m-Dvara 2.0: Mobile & Web 2.0 Services Integration for Cultural Heritage

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ABSTRACT

Web 2.0 marks a new philosophy where user is the main actor and content producer: users write blogs and comments, they tag, link, and upload photos, pictures, videos, and podcasts. As a step further, Mobile 2.0 adapts Web 2.0 technology to mobile users. We intend to study how Web 2.0 and Mobile 2.0 together can be applied to the cultural heritage sector. A number of cultural institutions and museums are introducing in their projects some Web 2.0 applications, but the main knowledge source remains a small group of a few experts. Our approach is different: we plan to let all the users, the crowd, to be the main contents provider. We aim to the crowdsourcing, the long tail power, as we call fuel of cultural heritage system. In this paper, we describe the m-Dvara 2.0 project, whose aim is a system that lets users to create, share, and use cultural contents including mobile context-aware features.

Categories and Subject Descriptors

J.4 [**Computer Applications**]: Social and Behavioral Science; J.5 [**Computer Applications**]: Art and Humanities; K.3.1 [**Computing Milieux**]: Computer and Education —*Computer Uses in Education*; K.4.3 [**Computing Milieux**]: Computer and Society - Organizational Impacts — *Computer-supported collaborative work*

Keywords

Culture, collaboration, cultural heritage, Mobile 2.0, museum, social, user-centered, Web 2.0, wisdom of crowd

1. INTRODUCTION

With Web 2.0 and social software we represent all web-based services with "an architecture of participation", that is, one in which users interact and generate, share, and take care of the content (`http://museumtwo.blogspot.com`). Mobile 2.0 is the evolution of mobile technology to let us "capturing the content at the point of inspiration" (`http://blog.comtaste.com/2007/06/what_is_social_in_mobile_web_2.html`), that is, in the exact moment in which the inspiration and the opportunity exist to do it. Nowadays, Cultural Heritage Organizations (museums, archaeological sites, historical towns, even libraries, etc.) are trying to understand the evolution of the Web, but they tend to stick to their traditional role, of being the sole owners of knowledge about their collections [4].

Our approach is complementary: we want to understand if a fully Web 2.0/Mobile 2.0 approach is viable for the cultural heritage sector. Indeed, in this research area, old and new conferences, e.g., Museum and the Web (`http://www.archimuse.com/conferences/mw.html`), International Cultural Heritage Informatics Meeting (`http://www.archimuse.com/index.html`), concentrate on the possible application of Web 2.0 concept and technology to museums, libraries, and other cultural heritage institutions. Web 2.0 offers a lot of useful tools:

- *Wikies* are websites that allow users to create, edit, and link web pages easily, e.g., Wikipedia (`http://en.wikipedia.org/`).
- *Blogs* are websites where entries of different types of content are commonly displayed in reverse chronological order, e.g., Blogger (`http://www.blogger.com/home`) and MoBlog:UK for mobile devices (`http://moblog.co.uk/index.php`).
- *Tagging (Folksonomy) and social bookmarking* let users to attach keywords to a digital object to describe it. Examples include del.icio.us (`http://del.icio.us/`), which launched the "social bookmarking" phenomenon or Mobilicio.us (`http://mobilicio.us/`), which is a "mashup" of Google Mobile (`http://www.google.com/mobile/`) with del.icio.us or Ma.gnolia (`http://ma.gnolia.com/`) as online bookmarking services.
- *Multimedia sharing* are services that allow storage and sharing of multimedia content, e.g., YouTube for video (`http://youtube.com/`), Odeo for podcast (`http://odeo.com`), Flickr for photo (`http://www.flickr.com/`), Twitter (`http://twitter.com/`), and Jaiku (`http://jaiku.com/`) for mobile.

By reusing and remixing these tools, static content authorities could evolve to dynamic platforms for content generation and sharing.

In this paper, we propose a set of combined Web-based services available on a unique platform, m-Dvara 2.0, that allows users to create, share, and use cultural contents. As

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Web 2.0 applications gain success and become more interesting and rich with more and more users, m-Dvara 2.0 provides content on the basis of users participation and collaboration, in the very same spirit of wikipedia. The ambition of this project is to have a content repository populated by user-generated textual and multimedia content, in a new approach to improve user cultural experience through collaborating environments.

In the following sections, we first analyze several cultural heritage organizations that use Web 2.0 and Mobile 2.0 services; then, we introduce purposes and main functionalities of the ongoing m-Dvara 2.0 project, which is in the analysis stage of its development.

2. RELATED WORKS

Most museums, cultural sites, libraries, and other educational and cultural websites are not involved in Web 2.0 evolution. They are the sole provider of contents, whereas users are only consumers; for instance, Louvre Museum (`http://www.louvre.fr`), one of the first museums with a website, offers no real Web 2.0 services [2].

However, some cultural heritage organizations and some educational istitutions have introduced Web 2.0 services in their sites. In this section we provide a short summary of these projects.

- A group of US art museums are taking a folksonomic approach to their online collections: Steve (`http://www.steve.museum/`) is a collaborative research project exploring the potential for user-generated descriptions of the subjects of works of art to improve access to museum collections and encourage engagement with cultural content.

