



LAPIN YLIOPISTO
UNIVERSITY OF LAPLAND



University of Lapland

This is a self-archived version of an original article. This version usually differs somewhat from the publisher's final version, if the self-archived version is the accepted author manuscript.

Exploring Local History and Cultural Heritage Through a Mobile Game

Luiro, Elina; Hannula, Petri; Launne, Emilia; Mustonen, Sanni; Westerlund, Toni; Häkkilä, Jonna

Published in:
MUM '19

DOI:
[10.1145/3365610.3368411](https://doi.org/10.1145/3365610.3368411)

Published: 01.01.2019

Document Version
Publisher's PDF, also known as Version of record

Citation for pulished version (APA):
Luiro, E., Hannula, P., Launne, E., Mustonen, S., Westerlund, T., & Häkkilä, J. (2019). Exploring Local History and Cultural Heritage Through a Mobile Game. In G. Jacucci, F. Paternò, M. Rohs, & C. Santoro (Eds.), *MUM '19: Proceedings of the 18th International Conference on Mobile and Ubiquitous Multimedia* (pp. 42:1-42:4). ACM . <https://doi.org/10.1145/3365610.3368411>

Document License
Unspecified

Exploring Local History and Cultural Heritage through a Mobile Game

Elina Luiro
University of Lapland
Rovaniemi, Finland
elina.luiro@ulapland.fi

Petri Hannula
Lapland University of Applied
Sciences
Rovaniemi, Finland
petri.hannula@lapinamk.fi

Emilia Launne
University of Lapland
Rovaniemi, Finland
emilia.launne@ulapland.fi

Sanni Mustonen
Lapland University of Applied
Sciences
Rovaniemi, Finland
sanni.mustonen@lapinamk.fi

Toni Westerlund
Lapland University of Applied
Sciences
Rovaniemi, Finland
toni.westerlund@lapinamk.fi

Jonna Häkkilä
University of Lapland
Rovaniemi, Finland
jonna.hakkila@ulapland.fi

ABSTRACT

We describe our work on developing a mobile game that utilizes local history and cultural heritage in its storyline and content. The game is depicted in the town of Kemijärvi, Northern Finland, in the 1920's, and its aim is to encourage visitors and locals to get to know the town's history. The game was designed with input from history experts on the topic, and it introduces local history in the form of a narrated story, where the user has to visit the town's historical places and characters. We present the design process, the game concept and a user evaluation. As the lessons learnt and findings from our design process, we highlight the challenge of finding the balance between historical accuracy and engaging game narrative, and the importance of selecting the target user group and involving them when refining the concept and user interface design.

CCS CONCEPTS

• **Human-centered computing** → **Human computer interaction (HCI)**; *User studies*; *Information visualization*; • **Applied computing** → **Arts and humanities**.

KEYWORDS

Mobile game design, cultural heritage, history, user experience, location based services

ACM Reference Format:

Elina Luiro, Petri Hannula, Emilia Launne, Sanni Mustonen, Toni Westerlund, and Jonna Häkkilä. 2019. Exploring Local History and Cultural Heritage through a Mobile Game. In *MUM 2019: 18th International Conference on Mobile and Ubiquitous Multimedia (MUM 2019)*, November 26–29, 2019, Pisa, Italy. ACM, New York, NY, USA, 4 pages. <https://doi.org/10.1145/3365610.3368411>

Permission to make digital or hard copies of part or all of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for third-party components of this work must be honored. For all other uses, contact the owner/author(s).

MUM 2019, November 26–29, 2019, Pisa, Italy

© 2019 Copyright held by the owner/author(s).

ACM ISBN 978-1-4503-7624-2/19/11.

<https://doi.org/10.1145/3365610.3368411>



Figure 1: The mobile game is based on the local history of the town Kemijärvi.

1 INTRODUCTION

Cultural heritage is increasingly taking advantage of digital technologies. Historical content and information about cultural heritage sites is not only found in the books, museums and archives anymore, but via internet and smart phones. Different types of web services are available for searching historical data repositories, and museums and historical associations have their own web pages to introduce the highlights of the content. There are also more and more technology based tools to get information about local cultural heritage, such as mobile app based thematic walking tours with location based content. Knowing more about the local history is often of interest to locals, tourists, and history enthusiasts alike.

