

Picture War Monuments: Creating an Open Source Location Based Mobile Platform

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Abstract

This paper provides insight in the development of the “Picture War Monuments” mobile platform. The project was coordinated by the Netherlands Institute for Sound and Vision, in close collaboration with the Dutch National Committee for May 4th and 5th, the Dutch National Archive, the EYE Film Institute and the Institute for War, Holocaust and Genocide Studies. An open source content management system (based on Drupal) connects content from different platforms. A mobile and web front end offer a range of interactive features that provide historical content in a meaningful context.

Keywords: mobile, Drupal, open source, crowdsourcing, location-based services

1. Introduction

According to a recent Gartner study, mobile phones will be the most common way for people to access the Internet by 2013. (Gartner 2010) That’s only two years from now. The same study predicts that by 2014, over 3 billion of the world’s adult population will be connected via mobile or Internet technology. Needless to say, mobile devices are becoming an omnipresent way to access information, including content from heritage organisations. GLAMs (Galleries, Libraries, Archives, Museums) are currently exploring which roles mobile devices can play in meeting demands by users expecting to play an active rather than passive role as they seek to explore ‘their’ heritage (Horizon 2010). In the context of museums (Proctor 2011) notes: “A Web-based version of museum tours, designed for the small screens of smartphones, increases access to the content not only for on-site visitors, but also for non-visitors, who can virtually tour collections and exhibitions thanks to soundtracks and other content that can be meaningful independently of the physical site.”

The range of technologies converging in mobile devices is very broad, as is the variety of ways they can be applied. Within the GLAM domain, applications range from in-gallery guided tours, catalogues optimized for mobile browsing and complete interactive expositions and applications that aim to entertain rather than inform. For the ‘Picture War Monuments’ project, we explicitly wanted to create a link between the digital objects from heritage collections and the physical reality of the monuments, and exploit knowledge of their geographical location on the mobile device. Specifically, we wanted to link the most important war monuments located across the Netherlands with contextual information from a range of information sources. Users can view videos explaining the story behind the events (for instance told by survivors or war heroes) as they are standing in front of the actual monument, hence creating a richer and more meaningful visit.

We also wanted to explore active engagement by inviting users to share their knowledge and content. We also wanted to explore active engagement by inviting users to share their knowledge and content, which falls in a bigger trend within the heritage domain of facilitating active user engagement using emerging technology. (Simon, 2010; Oomen, 2010).

This paper is structured as follows: we first (Section 2) outline a number of projects from the GLAM domain that places the ‘Picture War Monuments’ in a bigger context of so-called location-based services. In Section 3, we first elaborate on some of the design decisions and go through the different components comprising the platform. In the Section 4 we briefly outline the future plans.

2. Related Work: location-based services

The exploration of related work has focused on location-based services, using the GPS information. Below, we look at a number of services and cluster them on the basis of distinguishable features. We are aware this clustering is somewhat arbitrary, as more than one feature can be combined in one application, but nevertheless proved helpful in defining the functional specifications for “Picturing War Monuments”.

CLUSTER	FEATURE
Location-aware display of content	Mobile applications that use the GPS function to determine the place of the device and display content connected to that location.
Contributing content by end-users	Applications that allow users to contribute content that is linked to a certain place. This can include texts, photo’s, video, audio.
QR codes	Using QR codes to connect the physical space and related online content.
Browsing using an augmented reality application	The use of a third party augmented reality browser (f.i. Layar, Wikitude or Junaio) to display content linked to a geographical location.

Location-based games and Geocaching	The gameplay of a location-based game somehow evolves and progresses with a player's location. Geocaching is the most prominent example with a large community. Typically, is single-player kind of treasure hunt which is usually played using hand-held GPS receivers with user-hidden boxes.
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Table 1: Clusters of location-based applications used by GLAMs

2.1 Location-aware display of content

In the summer of 2010, the Museum of London released an application named Streetmuseum (http://www.mla.gov.uk/what/raising_standards/best_practice/Innovation/streetmuseum) that places photographs from the collection around London in the physical space. With the app running on their mobiles, users walking the streets of London can view these photos exactly from the perspective at which they were taken, often decades ago. If users are in the location pictured, they can click on a "3D view" button. Subsequently, the app will recognize the location of the user and overlay (Figure 1.) the historic image over the current view.



