Global Conference on Engineering and Technology
conference homepage: www.gcoet.org

Implementing QR Code to Create Indonesia Museum Interactive Information Application

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ABSTRACT

The tourism sector is one of the revenue resources that can be explored without any depletion. The tourism sector can also absorb a lot of manpower. One of the tourism potential is the historical heritage such as the ancient culture, religious relics, and the historical war. Currently, there is still lacking exploration from museum as one of tourism potential especially in Indonesia. People still think museum as a gloomy, historical, and boring place. In this research, we try to build a prototype of interactive museum information that made using mobile device application and QR code. The QR code tag will be place on museum artefact and rooms in the museum to give interaction information to the museum visitor. By scan the QR code tag, museum visitor will provided with more information about the artefact, rooms, etc. The museum information will provided using text, image, sound, and video.

Type of Paper: Practical/Implementation

Keywords: QR Code; Museum; Interactive Information; Mobile Phone

1. Introduction

Indonesia is a country that has many natural beauty, diversity of flora fauna, diversity of civilizations and culture, historical and ancient relics such as temples and engravings, relics of war against invaders such as fortress, cannons, muskets, etc. that spread across on all location in Indonesia. This makes Indonesia one of the countries that have huge tourism potential.
In Indonesia, tourism sector is the fourth largest country revenue contributor (9%) after oil, coal and palm oil [1]. The tourism sector also able to absorb 10 million workers. The government is targeting a significant increasing number of foreign tourists from 9 million (2014) to 20 million (2019) with 260 trillion rupiah (IDR) targeted. Which means an average growth of 16% per year [2].
One of the potentials of tourism in Indonesia is the historical relics (temples, monuments, artifacts, coins, etc.), religious relics (temples, monasteries, mosques, churches, etc.) and the heritage from time of independence war (fortress, cannons, weapons, etc.). This relics are stored

in many museums spread all over the country. There is approximately 400 museum that spread in many places in Indonesia that have been categorized into museum groups A, B, and C [3].
Currently, the exploration and promotion of the museum as one of the tourist destination in Indonesia is still lacking [4]. Museum promotions are still sporadic and fragmented without a well-integrated system. The promotion still using traditional media such as paper, leaflets, or in websites and mobile phone applications without utilizing the latest technology such as sound, video player, GPS (Global Positioning Systems), etc.
Several attempts have been made to developt of museum-based mobile information facility such as Ranggawarsita museum [5], Yogyakarta museum information system [6], and Perjuangan Indonesia Museum Information Application [7]. Unfortunately the development of this application is separated, still use very simple application with no clear and complete content. Only few applications display information that content of objects from the museum with text, and images as information.
Therefore, in this research we try to create an integrated Indonesian museum information system that could contain all information of museums that exist all over Indonesia. So hopefully the application can help provide information thoroughly about the museums in Indonesia. Applications built on mobile devices using the Android platform. In this application will be built by utilizing technology Global Positioning Systems (GPS), Google Map API, QR Code, Audio Video Player that already provide in the mobile phone.
The application will provide information such as general information about the museum itself, opening/closing hours, location of the museum (connected to Google Map and GPS), information about objects inside the museum (in text, image, audio, and video). There also information museum location that near the user.
In order to add the interaction between user and objects/artefacts inside the museum and also to provide additional information. We attached QR code tag in the museum objects/artefacts and also in the diplay rooms (as seen on Figure 4). The QR code tag could be scanned by visitors using their mobile phone. After the QR code is detected then the application will be connected to give additional information about objects or rooms that exist in the museum. The additional information that will be provide such as additional images about the object, additional sound that told the visitors about the object (such as audio from the museum tour guide), or additional video.
This is done to increase the interaction between visitors with objects/rooms in the museum. With this kind of interaction, visitors also could find additional information about the objects or room that they like. So each visitor could have more information about what they interest.
In this research we prefered to use QR code technology than other similar technology like NFC (Near Field Communication) and RFID (Radio Frequency Indentification). This is because not many mobile phone are equipped with NFC reader neither RFID reader. While QR code reader on the mobile phone can easily use the camera feature that already exist on every mobile phone. QR code tags also could be made easily and cheaply, by using QR code generator that freely available on the internet. Then the museum just simple print it on the paper using any common printer. So, the use of QR code will also much cheaper than using NFC or RFID. Museum administrator also could easily change the tags when the information is change by print another QR code tags without any reader or writer device needed.
In the conclusion, this technology will be easily to apply in various museums without need any special skills or large amount of money. Camera as QR code tag reader that become advantages of this technology, also at the same time be the weakness. This is because it requires sufficient light to run the QR code tag reading. But this is not become too much problem for most museums where there is rarely a museum with no light at all, at least a dim light can be used to read QR code tags through the camera.