- Trant [5] has compared the Metropolitan Museum of Art in New York (`http://metmuseum.org`) terms assigned by trained cataloguers and untrained cataloguers to existing museum documentation, thus exploring the potential of social tagging: preliminary results show the potential of social tagging and folksonomies for opening museum collections to new, more personal meanings. Untrained cataloguers identified content elements not described in formal museum documentation. Tags assigned by users might help to bridge the semantic gap between the professional language of the curator and the popular language of the museum visitor [5].

- Public Library of Charlotte and Mecklenburg County (`http://plcmc.org/`) in Charlotte, North Carolina, has a teen outreach program that includes a presence in SecondLife (`http://secondlife.com`) with Teen Second Life (`http://plcmc.org/Teens/secondLife.asp`).

- Tate web site offers the youngtate section (`http://www.tate.org.uk/youngtate/`) to young people to create new learning communities, opportunities for input, and activity based on personal choice, and innovative forms of interaction with art and artists [8].

- Brooklyn Museum site (`http://www.brooklynmuseum.org/community/`) has a Community section with blogs, podcasts, forums, and a Flickr-based photos sharing service [2].

- Brooklyn College Library (`http://www.myspace.com/brooklyncollegelibrary`) uses MySpace to allow participants to post personal profiles containing their favourite books, movies, photos, and videos.

- Many projects have been developed to study how to integrate mobile devices in museum visits; [6] discusses some projects of museum covisiting with mobile device.

From these few examples is evident that Web 2.0 technologies are transforming the methods of both production of and access to cultural and educational contents, and also that the heritage sectors evolve towards user generated content. However, all these "Museum 2.0" examples also share the common approach of merely giving to the users the tools to record what the exposition had been for them, whereas a few expert members still are the main content providers. This is different from a full 2.0 approach, in which the users are given the real opportunity of creating contents in a way that makes themselves essential.

3. M-DVARA 2.0

Our approach is to let users to be not only visitors of an exposition: we want them to be the main content creators through a framework of collaboration and participation based on Web 2.0 and Mobile 2.0 technologies.

3.1 Purpose

We think users can be reliable and effective content providers, and that the wisdom of crowds is a very important source of knowledge. Can the crowd actively participate to the cultural heritage life? Can the crowd become the undisputed contents owner? We believe it is possible or at least worthwhile to try. Web 2.0 and Mobile 2.0 appropriate tools already exist and they are widespread. We propose a unique platform that uses all Web 2.0 and Mobile 2.0 technologies for our purposes: m-Dvara 2.0. m-Dvara 2.0 is an ongoing project; it is an evolution of E-Dvara, a platform storing cultural and scientific contents (`http://edvara.uniud.it/india`). The "m" and "2.0" in m-Dvara 2.0 highlight the mobile and social nature of our project. More in detail, m-Dvara 2.0 encompasses:

- a reuse of Web 2.0 technologies,
- a reuse of Mobile 2.0 technologies,
- a mix of web and mobile services,
- minimum implementation, through reuse and aggregation of Web 2.0 and Mobile 2.0 services already available online.

m-Dvara 2.0 is just an empty box with many services, whose content must be added by users, being they experts or novices. In m-Dvara 2.0 there is no central authority who publishes, owns, and controls all content.

We aim to mashup several Web 2.0 existing services (i.e., YouTube, Flickr, Blogger, etc.), in order to avoid unnecessary user efforts to interact with our system platform, and to work in an easy and comfortable way. In this way, we will provide an all-in-one familiar set of services for users. To fulfill real users requirements and expectations we will make several surveys. We plan to evaluate through several

user testings how each single service improves user experience and if it is useful. We also plan to analyse the user behavior while using the whole integrated system. Finally we are going to observe if social and Web 2.0 tools are appropriate for diffusion and perusal of cultural heritage, through evaluation of content growth and user participation level: we will observe the crowd behavior.

According to Web 2.0 concepts of remixability and aggregation, the development and adoption of standard software solutions enable websites to interact with each other by using SOAP, Javascript and any other web technology. This approach allows to interconnect websites in a more fluid user-friendly way, not only for programmers but for users as well. m-Dvara 2.0 will be based on these methodologies, examples are:

- OpenApi and OpenSocial Api (`http://en.wikipedia.org/wiki/Open_API`, `http://code.google.com/apis/opensocial/`);
- OpenID (`http://openid.net/`);
- DataPortability philosophy (`http://dataportability.org/`);

For mobile context-aware feature, we will implement a mobile service aggregator by exploiting MoBe, a framework for developing context-aware mobile applications [10]. Collaboration and participation features involve evaluation mechanisms and for this reason we propose the adoption of social evaluation. Following [7], in our system all contents can be judged by users (e.g., according to accuracy, comprehensibility, etc.). In addition, every content provider has a dynamic reliability score that depends on the scores of contents she produced. In this way, the crowd is the reviewer of its own contents.

3.2 Use Cases

System functionalities can be classified according to:

- technology being used (a user can use a mobile device, desktop, notebook, etc.),
- user location (a user can be on-site or off-site).

