

Testaccio, A Digital Cultural Biography App

Maurice de Kleijn¹, Chris van Aart², Niels van Manen¹, Gert-Jan Burgers³ and Henk Scholten¹

¹VU University Amsterdam, Spatial Information laboratory (SPINlab), The Netherlands
mtm.de.kleijn@vu.nl

²VU University Amsterdam, the network institute, The Netherlands
cj@vanaart.com

³Koninklijk Nederlands Instituut in Rome (KNIR) / VU University Amsterdam, The Research institute for the heritage and history of the Cultural Landscape and Urban Environment (CLUE), Italy/ The Netherlands
gj.burgers@knir.it

Abstract. Features from the past in present cities have been identified as valuable and as potential assets for future urban development. Transferring knowledge about the history and heritage of the urban landscape is considered to be a challenging matter. This paper discusses how the process of knowledge transfer between past and future oriented disciplines can be optimized by combining mobile geospatial app technologies with the methodological framework of the biography of the urban landscape. A digital cultural biography app for Testaccio, a district in Rome, is presented which aims to optimize the process of knowledge transfer, thus optimizing the use of urban cultural heritage. This best practice is considered to be highly innovative for the integration of heritage in current and future cities.

Keywords: mobile app, history, heritage, geospatial technologies, SDI

1 Introduction

This paper is about the design and deployment of mobile location based app technology to be used by spatial planners and architects who have to deal with physical and non physical remains from the past in the current urban landscape and incorporate these somehow in their designs for the future landscape. As identified by many scholars, the potential for heritage in urban development is significant [1-6]. However, the management of heritage in an urban context is considered a challenging matter. Especially in cities with a high density of physical and non-physical remains from the past, like Rome, the challenge is how to deal with and how to use these heritage features in the current and future city. One of the main challenges is to transfer the scientific knowledge about the history and heritage, generated by past oriented scholars

like historians and archaeologists, to more future oriented disciplines like architecture and spatial planning. The landscape biographical approach developed by Kolen offers a methodological framework in which the gap between past oriented and future oriented scholars can be bridged, and thus help to optimize the use of physical and non physical heritage [7-9]. The biographical approach refers to the continual passing on of the landscape from one 'owner' to the 'other', shifting from one social context to another and influencing, and being shaped by, successive generations of inhabitants [7]. It combines different historical sources and past oriented studies, enabling scholars to identify and reconstruct dynamic processes of development and transformation. The information produced by these scholars, in turn acts as a source of inspiration for architects and urban planners. An important component of the biographical approach is therefore the ability to share data produced by the different disciplinary fields based on a location. In order to make this possible we have developed a Spatial Data Infrastructure (SDI) [10]. To make this data understandable, thus usable for future oriented scholars, the data needs to be elaborated and enriched, and functionality should be incorporated that facilitates the combining of information from different source. This paper focuses on the development of a *cultural biography mobile location based app* as an extension to the biographical research approach. It presents the development of the app for the neighborhood of Testaccio in the city centre of Rome, an area that is rich in heritage features and currently in flux. The app offers a tool to transfer the knowledge about the past dynamics of physical and non physical features to future oriented disciplines. Most map based apps are either for navigation or finding points of interest. Our app by contrast has been customized for professional usage, taking into account requirements for both past and future oriented disciplines. The app includes a cartographic storyboard of major transformation processes in Testaccio, derived by historians from historical maps of the area and presented in a series of maps with consistent font and key, designed to communicate the historical knowledge effectively to non-historians. It also makes the information accessible through a matrix on which time and theme (themes were defined by the intended end users) can be interactively combined, as the user sees fit. By thus integrating a pre-structured historical narrative with the matrix function that allows the user to create his or her own narratives, the digital biography aims to meet the variety of needs for historical and heritage information that the architect/ designer/ urban planner has in the course of the design process.

