The evaluation of usability of i-Rehlah prototype based on experts' consensus using Fuzzy Delphi Analysis

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Abstract
To verify the product’s usefulness, each application must go through a testing or evaluation phase. Usability evaluation is described as a test performed on a real user to assess how easy it is to use an application. In this study, the respondents must use the developed prototype and give an evaluation of the questionnaire provided in order to determine the usability of the i-Rehlah prototype. Since the evaluation of usability could not be applied to Arab tourists as the main respondents, the authors decided to appoint professionals in academia, industry, and government as respondents. For the initial phase of construction for the real application, the choice of this technique and a target group of experts is deemed appropriate. This study aimed to obtain experts’ consensus on the elements of i-Rehlah prototype application. The main focus of this study is to assess the efficacy of the i-Rehlah prototype, which aims to make it easier for travelers, particularly Arab tourists, to travel in Selangor. This study was used the Fuzzy Delphi Method (FDM) to achieve the result. This questionnaire contains three main domains with total 21 items and was distributed to 10 respondents. The criteria and characteristics of the experts who are the subject of this study are very much in line with the context of the study because it involves experts in the fields of academia, industry and government. The results show that two of the three domains got expert agreement, namely the information and interface domains. Meanwhile, for the interactive domains, four of the eight items stated were rejected by the experts due to a lack of fuzzy score requirements. As a
result, this prototype is only examined by professionals who are knowledgeable and qualified to do so before it is released.

Keywords:
i-Rehlah prototype, Fuzzy Delphi Method (FDM), Experts’ Consensus, Evaluation of Usability.

1 Introduction

1.1 The Concept of Islamic Tourism Based On the Organization of Islamic Operation (OIC)

The Organization of Islamic Operation (OIC) is the second largest intergovernmental organization after the United Nations with a membership of 57 countries spread across four continents. This organization is a collection of voices from the Islamic world. It seeks to protect the interests of the Islamic world by promoting international peace and harmony among the various communities of the world (Organization of Islamic Cooperation, 2011).

Islam and tourism are not foreign things. Traveling and wandering are highly recommended in Islam. Allah SWT says in surah al-Ankabut verse 20:

قُلْ سِيرُوا فِي الْأَرْضِ فَانظُرُوا كَيْفَ بَدَأَ اللَّهُ الَّذِي نُشِئَ اللَّهُ عَلَيْهِ الْخَلْقَ ۚ ثُمَّ اللَّهُ يُنشِئُ النَّشْأَةَ الْأُخْرَىَ إِنَّ اللَّهَ عَلِيٌّ صَٰبِرٌ

Say: “Travel through the earth and see how Allah did originate creation; so will Allah produce a later creation: for Allah has power over all things.

In the above verse, it is clear that Allah SWT encourages us as His servants to travel, walk all over the world to see the power and take lessons from every event that Allah has created. This is a clear and solid fact and evidence that religion plays a role in the daily activities of Muslims. Saad et al (2010) stated that Islam recognizes the right of its believers to move from one place to another. In fact, Islam also encourages travel for beneficial purposes, such as performing Hajj and Umrah, health and medicine, education, business, trade, entertainment and pleasure. Nevertheless, entertainment and pleasure need to be interpreted accurately so that the rules and obligations of Islamic Shariah are not violated (OIC & SESRIC, 2017).

Islamic tourism aims to target Muslim tourists specifically, although it can also be a universal attraction for tourists other than Islam for a variety of reasons. Among the reasons for the attraction of Islamic tourism to non-Muslim tourists is because of reasonable prices, safety and security, family-friendly environment, cleanliness and so on. Crescent Rating (2015) states that the concept of Islamic tourism has been widely used with various different names and connotations. However, the terms used have not
yet reached a universal definition. Among the names that have become common place are Halal Tourism, Shari’ah Tourism and Muslim-friendly Tourism (OIC & SESRIC, 2017).