Figure 1: Streetmuseum

Another good example is The Violated City (www.destadgeschonden.nl), a mobile application operated by The Hague Historical Museum. The Violated City consists of four different walks through the city of The Hague all based on the story of Menno Huizinga, a Dutch photographer who lived during the Second World War and witnessed the demolition of his neighbourhood, when German troops started constructing a tank ditch and the Atlantikwall defense line. The Violated City provides the user with an interesting view on telling stories and how digital cultural heritage can enrich these stories and the physical cultural heritage: straightforward, clear, consistent and capturing the imagination.

Another recent example that belongs to this cluster is Historical iMarkers (<http://www.dzineapps.com/apps/>). This application includes a comprehensive database

of roadside markers, with data on almost 130,000 local, state, and national of them. Data originates from State Historical Preservation Offices, the National Register of Historical Places, as well as from users who contribute information. It uses GPS to notify users of the presence of nearby historical markers.

2.2 Contributing content by end-users

A powerful example of the use of mobile technology to invite users to contribute content is UK_Soundmap (<http://sounds.bl.uk/uksoundmap/>). The sound archive of the British Library wanted to facilitate researchers to study the changing 'soundscape' of the UK by providing a rich corpus of sounds. From the UK_Soundmap website: "By capturing sounds of today and contributing to the British Library's digital collections you can help build a permanent researchable resource." The mobile application Audioboo is used as one of the main instruments through which users can contribute sounds. Users install this (already existing) application on their mobile phone, make recordings and subsequently upload them, including some contextual metadata that including the geo-coordinates of where the sound was recorded. After eight months, at the projects' mid-way point, the British Library managed to gather 1,300 sounds through this project. The sounds are placed on an interactive map and are also searchable through a set of metadata.

2.3 QR codes

QR codes are readable by dedicated QR barcode readers. Users will need to launch an application to retrieve the data encoded in the code, for instance URLs. QR codes are currently included in billboard ads, in-store displays, event ticketing and so on. The meaningful use of QR codes is currently being explored. As decoding QR codes requires quite a few steps, the added benefit should be obvious for users. In the words of (Chan 2009) "If I am going to have to install or worse still, find on my phone, a QR code reading application then the reason I am going to all this trouble has to be really really worthwhile."

A good example of using QR codes in the GLAM domain is "Monuments in Utrecht" (<http://www.utrechtsmonumentenfonds.nl/nieuws/qr-code-op-monument>). To celebrate the 65th anniversary of the Utrecht Monument Fund, it was decided to tag all the monuments in the city of Utrecht with QR codes. The QR codes are linked to the mobile website of the Utrecht Monument Fund, which provides background information on the monuments. On a larger scale the "Oneindig Noord-Holland" (http://oneindignoordholland.nl/#!/QR-codes_vertellen_ter_plekke_ee_verhaal) project is attaching QR codes to significant sights all throughout the province of Noord-Holland.

2.4 Browsing using an augmented reality application

Mobile augmented reality-browsers are applications that show third-party information. Users can choose from various services to provide each app with information. Layar, Wikitude and Junaio are currently market leaders. Data in the browser comes from web

services serving geo-located points of interest in the vicinity of the user. Such services are referred to as “layers” in Layar, as “worlds” in Wikitude, and as “channels” in Junaio.

The UAR mobile architecture application (<http://www.nai.nl/UAR>) from the Netherlands Architecture Institute (NAI) is an excellent example of an augmented reality application. UAR provides information about Dutch architecture on the basis of text, image, archival material and video. By means of advanced 3D models, right in the middle of the city, UAR can show what isn't there. The city as it once was – for instance by showing buildings that once stood there. The city as it might have been – by showing scale models and design drawings of alternative designs that were never constructed. And the city of the future (Figure 2) by showing artist's impressions of buildings under construction or in the planning stage (Lemmens 2010).



