Developing a GIS-Based Mobile Application for Heritage Education in Jamaica

ANDREW SMITH

University of Technology, Jamaica

Abstract

Research shows gaps in knowledge of the tangible heritage sites that exist in Jamaican communities. In order to address these knowledge gaps, a Geographical Information System- based heritage education mobile application (app) has been developed. The aim of this research is twofold, seeking to determine: 1) if there is a demand for a heritage education mobile application (app) centred on tangible heritage sites in Jamaica, and 2) the ease of use of the prototype heritage education mobile app. The two research questions that guided the research were, 'Is there a demand for a G.I.S-based heritage education mobile application in Jamaica?' and 'Do the current features of the heritage education app provide ease of use to the potential user?' Based on the Buff Bay Valley of western Portland, Jamaica, a prototype app was developed and tested among attendees at the Research Technology and Innovation Day of the University of Technology, Jamaica, in March 2018. These attendees provided data on demand for such an app, the ease of use and quality of the information in the app and areas for its improvement. Results showed a desire for mobile apps to educate Jamaicans about their tangible heritage and that the design is user-friendly, although it can be improved.

Corresponding author: Andrew Smith: andrew.smith@utech.edu.jm

Introduction

The development of a Geographical Information System (GIS)-based heritage education mobile app was motivated by a desire to address knowledge gaps about the presence, and potential use of tangible heritage sites located in Jamaica. The Government of Jamaica (GOJ), in its Vision 2030 national development plan, recognises that these knowledge gaps exist at the community and individual levels. It was stated that there is "limited awareness of cultural and heritage assets on the part of local people" (Planning Institute of Jamaica, 2009, p. 41). In addition, "some aspects of our heritage are being lost due to lack of interest by youth and inadequate transmission of knowledge/skills by adults…community members may not know how to capitalise on cultural heritage" (Planning Institute of Jamaica, 2009, p. 41).

Many of these tangible heritage sites are found in rural Jamaican communities, which are faced with socio-economic challenges, including poverty and the existence of a digital divide with regard to access to the internet via computers. Research undertaken among grade nine students at Buff Bay High School in the rural parish of Portland in northeast Jamaica showed that 54.5% of students do not have access to the internet at home, and 50.6% do not have access to the internet at school. However, this research also showed that 87% of these students owned smartphones (Smith, 2016).

The high prevalence of smartphone ownership led the researcher to examine whether developing an app for mobile devices was suitable for educating users about Jamaica's tangible heritage sites. This resulted in the development of a Geographic Information Systems (GIS)- based heritage education mobile app based on the Buff Bay Valley of Portland, Jamaica entitled *Sites to See: The Buff Bay Valley.* This app prototype was tested among users at the University of Technology Jamaica's Research, Technology and Innovation Day in March 2018. These users were then surveyed to determine the demand for such an app and to obtain feedback on the functionality and ease of use.

Research Questions

1. To what extent is there a demand for a G.I.S-based heritage education mobile application in Jamaica?
2. Do the current features of the heritage education app provide ease of use to the potential user?

Purpose of the Study

The aim of this research was twofold, seeking to determine: 1) if there is a demand for a heritage education mobile application (app) centred on tangible heritage sites in Jamaica, and 2) the ease of use of the prototype heritage education mobile app.

Literature Review

Mobile Learning

Over the past decade, there has been an increase in mobile devices such as tablets and smartphones across society. According to Vazquez-Cano (2014), "smartphones are increasingly becoming ever present, penetrating and transforming everyday social practices and space" (p. 1506), adding that they are "no longer only a tool for communication, but in many cases have become an instrument of people's social and work life, and possibly, a powerful instrument in academic life" (Vazquez-Cano, 2014, p. 1506).

This has resulted in a shift in how education takes place, with mobile learning (mLearning). According to United Nations Educational, Scientific and Cultural Organisation [UNESCO] (2013),

> Mobile learning involves the use of mobile technology, either alone or in combination with other information and communication technology (ICT), to enable learning anytime and anywhere. Learning can unfold in a variety of ways: people can use mobile devices to access educational resources, connect with others, or create content, both inside and outside classrooms. (p. 6).

UNESCO (2013) added that because mLearning "employs technology that is more affordable and more easily self-procured and managed than tethered computers, it requires reconceptualising traditional models of technology use and implementation" (p. 7). This was reinforced by Leinonen, Keune, Veermans, and Toikkanen (2016), who stated that "to respond to the changing ways of media use among young people, many progressive schools have aimed to integrate mobile devices into everyday study work" (p. 185).

