

Recommending user Experiences based on extracted cultural PErsonas for mobile ApplicaTions - REPEAT methodology

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Abstract. Cultural institutions today tend to favor the incorporation of mobile technologies and applications and usually offer interpretive electronic guides to their visitors, with adaptive and personalized cultural content. However, it is still unknown to what degree users approve and are satisfied with the level and depth of personalization that these technologies adopt. The purpose of this research aims to analyze the impact and quantify how personalized and obtrusive should a mobile application be and correlate these aspects with the users perception, perspective and desires. To achieve that, we propose the REPEAT methodology, that uses implicit data from users mobile device and explicit data from users answers to our REPEAT questionnaire, to categorize each visitor and assume the personalization level that fits better for his interests. Furthermore, this work will design a mobile prototype that implements the results of our research by dynamically incorporating user's feedback into the personalization process.

Keywords: Personalization · Cultural User Experience · Cultural Mobile Applications · User interaction · Methodology

1 Introduction

Nowadays, cultural institutions are consistently trying to adapt to the current computing state of the art and integrate mobile technology and digital guides to enhance visitors experience. As a result, galleries, libraries, archives and museums (GLAMs) are replacing traditional passive exhibitions with interactive displays and mobile virtual tour guides to aid visitors understanding without overwhelming their limited physical space [7, 8, 14, 16].

This tendency has effectively transformed the relationship that GLAMs maintain with their visitors, offering unprecedented levels of access in databases with

massive information and new opportunities for interactivity that affects substantially Cultural User eXperience (CUX), considering the fact that Semantic Web and Linked Open Data cloud databases have also been utilized to enrich cultural information [9]. An increasing number of cultural institutions around the world use personalized, mostly mobile, guides to enhance visitor's experience [11] and attract new visitors [15]. The use of personalization technologies has now become very common in cultural institutions. However, there is still a lack of understanding about how visitors interact with such methods and simultaneously with the exhibits.

In this paper we intend to investigate the current challenges and limitations in personalization of cultural heritage information. Moreover, we propose the REPEAT methodology that classifies each visitor according to his interests and actuates the desired level of personalization. REPEAT uses data from social media and mobile sensors, while also requiring users to initially answer a small questionnaire, to estimate their profile and adjust the digital content of the mobile guide that they may be interested in. Therefore, REPEAT exploits the functionalities of modern smartphone devices to offer efficient visiting services in a friendly manner.

The rest of the paper is organized as follows: in the first section we present the five categories that users are classified to and their characteristics according to personalization needs. The next section presents the methodology REPEAT, its questionnaire and architecture. Afterwards, we present the implementation of a mobile prototype based on the REPEAT methodology and finally, we conclude and discuss our future plans and directions.

2 Related work

Smartmuseum [10] addresses the current issues of personalization by using Semantic Webs ontologies and techniques, however it is strongly related to technically prepared environments (indoors or outdoors) with the use of RFID (Radio Frequency Identification) tags or WiFi, and thus the proposed system is depended on the exact user's positioning. Zancanaro et al. [18] validates past ethnographic research by applying unsupervised learning approaches to visitors classification, underlining the constant need of categorizing and understanding visitor's needs in order to personalize their cultural experience. Moreover, Ardissono et al. [1] advocate that personalization of cultural heritage information enables the implementation of mobile applications that model visitors by recognizing their interests, knowledge and personal characteristics, then select the most appropriate content, and deliver it in the most suitable way, encouraging researchers and institutions to put personalization research results finally to work in practice.

Also, Roussou et al. [13] create a set of personas representing archetypical museum visitors, as part of a multitude of user-centered design methods used to better understand the needs of visitors and develop for them a personalized mobile storytelling experience and Morris et al. [12] identify four different modes

of behavior among visitors in cultural institutions, especially when they select and engage with the exhibits: browsers, followers, searchers and researchers. Dim et al. [3] present the museum triage concept, arguing about the importance of an early detection of museum visitors identities. The triage concept relates to an area close to the entrance of a facility, equipped with sensors that enable massive data collection. Finally, Karaman et al. [8] claim that each visitor’s interests and knowledge induce a unique perspective of what is relevant among the massive amount of available information, and propose the MNEMOSYNE system which passively monitors user’s movements in the museum and builds its profile, which again is strongly related to technical aspects of the environment.

3 REPEAT Methodology

3.1 Users Classification - Theoretical approach

Recent articles and studies [6, 16] state that many museums and other cultural organizations have adopted Falk’s user classifications as a means of segmenting online audiences, even though these classifications were devised for the physical museum [4]. Falk believed that user classifications should not be based on demographics only and proposed an extended clustering of all the various motivations visitors ascribe to visiting museums into just five distinct, identity-related categories. Based on their profiles and characteristics, we can assume the level and depth of personalization, referring to the type and amount of information that satisfies each group of visitors:

Explorers: Visitors who are curiosity-driven with a generic interest in the content of the museum. They visit museums without specific targets trying to satisfy their curiosity, which is quite challenging to predict. As a result, explorers probably may not be satisfied with a strong personalization level, as they would like to find new topics to grab their attention.

