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Android/iPhone Mobile Application for Quick Response Pilgrims Campaign Locator

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Abstract

Development and implementation of pilgrims (Hajj) Guide application to be used at Hajj season would facilitate follow-up of campaign supervisors on their campaign's safety and location. The systems would also allow Hajj and Umrah administration to manage the crowd of the campaigns in an easy manner. In this paper, we propose Android/iPhone application that allows Hajj administration to monitor pilgrims using Quick Response Codes. Using quick response code application allows campaign supervisors and Hajj and Umrah employees to monitor pilgrims and guide them in case of getting lost. The application offers an easier and faster service than traditional approach used at Hajj season by human guidance. It is a very convenient service that would relief stresses of pilgrim's relatives who worry about their relatives performing Hajj. The results show that the average score of our approach (QR) is 4.72 out of 5 comparing with traditional mobile applications indicating that the users are feeling enjoyable while using the new application features and the system is easy to use. Finally, the systems would assist in achieving the highest degree of pilgrims safety at Hajj season.

Keywords

1. Introduction

In Islam, all Muslims worldwide are mentioned to perform Hajj once in their lifetime as long as they have the ability to do as such. This custom is directed on the twelfth month of the lunar Islamic schedule, specifically, "Dhul Hijjah". Hajj incorporates numerous ceremonies, which must be performed by the grouping

of occasions. On the ninth day of Dhul Hijjah, all explorers continue to Arafat and remain until nightfall before moving to Muzdalifah. Tossing of stones is performed in Al-Jamarat the tenth to thirteenth long periods of Dhul Hijjah. At long last, Hajj finishes by performing goodbye surrounding (Tawaf Al-Wadaa) around the blessed house (Ka'bah) and leaving Makkah. During this blessed voyage, numerous customs must be performed in better places at a particular time. Figure 1 demonstrates a guide of spots where the Hajj customs ought to be performed.

Such big gathering (around 2,500,000 people at same time) makes a big problem for the ministry of Hajj. Therefore, helping pilgrims to perform hajj in an easy way avoids people loss, because this is one of the main problems that occur during the Hajj season. Also, communication and information become instant and efficient [1]. Furthermore, locating people or objects is becoming a very important thing for business owners, for example, a hospital owner may want to locate patients, doctors and even equipment's for further uses.

Many technologies are used for tracking and locating, such as RFID [2], Barcode [2], GPS [3], Quick Response (QR) Morad [4]. All these technologies can be used in tracking and locating objects. However, all these traditional technologies do not use the Android/iPhone application.

The motivation behind this application Pilgrims will not worry about getting lost with the help of this application. No unidentified pilgrim will be announced if they stick to the rules and always carry their QR cards around their necks in the Hajj season.

The main idea in this study is development of an iPhone/Android Application (Hajj Guider) that uses QR technology, to be used by pilgrims, police officers and campaign administrators, as well as the general administrators of the Hajj and Umrah Ministry to facilitate on pilgrims locating their pilgrimage campaigns and the Campaign Supervisor while performing Hajj. Pilgrims first come to Makkah, then Arafat, followed by Mena and Muzdalifa; therefore, campaign location is not static; it's a dynamic location whether it is the hotel or a tent is set up for campaign in each of the Hajj rituals.
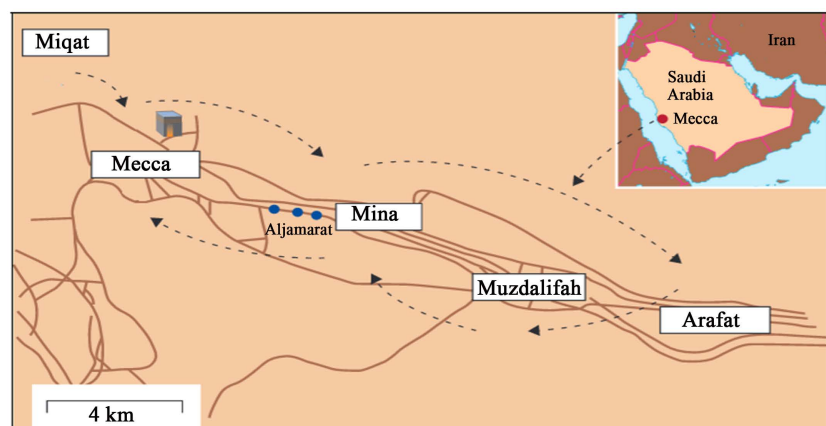

Figure 1. Hajj journey.

