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Halascan: *Halal* Brand Personality Screening Process Using Camera Phone Barcode Scanning

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ABSTRACT
The purpose of this study is to establish a Smartphone application for end users in Halal Brand Personality screening process that offers an option to facilitate consumers in justifying how the Halal certified brand respond to and satisfy their needs based on five Halal personality dimensions; Purity, Excitement, Safety, Sophistication, and Righteousness. The evolution of the end user application follows the waterfall development methodology. It mainly focuses on presenting the process of developing an Android application prototype using the user terminal in the electronic Halal screening system which makes it possible for users to check straightaway based on Smartphone barcode capture with the applied Halal branding database system and identify them, as well as rate the product brand using mobile devices. As for the project implementation, the functions of the end user application are introduced, and how these functions are realized is also displayed in detail. After the implementation process, the application is tested on an Android device emulator and real mobile Android devices to evaluate their performances. The version of Android 2.1 and above is chosen since most Android Smartphones operate with minimum Android 2.1. Moreover, it is tested with specialized mobile with respect to the collection of feedback. Finally, a reasonable conclusion to this project is made, including the contents reliability and security protection issues.
Keywords: *Halal* Brand Personality Screening Process, Android Smartphone application

INTRODUCTION

In certain parts of Malaysian market, the Halal consumers are facing a challenge in identifying and recognising the Halal products and services (Zain, 2004; Ahmad, 2015). With the arrival of the information era and the rapid development for checking the Halal status of a product in the market, there is a problem in recognising Halal brand products, and different threats and frauds of Halal (Kassim et al., 2012; Yahaya et al., 2012). Nowadays, Halal consumers can enjoy a number of Halal products (Danesh et al., 2010). The Halal brand has become global and Halal products are transported and available worldwide. Subsequently, the development of *Halal* Brand Personality (HBP) on Smartphone apps involves the application of electronic technology with a Halal brand screening system, which is a stand-alone (online) application for mobile devices for screening Halal brand index/ratings status of a product in the market based on barcode scanning (al Bakir et al., 2011).

HBP Smartphone apps have improved consumers' lives in different ways. There has already been a Halal portal (The Department of Islamic Development Malaysia - JAKIM), which is used by many companies and consumers, in which a systematic Halal certification procedure is gathered electronically. The department has been responsible for the standardization of Halal certifications since August 2009 (Saipullah, 2012). The Malaysian government provides full support in enforcing and implementing the Halal certification process on products and services. In addition, there are now a notable number of different kinds of Smartphone apps in the Google app for consumers to find Halal status and get some information regarding the Halal certification and the fatwa of Halal. Nevertheless, there is absence of reliable information in determining the Shariah/Halal status of the products and the services of the good personality of Halal branding rating is so limited (Wilson 2013). These create a huge gap for experts in both Shariah and communication technology to fill in.

Therefore, this study promotes five dimensions of HBP based on Aaker's (1997) Brand Personality Scale. The dimensions are identified as qualifying benchmarks and are unique as they cover Purity, Excitement, Safety, Sophistication, and Righteousness. Some have had extensive testing in a commercial environment and others have limited commercial exposure in Malaysia. To compare this app with the existing apps in the market, they just focus on the Halal identification, verification, and authentication (Zetty, 2010; Kassim et al., 2012; Van et al., 2012; Yahaya et al., 2012). Furthermore, they do not answer these following question; Are the products or services well-designed or well-made with good quality and practice good corporate ethics and religious compliance?

BACKGROUND AND PROBLEM MOTIVATION

HBP pioneering project has been implemented the E-HBP screening system (HS1-HalaScan) since early 2012 based on students' usage of the Halal brand identification system at the Centre for Entrepreneurship (*Taman Usahawan Muda Pelajar UniSZA* - TUMPU). At the first phase, a functional system has been established on a PC-base. As for the consumer and user end, they are able to rate the chosen product and brand based on the HBP dimensions (Purity, Excitement, Safety, Sophistication and Righteousness – based on Aaker 1997 Brand Personality Traits) data by means of a sensor, and then send the requested information to the server. The system will reply the analysis results to the users. A wireless sensor system has been developed to collect the HBP data. With this app, almost everyone can check the HBP status from anytime and anywhere before they pay or buy the products and services. In the second phase, the app has been made available in Android variant on Google Play Store, Windows iPhone, Samsung, Blackberry, and other Smartphone brands as well (Allen et al., 2010). With the unstoppable growth of the mobile Internet, the electronic HBP service with stationary devices is no longer sufficient to satisfy the increasing requests from consumers, who have now begun to rely more on mobile networks (Norman, 2009). This means it has become imperative to implement an Electronic-Halal brand screening System on mobile devices. In this project, a user end application on an Android platform is proposed (Chang et al., 2010), which makes the

communication and information exchange between the user/consumer and business more convenient (Li, Ding & Zhu, 2010).