Use of Geographic Information Systems by Heritage Professionals

Geographic Information Systems (GIS) refer to "suites of software implemented to manage and analyse geographic data, information correlated to a . . . specific

position on the earth's surface" (Ruoss et al., 2013, p. 42). GIS tools have been utilised in a variety of ways in the cultural heritage sector, as stated by Petrescu (2007). "GIS technology became a usual tool for heritage managers, conservators, restorers, architects, archaeologists, painters and all other categories of experts involved in cultural heritage activities" (p. 1).

GIS map applications have also been utilised for heritage tourism. Ruoss et al. (2014) observed that "maps and information on natural and cultural heritage connected to tourism application are an excellent contribution to capacity building and awareness-raising of visitors" (p. 44). In addition, GIS maps are beneficial to tourists as they provide information on "the cultural assets of the entire region and the proximity to other tourist attractions and can indicate the associated services" (Ruoss et al., 2013, p. 46). With the use of GIS mapping apps by heritage tourists, Ruoss et al. (2013) believed that these maps should be developed as mobile apps due to the size of the smartphone market (p. 42).

Methodology

Development of the Mobile App

The mobile app *Sites to See: Buff Bay Valley* was created using ESRI GIS mapping software as an online map tour, utilising the ArcGIS Online interactive map programme. The town of Buff Bay is located in the parish of Portland on Jamaica's northeast coast, where the Buff Bay River enters the Caribbean Sea. The source of Buff Bay River is located in the buffer zone of the Blue and John Crow Mountains UNESCO World Heritage Site, thus designated for its mixed natural and cultural heritage (UNESCO World Heritage Centre, 2015).

Tangible heritage sites in the town of Buff Bay and the Buff Bay Valley were initially identified from desk and field research. After the sites were identified, fieldwork commenced that involved the collection of the Global Positioning System (GPS) coordinates of the heritage sites. Still, photographs of all of the heritage sites were taken, and video clips of activities were also recorded. This information was combined using the ArcGIS programme to create a mobile application in the form of a story map. Funding support for the development of the *Sites to See: Buff Bay Valley* mobile app was received from the University of Technology, Jamaica through its Research Development Fund.

The app has three screens. The "List" screen lists all tangible heritage sites within the given location and includes thumbnail photos of the sites and descrip-

Figure 1: Wide view of the Map screen of the GIS Mobile App (Smith, 2018)

tions. The "Media" screen gives information about each site, along with either a video clip or a still image. The "Map" screen shows the exact location of each site (Figure 1), with a zoom function that gives the user directions to the site. The current version of the app can be viewed at: http://www.apsmithimages.com/sites-to-see-jamaica/sites-to-see-buff-bay-valley/.

Prototype Testing

A survey research design, using a one-page questionnaire (Appendix) was undertaken to answer the research questions, is 'Is there a demand for a GIS-based heritage education mobile application in Jamaica?' and 'Do the current features of the heritage education app provide ease of use to the potential user?' The research population were attendees of UTech Jamaica's Research Technology and Innovation Day which was held in March 2018, and participants were selected by inviting attendees to test a prototype of the *Sites to See: Buff Bay Valley* mobile app. An explanatory poster that gave users information on navigating the app was also present. A total of 32 participants tested the prototype and completed the questionnaire.

The app was installed on tablets provided to the users, after which users answered a 12 question survey (Appendix). The purpose of the questionnaire was to 1) collect data about participants' experience regarding the ease of use of the app and 2) determine if there is interest in similar heritage education apps for different locations. Responses regarding purpose 2 were used to answer the

research question 'Is there a demand for a GIS-based heritage education mobile application in Jamaica?' In order to answer the second research question, 'Do the current features of the heritage education app provide ease of use to the potential user?' users were asked to rate 1) the ease of use of the app, 2) the user's level of enjoyment and, 3) the quality of information of the heritage sites. This was done by responding to items in the Likert type format. Users were also asked to state if the information provided was useful, and which open-ended question was asked for suggestions to improve the app. The data was analysed using descriptive statistics.

Results

Biographical data and details of smartphone ownership of the participants were collected. Thirty-two participants tested the app, of which 69% were students and 31% were professionals, 66% of these were female, and 34% were male. The majority (63%) were aged 15 to 19 years old, 16% were over 30 years old, 9% were aged 20 to 24, 3% were aged 25 to 29, and 9% of the users did not give their age. Regarding smartphone ownership, 97% of the users stated that they own a smartphone, with 97% owning Android-based phones and 9% using Apple iPhones. The total is 106% because two users possessed Android phones and iPhones.

