

# A model for knowledge elicitation, organization and distribution in the cultural entertainment sector

Beatrice Valeri<sup>1</sup>, Fabio Casati<sup>1</sup>, Marcos Baez<sup>1</sup>, Robin Boast<sup>2</sup>

<sup>1</sup>Dipartimento di Ingegneria e Scienze dell'Informazione  
University of Trento, Italy  
Via Sommarive, 14 I-38123 POVO  
{valeri, casati, baez}@disi.unitn.it

<sup>2</sup>Museum of Archaeology and Anthropology  
University of Cambridge  
Downing Street, Cambridge, UK CB2 3DZ  
robin.boast@maa.cam.ac.uk

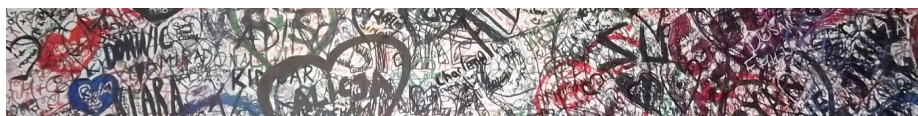
**Abstract.** In the past museums have been slow in fully utilising new technologies, but in the last decade this situation has changed dramatically. The need for more support to visitors and more collaboration between experts and between museums has led to the exploration of how new technologies can extend the traditional museum. In this paper a new concept of such an extended museum is presented, with particular attention to gathering, organization and consumption of knowledge.

## 1 Introduction

A museum is a place where objects with permanent cultural value are displayed. Cultural and leisure events are prepared by some experts: the curators. Over time, audio guides and extended content were provided to visitors in order to enrich their experience, but the narratives are still dominated by curators.

Many other people can provide knowledge about the exhibits, moving the source of information from curators to experts to everybody. Experts provide the knowledge coming from their researches and studies and have the capability to group objects in meaningful collections and paths inside exhibitions. Even other people can have some specific knowledge on the objects, like teachers and people with great interest in the topic. Moreover everyone can contribute sharing emotions he felt during the museum experience and providing his personal collections and paths, created following personal criteria. In this way, conversations on the objects where everybody can participate are created. People usually are willing to share their emotions when they feel it as valuable, like it happens on the walls near Giulietta's balcony in Verona. In museums, not only the information provided can be improved, together with its source, but also the location and time characteristics can be expanded. Museums can overcome the barrier of its building and become regional. An example is the exhibition that is in development in Trentino for the first centenary of the First World War. People will be

**Fig. 1.** Love messages near Giulietta's balcony



guided to the visit of war ruins on mountains around Trento. Elders that lived the war and their descendants can attach their photos and memories to the place they refer to. This is a very important resource for this exhibition.

Historical museums already provide knowledge of past events, but they usually take care of a particular time period. They can be extended in time by allowing them to cover the complete history of an area. For example, an exhibition could show the history of a city from its birth till now, collecting all important events happened in its all life. Again elders and citizens are a great source of information because they can provide photos of the city in last decades and memories of important events of their life or handed down by their elders.

In this paper we concentrate on the gathering, organization and consumption of museum-related knowledge. The main issues to be faced are the shyness of people in sharing and the filtering of information in order to make it easy to find interesting content. We model the extended museum, identifying which different types of users are involved and how to represent their knowledge in such a way that it is easy to be collected, organized and consumed.

Section 2 shows the other projects developed in last years in order to improve the museum experience, while Section 3 presents the model we built. A prototype is under development following such model, providing a proof of its applicability (Section 4).

## 2 Related Work

In last years many attempts to use mobile devices to improve museum visits have been done. Some projects focused more on the social aspect of the visit, allowing people to access the multimedia information together and without isolating themselves with earphones ([1], [2]). Others concentrated on providing more information ([3], [4], [5]).

Thanks to the spread of smartphones, many new technologies are nowadays available and many applications using them for enhancing the museum experience have been developed in last years. RFID<sup>1</sup> and its standard NFC<sup>2</sup> started to be used 2005 ([6], [7], [12]) and recently have been applied in smartphone's applications like in the Museum of London<sup>3</sup> and in Capitoline Museums in Rome<sup>4</sup>.

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<sup>1</sup> [http://en.wikipedia.org/wiki/Radio-frequency\\_identification](http://en.wikipedia.org/wiki/Radio-frequency_identification)

<sup>2</sup> [http://en.wikipedia.org/wiki/Near\\_Field\\_Communication](http://en.wikipedia.org/wiki/Near_Field_Communication)

<sup>3</sup> <http://www.nfcworld.com/2011/08/16/39129/museum-of-london-adds-nfc/>

<sup>4</sup> <http://romeinfo.wordpress.com/tag/capitoline-museum/>

Augmented reality<sup>5</sup> is an alternative for providing extra information augmenting the object. It started with some intrusive devices [8], till the use of smartphones that have a minor impact in the visit (Terracotta Warriors<sup>6</sup>).