1.2 Main Components of Islamic Tourism

The OIC and SESRIC reports (2017) outline five key components of Islamic tourism that need to be prioritized based on adaptations from Akyol and Kilinc (2014). The main components are the same as conventional tourism, but the difference is that these components must be halal and shariah compliant, namely; Halal Hotels, Halal Transportation, Halal Food Premises, Halal Tourism Packages and Halal Finance. The descriptions of each sub based on the OIC are as follows:

a) Halal Hotels: Every hotel that complies with Islamic tourism must ensure that there are no alcohol services, gambling places and any activities that lead to illegal and non-compliant acts and actions. The food provided must also be from a halal food source and get the approval of the authorities. In each room, there must be a copy of the Quran, a prayer rug and an arrow that shows the direction of Qibla. The position of the bed and toilet is also not facing the direction of Qibla. Hotel staff wear clothes that cover the aurat and hotel management such as payment and so on according to the procedures outlined by Islam. In addition, facilities and amenities such as swimming pools, gyms, massage parlors and so on should be segregated according to gender.

b) Halal Transport: Halal transport that is emphasized is airlines. Airlines must ensure that all services, especially in terms of food and beverages, must be halal. There is no alcohol or food that contains pork and syubhah. Materials such as digital information must also be appropriate and comply with the requirements allowed by Islamic law.

c) Halal Restaurants: Restaurants listed in Islamic tourism must ensure the source of food before, during and when served. Food based on animals must ensure that the animals are slaughtered according to the correct Islamic procedures. Alcohol is also not served in halal restaurants.

d) Halal Tourism Package: The tourism package's content must revolve around Islamic themes. Islamic tourism packages should focus on Islamic tourism destinations, such as mosque visits, Islamic monuments, Islamic museums, and Ramadan festivities.

e) Halal Finance: Hotels, restaurants, travel companies, and airlines must have adequate financial resources and adhere to Islamic processes and standards. In general, all parties involved in the creation and development of financial firms must participate in profit and loss sharing. Any type of interest, riba, or money laundering is absolutely prohibited in Islamic finance.

1.3 Establishment of Islamic Tourism Malaysia

The significant increase in Muslim tourists from the Middle East countries is due to the events of September 11, 2001. To organize various local tourism development programs and marketing strategies for local cultural products to Muslim tourists, the
government, through the Ministry of Tourism and Culture Malaysia, established Islamic Tourism Malaysia (ITC) on 16 March 2009. ITC is registered as a Limited Company pursuant to a Guarantee with the Companies Commission of Malaysia under the Companies Act 1965 (Abdul Ghani Abu, Dewan Budaya, March 2013).

Malaysia is one of the main attractions for Muslim tourists from all over the world, according to the Master Card record and Rating Crescent (2015) in the Organization of Islamic Operation (OIC) Report and The Statistical, Economic, and Social Research and Training Center for Islamic Countries (SESRIC) (2017). Malaysia is recognized as the first destination in the Global Muslim Travel Index version 2015. This is because Malaysia has been made the number one Islamic tourism destination for four consecutive years from 2011 to 2014. ITC (2015) states this is based on the availability of halal food, facilities and amenities for performing ibadah, Islamic-friendly hotel services and Malaysia’s own state of being free from all forms of threats and riots (OIC & SESRIC, 2017).

The Malaysian government has made various efforts to encourage Arab tourists to come to Malaysia. Malaysia Airlines System (MAS) and other airlines, documentary videos on Malaysia in Arabic were shown during the flight in Arabic, especially 30 minutes before landing at Kuala Lumpur International Airport (KLIA). This video explains important information related to our country. The Arab Ambassador, who works as a receptionist for Arab tourists, will be ready at the arrival hall to welcome tourists from the Middle East.

Those who serve as Arab Ambassadors are students who are fluent in communicating in Arabic. The Arab Ambassador program is indeed only specific to Arab tourists and this is a privilege and priority provided to them compared to other tourists (Sulaiman Ismail, 2008). For Arab tourists, there are still many among them who are not fluent in English. As a result, they require translators who can speak and provide information in Arabic, as well as Arabic-written signboards pointing to certain destinations within KLIA (Sulaiman, 2008). Muslim travelers will find it easier to pray and eat halal food thanks to these Arabic-language signboards. KLIA at the same time also provides prayer places on all levels of the main terminal building and satellite building, as well as 25 halal food booths in public areas and transit sections (www.halaltrip.com).

1.4 Selangor as Popular Destination for Arab Tourists

Selangor, as a developed state, is not left behind as one of the tourist destinations for Arab Muslims. Based on the Tourist Arrival Statistics Report (LSKP) issued by Tourism Selangor, there was an increase in the number of Arab tourists from 2015 to 2017, which was 160,615 to 360,749 (http://www.tourismselangor.my/tourism-selangor-profile/). The Selangor state economy recorded a Gross Domestic Product (GDP) growth of 7.1% in 2017 compared to only 4.8% in 2016 (Department of Statistics Malaysia, 2017) The tourism sector contributes a large part to the economic growth of the state of Selangor. State governments under the SMART concept through the SMART Governance domain aim to build a foundation towards smart government through smart and integrated technologies. Therefore, this research supports and realizes the aspirations of SMART
Selangor to increase the state's economic growth through the development of i-Rehlah Prototype Application for Islamic Tourism in Selangor.

