

Information Quality for Mobile Application Development to Assists Pilgrims: A Theoretical Model

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Abstract— Providing users with quality information is essential for the success of mobile application development. Hajj mobile application development is complex due to user satisfaction level, age and cultural difference, lack of interactivity, and the efficiency of the Hajj mobile application. Thus, in order to solve these problems, we intent to examine the effect of mobile information quality as the independent variables: a) content, b) contextual, and c) interaction on the effectiveness of the mobile application as the dependent variables: a) usability, and b) interactivity among user with different cultural and age range. This study identifies essential information quality dimensions which reflect to the characteristics of mobile application development in order to increase pilgrim satisfaction. There are total of 180 users selected randomly from pilgrims to validate the hypothesized model. The results show that some information quality factors are more essential than others in increasing user satisfaction and reflect the effective characteristics in mobile application development.

Keywords—*Information quality, Mobile application development, Effectiveness, Pilgrim*

I. INTRODUCTION

Mobile application is growing rapidly in a variety of contexts such as m-banking, m-commerce, m-learning, and m-health. The most advantage of mobile application is the mobility which is easy to gain information anywhere and anytime. In recent years, the usage of mobile application increased more than 100% in some countries [1]. Review shows that mobile application and related technology are also considered for a potential method to be used by pilgrim during Hajj season.

Even though information quality is expected to effect user loyalty of mobile application through user satisfaction, mobile applications are remained uncertain regarding the design and development. Whether to focus on the quality of application by improving system failure during development, or to focus on improving the quality of interaction and usability of the mobile application? Without an investigation of the various dimensions of information quality in mobile application development, it is challenging to provide effective guidelines to mobile application development. However, neither theoretical frameworks nor empirical validations of information quality have been studied with regard to the characteristics of mobile application in pilgrimage domain, that are different from those of other applications. Hence, we propose a theoretical model of information quality for mobile application and validate the model with a large-scale survey.

II. MOBILE APPLICATION DEVELOPMENT

Mobile application development is the act or process by which a mobile app is developed for mobile devices. Mobile applications are growing rapidly in a variety of contexts, due to an advantage of mobile phone mobility that can gain information anywhere and anytime. The mobile application development can be applicable for accessing information on the smart phones such as understanding the geography, sharing experience, gathering information and learning something more about the needed information. It has been used in many domains such as tourism, m-banking, m-commerce, m-learning, and m-health [2].

As a result of the high growth rate of mobile applications in the worldwide, most domains start using these applications to simplify users' tasks. As such in [2] mobile application is used in tourism industry to serve international tourists, as they are mobility and in need of support in their travel. The authors developed mobile application to assist travellers to get access to information of new places using their phones. The application was developed to provide understanding of the geography, sharing experience, and geographical awareness.

Likewise, in the educational perspective, the mobile application technology has been used as a learning tool to help educators. Traditional educational methods are changed towards more enhanced and easier learning methods [3]. Thus, [4] Proposed a model to cover the limitation of mobile devices (such as small screen size and inconvenient interaction). Their model addressed the issue of synchronize of content in a synchronous learning environment. The authors designed a context-awareness synchronous learning system and created a pedagogical framework, which is different from the existing synchronous learning approaches. However, mobile application development still have various challenges like synchronize, architecture, and user interface, and data and context management [4]. In general, mobile application development is complex in term of different aspects such as user satisfaction, budget, developing time, and the efficiency of mobile phone. To address these issues, many approaches were used such as context awareness and knowledge management approach. In the next section we briefly discuss the concept of knowledge management.

III. INFORMATION QUALITY FOR MOBILE APPLICATION DEVELOPMENT

Quality information is the concept of examining the relative importance of selected dimensions that influence the overall service quality [5]. Stationary internet information quality has been analyzed for long time. However, the

information environment or information quality of mobile Internet is different from that of stationary Internet [6]. [7] discussed the difference of the information quality of both stationary and mobile in three angles. According to the availability of resources, mobile devices have lower resources such as small screen and input capability. Secondly, in terms of accessibility, mobile Internet can be accessed and used anytime and everywhere unlike the stationary Internet. Thirdly, in terms of contextually, mobile Internet is used for different purposes as users move around with their devices. Although the mobile Internet is highly used but there is limited research on the basic preferences and expectations of the Mobile Internet users [6]. The following is a discussion of the main mobile quality dimensions that are mentioned in literature these include: content, interaction, contextual, effectiveness, interactivity, and demography.