Social aspect in visits is very important but rarely supported. A first project that allows people interact sharing their emotions was built for the Amsterdam Rijksmuseum [16]. It is very common today for museums to organize special events that make the visitor interact actively with the museum, playing some scavenger hunt ([13], [9]) or mystery solving ([10], [11], [12]) games dedicated mainly to children, but not only. But visitors could participate even more in the museum life, leaving their mark on interesting artefacts and annotating real objects [14]. What is missing is a model that captures collaborative annotation of real objects giving different levels of expertise. Knowledge Spaces is a project that supports the collaboratively gathering information, comments and tags and could be adapted to the museum environment [15].

### 3 Liquid Galleries Model

In this section we describe our notion of extended museum and present a model that captures the required structure and empowers the overall experience.

#### 3.1 The traditional view

A museum can be a big entity, usually bounded by a building, and can tell different stories: each story is described by a smaller group of objects grouped in a smaller space or available for only a specific period defined by an exhibition. Displayed objects can be artefact, like paintings, ornaments, scientific tools, or other kind of objects, like fossils or plants. Each object has a specific role in the story presented by the exhibition in which it is placed. Some of them have an important role as a collection and they are shown grouped in cases. Exhibitions can be experienced following paths, consuming objects in a specific order predefined by the curators. In order to understand the exhibits, visitors can read labels and explanatory panels, listen to audio guides or have a guided tour of the exhibition. The model in Figure 2a captures all this.

All these opportunities provide visitors a portion of the knowledge related to the object in the context of the exhibition, hiding to the user all other interesting information that research discovered. The *lack of knowledge* is due to the limit of space and time during museum's visits. In fact, it is not possible to fill the museum with explanatory panels or spend 30 minutes listening the explanation for each single object. But still this knowledge must be accessible to visitors, that must also be able to select only what is *interesting* to them.

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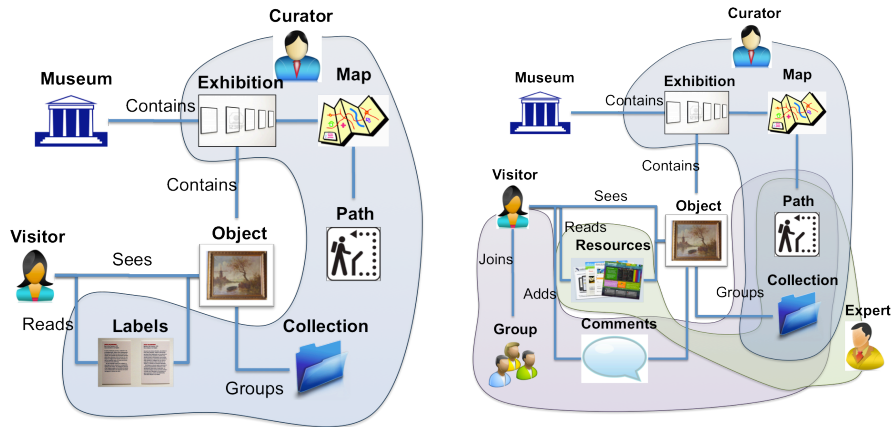
<sup>5</sup> [http://en.wikipedia.org/wiki/Augmented\\_reality](http://en.wikipedia.org/wiki/Augmented_reality)

<sup>6</sup> <http://www.techgoondu.com/2011/06/16/artefacts-come-alive-on-an-iphone-museum-app/>

Fig. 2. Conceptual models

a. Traditional museum

b. Extended museums



### 3.2 The extended view

Thanks to the Internet, a large amount of knowledge can be accessed without space limits, but which kind of information need to be collected and shown? First of all, the basic information about objects, like title, author, period and materials, are already collected in museum's catalogues. The need of a common place where these data can be collected and shared among museums is very strong. A deeper knowledge on the meaning of objects, their history and all details about them can be collected from researches conducted by experts. For example, a painting can have some information about what the author meant with it (i.e. its meaning), about the techniques used for painting it, but also the author's life situation when he decided to paint it (i.e. historical context) and the history of the painting (some of them had a very turbulent "life", with thefts and retrievals). All this different aspects of the objects are interesting and visitors should be able to access them.