This paper is organized as follows: Section 2 introduces literature review. Section 3 explains the new proposed method methodology. Section 4 introduces collection data and experimental evaluation and considers the efficiency of this system. Section 5 presents a conclusion and indicates possible future work.

2. Literature Review

2.1. Problem Definition

Most pilgrims come to Saudi Arabia for first time, its normal to get lost especially in Mena and Muzdalifah as some Hajj campaigns camp in tents which are all alike.

There is no way the pilgrim can locate his tent if lost and it takes more time to be able to get to the right location, either by calling the campaign supervisor on his phone to get directions or by the help of officers found in streets.

Elder really suffer as some of them come alone without younger companions, Hajj is a season where sometimes incidents happen as pilgrims may faint and may die due to crowd, finding a pilgrim with no identification is a burden on the police officers to identify the pilgrim, it's hard to tell his nationality or any information about him if he doesn't have an ID card. According to GASTAT [5], The General Authority for Statistics, an administration element [6] all out number of pioneers that performed hajj in 1439 are 2,371,675 Million explorers, it's actually exceptionally swarmed and restorative issues may strike travellers effectively in Hajj sessions as shown in Figure 2.

2.2. Related Work

Ershad [7] from the Ministry of Hajj and Umrah enables agents of Authorized Agencies of Annual Haj journey to recognize International and nearby Pilgrims present inside Saudi Arabia performing Hajj customs. By just utilizing our Android App, an Authorized Agency Representative User can examine the
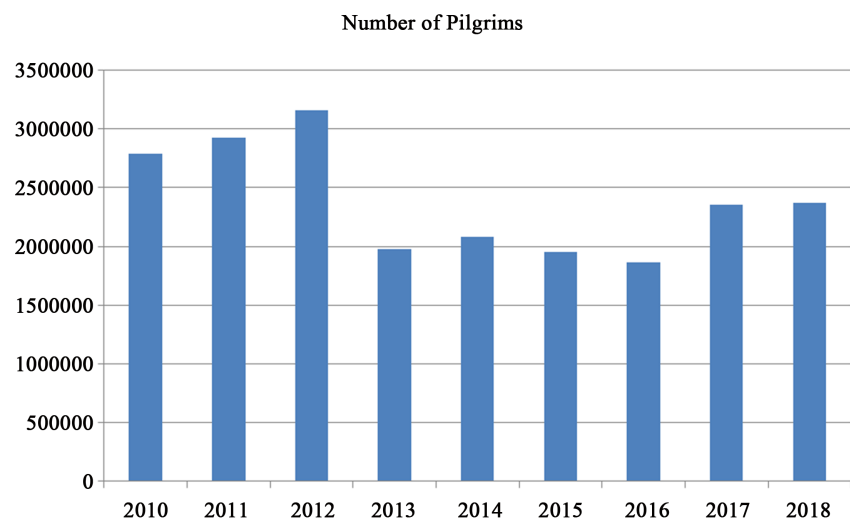

Figure 2. Pilgrims total numbers for years from 2010 to 2018.

eBracelet worn by a Pilgrim to get his "Own Info", "Hajj Service Provider Info", and "Logistical Info". This Application is proposed to help Authorized Agent delegates help Pilgrims and give simple section to them to play out all Hajj ceremonies just as order Hajj Service Providers to give Pilgrims the administrations vowed to them.

PHVG [8] is a MIS application that enables individuals from Pakistan Hajj To volunteer Group's (PHVG) with Hajj Operations during the journey season each year.

