality on it.

Unlike the interview results, the focus group members emphasized aspects regarding the physical context. They were considered to be of highest importance for understanding the specific circumstances of (non-)usage. The context of the interactive tags was the second most influential dimension when it comes to explaining non-usage from the lead users' point of view and it is directly related to the aspect of the physical context.

In the second part of the focus group, ideas were collected based on the experiences during the survey period, in order to identify an accepted concept of interactivating the "Kunsthauus". Qualitative content analysis was used to structure information from the protocol of the focus group.

The result was the concept of a multifunctional audio-guide for visitors without appropriate devices or a multifunctional mobile application for owners of smart phones. This solution was thought to be the best because of the following aspects:

- Audio-guides are socially accepted technical means to enrich one's visit of an exhibition by further information. Therefore, the usage boundaries are supposed to be rather low.
- The ideal audio-guide-concept is an application for smart phones, which can be used not only during the visit but also anywhere else.
- Especially tourists or visitors from abroad are afraid of roaming costs, therefore there should be an offline-solution available. This solution was thought to be an audio-guide that could be borrowed for the time of the visit.
- The audio-guide (app) should, furthermore, be available in several languages and provide information to all artists and objects and not just a few, as it was the case in the test setting.
- Also, it should allow multiple ways to give anonymous feedback on artists, objects, the museum and its personnel. The option of liking an artist via Facebook was not appreciated by those few who used the tags, as this kind of "feedback" was not anonymous at all.
- Furthermore, a free and working connection to the internet/WIFI should be available and the audio-guide must be integrated in the whole marketing and communication concept of the "Kunsthauus", so that usage boundaries are kept as low as possible.

Main purpose of this concept of interactivating the “Kunsthauus” is to provide different perspectives on exhibitions or museums, which should be perceived as being “fun” and “playful”.

5 Conclusions and Outlook

The main finding of this project was that usage and non-usage can largely be explained by context dimensions regarding the interactive tags. Most participants of this study named contextual reasons for their behaviour instead of traditional acceptance factors, i.e. usefulness and ease of use. This result indicates that it is important to emphasize the research on contextual factors in acceptance research. In future, it will be necessary to identify patterns of contextual influences on acceptance. In-depth knowledge on relevant context factors will enable researchers to choose appropriate designs and settings for acceptance evaluation projects. Moreover, it might be possible to develop theoretical contributions regarding the influence of context on acceptance of mobile technologies in general.

The low number of actual users of the interactive tags limits the explanatory power of the obtained results. Interactivation of art objects by means of technology can only be successful if it is possible to integrate these into the exhibition itself by allowing a design that is much more inviting to take part in and use the services. Also, many visitors stated that they were not interested in using their devices during their stay in the “Kunsthauus”. It is very likely that there will always be a certain share of people, who do not want to use interactive tags but it is also very likely that this share can be reduced by integrating these offers into the whole exhibition concept, e.g. by using interactive audio-guides as suggested by the lead users.

In a next iteration, the interactive tags will be replaced by a more visible design, e.g. in form of a cube that can be placed close to artwork objects. The cube will enable further ways of interaction between visitors and artworks by means of additional media channels, e.g. audio.

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