Smart Ambient: A pilot study to contextualise a location-based mobile application to support informal learning from cultural heritage sites

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Abstract— **This paper aims to present a pilot study of the development of a Location-Based Mobile application to support informal learning in the cultural heritage domain. In this paper, we introduce a prototype of the Mobile Location Based System. The application is intended for use in outdoor settings and aims to provide the user with automatic notifications of historical information regarding nearby heritage sites. The application presents the information automatically when the device is close to a certain place or statue while people are moving in the vicinity of those places. The study used a scenario-based method to investigate the actors and the suitable context of use. Finally, an evaluation of the prototype's main features was conducted to examine their usefulness.**

Keywords— **Informal Learning, Mobile Guide, Culture Heritage, Mobile Location Based Learning.**

I. INTRODUCTION

Since the renaissance in the field of mobile technology, it has had a significant impact in many domains such as the lifelong learning sector [1] where learning can take place anytime and anywhere [2]. This has led to the introduction of the term mobile learning (m-learning) [3]. M-learning supports both individual and group learning anywhere and anytime [4]. Moreover, m-learning can, support both formal and informal learning processes, and also helps encourage people to undertake new experiences in life in addition to promoting lifelong learning. [5]. Sharples [4] states that, "[...] lifelong learning, has gained currency through attempts to harness it as a means of providing people with the knowledge and skills they need to succeed in a rapidly-changing world [...]". Engaging and experiencing our cultural heritage forms part of the lifelong learning process and enables people to learn about historical artefacts, places and events and to understand their importance and significance. Consequently, there is a necessity to provide information regarding historical places to people efficiently and effectively to motivate them to learn about their cultural heritage. This may also encourage people to promote a cultural heritage site by motivating their friends and families to visit them which, in turn, may help sites to survive by convincing officials to maintain them from both a moral and a financial perspective [6].

A number of applications (apps) have been developed in the field of cultural heritage [7,8]. For example, Candello [7] proposed a number of guidelines for mobile application development for outdoor cultural memorial sites in terms of viewing images, videos and also the interaction between a user and the system with a touch screen device. She used location based services (LBS) to show and describe directions for pedestrians to get to a particular memorial site. She also examined the tourists' behaviour while using the application outdoors (i.e.: to see if they can use the other features of the app when they are listening to the audio presentation). Suh et al. suggest a mobile-based guide for cultural heritage sites that was developed for tourists. The purpose of their system was to enable a group of users to share their experiences. Audio eavesdropping was used to enable users to hear each other's conversations during a tour [8]. In a similar field, Simcock et al. [9] developed a tourist guide augmented with Global Position System (GPS). This project used a handheld computer utilising context-aware technology. The system enables users to find out where they are in real time and provide nearby places that they may need to find during their trip, such as toilets, public telephones, restaurants, etc.

Despite the progress in developing a mobile-based application for cultural heritage tours, further research is required to provide a multimodal guideline to address issues in terms of interaction design, usability, adaptation method and real-time notification.

II. METHODOLOGY: THE SCENARIO-BASED DESIGN

This research used a set of methods to carry out the pilot study. A scenario-based approach was used to investigate the main actors and the suitable context of use [10]. Additionally, a user review technique was used to capture some feedback regarding the main features that were provided in this prototype.

Scenario: Josef is a Jordanian engineer who works in an oil company; his job involves a lot of travelling across the world. He likes history and he is keen to learn about it especially when he passes nearby historical places. Once, while he was in Portsmouth, he met one of his old friends who were there on holiday. Joseph asked him to go for a coffee together and on their way to the coffee shop they passed a Historic Dockyard.

Joseph noticed that his friend received a notification. He asked him about this notification; he answered "this is a mobile phone app which enables people to receive an automatic notification when historical sites are nearby. The app also provides the users with different choices for presenting the information (i.e. pictures, audio, video or textual). This app gets Joseph's attention as he could use it while travelling. In this way, he can discover the stories behind the historical sites that he likes without the necessity to spend a significant amount of time surfing the Internet.

III. THE PROTOTYPE SYSTEM

The high-fidelity prototype was designed according to the scenario that was described earlier by using the Balsamiq tool. As in Fig.1, (a), the screenshot of the main inteface in this prototype illustrates the main functions: the *Start* and *Stop* buttons. The app starts when the user presses "start". An automatic notification will be displayed, as shown in Fig.1, (b), to inform the user about a historical site in their proximity and to ask if s(he) would like any information. If the user presses "yes", a screen displaying a set of options appears. Alternatively, the user can press "No" to skip that site. The options provide the options: "Text", "Audio", "Video" and "Picture" (See Fig. 1, (c)). Selection of one of those options offers a brief explanation regarding a particular historic site nearby in the specified format. In addition, the app provides an opportunity for the user to get closer to the site by providing a route map when the user selects the "show me the route" button as shown in Fig.1, (d).
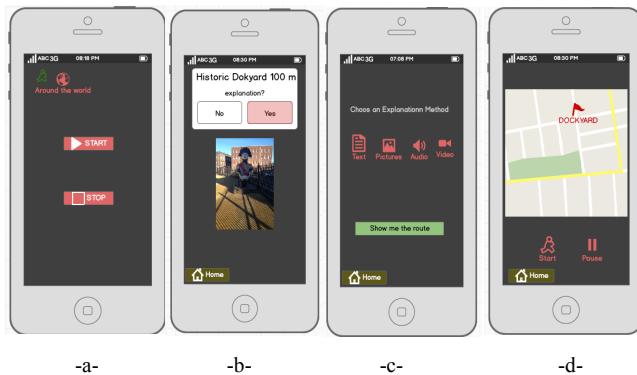

Figure 1. Screenshot of the main screens.

IV. EVALUATION

A user review evaluation was used to capture the usefulness of the prototype's features. This pilot study included two participants, one male and one female between the ages of 35-49 with both participants having experience of using technology and mobile phones. They were given an evaluation sheet which contained the scenario, the screenshots of the prototype main screens (See Fig.1) and a table detailing the main features, which includes: (1) Notification Message, (2) Display a site picture, (3) Explanation's method: ("Video","Text", "Pictures" and "Audio"), (4) "Home" Button

, and (5) Route Map. They were then asked to identify the most useful and the least useful features. The users have been asked to rate the features using a Likert scale ranging between 1-5, where 1 is the least useful feature and 5 is the most useful feature. Both participants scored all the main features a value of "5", apart from the video explanation feature, where both particpants scored a "4". They were also asked to suggest potential features that might be useful. One participant suggested the addition of a "website link" to the historical site and the other participant suggested a "favourite" function to save information about sites that the user is interested in.

In brief, the results indicate that the main features provided in the prototype are considered useful in terms of accessing and displaying information. In contrast, it shows that the Video function is perhaps not as important in this context. In their point of view, the "Audio" and the "Pictures" were sufficient to provide the information and they also stated that as the user is close to the site, a video tour may not be necessary.

V. CONCLUSION AND FURTHER WORK

In conclusion, this paper has proposed a mobile location-based system to help support learning and to promote cultural heritage sites. The study used a scenario-based technique to identify the actors and the context of use. In addition, we discussed a pilot evaluation study which used a user review technique to capture some initial feedback of the alpha version of the system.

Further research is needed to elicit requirements from users. We foresee there will be more features to be considered after the initial requirements engineering stage. We are planning to conduct an interview and a questionnaire with the end users. Finally, this prototype will be tested in the lab by using an eye tracking tool.

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