Following is a rundown of exercises an application client can perform:
- Register for another record
- Login to their current record
- View and update their profile data
- View their group data
- Scan QR codes to check participation (just for special clients)

Utilize your iPhone/iPad/Android gadget to follow participation with our application! [9] Print QR code cards straightforwardly from our product! It's so natural and basic. Disregard costly standardized identification perusers and confounded equipment or programming.

In the wake of scanning the QR code card, the product will check if any past contribution exists, and show this data to the client. We don't have to purchase additional product or equipment to follow participation with Dojo Expert. You simply print QR code cards from DojoExpert programming, cut the cards, circulate it to your individuals and utilize your current iPhone/iPad/Android gadget to follow participation (you should download our FREE iPhone/Android application from iTunes/Google play). The tracking is live, so you can use another computer to view who's in! Of course, you can always correct attendance manual.

In another study, Aladdein and Qasem [10] proposed the use of a mobile phone as a tracking device. This strategy can be used by the guide (Mutawwif) of a group of pilgrims to recognize their movements and determine their location

Hasimah *et al.* [11] proposed another portable application that can be utilized to manage pioneers when performing Hajj and Umrah administrations. The application likewise works as area tracker and Tawaf counter.

Area ID administration for Hajj was proposed by Morad [12]. This portable application administration was created to gather data about the area of travelers to distinguish and follow them.

Atlam *et al.* [13] development and implementing of Haram Map application to be used at Hajj season would facilitate the location for visitor of Haram. The research has been performed in order to provide facilities and comfort to the visitors of Masjed Al Nabawi.

In view of this writing survey, no investigation has assessed and broke down portable applications for Hajj and Umrah administrations. Consequently, this investigation is of impressive significance.

3. Proposed Method Methodology

A methodology is the steps or technique we will follow in our study. There are many methods, as waterfall, incremental, agile and others.

3.1. Agile Model

Agile model [14] [15] is an iterative development methodology meaning that it is divided into smaller parts (sprints), with each part building and improving off the past part that values human communication and feedback, accepts to changes, and producing working results. Agile is an approach based on efficient communication between the team members. Agile results in producing tangible product that can be adapted and changed easily. We will use Agile methodology because we can split the teams into smaller teams for development. Splitting the project into pieces and gathering all pieces at the end as shown in Figure 3.

3.2. Conceptual Design

User functional requirements where pilgrims must view locations of the campaign supervisor and campaign, besides campaign supervisors must login to update their locations for pilgrims to know where they are. Also security requirements where users login with username and passwords for security, we assume that website will be hosted on a secure host as shown in Figure 4.

3.3. System Components

Figure 5 shows the system Components of our system, where the pilgrim, employee, campaign supervisor log from Mobile. While hajj and Umrah Administrator, Travel Agency Management and Travel Agency Employee login form the website.

3.4. Pilgrim Interfaces/Ministry Employee

3.4.1. Main Interface

Main interface where pilgrim/Ministry employee will scan QR code to see main menu as shown in Figure 6.
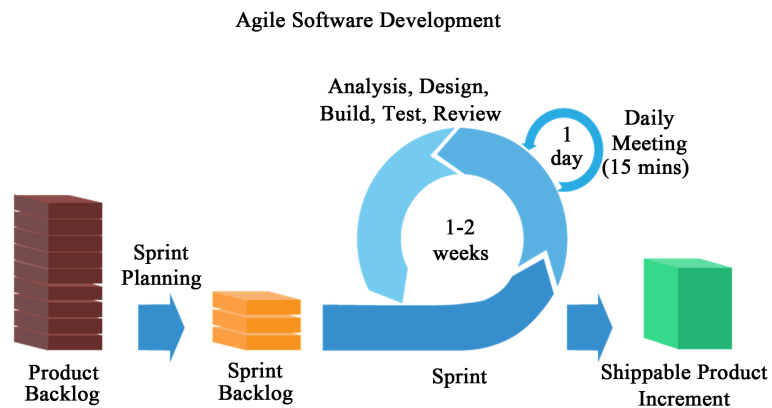