Hence, in order to achieve the overall aim of developing a user end application on the Android platform, the entire developing procedure was divided into several sections, and some concrete goals were set (Li, Ding & Zhu, 2010). Firstly, the user end application allows a user to perform the following operations: a) it relates to product barcode scanner by identifying and screening the information based on HBP of the products with the Halal status; b) views brand information, including the basic information, contacts, ingredient/component data, testing data concerning their Halal certification, and etc.; c) gives advice or feedbacks based on the data they have obtained; d) votes with the level of branding index of the product and services based on developer, consumers, and business perception. Secondly, a user-friendly GUI (Graphical User Interface), containing the following pages, is designed: a) Main screen page: For users to find which components of the HBP that they want to choose, i.e. Search History/Exit, Scan Barcode, Halal Information and Brand Ratings; b) Search History/Exit: For users to see newly info data and messages from the products and services; c) Scan Barcode: For users to scan and obtain brand/product information from the selected certified Halal products and services based on HBP screening process; d) Halal Information and Brand Ratings page: For users to see the Halal brands rating and to see the changes of brand information such as product with Halal update, and etc. Finally, the application is tested on different devices and a rational evaluation concerning the performance, and security system preservation is conducted.

PREVIOUS STUDIES

This project is aimed at developing an Android application for the user end in an e-HBP screening system with a user-friendly interface. Toward the end, the app of this project allows the connection between mobile end-devices and the server for data transmission. It integrates with the local database and a database on the server side, thus allowing the application to provide information exchange between them. The realization of this application is concentrated on achieving functions in relation to user end, which contains the functions of retrieving data of the products and services from the server and sending data, such as messages, to the target products and services. Before conducting the design and implementation of the app, some related work has been involved, including the background of Android, OOP, and the SQLite database, as well as the security system preservation method (Chin et al., 2012), and the criteria for a user-friendly application. This part will mainly introduce previous studies related to the theories and techniques used for the development of an application for end users.

A study on the Halal status was also carried out with the RFID technology. The process and system prototype of RFID were designed to authenticate the logo of Halal JAKIM (Norman, 2009; Nasir et al., 2011). The evaluation of the users was also performed to measure the set of satisfaction with the system in place. Yet, as an alternative of RFID, the researchers applied to use a digital camera for the recognition module and image processing. Thus, the result was 91.67% accuracy (Anir et al., 2008; Mohd et al., 2008; Arendarenko, 2009). Then, the 2-D

barcode is another detector for a fake halal logo with UV hologram recognizes system (Arendarenko, 2009; Maharom, 2011). The scanned image is interpreted and accustomed match for the database (Mohd et al., 2008) and the Halal audit is displayed on the scan device screen. For this purpose, the hardware prototype is designed by the developers to the users. Besides, the detection of alcohol is also incorporated with infrared radiation, whereby the materials used are the lens, photodiode and infrared LED that is developed with Microsoft Visual Basic and Excel. The appliance has been shown to detect product that contains with 1680 NM wavelength of alcohol's source.

Besides, the Halal animal products' efficiency can be developed from formal production and quality certification system. Halal products of animal origin are of great importance to agriculture in Muslim countries and some part of Northern China. Stochastic Petri Net (SPN), is one of the instruments employed to analyse the effectiveness of tool for operation and performance analysis, nevertheless, it is not suitable and fit for Halal animal products. Therefore, the definition and analysis methods of Halal components with expanded SPN model (HESPNM) is proposed in this project. Furthermore, there is the Platform-Independence architecture and Computer Independence meta-architecture calculation software based performance HESPNM by object-oriented design and analysis system techniques (Qiang, Jing & Wenxing, 2010).

Other researchers and inventors also have produced applications for the Muslims to identify the Halal status based on mobile support. The project used mobile devices but controlled the Halal method using SMS texts. The users would receive an MMS after their request. The paper discusses the concept of barcode scanning process and its applications in the end user goods business (Budde & Michahelles, 2010; Hao, Zhou & Xing, 2012). Furthermore, it discusses the system plan and framework design called MyMobiHalal 2.0 (Junaini & Abdullah, 2008).