In this paper, we introduce the design of a mobile application, which utilized gamification to introduce the history of the town Kemijärvi, Finland, Figure 1. By fusing together pieces of local history, we created a mobile game, where the user is familiarized with the history by conducting narrated tasks with historical characters and places in the town. In the following, we describe the design process, the design and implementation, and the initial user study evaluating the game. We also discuss the challenges when creating a local history mobile game.

2 MOBILE TECHNOLOGY FOR CULTURAL HERITAGE

Applications designed for augmenting the environments with cultural heritage content are numerous. Overlaying the physical world with historical information has been done by using advanced visual interfaces [6], and also with haptics [8] and audio UIs [1]. Augmented and virtual reality are also being applied for cultural heritage content [9]. Examples of this include e.g. a mobile AR game placed in Manila, designed for teaching the Philippine history [11], and mobile AR application for Prambanan Temple Complex, Yogyakarta, to support informal learning on the historical temple area cultural heritage [10]. HMDs have been used to explore e.g. the virtual presentation of Salla historical graveyard [7].

Large audiences have become familiar with location based mobile games especially due Pokemon Go, which created a world-wide phenomenon with smartphone users [5]. There are many examples of mobile tools to access location-based information, the early GUIDE tourist guide being the first example of this [3]. REXplorer is another example of a location-aware tourist application [2]. It utilizes gamification and narratives based on old stories and the city history to make the user to explore the city. Different approaches for content creation with local cultural heritage have been employed, including automated content creation [12] and user created content [4] for location-based narratives. Cheverst et al. have created a mobile service platform, where people can insert local heritage content, e.g. photos, and create narrated walks with POIs triggered based on the user's location [4].

3 THE GAME

3.1 The Design Process

The design process for the game started with a fieldtrip to the town Kemijärvi and the historical sights in the town center, e.g. the town museum and the old fire station. Visual data, such as 360-degree-photos, were collected from the locations. From this data we created 360-degree-walkthrough-demos, which were then tested at a co-design workshop during a second fieldtrip to Kemijärvi. Participants of the workshop included small travel agencies and museum staff, who gave feedback on the selected scenes and comments on the local history. In the workshop, the historical themes and a need for pedagogical edutainment content and historical storytelling was highlighted. The local stakeholders were interested in how to revive history, and make it more interesting for today's audiences, especially schoolchildren and tourists. In addition, the town museum was consulted for the historical content, such as maps and photos.

We continued the design process by interviewing an art historian and exploring the publications by a Kemijärvi history novelist to get more in-depth knowledge on the cultural history and the local historical characters. The material from the town museum and interviews with the cultural historian were utilized in gaining understanding of the historical details, events and their locations, Figure 2. Based on the research, the time period of the 1920s was chosen, as it was found to be an active period in the economic growth and cultural development of the town, with many interesting professions and characters.



Figure 2: Investigating the local history for the game design.

Four different preliminary game concepts and core game mechanisms were designed based on the historical characters. The concept of a postman that links together different historical characters and the Kemijärvi sites, was chosen for further development. Also, the genre of casual gaming was decided on as the main focus; the player did not need special skills or previous experience, and the game did not require a long time commitment.

3.2 The Game Concept

The game concept is based on a narrative, where Lyyli Perunka, a well-known local lady at the time, is organizing a birthday party. The player's avatar is a postman in the 1920's, and the task is to deliver the party invitations to other influential and historical persons in the town. At the same time, the players have a chance to get to know the persons. Lyyli guides the player along the way and tells facts about the characters and the buildings of Kemijärvi. The historical persons are placed in the historical buildings, and to complete the task, the player needs to visit the location, which is detected with the smartphone GPS. The player can see how the buildings looked like in the 1920s in the phone virtual reality or augmented reality view, and at every location, the player collects a present for the birthday. The player can follow the route on a game map, and sees the progress of the delivered invitations with the postman's supply list and picked up presents in the postman's bag. At the end of the game, the player can test the accumulated historical knowledge with a quiz.