Figure 3. Agile model [11].
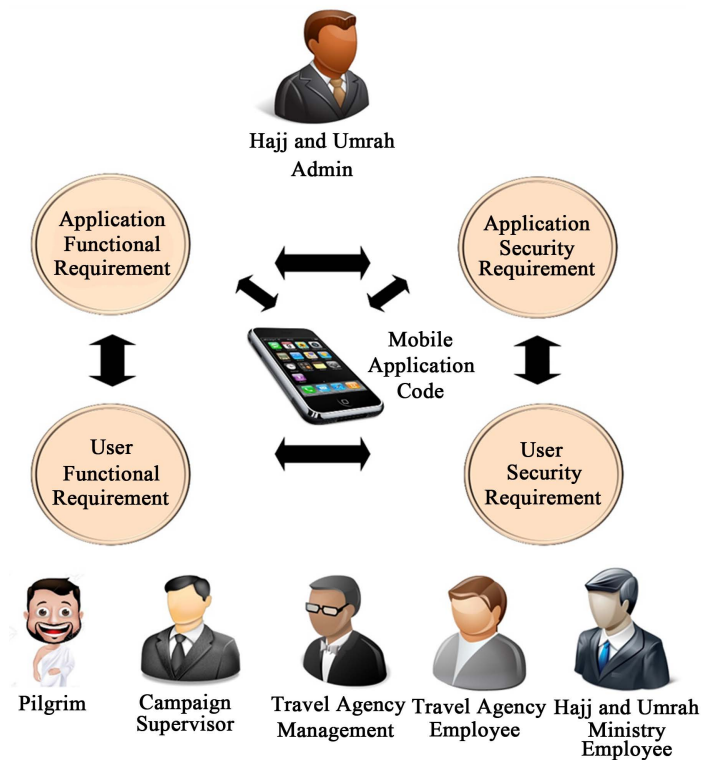
Figure 4. Conceptual design.

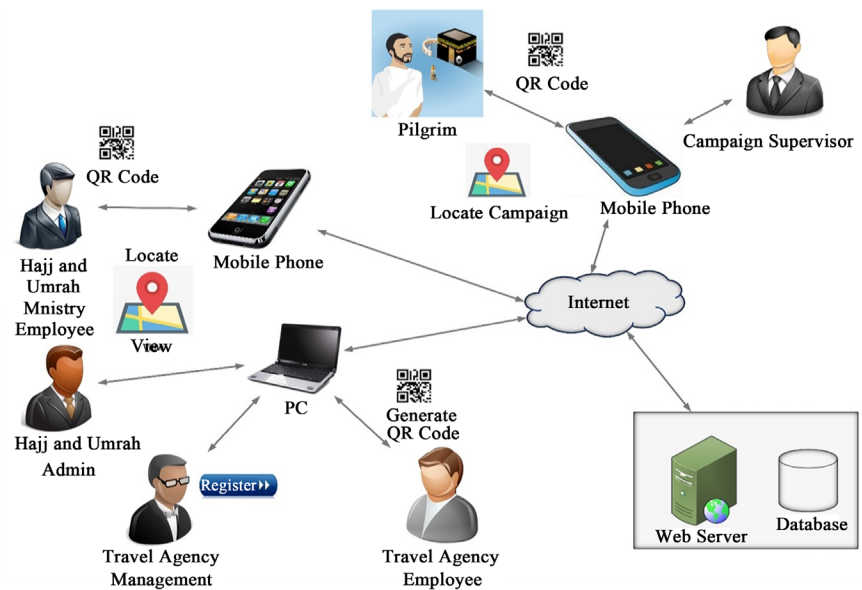**Figure 5.** System components.

3.4.2. Main Menu

Main menu with tasks pilgrim/employee can perform where they can view pilgrim information, locate campaign and locate campaign supervisor as shown in **Figure 7**. **Figure 7** shows the main supervisor interface where supervisor can view pilgrims, view pilgrims location, update own location and update the campaign location as shown in **Figure 7**.