A study conducted by Hashim (2013) shows that there are communication problems among Arab tourists in our country. As many as 70% of respondents faced communication problems at airports, 80% in hotels or accommodation, 80% in shopping malls, 80% related to tour guides and 80% related to taxi drivers.

Based on interviews conducted with the Islamist Tourism Center (ITC) (Hashim, 2013) stated that the common problems faced by Arab tourists are:

1. Lack of hotel staff who can communicate in Arabic
2. There are no Arabic language television channels in the hotel.
3. Tour guides have low proficiency in Arabic
4. Taxi drivers cannot speak Arabic.
5. Tourist police cannot communicate in Arabic.

Starting from this issue, researchers have developed a needs analysis model for Islamic tourism by focusing on the needs (necessities), lacks (lacks) and wants (wants) (Hutchinson & Waters. 1987) of Arab tourists. Based on the model, the level of needs, shortages and desires of Arab tourists on this issue is high. Thus, this study proposes the development of a prototype i-Rehlah Application for Islamic Tourism in the State of Selangor for the use of Arab tourists to the state of Selangor.

2 Methodology

Usability testing was conducted on 10 experts to test the validity of the content, the suitability of the interface form, and the smooth functionality of the prototype of this application. The experts involved are experts in academia, industry and government. If there are any errors, a process of improvement will be implemented to address the issue before it is adopted by the public especially Arab tourist. The prototype's usability was assessed using the Fuzzy Delphi (FDM) approach. Experts were given a set of questionnaires to assess the usability and effectiveness of application prototypes.

The Fuzzy Delphi (FDM) approach as mentioned in above is based on the conditions contained in the triangular fuzzy number and defuzzification process. The condition for a triangular fuzzy number involves the threshold value \( d \) and percentage of expert agreement with a threshold value \( d \) for each item (component and element) measured must be less than or equal to 0.2 (Chen, 2000; Cheng & Lin, 2002) and a percentage of expert agreement must exceed or equal 75% (Chu & Hwang, 2008; Murry & Hammons, 1995). The threshold value \( d \) will be analyzed using Microsoft Excel based on the following formula:


\[ d (\bar{m}, \bar{n}) = \sqrt{\frac{1}{3}[(m_1 - n_1)^2 + (m_2 - n_2)^2 + (m_3 - n_3)^2]}. \]

For the defuzzification process, there is only one condition that the value of the Fuzzy score (A) must be greater than or equal to the \( \alpha \)-cut value of 0.5 (Tang & Wu, 2010; Bodjanova, 2006). The value of this fuzzy score was also analyzed using Microsoft Excel using the following formula:

\[ A = \frac{1}{3} (m_1 + m_2 + m_3) \]

In summary, it can be concluded that the data analysis was based on three expert consensus conditions, namely:

1. The threshold value (d) should be less than or equal to 0.2
2. Percentage of expert agreement exceed or equal 75%
3. The Fuzzy score value (A) greater than or equal to 0.5

The research instrument used a questionnaire containing a total of 21 elements of information domain (6 elements), interactive domain (8 elements) and interface domain (7 elements). This questionnaire aims to identify suitable items to be developed into the prototype. These items will be identified by distributing questionnaire forms that will be analyzed using the Fuzzy Delphi technique to obtain expert consensus. All question items were answered according to a 7-point Likert scale (from 1 = Strongly Disagree, to 7 = Strongly Agree) as shown in Table 1 below:

<table>
<thead>
<tr>
<th>Preferential Level</th>
<th>Fuzzy Scale</th>
<th>Likert Scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly disagree</td>
<td>(0.0, 0.0, 0.1)</td>
<td>1</td>
</tr>
<tr>
<td>Somewhat disagree</td>
<td>(0.0, 0.1, 0.3)</td>
<td>2</td>
</tr>
<tr>
<td>Disagree</td>
<td>(0.1, 0.3, 0.5)</td>
<td>3</td>
</tr>
<tr>
<td>Neutral</td>
<td>(0.3, 0.5, 0.7)</td>
<td>4</td>
</tr>
<tr>
<td>Agree</td>
<td>(0.5, 0.7, 0.9)</td>
<td>5</td>
</tr>
<tr>
<td>Somewhat agree</td>
<td>(0.7, 0.9, 1.0)</td>
<td>6</td>
</tr>
<tr>
<td>Strongly agree</td>
<td>(0.9, 1.0, 1.0)</td>
<td>7</td>
</tr>
</tbody>
</table>