2. Literature review

Several promotional efforts and providing facilities for tourists, especially by using information technology have been done, for example by making mobile application to support sightseeing tour [8], recommendation system for tourism [9], [10], Location Based Services for tourists [11], also using the latest technology such as NFC [12] for tourism activities.
In Indonesia there are also some efforts to create applications to support tourism activities, such as multimedia mobile website applications with flash programming language [13], Surabaya battle tour applications [14], Surabaya city guides application on android [15], tourism information application in Ciamis district based on mobile phone [16], Solo tourist information system application on mobile device [17], and also heroes and multimedia apps and multimedia applications [18].
On the other hand, the use of technology in the effort to provide facilities for museum visitors has been done by many researcher. Such as through audio information that can be heard by phone, online (website), and downloaded on mobile device and mobile audio guide [19], games about museum via SMS on mobile [20].
Unfortunately, the development of museum and tourism applications to support Indonesia's tourism is unfortunately still fragmentary and still very simple content with no clear and complete content, nor supported with adequate technology such as digital maps (Google Map API), GPS, QR code reader, etc.
On the other hand, research on the use of QR code in improving user engagement in the tourism sector has also been done such as on [21] which incorporates website technology, 3D display, and QR code to create interactive applications on tourist guide. Sanagustin [22] using QR code that can be accessed by the mobile phone then to provide information to the user through the information on the website. This information is provided for museum-like space such as a city park or other open space. Chivarov [23] also uses a portal website to display additional information on museums that are triggered by QR code. However, this all research still focus on give a standard information to visitor such as using plain text. There is still few research that using QR code to give enrichment information such as images, sounds, or videos. Therefore, this research try to enrich the information that give for visitor using their mobile phone and QR code tags that attached.

3. Implementation

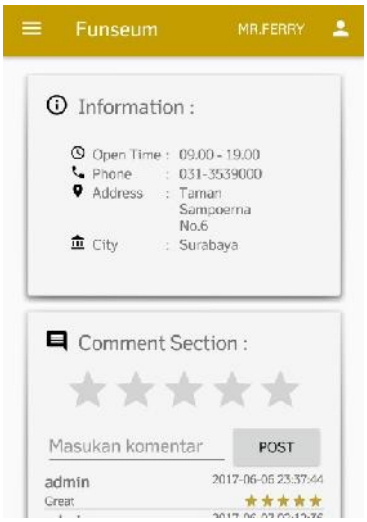
To run this application, users do not need to login first. User just simply could download and install the application via Google Playstore. After running, the main menu will display on the left side of the app (as shown in Figure 1) Users can select feature that they want.
Users can see the list of museums in Indonesia that exist in the application, as shown in Figure 2. The museum list will be displayed based on rating points obtained from other users. The application also equipped with a searching feature to find specific museum that user want.

Figure 1. Main Menu

Figure 2. Indonesia Museum List

User then could select the details of the museum information (Figure 3) that user want to see such as a museum building picture, museum opening hour, rating, and also location map that connect to Google Map.

(a) Museum Main Building Image



(b) Museum Opening Hours

(c) Museum Location using Google Map

Figure 3. Museum Information Detail

QR code tags will be placed on objects or in the existing rooms on the museum (as shown in Figure 4). Users can then use QR coder reader application using the mobile phone camera. The results that obtained by the code will be directly run on the application, such as play video on

youtube (as shown in Figure 5). This feature can be used to provide additional information like text, images, sound, movie or even games on objects in the museum.
By this method the museum visitors can get more detailed information from objects or rooms that they want. Museum administrator also could place as many as detail information not only on text description like usual but also in sound, video, animation, website link, games, etc. So this will be improve the information that could explore by visitors.
Museum administrator could entry any details of museum information (Figure 6) such as a museum general information, building and objects picture, opening/closing hour information, etc. from website administrator. Museum administrator also could assign action on QR code tags using administrator website as can seen on Figure 7.