3.3 The Concept Evaluation with a User Study

3.3.1 Setting of the Study. For the user study, we created an interactive prototype with Marvel App simulating the UI. The simulation was run on a mobile phone, and had the game UI layouts with POIs that enabled the participants to progress on the game. The game concept was tested with five children (female, 8-11 years) that had earlier experience on playing games on a mobile phone. The user study was run in three test sessions, where the participants attended in pairs (n=4) or alone (n=1). For the practicalities, the



Figure 3: User test on-going.

evaluation was organized indoors, in a room where photos representing the physical Kemijärvi buildings were placed to be visited during the the evaluation session, Figure 3. Each test session lasted approximately for 15 minutes. During the test, the participants were asked to think aloud and prompted with additional questions encouraging them to give comments.

3.3.2 Results. The participants' feedback can be divided into two categories, i.e. related to the game design and story, and focusing on the user interface and interaction design. Related to the story content, the participants were interested in the narrative, and wished to know more about the buildings and characters. Details making the game characters interesting were found important to engage children in the game, and character information such as age, name, favourite color, pet animals, and how good they were in their profession, were asked during the session. The participants also wanted to know more details about the historical buildings. The participants remembered the information about the historical persons well in the end quiz.

For the UI design, the interaction, terminology, and colors were commented. The brown color scheme of the game was perceived somewhat not typical or attractive, but also seen as part of the history context, e.g.: *"These colors are quite old fashioned, but as this [game] was about old times, that is understandable"*. The participants thought that some words were difficult to read, especially if calligraphy was used, or if the terminology was foreign. Some usability issues in the UI design and the game mechanics were found. The input areas and the next steps in the interaction flow were unclear at times, receiving questions such as *"What should I press now?"*. The interactive elements on the UI needed to be more clearly visualized.

3.4 The Implementation

After the prototyping phase, the game was implemented using Unity3D game engine, which made it easy to add cross-platform support; Android and iOS. The game was designed to be played using a mobile device with GPS support. The game environment was created based on open street map data, and first, a tool for reading the open street map data and generating a 3D environment map data was designed and implemented. The city generated by using the 3D tool looked quite simple, taking inspiration from other

GPS-based games such as Pokemon Go and Harry Potter - Wizards Unite. The game world was mapped with GPS coordinates to the real world.

All event location content was created by using traditional 3D modelling tools, Blender and Substance Painter. 3D models were created of the most important buildings. This was seen as a way to provide the player better understanding about the location and the surroundings. Four 3D non-player characters (NPCs) were created for the 3D world to give tasks to the player. High-poly and low-poly characters from the same 3D model were created inside ZBrush tool, and Blender was used to UV-map both versions of the same character. Inside Substance painter tool, the high-poly data was used to texture the low-poly model of the character to optimize the visual look and feel, and to match the performance of a smartphone.

The narrative characters were created by using 2D element art by the artist working in the project. The avatar dialogues and story parts were illustrated in 2D format to decrease the production time and to maintain a consistent art style.

4 DISCUSSION

The main challenge in the game design was finding the right balance between the historical accuracy and creating an interesting storyline and characters. For example, the historical anecdotes and stories needed to be simplified to work in a mobile UI and in short character dialogues. Also the historical time window needed to be selected carefully to create a coherent and engaging historical story with authentic details and characters. The audience may wish to have additional details in the characters to make them more engaging, which became evident with the children participating in the user test. This requires skill and careful consideration in design in order to maintain the historical framework plausible and correct, especially as the purpose of the game is to introduce the local history.

It was evident that the local stakeholders involved during the design process were enthusiastic to have a game with the local history and cultural heritage content. They could see several potential user groups for the game from schoolkids to tourists. It was evident from the user study however, that it is important to think of the main target group of the game. Especially one needs to keep in mind that the age of the children influences on the required complexity level and presentation of the historical information. Whereas this may seem as a self-evident condition according to the user centric design principles, it is still too easy to forget when creating the narrative and content with the local and history experts. It was important to run the user test during the design process with children, as the participants gave valuable feedback on the UI design, terminology, and the story content.