The number of experts in this study was 10 people. According to Adler and Ziglio (1996), the number of experts for the Delphi technique can range from 10 to 15 people if the experts can reach a high level of agreement with one another. Nevertheless, Rosnaini (2006) in Mohd Ridhuan (2016) state that the minimum number of experts for the Delphi technique is as many as five experts. This is in line with Rowe and Wright’s (2011) argument that the number of experts can range from 5 to 20 people based on their area of expertise. Jones and Twiss (1978) suggested that the number of experts involved in the Delphi method approach was 10-50 experts. The criteria and
characteristics of the experts who are the subject of this study are very much in line with the context of the study because it involves experts in the fields of academia, industry and government. This selection is also based on a group of scholars who assert that experts are those who are highly skilled and experienced in the field of study (Swanson & Falkman, 1997; Dalkey & Helmer, 1963).

Thus, based on the discussion on the selection of experts, the authors have identified several criteria for experts and the criteria are as follows:

<table>
<thead>
<tr>
<th>No.</th>
<th>Field Experts</th>
<th>Number of Experts</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Academia</td>
<td>3</td>
</tr>
<tr>
<td>2.</td>
<td>Industry</td>
<td>6</td>
</tr>
<tr>
<td>3.</td>
<td>Government</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>10</td>
</tr>
</tbody>
</table>

2.1 Implementation of i-Rehlah Prototype

The prototype was developed using InVision software. All information or content, interface and interaction design were added to the prototype to give the feeling of a real application. However, a few interactions are not able to be implemented due to the limitation of this application. The prototype link was given to the experts and they could open it from their mobile phone or computer using a web browser platform. The figure below represents part of the i-Rehlah interface and content.
There are three phases of design in the development of this prototype. The first phase is Information Design, the second phase is Interaction Design and the third phase is Interface Design (Kristof & Satran, 1995). For the Information or content aspect, the selection of information is based on requirements and analysis by the experts from government bodies and academia. The presentation of content is given consideration to make it more attractive by using multimedia elements. In terms of interface design, the look and feel of the interface with the presentation of layout, text and graphics are planned accordingly to suit the concept of Islamic Tourism. As for the interaction aspect, the type of interaction that included in the system is designed to facilitate user to find the information and navigate between pages in a structure. All these three aspects have been going through the analysis of requirements, design and development process. They are related and supporting each other to create a comprehensive and usable mobile application. The relation between items is as Figure 2.

Figure 2: Relation and Criteria of Evaluation
3 Findings

Summary of FDM analysis by showing the calculated threshold values, percentages of experts’ agreement, and Fuzzy score (A) value are illustrated in the following table of analysis.

Table 2: Summary of Fuzzy Delphi (FDM) Analysis for Information Elements

<table>
<thead>
<tr>
<th>Construct</th>
<th>Elements</th>
<th>Threshold Value, d (d &lt; 0.2)</th>
<th>Percent of Expert Agreement (&gt;75%)</th>
<th>Fuzzy Score (A &gt; 0.5)</th>
<th>Expert Consensus</th>
</tr>
</thead>
<tbody>
<tr>
<td>All information is well presented and easily accessible.</td>
<td></td>
<td>0.166</td>
<td>90.0%</td>
<td>0.81</td>
<td>7</td>
</tr>
<tr>
<td>It is very easy to find the necessary information about Islamic tourism</td>
<td></td>
<td>0.180</td>
<td>90.0%</td>
<td>0.80</td>
<td>0</td>
</tr>
<tr>
<td>in Selangor.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The information contained in the prototype is sufficient for tourists</td>
<td></td>
<td>0.227</td>
<td>80.0%</td>
<td>0.79</td>
<td>0</td>
</tr>
<tr>
<td>visiting the state of Selangor.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Photos and videos contained in the prototype can attract tourists to</td>
<td></td>
<td>0.151</td>
<td>90.00%</td>
<td>0.84</td>
<td>3</td>
</tr>
<tr>
<td>visit the place.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The prototype content is very useful for the target users especially</td>
<td></td>
<td>0.135</td>
<td>90.00%</td>
<td>0.82</td>
<td>3</td>
</tr>
<tr>
<td>the Arab tourists.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>The information applied in the prototype is hierarchical.</td>
<td></td>
<td>0.148</td>
<td>90.00%</td>
<td>0.79</td>
<td>7</td>
</tr>
</tbody>
</table>

Table 2 above shows that each item in the Information element achieved all the following conditions; a threshold value (d) ≤ 0.2, the percentage of experts’ agreement surpasses 75% and all the values of fuzzy scores (A) exceed 0.5. This finding shows that the level of experts’ consensus for all items in the information element was accepted.