Figure 6. Main page.
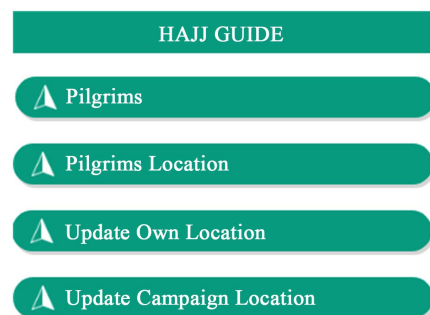
Figure 7. Main menu.

3.4.3. Pilgrim Information Interface

When clicking on pilgrim information this interface will be shown where information of pilgrim will be displayed as shown in **Figure 8**.

3.4.4. Location Interface

When employee/pilgrim click on locate Campaign or locate Campaign Supervisor an interface with location be viewed as shown in **Figure 9**.

4. Experimental Evaluation

4.1. User Data Collection

A poll was disseminated to test and assess the framework procedure, since it is the essential capacity that relies on the achievement of the framework. The example size was 20 respondents their ages in the range of 30 and 70 associated with the market study. As uncovered in **Figure 10**, there are different periods of various sexual orientation playing out the Umrah and Haj.

Figure 8. Pilgrim information.

Figure 9. Campaign location.

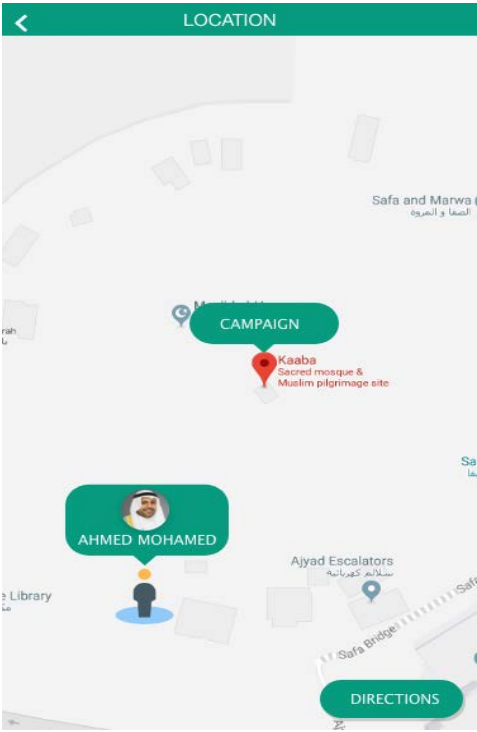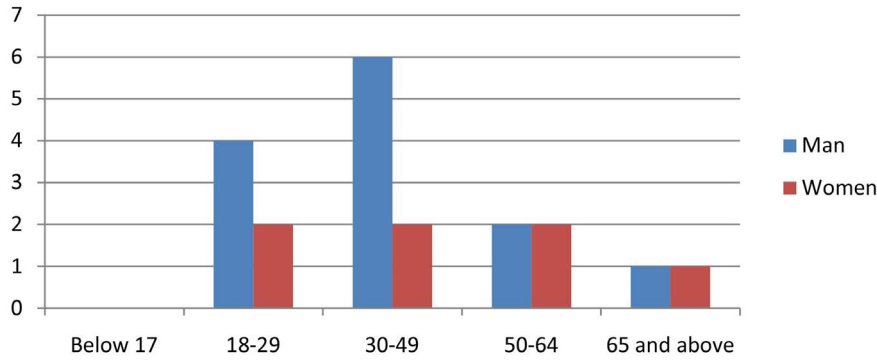**Figure 10.** Performed Umrah and hajj by gender and age.

4.2. Questioners Design

Information examination was being directed utilizing Excel. In this survey, scale had been set as pursues: 1 = Strongly Refuse 2 = Refuse 3 = Neutral 4 = Agree 5 = Strongly Agree, the accompanying tables present the Mean for all measurements. Moreover, The QR method contains three main categories, namely, engagement, aesthetics and functionality, for assessing the quality of application. Rating the application according to these categories will provide better application evaluation compared with the user ratings in the application store as shown in Table 1. The subjective quality of each category contains a number of items as shown in Table 1.