Figure 2: UAR showing a 3D model

A second example from the Netherlands is focusing on modern art. Together with multimedia agency Fabrique, the Stedelijk Museum in Amsterdam is developing an open source platform to innovatively present and share stories about collections with the public. The project, called ARtours (<http://www.artours.nl/>) is making use of the Layar augmented reality browser. ARtours will actively engage with its users to stimulate them to contribute their own stories, photographs and information.

2.5 Location-Based Games and Geocaching

The gameplay in location-based games and geocaching somehow evolves and progresses via the location of the players. 7scenes is a location based storytelling platform developed by Waag Society and allows to the creation of such games. 7Scenes supports a range of different rules of interaction: from complex multi-user role-playing games to

interactive treasure hunts to media-rich cultural tours. Recently, the Diamond museum in Antwerp used 7scenes to create a GPS-based game called 'The Infiltrator'. Within the game, users will take on the personality of a diamond cutter or seller. The curator notes on the 7scenes blog (<http://7scenes.com/blog?page=4%2C0%2C20>) that "Depending on the chosen personality, players will get a specific assignment, a map of Antwerp and an identification tag with a crossword puzzle. Along the way, the results are filled in at the crossword puzzle to unravel the mystery. Players have a maximum of two hours to get past all ten locations in the city.

FourSquare is a well-known location based service that includes several game elements. It invites users to digitally 'check in' to public places like bars, restaurants, stores or etc. The user earns credit points when checking-in to a venue and befriended users will be notified when this happens. The user that checks-in the most often to a venue can become its 'mayor' and earn badges. These badges are bound to certain achievements. Interesting about FourSquare is the fact that venue owners can put up a reward for users owning a 'mayor' status. GLAMs are also using the application. For instance, the Van Gogh Museum rewards its 'mayor' with free drinks (<http://foursquare.com/venue/58204>). Such initiatives add a social dynamic to physical locations and show the marketing potential of location-based games. The Whitney museum even awards visitors a virtual "Whitneyphile" badge if they check in twice (<http://hyperallergic.com/18474/whitney-foursquare/>).

A prominent sub-genre of location-based games is Geocaching (<http://www.geocaching.com/about/default.aspx>). This revolves around finding 'hidden' locations containing treasures through the use of a GPS receiver and a mobile device. The quest itself is the major driver for user to play "... (I)t is important to think about the activity not simply as a destination or a find. Rather, an integral part of the experience is the getting there" (O' Hara, 2008. What makes Geocaching popular is the way it gives meaning to a walk: "What is significant is how caching was used by people to give a walk a sense of purpose. This sense of purpose helped motivate participants to walk and engage in physical activity and without which they would be less inclined to go" (ibid). The activity stimulates people to get out and experience and enjoy the surroundings. Location-based services tend to have a common denominator in the fact that they are always about infinite activities: "One cannot understand the impulses and urges to get out and do another cache without considering it as an ongoing achievement" (ibid). It seems to be important to notice the dynamic nature of these locative activities and it therefore can be stated that there are two significant factors affecting the use of locative services. Firstly, we have to understand that locative activities are about the whole experience and not just eventual end-goal. Secondly, the activity adds up to the joy of a walk and in general.

3. Picture War Monuments

The project "Picture War Monuments" is funded within the Images for the Future (<http://imagesforthefuture.org>) digitization programme. The consortium executing the programme consists of four partners, including three large collection owners.

Through Images for the Future, between 2008 and 2013, 137,000 hours of video, 20,000 hours of film, 124,000 hours of audio and more than three million photographs will be digitized and hence saved for future generations to enjoy. In addition to migrating from analogue to digital, Images for the Future invests in enriching existing metadata and the creation meaningful links to other heritage collections, for instance Europeana (<http://www.europeana.eu>). Additional services are developed that make the material meaningful and useful for a variety of user groups.

In this context, exploring the use of mobile technology for content distribution was a logical step to take. In 2010, it was decided to create a reusable and open source software platform, specifically with the aim to support location-based services.