Interest in Heritage Education Mobile Apps

To answer the research question: Is there a demand for a GIS-based heritage education mobile application in Jamaica? The users of the *Sites to See: Buff Bay Valley* mobile app were questioned to determine if there was interest in mobile apps for heritage sites in other locations in Jamaica. Ninety-four percent indicated that they would be interested in mobile apps of other locations in Jamaica, with Table 1 showing the suggested locations according to the parish. Users indicated that there was a great interest in apps for heritage sites in the parishes of St. Ann, St. Catherine and Portland. The 32 users gave 60 responses because they were each asked to give up to three suggested locations.

Table 1: Suggested Locations for Future Editions of the Mobile Apps according to Parish

Parish	Frequency	Percentage
St. Ann	16	27
St. Catherine	11	18
Portland	9	15
St. Andrew	5	8
St. Thomas	4	7
St. James	3	5
St. Elizabeth	3	5
Westmoreland	2	3
Kingston	2	3
St. Mary	1	2
Clarendon	1	2
Trelawny	1	2
Hanover	1	2
Manchester	1	2
Total	**60**	**100**

Ease of Use of the Mobile App Prototype

In order to answer the research question 'Do the current features of the heritage education app provide ease of use to the potential user?' users were asked to rate the app in terms of ease of use, enjoyment level and quality of information, with '5' representing the highest level of satisfaction, and '1' the lowest. The results are presented in Table 2. The users were also questioned on how useful they found the information and were asked to make suggestions for improving the app.

Table 2: Feedback on Mobile App Usage

Rating of App	1	2	3	4	5	Total
Ease of Use	9%	3%	13%	31%	44%	**100%**
Enjoyment Level	9%	6%	16%	47%	22%	**100%**
Quality of Information	6%	6%	28%	22%	34%	**96%**

This information shows that the mobile app prototype received a favourability rating of 75% for ease of use (44%, very high satisfaction & 31% high satisfaction). The favourability rating for the level of enjoyment was 69% (22% very high level of enjoyment & 47% a high level of enjoyment). These results show that the current design is user-friendly and suitable for a heritage education mobile application.

Regarding the quality of the information provided about the heritage sites, the scores showed room for improvement, with 28% rating the information as medial and 56% rating the information as favourably (34% very high quality & 22% high quality of information). In response to the question regarding the usefulness of the information on each heritage site, 97% of the users stated that they found the heritage sites useful.

Suggestions for improving the app were sought to improve the ease of use and functionality of the app, with the results shown in Table 3. The result showed that the area identified for the greatest improvement is the need for additional information on the heritage sites, with 25% of users making this suggestion. This corroborates the results presented in Table 2. Other suggestions for improvement concerned the design of the app. Eleven percent of users requested a clearer zoom, 11% requested the inclusion of additional heritage sites, and 8% requested additional photographs. Three percent suggested that a search bar be provided, 3% requested a GPS traffic assist, and 3% requested that a virtual tour of the location be included in the app.

Table 3: Suggestions for Improving the Sites to See: Buff Bay Valley Mobile App

Suggestions	Frequency	Percentage
Provide additional information on the sites	9	25
No response	7	19
No suggestions for improvement	4	11
Provide a clearer zoom	4	11
Include additional sites	4	11
Include additional photographs	3	8
Provide information about where the App can be accessed	2	6
Provide a GPS Traffic Assistant	1	3
Provide a search bar	1	3
Include virtual tours, using contemporary costumes of the period	1	3
Total	**36**	**100**

Conclusion

This research was undertaken to answer two research questions. In answering the first research question, the suggestions of locations that the users would like featured in similar mobile apps showed demand for such an app. Concerning the second research question, users agreed that the overall design of the *Sites to See: Buff Bay Valley* mobile app is easy and enjoyable to use. Although the information provided was deemed useful, improvements are required regarding the quality of the information provided for each cultural heritage site.

The results also showed the prevalence of smartphones among potential users, confirming ready platforms for mLearning in Jamaica. This will make the delivery and use of the G.I.S.- based heritage education mobile app relatively easy once it is made available for potential users. The suggestions that were made for the improvement of the app will be incorporated. Afterwards, an application for a patent for the *Sites to See* mobile app will be sought from the Jamaica Intellectual Property Office (JIPO). Plans are advanced to develop the app for the Android platform and developing the *Sites to See* apps for other locations in Jamaica.

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