4.2.1. User Interface Questionnaire (Engagement)
As shown in Table 2, the Mean for wording utilized in the framework measurement is 4.76 for clients, demonstrating that clients concede to the phrasing utilized in application, and the wordings utilized in the framework are clear and uncomplicated.

4.2.2. Usefulness Perceived (PUEU) (Aesthetics)
As shown in Table 3, the Mean for apparent value measurement is 4.75 for clients, demonstrating that the Pilgrims concede to the framework use and the framework empower to achieve the procedure all the more rapidly particularly in a season as swarmed as Hajj.

4.2.3. Ease of Use (PUEU) (Functionality)
As shown in Table 4, the Mean for apparent simplicity use measurement is 4.86 for clients; Customers discover the framework simple to utilize and the tasks in the framework easy to use and simple to explore.

Table 1. Items categories.

Category	Items
Engagement	Interesting
	Interactive
	Useful
Aesthetics	Layout
	Visual appeal: How good does the app look?
	Performance
Functionality	Ease of use
	Gestural design

Table 2. Terminology used in hajj guide system "descriptive statistics" (Engagement).

Questions	Mean
Hajj Guide wording is steady.	4.90
The Application's notices are useful and interesting.	4.80
Average	4.76

Table 3. Perceived usefulness "descriptive statistics" (Aesthetics).

Questions	Mean
Pilgrims will be helped after using the application	5
Using the system would improve pilgrims loss in Hajj season	4.30
Using the application will make it easy to request a Hajj Guide service from one application	4.70
I would find the Application useful in urgent cases	5
Average	4.75

Table 4. Perceived ease use "descriptive statistics" (functionality).

Questions	Mean
Figuring out how to utilize the application was simple for me	5
My association with application is clear	4.70
Hajj Guide System easy to use.	4.90
Average	4.86

4.3. Experimental Analysis and Discussion

4.3.1. New Approach Average Scores

We averaged the scores of the collected application surveys according to the QR categories. Each QR item uses a three-point scale, a score for each category is calculated as the mean of all belonging items, and the overall score is calculated as an average across the categories. The overall satisfaction measures are, as shown in Table 5. The overall mean for all Dimensions is 4.72.

From Table 5, the results show that the average score of 4.72 out of 5, indicating that the users are feeling enjoyable while using the application features and the system is easy to use. Finally, the systems would assist in achieving the highest degree of pilgrims safety at Hajj season.

4.3.2. Comparison of New and Traditional Approaches (Applications Features)

We averaged the scores of the collected application surveys according to the QR categories. Each QR item uses a three-point scale, a score for each category is calculated as the mean of all belonging items, and the overall score is calculated as an average across the categories. As Table 5 illustrates the total average score of each QR category (engagement, functionality, aesthetics) which is 4.72 out of 5. Table 6 make a comparison for the selected applications [10] [16] [17] [18] [19] [20] with the same categories. The results demonstrate that the "Mutawef" app has scores with 2.73, "Manasikana" with 2.66 and "Salam" apps 2.42, respectively.

From Table 6, the results show that our approach (QR) has highest rank among them (4.72) with new features (supporting old and sick people) indicating that the users are feeling enjoyable while using the new application features.

Table 5. Overall Satisfaction.

Dimensions	users	mean
Hajj Guide System Screen	10	4.75
Terminology Used in Hajj Guide System	10	4.76
Hajj Guide System Capabilities	10	4.5
Perceived Usefulness	10	4.7 5
Perceived ease of use	10	4.86
Overall average		4.72

Table 6. New and traditional methods comparison.