“Picture War Monuments” was the first project in which this platform was used. As outlined in the introduction, the central idea of this platform is to enrich visits to war monuments by providing contextual data from a range of institutional repositories and other information sources. The most visible manifestation is an iOS based native iPhone application that enriches a visit to the 200 most important war monuments in the Netherlands with audiovisual heritage and textual context information on-site. In the first three months after its release, the application was downloaded over 6,500 times. The topic ‘war monuments’ was chosen for several reasons, notably:

[1] Rich user experience: adding contextual data will help to tell the story behind the monuments (a wish from the Dutch National Committee for May 4th and 5th).

[2] Available data: a database of 3,500 monuments was available, plus a collection of video interviews with ‘witnesses’ that give a first-hand explanation of the significance of a particular monument.

[3] Partnerships: all partners within Images for the Future have meaningful audiovisual content from their collections. Furthermore, such collaborations can be the basis of forging new collaborations with sister organizations.

In the coming years, more projects will be launched by using the “Picture War Monuments” technology, focusing on other subjects. In the two subsections below, we subsequently outline the challenges in designing the application and outline the main features of the backend and front-ends (mobile application and supporting web-based platform).

3.1 Challenges in designing the application

The Picture War Monuments mobile application project faces - what is called - a “digital divide” on two levels. This digital divide can be understood as a social separation, a dichotomy between the “information rich” and the “information poor” (Norris, 2001). First of all, ‘only’ 3.3% of people in the Netherlands own a smartphone, capable of connecting with the Internet, a precondition for most of the location-based services (Luijbregts 2011).

A greater part of iPhone users worldwide can be assigned to the age range of 25 to 44 years old (42%) and are expected to have an indirect relation to the events of the

Second World War. Only 14 % of the iPhone users worldwide are 55 years or older, and are more likely to directly relate to WWII, since they themselves or their close relatives may have lived through and witnessed the events (Shah 2010). Therefore, it can be stated that there is no unambiguous target group when it comes to defining the Picture War Monuments user. This raises some questions about how to reach such a fragmented target group, especially considering the project's aim to create a technology that can be re-used for new applications in order to make digital cultural heritage accessible based on geodata and mobile technology.

In addition, the possibilities for users to create and upload audio, textual and/or video content fall short, since right now there is still often insufficient physical and digital space to create content extensively on a mobile device. A complementary web platform might be a solution to overcome these problems to some extent, if 1) there is a solid link between the platform and the mobile application and 2) if the platform is able to stimulate social dynamics in the use of the mobile application. Furthermore, the web platform can synchronise with the information available on the mobile application, and in particular it can complement the mobile application since the web platform will provide more space for interpretation and elaboration with regard to the heritage concerned. Moreover, the web platform could serve as a communal space for users, a breeding ground for User Generated Content (UGC) and a home for a fragmented target group. Finally, the web platform can be accessed by those who (yet) do not have an iPhone, but who nevertheless might be interested in the Picture War Monuments' content.

Memory spaces

When using the Picture War Monuments mobile application, it becomes difficult to retain the idea of Second World War monuments as being only physical spaces, since the user gains access to both the physical and the digital domain of the object concerned. Therefore, it would be more adequate to speak of 'memory spaces' since both spaces evoke memories. It is important to both have users engage with the mobile application and its content, and to stimulate them to provide UGC, especially when there is a lack of available contextual digital heritage.

With regard to mobile applications it seems difficult to link target groups to specific qualitative and demographic data. Due to the fact that developing mobile (locative) applications is a relatively pioneering activity and the fact that research on the subject is increasing but certainly not saturated yet, it is understandable why target groups often are merely defined as 'the user of smartphone x'. This can be problematic considering the fact an application's content might not match the target group's wishes and preferences. One user of the mobile application might for instance be interested in using the mobile application only occasionally and might not dive deep into the applications' content, while another user might have the urge to use it all day long to take in all the content provided. In conclusion, in designing the portal we had to accept that the users group was quite heterogeneous.