2 The Context: Testaccio

The district (*rione*) Testaccio, in the city centre of both modern and ancient Rome, is rich in archaeological and historical features. The area underwent numerous transformations, many traces of which remain in the current urban landscape. In the Roman period, Testaccio housed the river harbor of the *Urbs*. In the 3rd century AD it was incorporated within the Aurelian city walls. Major monuments are the Cestian Pyramid, the Porticus Aemilia and the Monte Testaccio, a 35 meters high artificial hill consisting entirely of ancient pottery. In the late Roman period, Testaccio transformed drastically. The harbor structures were in decay and the area came to be used for agriculture, notably viticulture. Only in the late 19th/early 20th century Testaccio was *re-urbanized*, when it was built up with blocks of flats, accommodating the laborers so crucial to Rome's new urban and industrial development. The processes of the de-urbanization and the re-urbanization of Testaccio also produced physical evidence. The non-Catholic cemetery of Rome can be seen as a physical proof of this. According to 18th century rules of the Roman Catholic Church, non-Catholics were not allowed to be buried in the consecrated earth of Rome [11]. Instead, they had to be buried outside of the city. Whilst Testaccio was considered to be part of the *Urbs* in ancient times in the 19th century, it was peripheral indeed and considered to be exterior to the city. Only the subsequent re-urbanization re-integrated Testaccio into the urban tissue.

Currently, Testaccio is experiencing an urban regeneration process, partly through private initiatives, partly steered by municipal authorities. In the context of this process, initiatives are being developed to give credit to the district's history and heritage. The *Soprintendenza Speciale dei Beni Archeologici di Roma* (SSBAR) for instance formulated a strategy which aims to reconstruct the use of the district in the past two millennia and to develop strategies for re-using, redeveloping, thus *rediscovering* Testaccio's history and heritage; strategies that meet the modern needs of the district [3], [12].

3 The Conceptual Design of the Digital Cultural Biography App for Testaccio

The purpose of the digital biography app is to generate a shared view on the history and heritage of Testaccio for both past- and future oriented scholars.

Because the different disciplines and information sources –figuratively– meet at a specific spot, location is placed at the heart of app. Being able to access, add and share information on an interactive map while being at a specific location in a non rigorous way is identified as important functionality needed. This especially accounts for architects for whom fieldwork is an important part of their work progress and browsing associatively through the information enables them to generate a personalized narrative in their designs [8]. The digital cultural biography app for Testaccio is therefore developed as a mobile app with an interactive map and dynamic handling of information.

In order to transfer the disciplinary data on the history and heritage into information for other disciplines, three key components have been identified. Location, period and theme are seen as the key to transfer data into information, thus generating knowledge. The data to be shared geographically consists of points of interest and cartographical information. The points of interest link to stories, pictures, drawings and other documents from different sources. The cartographical data consists mainly of historical maps. Over 150 historical maps of Testaccio have been identified in different archives.¹ The historical maps form a valuable source of information. By overlaying the different historical maps geographically, the transformation dynamics in Testaccio from the 17th century until the present day can clearly be identified and studied. The digital cultural biography of Testaccio has therefore a number of georeferenced historical maps on top of the current topography.

For future oriented scholars to get a grip on the significance of the heritage features, having the information spatially accessible is not sufficient. Besides mapping the information about the history and heritage of Testaccio, the digital cultural biography app has therefore categorized the information chronologically and subdivided in different themes. A thorough analysis of the historical and heritage features has led to the classification of five different periods and eight different themes. Enriching the datasets, including the maps, with both attributes (era, theme) enables users to interactively explore the history and heritage of Testaccio. In addition to the historical maps, for every period a thematic map is produced in which the most important transfor-

¹ Thanks to a thorough survey by Joris Jehle.

mations of Testaccio are thematically summarized. Categorizing the information on the history and heritage of Testaccio as such enables future oriented scholars to browse through the information associatively. By offering functionalities in which they can spatially combine different periods of time and different themes enables them to arrive at a better understanding of the significance of the remains from the past, thus enabling them to generate personalized narratives in their designs.