ACKNOWLEDGMENTS

The work has received funding from European Regional Development Fund (ERDF) for the project Lapland Experience Technologies 2025.

REFERENCES

- [1] Carmelo Ardito, Maria F Costabile, Antonella De Angeli, and Rosa Lanzilotti. 2012. Enriching archaeological parks with contextual sounds and mobile technology. *ACM Transactions on Computer-Human Interaction (TOCHI)* 19, 4 (2012), 29.

- [2] Rafael A Ballagas, Sven G Kratz, Jan Borchers, Eugen Yu, Steffen P Walz, Claudia O Fuhr, Ludger Hovestadt, and Martin Tann. 2007. REXplorer: a mobile, pervasive spell-casting game for tourists. In *CHI'07 extended abstracts on Human factors in computing systems*. ACM, 1929–1934.
- [3] Keith Cheverst, Nigel Davies, Keith Mitchell, and Adrian Friday. 2000. Experiences of developing and deploying a context-aware tourist guide: the GUIDE project. In *Proceedings of the 6th annual international conference on Mobile computing and networking*. ACM, 20–31.
- [4] Keith Cheverst, Helen Turner, Trien Do, and Dan Fitton. 2017. Supporting the consumption and co-authoring of locative media experiences for a rural village community: design and field trial evaluation of the SHARC2.0 framework. *Multimedia Tools and Applications* 76, 4 (2017), 5243–5274.
- [5] Ashley Colley, Jacob Thebault-Spieker, Allen Yilun Lin, Donald Degraen, Benjamin Fischman, Jonna Häkkinen, Kate Kuehl, Valentina Nisi, Nuno Jardim Nunes, Nina Wenig, et al. 2017. The geography of Pokémon GO: beneficial and problematic effects on places and movement. In *Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems*. ACM, 1179–1192.
- [6] Cristina Gena, Berardina De Carolis, Tsvi Kuflik, and Fabrizio Nunnari. 2016. Advanced visual interfaces for cultural heritage. In *Proceedings of the International Working Conference on Advanced Visual Interfaces*. ACM, 360–362.
- [7] Jonna Häkkinen, Petri Hannula, Elina Luiro, Emilia Launne, Sanni Mustonen, Toni Westerlund, and Ashley Colley. 2019. Visiting a Virtual Graveyard - Designing Virtual Reality Cultural Heritage Experiences. In *Proceedings of MUM 2019: 18th International Conference on Mobile and Ubiquitous Multimedia (MUM2019), November 26–29, 2019, Pisa, Italy*. ACM, New York, NY, USA, 5 pages. ACM.
- [8] David McGookin, Yolanda Vazquez-Alvarez, Stephen Brewster, and Joanna Bergstrom-Lehtovirta. 2012. Shaking the dead: multimodal location based experiences for un-stewarded archaeological sites. In *Proceedings of the 7th Nordic Conference on Human-Computer Interaction: Making Sense Through Design*. ACM, 199–208.
- [9] Zakiah Noh, Mohd Shahrizal Sunar, and Zhigeng Pan. 2009. A review on augmented reality for virtual heritage system. In *International conference on technologies for E-learning and digital entertainment*. Springer, 50–61.
- [10] Ulka Chandini Pendit, Syamsul Bahrin Zaibon, and JA Abu Bakar. 2014. Mobile augmented reality for enjoyable informal learning in cultural heritage site. *International Journal of Computer Applications* 92, 14 (2014), 19–26.
- [11] MM Rodrigo, Nicko R Caluya, WD Diy, and ECE Vidal. 2015. Igpaw: intramuros—design of an augmented reality game for philippine history. In *Proceedings of the 23rd International Conference on Computers in Education*.
- [12] Johannes Schöning, Brent Hecht, and Nicole Starosielski. 2008. Evaluating automatically generated location-based stories for tourists. In *CHI'08 extended abstracts on Human factors in computing systems*. ACM, 2937–2942.