Storytelling, mobile walks, social interaction and edutainment

Numerous stories underlie the monuments 'audiovisually enriched' by the "Picture War Monuments" mobile application. As elaborated on previously, location-based mobile applications like 7scenes and FourSquare, and the activity of Geocaching explore the boundaries of informative and rather serious pursuits on the one hand, and light entertaining purposes on the other. The Second World War remains a delicate subject and when coming up with different features for different kind of users, it is crucial to steer a middle course: with due respect for the matter, the content and all those involved, but without losing sight of enriching user-experience.

We can imagine a user in the age range of 17-25. He or she might be interested in cultural heritage, but cannot be labelled as a frequent visitor of cultural heritage spaces. This user could be served with location based social media features, stimulating the user to get out, look up a monument and leave a comment on location, supplemented by their own images or video footage, earning credits for answering questions about specific monument or events that occurred, subsequently posting it to Facebook or Twitter. These social components might stimulate a part of the target group that is known for expressing themselves through online profile pages. Furthermore, we can imagine the cultural heritage enthusiast might be well served by providing extra content, like externally linked references to Wikipedia, historical websites, image banks and other relevant sources. We can also imagine an elderly user, with an average interest in cultural heritage, but without a significant bond to the Second World War. He or she might like the outdoors on a weekend day, and might therefore enjoy biking or walking tours along several monuments: getting a chance to see the surroundings, while learning something more about the heritage on location. Creating social interaction can be achieved by providing dynamic features on the web platform and by linking the mobile application to locative services. Using and creating walk- or bike routes, elaborating on provided Geocaching coordinates, writing about a visit to a monument and the possibility to respond to such a report are all means to create an active user community. Especially interesting is the fact that the already existing Geocaching community can easily be reached, when providing Geocaching routes linked to the war monuments. Users interested in Geocaching can for instance create their own Geocaches and tie them to a story.

Regarding the "Picture War Monuments" mobile application, it is important to create distinctions within a heterogeneous target group and to make sure these distinctions are bound to differences in interests, preferences and wishes, since its aim is to enrich the experience of physical cultural heritage. The examples made above are anything but final or resolute, but yet they show possibilities to hopefully stimulate, enthuse and create value for the user.

Also, the choice for the Drupal CMS (see Section 3.2) is important, since it serves as an editorial environment which can be easily adjusted and augmented with new contextual sources from the available (audio)visual repositories, based on the wishes of specific

target groups. Furthermore, the technology can be easily re-used and built upon to create wholly new interfaces and / or services.

The table below shows a possible subdivision of Picture War Monuments' target groups and the recommended features assigned to the different groups. It formed the baseline for the design of the platform. Many features are already included in the current release of Picture War Monuments (Sections 3.2 and 3.3), others will be included in future releases.

User group	Recommended features
Youth (up to 24 years)	Locative games / competitions /
Cultural heritage enthusiast	Locative storytelling
Average interest in cultural heritage	Locative social media features
Social/locative media enthusiast	Geocaching / locative storytelling /locative social media features
Average interest in social/locative media	Geocaching

Table 2: users and features

3.2 The Drupal Backend

The architecture developed by Sound and Vision and the software developers from OneShoe mobile is based on a Drupal installation that connects to relevant open content repositories using their respective API's, and enables the creation of (mobile) location-based services for cultural heritage. To be able to connect to the online audiovisual heritage needed to enrich the war monuments several API connections between the Drupal backend and popular content platforms for (open) heritage content were established. For moving images this was the Open Images platform (www.openimages.eu), which was linked using its OAI-PMH implementation. For photographic material Flickr (www.flickr.com) was chosen, because of its powerful API. To provide additional textual information the Drupal backend (Figure 3) also provided the ability to include a reference to a Wikipedia article about a war monument (if one existed).