Fig.1. The digital cultural biography app for Testaccio, showing the map of Nolli from 1748.

4 Technical Design

The core of the digital cultural biography Testaccio App is to enable users to access and add information based on a location, through an interactive map using a mobile device. To integrate these functionalities the app is developed for tablets and is developed by making use of geospatial technologies. The Testaccio app is developed as an app for iPads with 3G functionality. This type of tablet has an integrated GPS sensor, which enables it to communicate its location to the apps installed. For the development of the app Apple's iOS developer tool package *xcode* together with ArcGIS's runtime desktop Geographic Information System (GIS) software and the VU Amsterdam University library Geoplaza SDI are used [13-15]. These toolboxes enabled us to im-

plement overlay functionality, drawing geometry functionalities and access information on the points of interest.

The thematic cartographical and thematic geographic information layers generated for the Testaccio app were prepared making use of desktop GIS software and integrated in the Geoplaza SDI, which provides mapping services that communicate with the app through the internet. Scans of the maps were georeferenced based on similarities with current topographical layers to a projected coordinate system. By analyzing these projected historical maps and analyzing archaeological and historical sources, thematic maps were generated in which the most significant features of Testaccio according to theme and period were created. Having this spatial information stored geographically, ArcGIS's runtime is able to apply overlay functionality and integrate the GPS signal on the map for an iOS app.

The Testaccio app is developed as an app that can also be used offline. In order to use the app when being in Testaccio, we have decided not to be dependent on mobile internet. The signal for the internet connection is too weak for the amount of data that the app needs. Especially the historical maps require too much data transfer and are therefore mostly cached from the Geoplaza SDI to the device. Although techniques to optimize this process are under development [16] and available in the Geoplaza SDI, the main bottleneck is the weak internet connection. The performance of the app in the short term had the priority. A disadvantage of this approach is that the app is very large – more than 1000 MB – and less interactive when data is updated.

The app is freely available in the Apple iTunes store [17].

5 Concluding Remarks and Future Research

The digital cultural biography app presented in this paper enables future oriented disciplines to access information on the history and heritage of Testaccio. By categorizing the information according to different themes and periods, past and future oriented disciplines create a common view which should enable them to gain a better insight in the significance of the heritage in the area. The interaction between the different disciplines takes place at a specific location. The role of geospatial technologies in this sense is therefore considered to be innovative.

The impact of the digital cultural biography app for Testaccio will be assessed in the next stage of research. A design concourse is organized in which architects are invited to produce a design for *Piazza Orazio Giustiniani*; half of the contestants will work with the app, the other half with a conventional textual history of the area. The assignment for the architects is to develop a design that takes the history and heritage of the square into account. Although a thorough analysis of the development of the app has been conducted, organizing this concourse will enable us to measure the actual impact of the app on the use of heritage in the designs, thus optimizing the potential of heritage in the urban landscape. The impact of the instrument will be evaluated by comparing the designs on different criteria, evaluating the design process with questionnaires, and interviewing members of the public about their views on designs created with and without the digital biography.

Integrating the spatial information on the history and heritage of urban areas on a conceptual level as presented above is considered to be a new way of stimulating and optimizing re-use of urban heritage in current and future cities. However, on a practical and technical level the app has to improve. We are currently at the turning point at which more data becomes available to the public and in which mobile internet networks can handle more data transfer. This app is therefore considered to be a best practice, which for future heritage issues can be used more generically by integrating different sources of open data and be part of a user centric Spatial Data Infrastructure (SDI) for the history and heritage of urban landscapes [10].

Acknowledgements

The research presented is part of research strategy *Rediscovering Landscape*, implemented jointly by the SPINlab and the CLUE Institute. The authors would like to thank Renato Sebastiani (SSBAR) for his active support and the invitation to join the Testaccio research program. Furthermore the authors like to thank Menje Almekinders and Joris Jehle who both did an internship at the KNIR and collected most of the content for the digital biography app.

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