Application's Features	Traditional Mobile application Methods			New Approach
	Mutawef	Manasikana	Salam	QR
Provider	Prophet' Mosque	Ministry of Hajj	Ministry of Social Affairs	Hajj Hackathon
Language	Arabic/English	Arabic/English	Arabic/English	Multi-Language
Number of Serves	2	3	2	4
Reviewing Rate	2.73	2.66	2.42	4.72
Supporting (Old and Sick people)	X	X	X	√

5. Conclusions

This paper concluded that the Hajj Guide application we are developing will help in easing Hajj season on all parties involved, weather Hajj and Umrah Ministry, Travel Agencies or Pilgrims and Hajj and Umrah employees, and the system main goal is to make Hajj a memory to remember for pilgrims by living the experience without having to worry about any issues or minor incidents that may happen. Locating campaign supervisors or campaign locations will be easy by just one click. Even pilgrims with no mobiles were not forgotten in this application as the campaign supervisor will link them to his QR code to be easily tracked. This feature can be beneficial to pilgrims, which is not found in most of the existing Hajj applications. Moreover, the results show that our approach (QR) has the highest rank (4.72) among traditional mobile applications with new features (supporting old and sick people) indicating that the users are feeling enjoyable while using the new application features.

Finally, we expect that this investigation can give great bearings to analysts and application engineers in improving the administrations accommodated Muslim travelers and guests and consider the most alluring highlights focused on and wanted by clients.

As Hajj guide application applied for Arabic and English languages speaker only. Future work could focus on use our application for all other languages.
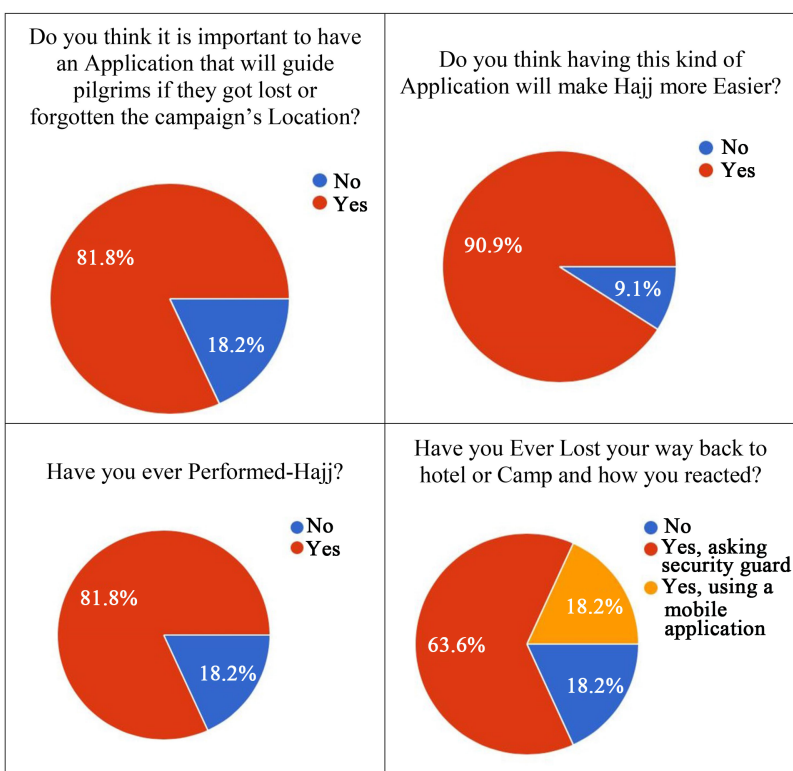
Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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Appendix 1: Survey

Do you think it is important to have an Application that will guide pilgrims if they got lost or forgotten the campaign's Location?

- ● No
- ● Yes

81.8%
18.2%

Do you think having this kind of Application will make Hajj more Easier?

- ● No
- ● Yes

90.9%
9.1%

Have you ever Performed-Hajj?

- ● No
- ● Yes

81.8%
18.2%

Have you Ever Lost your way back to hotel or Camp and how you reacted?

- ● No
- ● Yes, asking security guard
- ● Yes, using a mobile application

63.6%
18.2%
18.2%

Appendix 2: Survey

Age

- ● 18-30
- ● 31-40
- ● 41-50
- ● 51-above

45.5%
18.2%
9.1%
27.3%

Nationality

- ● Saudi
- ● Arab
- ● Other

63.6%
9.1%
27.3%

Gender

- ● Male
- ● Female

45.5%
54.5%

Education Level

- ● Secondary school
- ● Undergraduate degree
- ● Postgraduate degree

45.5%
27.3%
27.3%