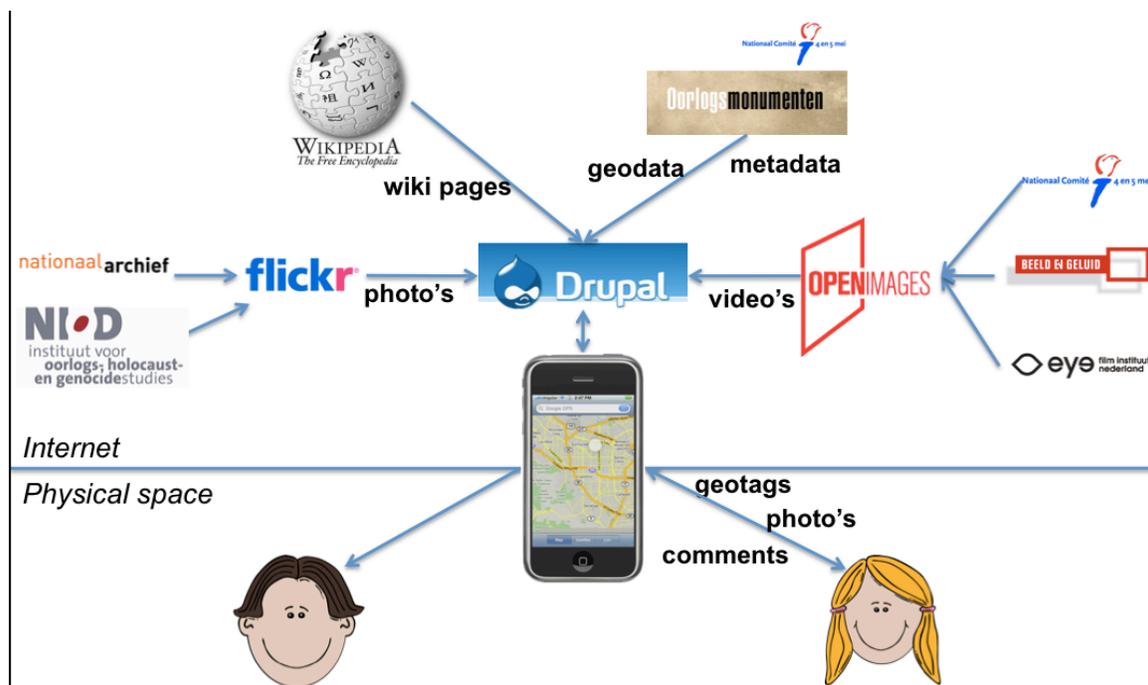


Figure 3: Screenshot of the technical architecture

The system then functions as an editorial environment where editors can enrich a set of physical heritage sites with relevant content from the available (audio)visual repositories. By building a location-aware application that utilizes the location information and the references to related audiovisual heritage stored in the Drupal installation, users can access relevant information based on their GPS location to enrich their on-site experience. The architecture also supports applications to enable users to contribute comments and media files and to the locations themselves.

To promote reuse and further development of the architecture and to ensure that other institutions can easily participate, the complete architecture is based on open source components. Because all information and references to the online content are centrally stored, it is relatively easy to develop applications on top of the Drupal based architecture. The content is separated from the application users install on their mobile devices. As a consequence, the applications built on top will be very lightweight and can be filled with up-to-date content easily. Applications can be an iOS based application (like our first iPhone application), but with a similar effort this can also be an Android or Symbian based application.

3.3 The Mobile and On-Line Front-ends

As stated earlier, the most visible manifestation is an iOS based native iPhone application that enriches a visit to the 200 most important war monuments in the Netherlands with audiovisual heritage and textual context information on-site. Sound and Vision (member of the Images for the Future consortium) collaborated with the Committee May 4th and 5th. This Committee maintains the digital database of all war monuments in The

Netherlands. The database currently consists of over 3,500 entries. This database was imported into the Drupal backend as the starting point for the mobile application (this included geographic locations, textual descriptions and photographs, among other things). From this database the pre-selected set of 200 locations was enriched with audiovisual content from the Images for the Future consortium (apart from Sound and Vision, this includes the EYE Film Institute and the Dutch National Archive) and the NIOD Institute for War, Holocaust and Genocide Studies.