In our model, this implies extending the **time dimension** from one point in time to the entire history (See Figure 3a).

**Experts** have deep knowledge about objects, but also visitors can provide content that future visitors are willing to consume. In particular, **feelings** and **comments** on the experience they have looking at an object are important to be collected and create interest in future visitors, giving them hints on how to organize their visit inside the museum allocating time accordingly to the interest an object has excited before. Figure 2b shows how the traditional model is extended with the knowledge provided by experts and visitors.

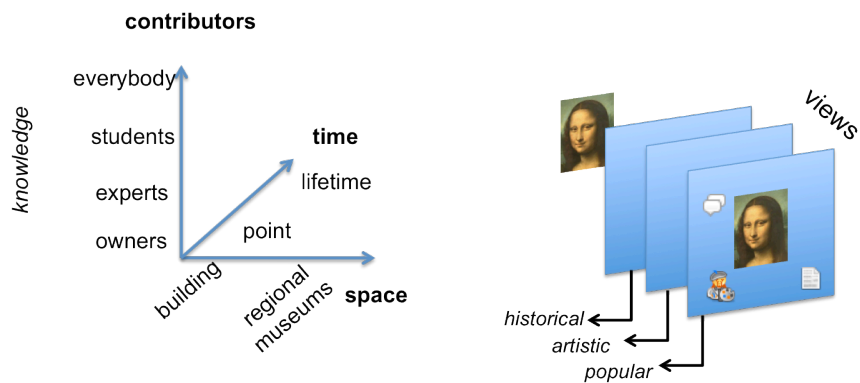
Allowing experts and visitors to give their contributions result in a great amount of information evolving with time, always updated. On the other hand, it is important for people to be able to find easily what is considered interesting, so there is the need of a good organization. For this reason, comments and emotions by visitors are kept separated from the resources added by experts, that are then grouped by point of view (as

in Figure 3b). In this way, users can decide to read only the subset of resources that talk about the exhibit from the point of view they find interesting. To this end, the model extends the **participation** from only curators to experts to everyone.

**Fig. 3.** Extended museum explained

a. Extension in time, space and contributions

b. Knowledge views



Some organization is needed also at a higher level, between cultural objects. For example, people interested in Egyptian culture would like to find all Egyptian objects very quickly, even if they are shown in different exhibitions. This service is provided with generic **collections** that, as opposed to traditional collections, they can be created by everyone and can group objects with specific similarities (same period, same author, same technique) or for more personal reasons (the artefacts that made a user feel happy). In alternative, users can even create personal **paths** they plan to follow in next visits or they want to suggest to friends or all future visitors. In this way, visitors are involved in the creation and management of services consumed by them, feeling important in the community.

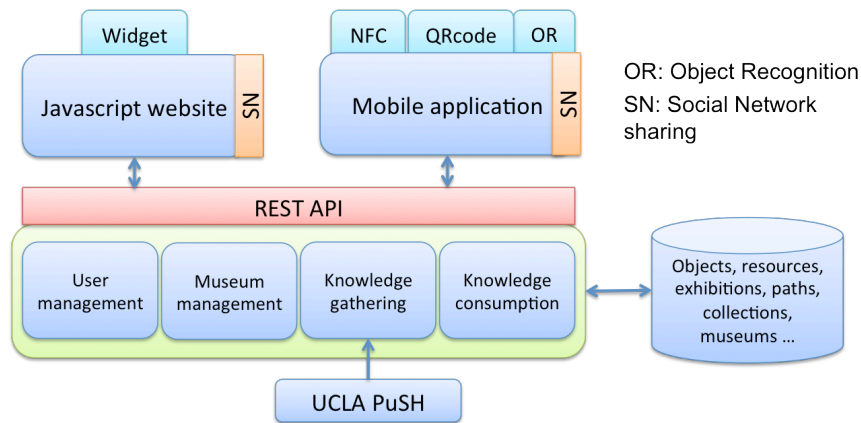
Expressing their feelings, visitors reveal their interests and they can form groups where they can talk and keep updated about their objects of interest. They can share collections, paths and favourite objects, organizing them by content and making them easier to find. Thank to these groups, new networks are built, creating a communication channel between visitors with same interests, experts in the same field and, the most important one, between visitors, experts and museums organizers. Having the possibility to read thoughts and comments by visitors, museum organizers have a better understanding of visitors' expectations and how to build more exciting exhibitions.

## 4 LiquidGalleries platform

The model presented before has been implemented in LiquidGalleries. Figure 4 shows the architecture of the project.

