

RFID Tag for Halal Food Tracking in Malaysia: Users Perceptions and Opportunities

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Abstract: Weakness of information presented on the food packaging of specific food product usually lead to confusion and redundant unsold goods stacked-up in the shopping market. Barcode, labels and ingredients information by far is not adequate to authenticate the validity of the information claimed by the manufacturer or food producer. This long-established approach fail to inform and no longer fitting in this cyber world. This study aimed to understand the Malaysian users' perception on implementing a real-time tool to feed users with genuine and validated information to assist user-buying process. Besides, this study will also help to identify the market opportunity to deploy such technology to the Malaysia users. A qualitative approach was chosen to gather data from the users around Klang Valley and Kuala Lumpur, Malaysia. A survey form consisting of 32 questions were distributed to 50 identified users were respondents varies from Halal and non-Halal users. Graphs and tables are presented to depict the findings of users' perception on the RFID tag for Halal Tracking in Malaysia. The results show 48% of the users agreed that a real-time system is required for the information dissemination. However, sadly only 34% knows what RFID is and what RFID can do in developing a real-time system for Halal tracking. This result show clear opportunity to introduce new tools, nevertheless solid awareness activities are required to ensure the success of the new system.

Key-words: tracking, Halal information, information dissemination, RFID

1. Introduction

Radio Frequency Identification (RFID) was discovered as early as 1935, which was during the World War II. RFID is one of the oldest tools available in the tracking technology today. Its capacity in tracking involving a complicated system to an ordinary system makes it one of the best tracking tools of its kind. Tracking system using RFID covers from the high-end business sectors to mid-range usage due to RFID's feasibility in the number of applications available today. Tracking includes from raw materials to human being. In food and packaging industry all around the world, RFID tracking system is picking up momentum as it is being utilized to cater the demand of tracking inventory besides theft cases in the hypermarket. One of the largest food market chains, Wal-Mart had notified its 100 suppliers to install RFID tags (for inventory tracking) by January 2005.

The remaining 12,000 supplier will have to follow suit by 2006 (Meloan, 2003).

In Malaysia's food industry, food status especially involving *Halal* status is one of the prime area that has potential to leverage this technology. This is simply because the Malaysian Muslim consumers' are very much concern about the authenticity of *Halal* food products claimed by food producers. There are findings that revealed fabricating activities done by food manufacturer to post halal logo on their food packaging in order to attract Muslim users to buy their product, though in reality, the food manufactured from their premises are not certified by the authorize body. This is major problem in Malaysia market today. *Halal* brands, trademarks and logo hold no reliability or authenticity leading to possible doubts from the customers. Debate about tracking the food ingredients sold in the market is not only our worries, but Muslim in Malaysia is also concern

on the way of how the particular food is being prepared and how it is being packaged. Realizing the potential market for *Halal* food industry since the last two decades, countries worldwide began to set up *Halal* authorities to provide *Halal* certification services. However, a tracking system is needed to verify the *Halal* brand, trademark or logo on food packaging. A comprehensive tracking system need to be employed to help depict related claims of the brand or the trademark on the package in a real time basis and in a trusted environment. Current *Halal* tracking approaches are manual, and just recently move towards the development of web-based information system that provides the list of *Halal* foods and *Halal* food search.

2. Religious Observances and the Impact towards the Economy

The growth of Muslim population, the speed of trade globalization, the advancement in science and technology and the ongoing initiatives to simplify manufacturing processes makes it essential that the *Halal* concept be fully understood by marketers (Shahidan and Mad Nor, 2006). There are estimated to be around 1.8 billion of Muslims around the world today. The Muslims has strong fellowship surrounding food whereby they practice according to a strict food preparation and procedure as governed by the holy Quran. Halal is an Arabic word that means lawful. Food or drink product approved for Muslim consumption, must conform to the Islamic dietary laws as specified in the Holy Qur'an, the *Hadith* or sayings of the Prophet Muhammad (Peace and blessings of Allah be upon Him), his *Sunnah* or tradition, and in the *Fiqh* or understanding of the Islamic Jurists: *Imam Hanafi*, *Imam Shafi'*, *Imam Maliki* and *Imam Hambali*.