Users of the application can consult the digital information offered about the monuments in several ways. When launching the application the user is presented with several menu options. The list of nearby monuments option (Figure 4) utilizes the current GPS location of the user to create a sorted list of nearby monuments, with the monuments closest to the user at the top. The map option (Figure 5) utilizes the same information, but visualizes this by projecting the location of the monuments in the database and the user on a Google Map. The gallery option (Figure 6) consists of a randomly organized page with thumbnails of the war monuments, to facilitate spontaneous discovery.



Figure 4: List of nearby monuments



Figure 5: Map view

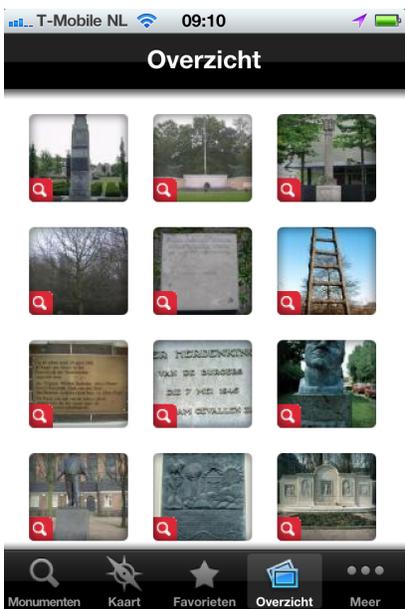


Figure 6: Galley view

When selecting a specific monument from the abovementioned menu options, the user is referred to its dedicated monument page. Starting with a landing page giving basic textual information, a carrousel with the related audiovisual heritage and the last user comment, the user can access the additional monument-specific functionality. On the

information section, users can find descriptive textual metadata about (for instance) the monument, creator and the historical events it refers to. If there is a Wikipedia article available for this specific monument, an additional tab is activated for users to also directly consult this source within the app. Using the star button, users can add the monument to their favourites. Using the comment section (Figure 7) users can generate their own content about the monument. They can add a textual comment and/or add a picture (utilizing the camera of the iPhone, or from their library) to the monument.

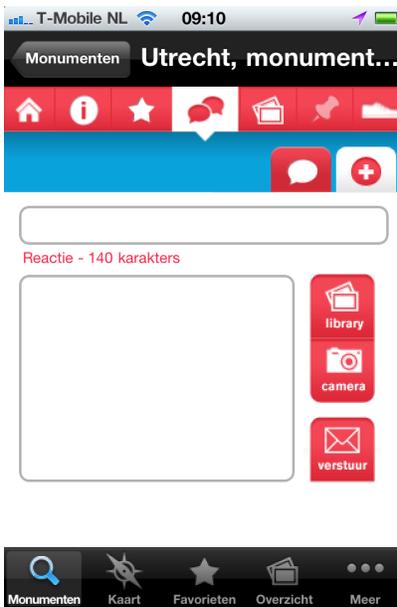


Figure 7: Comments

All user-contributed content is moderated, before publication. Within the gallery section users can browse through the audiovisual heritage related to the monument. The material is represented with a thumbnail and descriptive metadata. By tapping the thumbnail, a video will start streaming from directly from the Open Images platform or a photo from Flickr.com will be shown in a slide show.

Initially, geo-coordinates have been determined by linking addresses of monuments to a GIS database. These coordinates can be improved by inviting users to provide this information as they visit the site. Depending on the distance of the user to the monument, a geotagging section can also be activated. If activated, users are encouraged to help to further improve the geo-locations present in the database, by following a three-step procedure. With the directions section users can view the location of the monument on a Google Map and switch to the native Google Maps application on the iPhone to get directions to travel from the user's current location to the location of the monument.

To compliment the Picture War Monuments iPhone app, an additional web platform (as described in subsection 3.1, see Figure 7) was developed.



Figure 8: The Internet platform www.erfgoedinbeeld.nl

The goal of this platform was twofold: first of all it aimed to provide access to the enriched war monuments and related audiovisual heritage to a broader target group than that of the Picture War Monuments app, from people owning an iOS-based device to people with access to the Internet. Secondly, it aims to facilitate forms of user contributions to the monuments in the database that exceeded the capabilities of the iPhone in general and its small physical screen in particular. Finally, the platform also functions as a promotional tool for the Picture War Monuments iPhone app.