Recently, the Halal Industry Development Corporation (HDC) has published its first version of Halal Locator that runs on BlackBerry. With GPS tracking locator, users can see the list of places with Halal food with a radius of 20 km via Google Maps. The social media also helps to share their check-in on Facebook and Twitter. This application is also integrated with knowledge about Halal ingredients and appropriate fatwa, while at the same time; it is equipped with a real-time HDC Global Industry RSS. The user may be presented with statistics from the authorities in the review of Halal principle, in which the results are submitted to JAKIM to help undertake the application function and enforce it. As for policy makers, the statistical support is to live well in the planning and management in the Halal industry (Abdul et al., 2009). The Halal directory is linked to the database and JAKIM provides automatic updates on certified Halal companies on a monthly basis.

All researches presented show that the main concern is on Halal products, tests, and findings, especially in Malaysia. The system is comparable to this project. However, it focuses on an innovative construction detailed database on brand personality dimensions to check on Halal

vigilance and new technique of technical application by using Smartphone deprived of retrieving the network, which will be a novel impact in this project.

METHODOLOGY

Choosing the correct methodology and methods is the first step and the key in relation to project procedure. For developing this application, the application development platform must be firstly determined and one suitable development model is chosen. Object oriented programming and modularized programming are adopted in this project. After testing the application, it is evaluated according to its user-friendliness, and other principles are discussed. The concerning technology and methods are introduced in this part.

Selection of Development Platform

In relation to the popularity and availability of the user end application, a suitable platform was chosen. Based on the years of efforts by our project team, the system has been successfully established on a PC platform. The new requirement is its establishment on mobile devices such as smartphones and tablet PCs. Currently, the most popular operating systems on mobile devices are Android, iOS, and Windows phone. A software stack is adopted in the Android platform with Linux core providing the basic functions and various programmers developing diverse applications (Hu et al., 2012). Openness, independence from a service provider, abundant hardware options, no developer restriction, and supporting Google Play are the notable advantages of the Android platform over any of the other available options. Android allows any mobile end manufacturers to join the developing platform, which leads to the diversity of novel applications. This also gathers a wide user base for itself. The internet service is not restricted to the Android platform and the choice of hardware is also significantly plentiful. Manufacturers promote all sorts of products with different features and specialities, but this does not affect the compatibility of software or the data synchronism. Choosing the Android platform minimizes the problems that occur in the programming process, simplifies the developing procedure, and lays the foundation for future popularity of the user end application (Chang et al., 2010).

Selection of Development Model

Over the years, a large diversity of application development models, such as agile methodology, waterfall methodology, extreme programming, and rapid action development have taken shape. While each model has its own advantages and disadvantages, based on the requirements, scale, and urgency of different mobile application development projects, particular models are able to be applied. For example, as for agile methodology, the whole development procedure is divided into several parts. This approach makes it easy to alter the project and reduces the overall risk in relation to the whole project. The waterfall model is best suited to steady and static projects for which the main emphasis is in relation to schedule planning and for which there are no significant changes throughout the entire process. If the application requires a quick delivery, the best choice is rapid action from the developer.

This project is a function-oriented application development aimed to realize an Android application with concrete functions (Lee, 2012). Hence, the waterfall model is adopted in this project. The project starts with the gathering of related information and background searching. Once the general goal has been settled upon, the move is then towards schedule planning after which the whole project course is completed step-by-step.

Before the design and implementation are initiated, it is important to have knowledge of the background and the current situation for the E-HBP screening system. This information is gained by reading the previously reported paper regarding the Halal Android apps in the team, as well as studying the paperwork of other Electronic Halal systems.

To accomplish this task, the first aspect to be considered is the required functions. The user population of this application is the app users, who require HBP and Halal information data. Without a doubt, a great deal of effort is required to be put into the data interaction. The data from the brand's index do not come directly from the database. Firstly, the developers upload different data to the server, which would process and save the data. When the user clicks into the application, it will send a requirement to the server for data and information. The remainder of the process is displaying the data in a user-friendly manner. However, it is not sufficient for the user end to merely possess this function. This application should also enable interaction to take place between the users and branding index. As the function of this application is now clarified, the realization of the application is based on these functions.

IMPLEMENTATION OF THE FRAMEWORK

Hardware

The application of the smartphone is used for this project is the Android smartphone (Ballagas, 2006; Yahaya et al., 2012). The Android version 2.1 (Eclair_MR1) operating system and above is chosen because most Android Smartphones work with the minimum application of Android 2.1 (Hashimi, Komatineni & MacLean 2010; Yahaya et al., 2012). Usually, Android applications are well-matched with an application programming interface (API) levels and Android new versions platform. The application needs to work on all upcoming Android new versions platform. In general, all Android devices run the ZXing barcode scanner application based on Android 1.5 ("Cupcake") or more and a camera running (Yahaya et al., 2012).