Many scholars have recently been studying the quality of information from various sources such as databases and web pages [8]–[10]. Wang and Strong suggested four major dimensions of information quality, which consists of accessibility quality, intrinsic quality (content quality), contextual quality, and representational quality [8], [10]. Chae et al, has modified Huang and Wang four dimensions to reflect the characteristics of information environments of mobile Internet [7]. They have investigated connection, content, interaction, and contextual quality dimensions for mobile internet application. In this study, we have modified Chae’ four dimensions to in order to reflect the characteristics of information for Hajj mobile application, which are content quality, interaction quality, and contextual quality. Moreover, knowledge management will be used for this research to assists engineering support for Hajj mobile application experience and the potential design of Hajj mobile application.

IV. MOBILE APPLICATION IN HAJJ DOMAIN

As the technological sophistication of mobile devices has grown, the User Interface (UIs) of Mobile Application is becoming increasingly complex. Consequently, providing high quality information is an important factor for successful Mobile User Interface (MUI) design. In order for mobile applications to be used effectively by pilgrims during Hajj, we need a better understanding of which factors influence a successful implementation of mobile application and the information quality such as content, interaction, and contextual.

Study performed by [11] found that most of the Hajj and Umrah applications developers focused on basic and lack of interactive features. Whereas the attitudes of the users are directed toward the visualized applications, and more than 87% of studied applications support only one language. In addition, the study revealed weakness in presenting interactive features that supports virtual communication between users such as fatwa chatting. Another important issue found by this study shows that existing Hajj mobile applications are lacking real time map updating, which would provide location awareness to assists users from different cultural and age range.

Review shows the lack of empirical evaluation of mobile information quality on interface design with regard to the characteristics of Hajj mobile application [11], [12]. Hoehle & Venkatesh address that mobile content quality e.g.

interface design positively correlate with usability and effectiveness of the mobile applications [13].

To overcome these issues, number of researchers proposed some solutions that address such an issues. [14] proposed Knowledge-based expert systems (KBES) that can be useful to pilgrims in different stages; before Hajj, in Hajj, and after Hajj. Their main goal was to support pilgrims in learning and decision-making process. Similarly, [15] has proposed a dynamic knowledge-based approach that enables decision support system used by pilgrims to query information from dynamic-knowledge based records. The system also tends to enable pilgrims to reach the experts so that it provides possible solution for their problems. The application known as M-Hajj DSS is meant to provide simple and advanced questions and answers using artificial intelligence (AI) based on decision tree and case-based reasoning (CBR). However, the system was developed only to android smart phone and single language only. Additionally, universal user interface and mobile information quality was not considered in this work.

The issue of language is addressed by [16], in their paper, the author presented a mobile translation application for Hajj with different languages to help pilgrims in accomplishment their Hajj accordingly. The application will also assist pilgrims to easily link with other pilgrims using different languages. A detailed survey was conducted for the available Hajj and Umrah related applications along with all features and services of the surveyed applications and the behavior trends of application providers and users [11]. The survey result revealed that current hajj applications provide support in a very basic manner, whereas the expectation of the users is anticipated towards the visualized apps services. Moreover, the paper demonstrated that majority of the applications used by users are for live video service applications followed by applications supporting images and wallpaper services. The applications are mostly developed for one language.

This work focuses on examining the effect of mobile information quality as the Independent Variables (IV): a) content, b) interaction, and c) contextual on the effectiveness of the mobile application as the Dependent Variables (DV): a) usefulness, and b) interactivity among user with different cultural and age range as the two Mediating Variables (MV).

The proposed model related to the factors that have significantly influenced on the development of Hajj mobile application prototype using knowledge management. It encourages pilgrims to acquire, store, share, apply and create knowledge via effective and user-friendly interface. It also provides rich global signs in order to assists pilgrims from different cultural and age range though Hajj mobile application. Figure 1 shows the research model of this study. The theoretical hypotheses are grounded on each of the relations between dependent and independent variables among user with different demography, are as follows:

No	Hypothesis	Statistical Methods
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No .	Hypothesis	Statistical Methods
H0 1	There is no significance positive relationship among mobile information quality with the usefulness in term of contents.	Linear Regression
H0 2	There is no significance positive relationship among mobile information quality with the usefulness in term of interaction.	Linear Regression
H0 3	There is no significance positive relationship among mobile information quality with the usefulness in term of contextual.	Linear Regression
H0 4	There is significance positive relationship among mobile information quality with the interactivity in term of contents.	Linear Regression
H0 5	There is no significance positive relationship among mobile information quality with the interactivity in term of interaction.	Linear Regression
H0 6	There is no significance positive relationship among mobile information quality with the interactivity in term of contextual.	Linear Regression
H0 7	There is no significance positive relationship among content with the usefulness among users.	Multiple Regression
H0 8	There is no significance positive relationship among interaction with the usefulness among users.	Multiple Regression
H0 9	There is no significance positive relationship among contextual with the usefulness among users.	Multiple Regression
H0 10	There is no significance positive relationship among content with the interactivity among users.	Multiple Regression
H0 11	There is no significance positive relationship among interaction with the interactivity among	Multiple Regression