Similar to the iPhone app, users can navigate the database of war monument using a Google Map or using search functionality on the web platform. They can also view monument page for specific monument to consult the related audiovisual heritage and the textual descriptive metadata. But next to leaving comments and uploading their own photographs, users can also use the web platform to plan their own tours along the war monuments of choice that are available in the database using the Google Maps web application. Users can save, share and print this route, hence building a bridge to the interaction with the (individual) online information about and related to the war monument, and the (social) offline activity of actually visiting the heritage sites, ideally accompanied with the Picture War Monument app in order to enrich the experience with the available digital sources.

4 Future work

This paper has shown a diversity of approaches to location-based services for heritage. All have in common that they try to create additional value for the user, by offering digital collections within a meaningful - location aware - context. Our experience with the Picture War Monuments has once again shown that this is easier said - or conceptualized - than done. The current technology that is available for location-based services has no unambiguous target group. For our own project this meant that the potential users had different relations to the topic. This makes it challenging to relate audiovisual archive material to locations that convey a meaningful message about the location to all users. However, the flexibility of the platform (making it easy to relate and alter a multitude of items to a location) and the enabling of user generated content provide the means to turn this process of the creation of meaning into a fluid conversation. The "Picture War Monuments" application is being evaluated currently, and an updated version will be launched later this year. Sound and Vision will be working on a number of additional theme based platforms over the coming years, always seeking active collaboration with end-users and partner institutions.

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References

- Chan, S. (2009). QR codes in the museum – problems and opportunities with extended object labels. <http://www.powerhousemuseum.com/dmsblog/index.php/2009/03/05/qr-codes-in-the-museum-problems-and-opportunities-with-extended-object-labels/>
- Gartner (2010). Gartner Highlights Key Predictions for IT Organizations and Users in 2010 and Beyond. <http://www.gartner.com/it/page.jsp?id=1278413>
- Johnson, L., Witchey, H., Smith, R., Levine, A., and Haywood, K., (2010). The 2010 Horizon Report: Museum Edition. Austin, Texas: The New Media Consortium.
- Lemmens, P., Connecting the Collection: From Physical Archives to Augmented Reality in the Netherlands Architecture Institute. In J. Trant and D. Bearman (eds). *Museums and the Web 2010: Proceedings*. Toronto: Archives & Museum Informatics. Published March 31, 2010. Consulted February 9, 2011. <http://www.archimuse.com/mw2010/papers/lemmens/lemmens.html>
- Luijbregts, R. (2011). BlackBerry bestverkochte smartphone in Nederland <http://www.winmag.nl/artikel/2331723/blackberry-bestverkochte-smartphone-in-nederland>
- Norris, Pippa (2001). *Digital Divide: Civic Engagement, Information Poverty, And the Internet Worldwide*. Cambridge: University Press.
- O' Hara, K. (2008). "Understanding geocaching practices and motivations." In proceedings of the twenty-sixth annual SIGCHI conference on Human factors in computing systems, Florence, Italy, 5-10 April.
- Oomen, J., L. Baltussen, S. Limonard, A. van Ees, M. Brinkerink, L. Aroyo, J. Vervaart, K. Afsar, R. Gligorov, Riste (2010). "Emerging Practices in the Cultural Heritage Domain - Social Tagging

of Audiovisual Heritage”. In: Proceedings of the WebSci 10: Extending the Frontiers of Society On-Line, Raleigh, NC, US.

Proctor, N. (2010). The Museum Is Mobile: Cross-platform Content Design for Audiences on the Go. <http://www.archimuse.com/mw2010/papers/proctor/proctor.html#ixzzIDPGvZ04U>

Shah, H. (2010). “AdMob Mobile Metrics Report.” AdMob Online: <http://metrics.admob.com/wp-content/uploads/2010/02/AdMob-Mobile-Metrics-Jan-10>.