Facilitators: Visitors who are socially motivated. A personalized mobile application may not impact Facilitator’s experience in a museum, because they are primarily attuned to the social aspects of the visit and don’t see the museum primarily as a place for extensive personal learning and growth.

Professional/Hobbyists: Visitors who feel a close tie between the museum content and their professional or hobbyist passions. Their visits are typically motivated by a desire to satisfy a specific content-related objective. Consequently, strong personalization is a priority for the visitors of this category.

Experience Seekers: Visitors who are motivated to visit because they perceive the museum as an important destination. Their satisfaction primarily derives from the mere fact of having been there and done that. They may not require personalized mobile guides, as their only motivation is to be in a culturally important place and have a great experience.

Rechargers: Visitors who are primarily seeking a contemplative, spiritual and/or restorative experience. They see the museum as a refuge from the work-a-day world or as a confirmation of their religious beliefs. Even if they actually

examine the exhibits of the museum, they often look for that special at-one experience without any particular interest in gaining additional knowledge. Therefore, personalization levels for this category should be minimum.

3.2 REPEAT methodology architecture

The cultural heritage experience is being viewed as an ongoing lifelong experience: curators and cultural researchers are continuously looking at how visitors can be captured and retained over time, both online and onsite. User personalization can play a major role by reasoning on past experience and other daily and contextual characteristics of the visitor, making the current cultural heritage experience a link in a lifelong chain. This lifelong experience through the personalized data is the basis of our methodology, which aims in identifying the user persona with the least possible user input or intervention and customize mobile guide’s functionality accordingly. The data flow is shown in Figure 1 which depicts the architecture of the methodology.

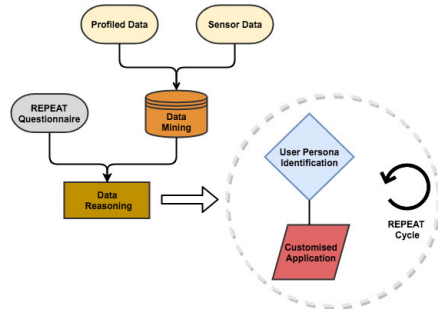


Fig. 1. The REPEAT methodology

Data acquisition: This stage corresponds to data acquisition from multiple sources, either explicit or implicit (with respect to privacy and security issues). Those sources can be organized into the following three types: (a) profiled data derived from mobile device, social media, etc, that allow a refinement of the associated persona, (b) user input - REPEAT questionnaire which based on our previous analysis of Falk’s five categories of visitors [5] will let us define how personalized and obtrusive do the users want their cultural heritage content and (c) sensor data retrieved from the mobile device’s sensors (during the current or previous cultural visits) to extract useful information such as their location, if they are part of a guided tour group, how many times did they visit this location before etc. [2].

Data reasoning: This stage includes the processing of the multiple data sources whose wide complexity and diversity will need to be modeled and reasoned. The abundance of social media user input and the subsequent opinion mining on it will allow a better user classification and overall the fusion of het-

erogeneous data streams will associate the user with a customized user persona, allowing a better understanding of the user’s needs and goals.

Prior studies argue that people can play multiple roles during their interaction with a system which can change over time, either because of interest increase in a specific topic, or that once the initial experience has been satisfied, users look for what else is on offer [17]. This behavior is also predicted by REPEAT methodology, as the user can change the topics of the proposed context anytime. Also REPEAT not only estimates the main category of each visitor, but also assesses the possibility for all five categories (e.g. Professional/Hobbyist - Strong possibility, Explorer - Medium Possibility, and Recharger - Low possibility).

3.3 The REPEAT questionnaire

As we described above, Falk identified five categories of visitors based mainly on extensive post-visit interviews which showed that these identity-related reasons for visiting museums are a direct reflection on how the public currently perceives the attributes and affordances of museums; in other words, what the public perceives as the right reasons for visiting museums [5].

The purpose of REPEAT questionnaire is to estimate the possibility of the user to belong in one or more of the above categories. Our original selection of questions which aimed for simple questions that will expose the basic differences between the five categories is shown on Figure 2.