To introduce m-Dvara 2.0 functionalities description, we present some examples of typical use cases.

Use case 1 On-site users with a mobile device, e.g., tourists visiting a museum, an artwork exhibition, an archaeological excavation, etc.

- *Update in real-time*: the tourist can upload in real-time on m-Dvara 2.0 photo, video, audio, text about an artwork. Twitter, Jaiku technology, and/or YouTube Mobile (`http://youtube.com/mobile`) can be used to upload video.
- *Social tour*: the system can helps tourists by suggesting a tour. The tourist can request to the system an ideal tour according to her preferences, and/or tourist can select on her mobile device a tour criterion. There are three main kinds of tours: custom, dynamic and contextual tour. For custom tour we mean that system can detect user information keeping track of her actions (e.g., visited places or artworks, commented posts) or it can evaluate user's profile to set her preferences, then system process these information in order to create the user's ideal tour. A dynamic tour does not relate to user's personal information, but it depends on all users actions, thus user can decide to visit the most viewed, most commented, or most voted artworks. In other words, she can visit all the artworks that the crowd (community) advises to see. Finally, in a contextual tour, user can decide to visit only artworks about a specific topic or artworks belonging to the same artist, and so on. In addition, a tourist can change the tour criterion or she can add or remove artworks to visit from the suggested list at any time. To detect user location we intend to integrate Google Mobile with MoBe location features [10].
- *Social guides*: a cultural heritage system could be a guide. A tourist can record an artwork description as a guide and listen an audio description from her mobile device about the item she is examining. She can also access a wiki in order to read or use a screen reader to know what she needs. All different descriptions about a certain object are rated according to the crowd opinion (social evaluation). We can use, again, Twitter or Jaiku.
- *Live tagging*: the tourist can tag, using her own mobile device, the artwork she is looking at.
- *Evaluation & Rating*: the tourist can rate the artwork she is looking at. A simple rating application is automatically downloaded and executed on the tourist's mobile device, thanks to the MoBe framework [10]. The judgment is weighted accordingly to the technique proposed in [7].
- *M-Bookmark*: to bookmark from mobile devices. For this we can integrate Mobilicio.us.
- *Travel diary*: the system can keep track of artworks, monuments and places the user has seen, in order to maintain a personal travel diary.
- *M-Teach*: students can use their own mobile devices for educational lab activities.

Use case 2 Off-site users with a desktop or notebook device.

- *Wiki per topic*: the user can add contents about a topic or an object to the open wiki, e.g. Wikipedia.
- *Wiki per author*: every user can write own wiki page, e.g. Knol.
- *3D collaborative environment*: we can merge the 3D museum (e.g. Second Life) with wiki, chat, photo, and comments of users. In this way the user can visit 3D environment but she can also update wiki, talk with other visitors, write comments...
- *Blog*: the user can write a post about an artwork on her own blog, on a blog dedicated to a specific topic, or comment other blogs.
- *Bookmark*: the user can bookmark other users web-pages or artwork dedicated web-pages.

- *Personal profile and social network*: user can manage her social network, defining white and black lists. She can select her "friends" in order to create a personal sub-community. She can also suggest other users she is interested in, in order to be notified of their new posts. Similarly a user can suggest posts or themes she is interested in to be notified of their evolution.

Use case 3 Off-site users with a mobile device.

- *MoBlog*: to upload photo, video, text, audio on the blog section. We can exploit MoBlog.

- *Update in real-time*: tourist can upload in real-time photo, video, audio, text about an artefact.

To enhance user functionalities, we are considering what we call the *user events cloud*. The system will collect all available data about registered users, keeping track of all events generated (i.e., real or digital visited objects, topics of generated content, past expositions viewed, etc.), in order to create for each user an events cloud (a sort of user cultural history). We would like to use the power of the long tail of those users that know (or use) only few system functionality and help us to enjoy new features or improve already existing services (e.g., rank of content to be shown in a social tour or by social guides). All m-Dvara 2.0 functionalities will be offered to all kind of users, although we foresee a graceful degradation depending on the user context, the location, and the technology currently used.

4. DISCUSSION

In this paper we have presented how various current museum evolution projects integrate Web 2.0 services for improving user experience. We emphasized the common limitations of these "Museum 2.0" examples: they share the approach of merely providing to the users the tools to record their personal experience, while a few expert members still are the main content providers. This is different from a full 2.0 approach, in which the users participate and collaborate as the central content creators. This is the approach followed in the m-Dvara 2.0 project, whose aim is to produce a service that allows the crowd of users to control and manage the knowledge flow through collaboration and participation. We will develop an aggregator of Web 2.0 and Mobile 2.0 services for institutions of humanistic field.

Many are the problems that we are taking into account. The reuse and remixing of already existing external services involve the direct dependence from:

- their implementation - How to develop an architecture able to aggregate services featuring their own standard open interfaces and services providing personalized interfaces?

- their life - What will happen if some service does not exist anymore?

Also, copyright issues are a complex field, dependent on each nation legislation, and should be taken into account when working with cultural heritage contents. Another open question is the vandalism, that is any addition, removal, or change of content made in a deliberate attempt to compromise the integrity of the system.

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