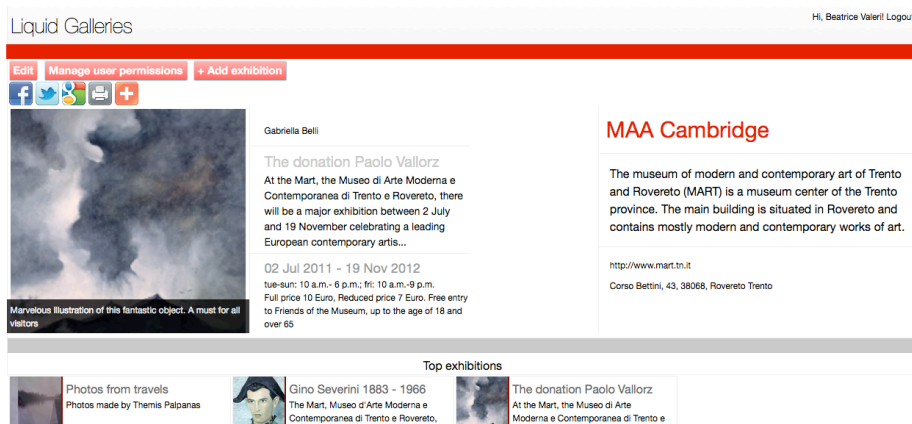
Starting from the top, two different interfaces are built. The website provide access to the full functionalities of the platform and is meant for all management activities and for support before and after the visit. Together with the website, a widget is available, that provides access to LiquidGalleries right in the museum's website. A screenshot of this application is shown in Figure 5.

Fig. 4. LiquidGalleries architecture



The mobile application, instead, is thought to be used mainly inside the museum, providing fast access to information while experiencing the related object. The choice of the smartphone application is due to the new technologies that make very easy to interact with the world through a smartphone and to the spread of such devices. For example, Near Field Communication, QR codes and object recognition allow the user to request the information of a specific object with a simple movement.

Fig. 5. Screenshot of the LiquidGalleries web application



These interfaces works on top of the backend, which is implemented in Java and provides a REST interface that allows it to provide all needed functions. A database stores all the needed information about users, museums, exhibitions, objects, collections and paths. The user management module takes care of users' login in the application and manages the private area of each of them. For example users can bookmark interesting objects and access them quickly from their personal area.

A particular section is dedicated to museum's managers and curators, where they can create new exhibitions, insert new objects and get statistics on user's usage of LiquidGalleries for what is related to their museum, just to name some of the available functions provided by the museum management module.

The knowledge-gathering module contains the functions that allow experts and visitors to contribute with their expertise in the field they are interested in. Experts share their knowledge on the Internet and then link it to objects as URL, so they can publish how they want and in the format they prefer. Visitors can share their emotions and experience leaving comments and grouping objects in collections and paths. Also museums catalogues' data are collected, thanks to the UCLA PuSH project [17]. This is a National Science Foundation (NSF) funded project based at the University of California, Los Angeles (UCLA), and its goal is to meet the need for museums to share their catalogues' information. LiquidGalleries uses this particular channel for adding in an automatic way all the vast knowledge collected by museums.

The last part, the knowledge consumption, is the most important one, allowing visitors and all users to consume all the collected and organized knowledge and share the interesting one.

The website is available<sup>7</sup> and only the Android version<sup>8</sup> of the mobile application has been built, with the intention to develop an iOS version as soon as it will support NFC. A video showing how LiquidGalleries is used is available on YouTube<sup>9</sup>.

The project has been developed in collaboration with the Museum of Archaeology and Anthropology of the University of Cambridge and had good feedback from the museum field.

## 5 Findings

In this paper, a model for an enhanced museum experience has been presented. Collecting knowledge from experts and feelings from visitors, organizing them and allowing a fast and easy access to them at any time, people are supported in both social and learning dimensions of museum. Moreover, the use of mobile technologies during the visit allows people to concentrate on the exhibits, collecting links to interesting content for a later access. The model has been presented to experts in the museum field, receiving positive feedback, and it is implemented in a platform, demonstrating its applicability improving the museum experience.

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<sup>7</sup> <http://test.liquidjournal.org/LiquidGalleries/>

<sup>8</sup> <https://play.google.com/store/apps/details?id=org.liquidpub.lgmobile>

<sup>9</sup> <http://www.youtube.com/watch?v=Lo5gK9xFPSI>

A first test of the prototype, now under development, will take place in Kettle's Yard, University of Cambridge, where the project has already been presented to director and curators arousing a big interest.

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