Software and Tools

Zebra Crossing (ZXing)

ZXing is used as a library of image processing barcode open source Java. ZXing uses the built-in camera on the cell phone to the device, without using a server to capture and interpret barcodes (Yahaya et al., 2012).

Java Development Kit (JDK)

The JDK Java inventor proposes the development and implementation of Java applications on servers and desktops of the smartphone. It supports developers to satisfy the requirements of

the integrated environment nowadays (Yahaya et al., 2012). Java deals with rich user performance, portability, flexibility, and security applications that need interfacing. Android Virtual Device (AVD) Manager Android SDK, Android Software Development Kit (Android SDK), and AVD Manager allow developers to build applications for the Android platform. It offers emulator, development tools, source code, and libraries that require Android 2.1 operating system.

Eclipse Integrated Development Environment (Eclipse IDE)
What Java-developers need to create Java applications is the Eclipse IDE (Yahaya et al., 2012). It is measured the chosen Java development tool. Eclipse IDE offers better Java editing with incremental compilation, validation, code assistance and references (Yahaya et al., 2012). What Java-developers need to create Java applications is the Eclipse IDE. It is measured in the selected Java development tool (Kassim et al., 2012; Yahaya et al., 2012). Eclipse IDE Java edition offers better-quality tool with incremental compilation, validation, with code and references.

Eclipse IDE based on Android Development Tools Plug-in (ADT-Plug-in)
Eclipse IDE based on ADT plug-in to make Java developers a great and substantial background on Android applications. ADT allocates capacity of Eclipse to quickly create new Android developments, added components on the API creates, debugging applications using the frameworks Android SDK tools, create a user interface application, and even export signed (or unsigned) to distribute apk application created (Kassim et al., 2012; Yahaya et al., 2012). Image 7 presents the development tools in the ADT plug-in be installed on Eclipse.

Based on the Android tab that is available after the installation of ADT plug-in. In addition, there is no restriction on the Android system in relation to hardware device and the portability of application is high, which solves the problem of incompatibility regarding different file formats between different smartphones. The Google founded OHA (Open Handset Alliance) in 2007 with 84 hardware and software manufacturers and telecom service providers in order to develop and improve the Android system. According to the survey data, at the end of 2012, the market share for the Android system has exceeded the Nokia Symbian system, which has dominated the market for over 10 years. The first Android smartphone arrived on the market in 2008, after which the system also expanded into tablet PCs and other areas. The Android system provides a built-in small-sized relational database-SQLite for data storage. The primary system services, such as internal memory management, security, process management depending on the Linux 2.6 kernel, which also performs as the abstraction layer between the software and hardware stack. In general, the Android application consists of activity, content provider, service, and intent. Android is a Linux-based operating system developed mainly for mobile devices. Due to its portability and openness, the Android system is used on majority electronic products. During the early period, Java is usually used in Android SDK (Software Development Kit) for application development. It is also accessible for the use with C/C++ in Android NDK (Native Development Kit).

Object-oriented Programming

The classes and subclasses are created in different modules, which are able to interact with each other in order to enable the whole programme to be functional. Each object is able to interact with other objects for data exchange and message passing. To be specific, in this application, during the process of programming, many classes are used to realize different functions and these classes are able to be inherited and overloaded. If these are set as private, then other objects cannot access to these attributes and methods, which is a very effective way of preventing confusion and abuse of data. Objects are related to methods and several objects are usually used together to interact with each other in the design of applications and programmes. Object-oriented programming (OOP) is a programming paradigm type, in which the concept "objects" are usually instances of classes. This, in turn, makes it easier for the program to be understood and analyzed and thus, OOP is widely used nowadays in programming design. In the process of programming, an object is the substantializing of the abstract concept-class. The basic rule of OOP is to divide the whole programme into several sub-programmes, i.e. Units or objects.