No .	Hypothesis	Statistical Methods
	users.	
H0 12	There is no significance positive relationship among contextual with the interactivity among users.	Multiple Regression
H0 13	There is no significance positive relationship among content with the usefulness among user from different age range.	Multiple Regression
H0 14	There is no significance positive relationship among interaction with the usefulness among user from different age range.	Multiple Regression
H0 15	There is no significance positive relationship among contextual with the usefulness among user from different age range.	Multiple Regression
H0 16	There is no significance positive relationship among content with the interactivity among user from different age range.	Multiple Regression
H0 17	There is no significance positive relationship among interaction with the interactivity among user from different age range.	Multiple Regression
H0 18	There is no significance positive relationship among contextual with the interactivity among user from different age range.	Multiple Regression

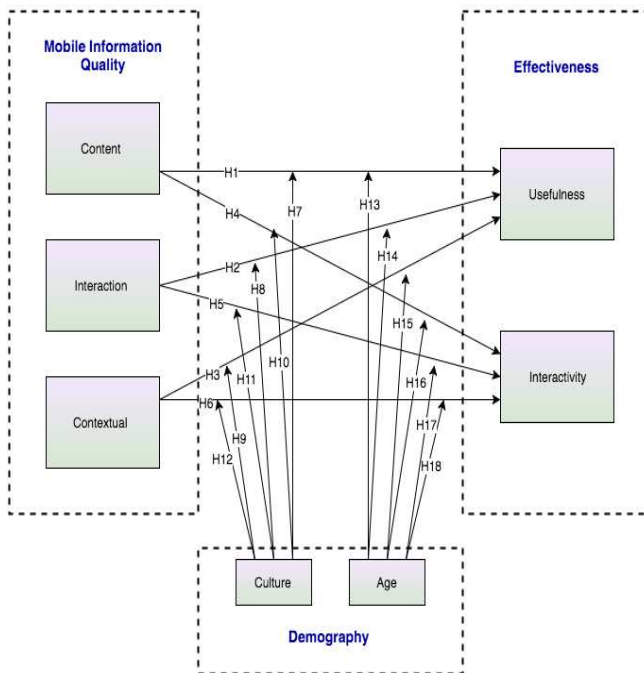


Figure 1. The theoretical model

V. METHODOLOGY

There are three major instruments that will be used to assess and examine the effect of mobile information quality as the independent variables: a) content, b) contextual, and c) interaction on the effectiveness of the mobile application as the dependent variables: a) usability, and b) interactivity among user with different cultural and age range. The preliminary study questionnaire will be used to determine the user demographic characteristic and also their requirements. This questionnaire will be distributed to a total number of 50 respondents. Based on the preliminary study data analysis, we will attempt to develop the hajj mobile application prototype. Heuristic expert review questionnaire will be used by two subjects matter experts (SMEs) in order to validate and evaluate the Hajj Mobile application prototype.

Total number of 30 users will test the Hajj mobile app for the Pilot testing. During this phase, the respondents will fill in the questionnaire for the pilot testing. Based on data collection, we will analyze the reliability of the questionnaire using SPSS v2.4. The Cohen's kappa (κ) the value should be more than 0.5 this means that the questions achieve the almost prefer agreement, If the value is lower than 0.5 then we will review the questions of this questionnaire.

During the actual testing phases, a total number of 200 respondents will be invited to test on the Hajj mobile app. The respondents have to register and log in in order to perform giving tasks based on required scenarios. Participants therefore will be offering the questionnaire to fill in during the actual testing. The researcher will collect the questionnaire and conduct the data analysis using SPSS. Data would be analyzed based on the regression analysis in order to test the hypothesis.

VI. CONCLUSION

This study examines the impact of the mobile information quality dimensions content, interaction, and contextual on the effectiveness among different cultures and

age range. The content quality is critical in assisting pilgrim's expectation on Hajj mobile application, this is due to the small screen, inconvenient input. Interface design and layout are essential and considered for group of target users. The users' perception in content quality may be a crucial factor for the usefulness of the Hajj mobile application development. Mobile information quality perspective is difference among user from different cultural and age. For instance, young people from different cultural perceive mobile information quality in terms of interactivity. Older people perceive towards visualization as useful and critical features in the mobile application. The result of this work will be subject to the following limitations: It is convenient to perform this study in Mecca - Saudi Arabia due to the Hajj season which would be easier to search for all samples nationality during the season. The study includes the purposively sampling due to the limitation of pilgrims who are performing Hajj yearly and the statistic about the mobile user for common nationalities are high.

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