Figure 4. QR Code Tag on Bicycle Miniature Display

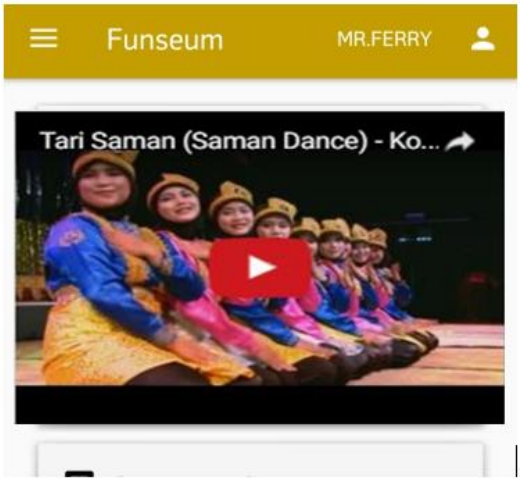


Figure 5. Running Youtube Video Player - Based Link on QR Code Tag

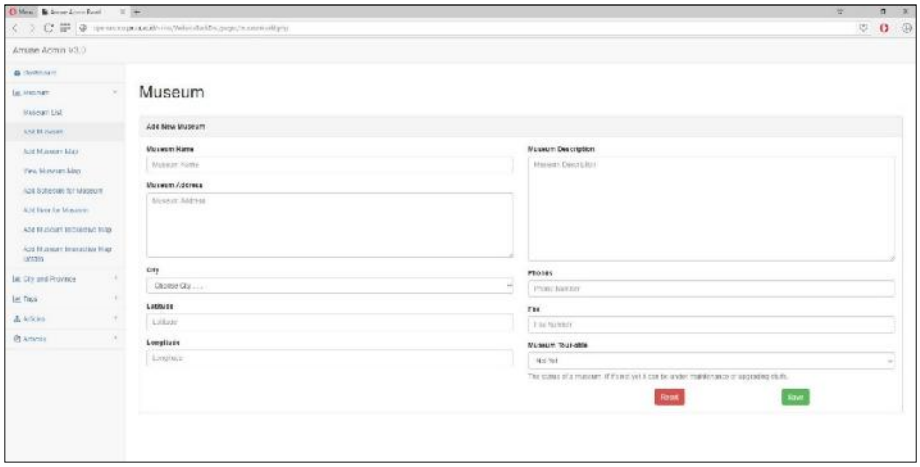


Figure 6. Website Administrator

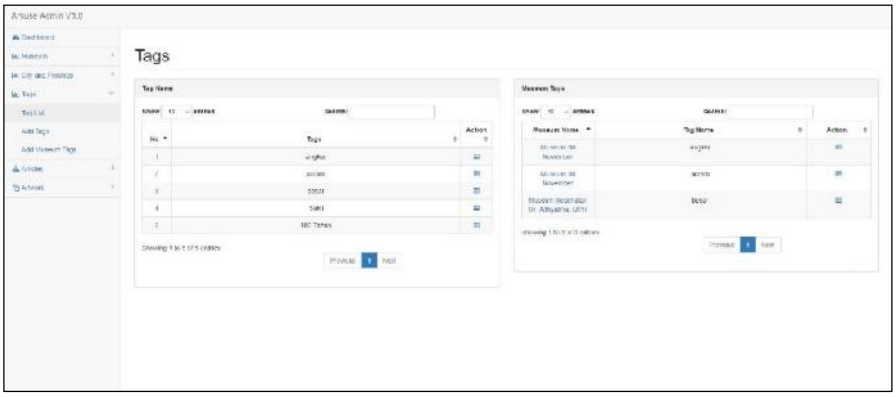


Figure 7. QR Code Tags Assignment Data

Conclusion

This research is trying to develop applications on mobile phone to provide an interactive museum information for visitors, especially museums in Indonesia. Applications that created could be a composite information from all museum in Indonesia. So the user can see the complete information about many museums in Indonesia. Information that provided such as general information about museums, opening/closing hours, museum location using Google Map, image gallery from the objects in the museum, etc.

In addition, this study also try to use QR code to provide additional information while increasing the interaction for museum visitors. QR code tags also placed on the objects or in the exhibition room in the museum. Visitors can scan the QR code tag using camera on the mobile phone and QR code reader that could simply downloaded from the Google Playstore.

Then the application will display additional information that provided (according the code on the QR code tag) such as details information article about the object or additional images, and also sound or video that could enrich the existing information. By this way visitors are expected to get more detailed information from objects or rooms, where this information can be displayed in a more interactive.

This prototype has been tested to 40 people (from age 10-55) using 2 museum data. The results that obtained is that the level of user satisfaction from this application is 88%. So it can be concluded that the application that made already meet user requirements.

Acknowledgements

This research was supported supported by Indonesia Directorate Research and Technology of Higher Education under grant 002/SP2H/P/K7/KM/2017. We would also like to show our gratitude to the Mobile Computing Research Study Group for assistance to improve this research.

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