Due to advancements in food technology and distribution, Muslims today are more exposed to various ingredients and manufactured foods. While many things are clearly *Halal* or clearly *haram*, there are some things which are not clear. These items are considered questionable or suspicious and more information is needed to categorize them as *Halal* or *haram*. The most common of these are

food additives, gelatine, emulsifiers and rennet in cheese manufacture. These products can become *Halal* if the raw materials are *Halal* and the process is agreeable according to the Islamic way. It must be understood that finished food products made from *Halal* animals are no longer *Halal* if they have been contaminated by *haram* products. Therefore, the Muslim community would have to know whether the addition, ingredients or finished foods contain any *haram* substance. Lawful foods are practiced by different types of religion whereby the practices are different with respect for each of the religion. In Islam for example, food practices are vital as it has a strong connection with the well-being of the believers. Table 1 below from IslamicPopulation.com (2006) shows the percentage of Muslim population by continents in the year of 2006.

Table 1: World Muslim Population in 2006 (IslamicPopulation.com, 2007)

Continent	Total Population	Muslim Population	Muslim %
Africa	923.2 million	442.88 million	47.97
Asia	3970.5 million	1060.65 million	26.71
Europe	731.7 million	50.7 million	6.93
North America	331.7 million	7.13 million	2.15
South America	566.05 million	3.08 million	0.54
Oceania	33.54 million	0.60 million	1.79
Total	6313.78 million	1565.28 million	24.79

In Southeast Asia alone there are over 250 million Muslim *Halal* consumers. Malaysia, Indonesia, Singapore and many other countries in the region have government mandates to import *Halal*-certified products only. In these countries, *Halal* is considered as a symbol of quality and wholesomeness not only by Muslims but also by non-Muslims (Riaz, 2004). Melati Mohd Ariff, (2004) claimed based on the estimated expenditure per capita for food of

US\$0.85 (RM3.23) a day, it is estimated that the market for *Halal* products is US\$560 billion (RM2.12 trillion) a year. In Malaysia, 60% of the populations are Muslims and if one were to estimate the per capita expenditure for food as RM1 a day, then the demand for Halal products is more than RM5 billion a year. From 1995 to June 2003, the Malaysian Industrial Development Authority (MIDA) has issued licenses to 424 food-manufacturing companies with a total investment of RM5.9 billion. The growing request of Halal food has turned the Halal food market to be one of the major agri-food components in today's market trade. The impact towards economy at this instant is no longer in the Muslim countries but countries around the world were there are Muslim presences.

3. Research Methodology

A survey was conducted to gather users' requirements in order to implement the Halal tracking system thus understanding the Malaysian users' requirement on new suggested system. This survey is also important to collect and analyse the users' understanding on Halal concept. The questionnaire consists of 32 questions, distributed to 50 selected consumers in the area of Lembah Klang and Kuala Lumpur. Respondents involved in this survey are from the Halal and non-Halal consumers. The questionnaire was created with the objective to see the readiness of Malaysia users to move to new technology on Halal tracking which are the RFID technology and its benefit for users.

4. Research Findings

From the data collected, analysis showed 78% users questioned about the authenticity of the halal certificate received by manufacturer and 66% users questioned about the authentication of the logo. This result showed that users are not convinced on the certificate issued and logo used by manufacturers to claim product are Halal. This shows that both identifications fail to provide a validity check for user to ensure the food status.

Question arise	Percentage (%)
Authentication of Halal certificate	78%
Authentication of Halal logo	66%

Table 2: Uncertainties in Halal logo and certificate.

Based on the survey done, we found that 92% of the respondents agree that improvised detecting machines will assist them to certify, authenticate and validate Halal certificate and logo. About 96% of the respondents wish to have a system that can provide information to track and trace Halal certification. Therefore, a detecting system is required to fulfill these requirements.

Type of detector	Percentage (%)
Real time	48
Offline	4
Barcode	22
RFID	26

Table 3: Types of detector

Table 3 shows the percentage for types of detector that are being suggested to fulfill the requirements. Only 26% of the respondents choose RFID as detecting tools while 48% of the respondents choose real time applications example online SMS as a detector. We have concluded that due to lack of exposure, it has resulted that users are keen to use SMS as the detector as they fail to see and understand the benefit of RFID as a better tracking tool. Fig. 1 shows the RFID awareness amongst our respondents).