Question	Answer	Facilitator	Explorer	Exp. Seeker	Pro/Hobbyist	Recharger
Is this the first time you visit this place?	Yes	● ○ ○ ○	● ● ○ ○	● ● ● ○	● ● ○ ○	● ● ○ ○
	No	● ● ○ ○	● ● ● ●	● ● ○ ○	● ● ● ●	● ● ● ●
Are you fully aware of the context exhibition of the current place?	Fully aware	● ● ○ ○	● ● ○ ○	● ● ● ○	● ● ● ●	● ○ ○ ○
	Partially aware	● ● ○ ○	● ● ● ●	● ● ○ ○	● ○ ○ ○	● ● ○ ○
	Not aware at all	● ○ ○ ○	● ○ ○ ○	● ○ ○ ○	● ○ ○ ○	● ○ ○ ○
If yes, how much experience/ knowledge do you have for this context?	Yes	● ● ○ ○	● ● ● ●	● ● ○ ○	● ● ● ●	● ○ ○ ○
	No	● ● ● ●	● ● ● ●	● ● ● ●	● ○ ○ ○	● ● ● ●
Do you visit this place as a member of a group/ family?	Yes	● ● ● ●	● ● ● ●	● ● ○ ○	● ● ● ●	● ○ ○ ○
	No	● ○ ○ ○	● ● ○ ○	● ● ○ ○	● ● ○ ○	● ● ● ●
Seeking Knowledge, socialization or entertainment?	Knowledge	● ○ ○ ○	● ● ● ●	● ● ○ ○	● ● ● ●	● ○ ○ ○
	Socialization	● ● ● ●	● ● ● ●	● ● ● ●	● ○ ○ ○	● ○ ○ ○
	Entertainment	● ● ○ ○	● ● ● ●	● ● ● ●	● ○ ○ ○	● ○ ○ ○

Fig. 2. REPEAT Questionnaire

For example, Facilitators and Explorers usually don’t visit museums to seek specific knowledge based on the topics of each museum and their interests, since their first priority is to satisfy other’s interests or their own curiosity respectively. This feature strongly discriminates them from Professionals/Hobbyists, because

this category almost always enters a museum with a fairly specific goal in mind. Furthermore, Rechargers, Explorers and Professionals/Hobbyists are typically repeat-visitors to their local museum while Experience Seekers are first-time visitors to the museum and many are relatively infrequent museum visitors. Finally, Facilitators and Experience Seekers are motivated to visit a museum from their desire for socialization and entertainment, while Professional’s /Hobbyist’s primary motivation in visiting is typically quite specific knowledge. Meanwhile, Rechargers don’t fall into the above categories at all, because they see museums as places that offer them an opportunity to avoid the noisiness and clutter of the outside world [4].

After the initial selection of questions, we evaluated the possible answers and removed questions which may lead us on the same results. Thus, based on our research, the not aware at all answer at the second question leads to non-significant results, consequently we ignore it during the final questionnaire implementation. Subsequently, we ignored the first question regarding the first time visit, which can be extracted from mobile sensors and user history.

4 Personalized Prototype

We designed and implemented a prototype using Proto.io in which the above issues will be examined to reach to proper conclusions and estimate the appropriate level of personalization in several occasions. Prototypes are commonly built to serve as explorative artifacts inside a vast design space, and in later phases as means to evaluate the incrementally formulated design ideas.

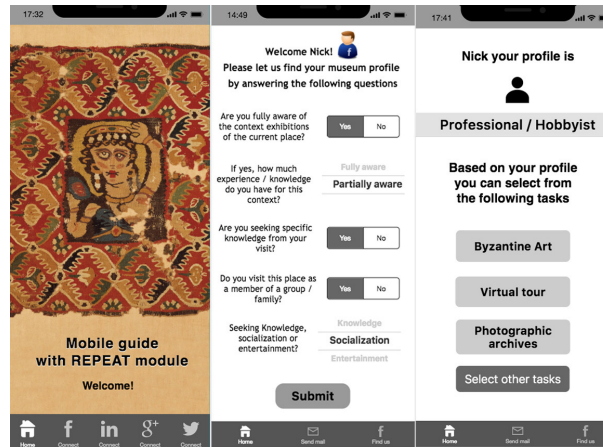


Fig. 3. Mobile prototype screens

In figure 3, the visitor signs in the mobile guide by choosing one of his social media profiles. As we already discussed, REPEAT uses these profiles to identify

possible interests and thus adjust the context of the mobile guide. Thus, user's registration is a basic feature of the REPEAT module. Afterwards, the visitor answers a questionnaire that will classify him in the five categories analyzed above. The questions are as few as possible and easy to be answered, as we don't want to distract visitors from their cultural experience. Figure 3 also depicts the personalized content as a result of the REPEAT methodology, based on the museum's topics. The visitor can change his personalization level by selecting other tasks which are based on the next most probable estimated profile category.