SQLite Database Browsers

A visual tool of freeware is an open source for creating, editing, and planning database files to be well-matched with the SQLite Database Browser. It is without the need for complex SQL commands to learn from users and developers to create, modify, and retrieve data from the database in a familiar spreadsheet-like interface (Jiang, & Ku, 2010). The SQLite Database Browser if executed. Ever since the appearance of commercial applications, the database has been an important constituent part and it is becoming increasingly important, taking more system resources, and complicating the management. With many applications having modularized components, a new kind of database system is required other than the traditional large-scale ones. SQLite is an embedded database system, which is an integral part of the application rather than being accessed from the user application. SQLite takes up minimal internal resources and realizes zero-configuration running model. It is an ACID (atomicity, consistency, isolation and durability) compliant and follows out the majority of the SQL standard using a vigorously inefficiently typed SQL syntax that does not assurance with the truthfulness of the domain. Unlike the usual client/server structure, SQLite is not a detached process of application; instead, it is an important embedded part. Thus, the main communication protocol is a direct API invocation of the programme. This reduces the total resource consumption, latency, and complexity. The whole database, including definition, tables, indexes and data record, is stored in a single file. A piece of data can be read by several processes or threads at the same time, while only one process or thread can be written in the data at any time. SQLite3 is a standalone programme that can be used to manage the SQLite database.

User-friendly application guidelines

As for an application, it is important to involve user-friendly features. The Android guidelines provide user-friendly design principles for a developer to follow. Fundamentally, it states that

an app should combine attractiveness, simplicity, and purpose to create a good experience for users. It is ought to be easily understood so that even if people are using it for the first time, it is possible to grasp the most important features and can enable them to gain access to superb technology with clarity and grace. However, when it comes to details, there are some basic principles to follow. Firstly, things should be kept as brief as possible and an attempt should be made to use pictures, and icons in order to explain ideas. Secondly, the style of components is made to be consistent with the theme and visually distinct to assist users in discerning their functions. Thirdly, the common application user interface consists of the main action bar, view control, content area, and split action bar, which is a relatively transparent manner in which user can operate. As for GUI, the layouts should be flexible in order to suit different devices.

Data flow & Data storage

Data plays an important role in the end user application. It contains the product information and is critical in relation to the brand—user information exchange. The app will perform "getting data—storing data—reading data" for a user. The data flow and data storage process are described in the following sections.

The data displayed on the user end is being received from the server. Data flow between the user end and the server can be distributed into 3 parts. The 1st part is the end user side asking the server for data. The 2nd part is the data being transmitted from the server to the end user. The 3rd part is the data storage in the end user and the display of the data.

The contents reliability and security preservation system

In the Halal branding field, the reliability and preservation of the contents issues have always been given great importance and thus, this aspect must be given significant effort. As for logging in to the application, every user is required to scan the barcode or enter the barcode numbers (Budde & Michahelles, 2010). This method ensures that every user can only obtain basic information and Halal brand data from the user's chosen brands. During the data transmission between the server and the user end, the information is preserved based on the contents reliability and preservation rules. As for local data storage, the information is encrypted by the app contents reliability and security preservation system (Chin et al., 2012). The system is realized by adding a round key, sub-bytes, shifting rows, and mixing columns. Even if the users have lost their phones, the brand information that has been stored inside the phone will not be easily revealed due to the security preservation system (Zhou et al., 2011).

CONCLUSION

In order to further improve the function of the electronic Halal screening system that our project team has been working on, an end user application on an Android platform has been proposed and implemented in this project. The screening system follows the application design principles and methodology. It provides a user-friendly application that the user can use to retrieve a brand's Halal index data and provide the ability to offer both feedback and information. The basic functions are also included contacting the brands of HBP, information,

and the ability to check a brand rating. This application has been designed and implemented using eclipse with ADT plug-ins to programme. In order to evaluate the whole project, the application was tested on an Android device emulator and several other mobile devices. The results are in accordance with expectations. The overall performance of the app is satisfactory. There were no display errors and little response time latency.

Through years of efforts by our project team, a PC-based E-Halal system has been established. Based on the practical contribution, since early 2010, the project team began the implementation of a mock E-Halal system on an Android platform. They are responsible for the setting of the security system preservation rules within the E-Halal system, the Bluetooth data transmission between the HBP development team and user terminals. They also focus on the scheduled SMS Halal info reminder application and some of them are responsible for the end user application.

This app reduces the complexity and inconvenience experienced between user-brand information exchanges. With the popularity of mobile end devices and the facility to have internet access, data transmission can be nearly real-time. This can significantly contribute to brand index situation control and Halal certification response. The app brings the user—brand relationship even closer. However, there are some issues that must be given attention to. In the Halal branding field, brands security system preservation gives significant importance and this involves many ethical issues (Wilson 2013). This application concerns a large amount of sensitive Halal brand data that must be preserved at all costs. During the development of this app, the data were encrypted by means of security system preservation methods during the storage process. However, it is still not possible, even when using these methods, to completely ensure the security of the data. Thus, in future, greater efforts are required in relation to brands security system preservation, as well as the function and UI modification of the app.

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