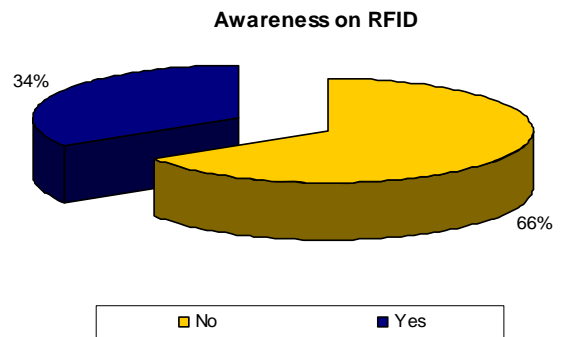


Fig. 1: Awareness of RFID among consumers in Malaysia

Although only 34% of the consumers aware of the usage of RFID in Malaysia, 66% users believe, that RFID can be a useful tool to authenticate and validate Halal certificate and logo. Another 68% users also agreed that RFID should be widely used in Malaysia (Please refer Fig. 2).

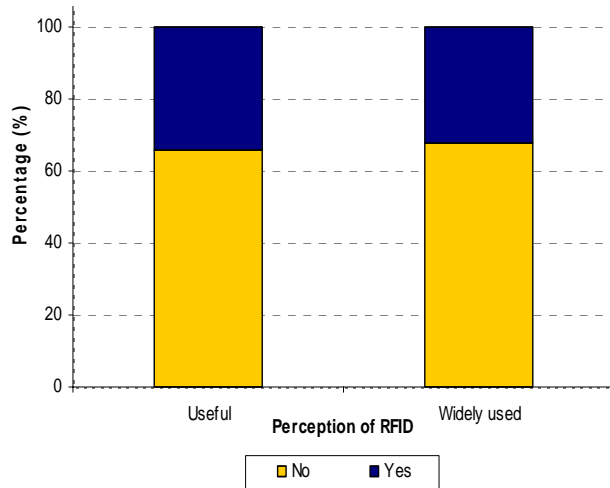


Fig. 2: Perception on RFID among consumers in Malaysia

Mean score in Table 4 shows the awareness of consuming Halal for respondents especially Muslims due to their obligation to the religion (Please refer Table 4).

Awareness	Mean	Std. Deviation
Understanding on Halal	1.28	.607
Importance on consuming Halal products	1.24	.822
Buying habits	1.98	.958
Reactions on unsure status	1.08	.274

Scale:

1.00 = Very important, 2.00 = Important,
3.00 = Less important, 4.00 = Not important

Table 4: Awareness on consuming Halal products

In order to consume Halal products, certification on Halal logo is crucial. Near 74%, respondents will look for Halal logo on the food packaging, 22% respondents will read the ingredients while 4% respondents determine the manufacturers. Thus, we can conclude that, 100% respondents are positive that it is important for the manufacturers to give right information to users. Manufacturer also must help accommodate the market on Halal status where 98% respondents suggested using a system for this matter. To ensure the success of this system, 98% of the consumers confirmed the importance of getting Halal updates the Halal authorities on each Halal status of a manufacturer. Therefore, the implementation of a new system that uses RFID in tracking Halal food will be important to achieve the objective of being the Halal Hub of the world.

5. Proposed System: Halal Tracking System

The two main components of the EPC network are EPC embedded in a RFID tags and RFID readers. The aim of the EPC network is to let consumers to sense products e.g. food in real-time basis whether the foods is *Halal-certified* or not. Following Fig. 3 describes the proposed system:

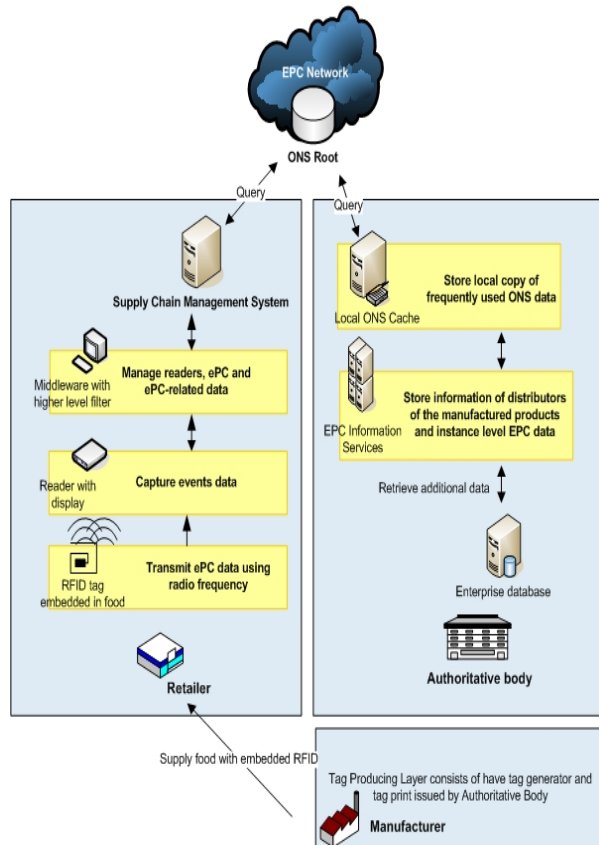


Fig. 3- Halal Tracking System: Component and Layers

1. An EPC, a unique identification number that identifies a specific food product in the supply chain will be embedded in microscopic RFID-tag and will be attached to the food product.
2. RFID readers situated in the food store either at each food rack lanes or at the cashier points will automatically scan each RFID-tag when tags enter their read range and then broadcast small bits of data contains EPC to the reader.
3. The use of middleware to act as a connecting layer to manage and process the flows of data coming from one or more tag reader devices, send to the application layer. In addition, it also performs filtering, aggregation, and counting of data, to reduce the volume of data prior to sending to retailer's enterprise applications e.g. Supply Chain Management System.
4. Retailer's enterprise applications query the Root ONS for the location the related information of the Authority Body's Local ONS. Architecturally, the ONS has two layers; the first is called Root ONS, which built using the same functionality and technology as the Domain

Name Service (DNS) (Mealling, 2000 & 2002) of the internet that provides a global lookup service to map an EPC into one or more Internet Uniform Reference Locators (URLs) that describes the item represented by the EPC. While, the second layer of the ONS is called the local ONS, which is the directory of manufacturer and related information for that particular of food product.

5. The Authority Body's Local ONS is queried for the location of the product data, which is stored in an EPC information System.

6. EPC-IS that stores all information of the item including shipping, manufacturing and other data related to the product (Halal information) in Physical Markup Language (PML) will enable consumer to get the information on a real time basis before they compete their purchasing at any of food rack lanes or the cashiers point. The purpose of PML core (Floerkemeier at al., 2003) is to standardize the format and content of messages exchanged by the sensors within the EPC network.

6. Conclusion

This paper discussed on the findings of users requirements of newly suggested Halal tracking system. The analyses of data collected shown clear opportunity of new real time system for Halal tracking in Malaysia food market. The requirement from users will be the platform to test proposed system architecture design in the earlier stage of the proposed project. Leveraging on the suggestion of the design by the EPC Network to include the Product Authentication Service (EPC-PAS) (Staae et al., 2005), the Halal tag tracking will be able to decrease fraud and counterfeit of tags and information in tags. There are still some research needs to be carried out in order to incorporate information in the EPC code. Subsequently a standard of data or information that must be included in the code must be agreed on, thus making the tracking tool more beneficial. Each of the markets or supermarkets involve in this proposed system must enable a tracking device at each of the check out counters for the purpose of scanning product Readers must also be place on the rows where the groceries are displayed to assist the

while shopping. Besides, EPC-IS server must have connection with 'Halal servers' build by the relevant authorities to give update on the Halal food product at real time basis. Further research may include discussion on items such as:

- a) Establishment of a standard that will be used nationally in implementing the RFID technology
- b) Developing a database with real-time synchronization within the participating countries to enable ubiquitous tracking system.

7. Acknowledgement

This research is fully funded by Research University Grant SF008/2007A. The author would like to thank for the full support received from the University Research Grant, University of Malaya. Thank you to the team members and the Information Science Department of the Faculty of Computer Science and Information Technology, University of Malaya.

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