5 Conclusion and future work

Through our REPEAT methodology, we were able to elicit the technology and user personalization needs regarding cultural areas. This study provides the justification needed for the implementation of a personalized methodology for a cultural space that attempts to satisfy the needs of the users. The proposed methodology will help the visitors understand how and how much the cultural space can meet and satisfy their individual identity-related needs.

In our study, we have extended the already existing work by designing new user personalization methods. In retrospect, we trust that our choice of research methods and process can also be used for the UX evaluation of other technology concepts that are futuristic and novel. Also, our contribution will help the cultural spaces to make changes in the nature of what they offer to the public that are more consistent with the perceived needs of their visitors and increase their institutional value by applying the principles of the proposed module to everyday practice.

In the future, we will use this personalized methodology as a basis to design the frontend and backend components of the REPEAT module. Furthermore, our next step is the implementation of the module in a cultural mobile application of an institution and a formative evaluation with prospective users and a redesign cycle to ensure that the mobile user interface adequately supports user's needs, and also check the efficiency, validity and reliability of the questionnaire proposed. The module will be implemented with a strong feedback mechanism that will request user opinion about ease of use, potential usefulness, persona's identification accuracy user satisfaction and intrusion level etc., allowing for a semi-automated customization procedure towards a more satisfactory Cultural UX overall.

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References

1. Ardissono, L. et al.,: Personalization in cultural heritage: the road travelled and the one ahead. *User modeling and user-adapted interaction* **22**(1-2), 73–99 (2012)
2. Ayala, I., et al.,: iMuseumA: An Agent-Based Context-Aware Intelligent Museum System **14**(11), 21213–46 (2014)
3. Dim, E., et al.: Early Detection of Museum Visitors Identities by Using a Museum Triage. In: *Proceedings of 4th International Workshop on Personalized Access to Cultural Heritage*. Montreal, CA (2012)
4. Falk, J.: *Identify and the museum visitor experience*. Routledge, (2009)
5. Falk, J.: Understanding museum visitors motivations and learning. I. B. Lundgaard and J. T. Jensen (Eds.), *Museums: Social learning spaces and knowledge producing processes*, 106–127, (2013)
6. Fantoni, S. F., et al.: Exploring the relationship between visitor motivation and engagement in online museum audiences. In: J. Trant, and D. Bearman (Eds.), *Museums and the Web 2012: Proceedings*. Toronto, Canada (2012)
7. Ghiani, G., et al.: UbiCicero: A location-aware, multi-device museum guide. **21**(4), 288–303, (2009)
8. Karaman, S., et al.: Personalized multimedia content delivery on an interactive table by passive observation of museum visitors. *Multimedia Tools and Applications* **75**(7), 3787–3811, (2016)
9. Konstantakis, M. et.al.: Formalising and evaluating Cultural User Experience. In: *Semantic and Social Media Adaptation and Personalization (SMAP)*, 12th International Workshop. IEEE, Bratislava (2017)
10. Kuusik, A., et al.: SMARTMUSEUM: Cultural content recommendation system for mobile users. In: *Computer Sciences and Convergence Information Technology*, pp 477–482. IEEE, Talin, Estonia, (2009)
11. Lykourantzou, et al.: Improving museum visitors' Quality of Experience through intelligent recommendations: A visiting style-based approach. In: *Proceedings of the Intelligent Environments (Workshops)*, pp. 507–518. IOS Press, Athens (2013)
12. Morris, Hargreaves, McIntyre Website, <http://www.lateralthinkers.com/lncs>. Learning journeys: Using technology to connect the four stages of meaning making, Birmingham, (2004)
13. Roussou, M., Slater, M.: A virtual playground for the study of the role of interactivity in virtual learning environments. In: *8th Annual International Workshop on Presence*, pp. 245–253. International Society for Presence Research, London (2005)
14. Stock, O., et al.: Adaptive, intelligent presentation of information for the museum visitor in PEACH. *User Modeling and User-Adapted Interaction* **17**(3), pp.257–304, (2007)
15. Tan, E.S., Oinonen, K.: Personalising Content Presentation in Museum Exhibitions - A Case Study. In: *Proceedings of the 2009 15th International Conference on Virtual Systems and Multimedia*, pp. 232–238. IEEE Computer Society, USA (2009)
16. Tsai, H., Sung, K.: Mobile applications and museum visitation. *Computer* **45**(4), pp.95–98, (2012)
17. Walsh, D., Clough, P. and Foster, J.: User Categories for Digital Cultural Heritage. In: *First International Workshop on Accessing Cultural Heritage at Scale*, pp. 3–9. Newark, USA (2016)
18. Zancarano et al.: Analyzing museum visitors behavior patterns. *User Modeling, Lecture Notes in Computer Science* **451**, pp.238–246, (2007)