Table 3: Summary of Fuzzy Delphi (FDM) Analysis for Interactive Elements
Interactive Content delivery is highly interactive. 0.169 90.0% 0.790 Agreed
Interactions are consistent in every app content. 0.200 90.0% 0.787 Agreed
Very easy to interact between pages. 0.247 60.0% 0.743 Disagreed
The navigation structure is well designed. 0.200 90.0% 0.787 Agreed
Interactions run smoothly without delays and errors. 0.206 90.0% 0.770 Agreed
Users can distinguish between display images and interactive images. 0.232 60.0% 0.733 Disagreed
Users are always informed of their status in the system. 0.267 70.0% 0.720 Disagreed
Users are notified before exiting the application. 0.365 50.0% 0.520 Disagreed

Table 3 above shows that only 4 items out of eight in the Interactive element achieved all the following conditions; a threshold value \( d \leq 0.2 \), the percentage of experts' agreement surpasses 75% and all the values of fuzzy scores \( A \geq 0.5 \). Meanwhile, the other 4 items were disputed due to the experts' agreement percentage of less than 75%.

### Table 4: Summary of Fuzzy Delphi (FDM) Analysis for Interface Elements

<table>
<thead>
<tr>
<th>Construct</th>
<th>Elements</th>
<th>Threshold Value, ( d \leq 0.2 )</th>
<th>Percent of Expert Agreement (( \geq 75%) )</th>
<th>Fuzzy Score (( A \geq 0.5 ))</th>
<th>Expert Consensus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interface</td>
<td>The interface layout is well arranged.</td>
<td>0.125</td>
<td>100.0%</td>
<td>0.837</td>
<td>Agreed</td>
</tr>
<tr>
<td></td>
<td>The overall design is simple and practical.</td>
<td>0.115</td>
<td>100.0%</td>
<td>0.827</td>
<td>Agreed</td>
</tr>
<tr>
<td></td>
<td>The color is attractive and does not hurt the eyes.</td>
<td>0.157</td>
<td>90.0%</td>
<td>0.807</td>
<td>Agreed</td>
</tr>
</tbody>
</table>
The icons used are easy to understand.  

| The icons used are easy to understand. | 0.096 | 100.00% | 0.853 | Agreed |
| The text is easy to recognize and read. | 0.267 | 80.00% | 0.797 | Agreed |
| The graphic design concept is suitable for Islamic tourism applications. | 0.143 | 90.00% | 0.833 | Agreed |
| The main menu is clearly presented for users to explore its contents. | 0.115 | 100.00% | 0.827 | Agreed |

Table 4 above shows that each item in the Interface element achieved all the following conditions; a threshold value (d) ≤ 0.2, the percentage of experts’ agreement surpasses 75% and all the values of fuzzy scores (A) exceed 0.5. This finding shows that the level of experts’ consensus for all items in the information element was accepted.

4 Conclusion

The usability evaluation process of the i-Rehlah prototype focuses on the level of experts' agreement on the usability and suitability of a product developed. In this study, a product called i-Rehlah has been developed which aims to facilitate tourists, especially tourists from the Middle East, when visiting the state of Selangor.

The experts involved have expert criteria and characteristics that are highly relevant to the context of the study as they are experts in the fields of academia, industry and government. The study faced constraints on obtaining Arab tourists due to the spread of the COVID-19 epidemic. Therefore, the prototype of this application is only evaluated by experts who are skilled and suitable to evaluate this prototype before this prototype is developed and tested on Arab tourists. The results of this study show that two of the three domains have expert agreement, namely the information and interface domains. Nevertheless, for the interactive domains, out of the 8 items stated, 4 items were rejected by the expert panel. The items are "It is easy to interact between pages, users can differentiate between display and interactive images, users are always informed of their status in the system, the user is notified before signing out of the application". However, the authors do not agree with the recommendations of the experts but will improve the i-Rehlah prototype of the developed application. Furthermore, information such as user background is very important for authors to keep track of user information.

It is proposed that the i-Rehlah prototype application for Islamic tourism be evolved into a specific application that Arab tourists can use and apply while visiting the state of Selangor.
5 Acknowledgement

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6 References

Al-Quran Al-Karim


