Jurnal Komputer Terapan

Dewan Redaksi

Edmond Febrinicko Armay, S.Si., M. T

Universitas Islam Negeri Sultan Syarif Kasim Riau

Edi Saputra, S.T., M. Sc

Universitas Jambi

Dwi Ely Kurniawan, M.Kom

Politeknik Negeri Batam

Warnia Nengsih, S.Kom.,M.Kom

Politeknik Caltex Riau

Anggy Trisnadoli, S.S.T., M.T.

Politeknik Caltex Riau

Dini Nurmalasari, S.T.,M.T.

Politeknik Caltex Riau

Rahmat Suhatman, S.T.M.T

Politeknik Caltex Riau

Daftar Isi

Application System for Checking Halal Product Status Using QR-Code Based on Android and Web

Hidayat[1] and Afrizal Imanullah[2]

[1]Universitas Komputer Indonesia, Department of Computer Engineering, email: hidayat@email.unikom.ac.id
[2]Universitas Komputer Indonesia, Department of Computer Engineering, email:
afrizalimanullah@mahasiswa.unikom.ac.id

[1]   Abstract

This paper presents the design of an application system to quickly determine the halal product status circulating in Indonesian society by checking certification ID from LPPOM MUI. This is conducted to overcome the anxiety of the Muslim community in Indonesia on halal-labelled products that are sold in supermarkets and traditional markets. The system consists of two parts. Part one of the system uses PHP programming to record the halal certification of products and generate QR codes. Part two of the system uses an android application to scan the product's halal certification status from the QR codes. The information displayed on android is the product's name, the product manufacturer, the status of the product's halal certification, and other information. The results show that the application successfully scans the QR code and displays information on the halal certification status of the product. The smallest size of QR code version 1 that can be scanned is 0.6 x 06cm. The longest distance was 13cm.

Keywords: *android application, halal certification status, halal product status, PHP programming, QR code.*

1. Introduction

Consuming healthy food and beverages is extremely important for humans. According to Islamic law, especially for Muslims, the food and beverage products consumed are healthy and must be halal [1]. Halal word is interpreted as something that is permitted, including food and beverage products. In Islam, various foods are allowed and not allowed to be consumed. Halal food is based on excellent and legitimate methods in the process of obtaining it. However, foods that are not halal tend to be mistaken in the process of getting it or cause harm when eating. For example, goat meat that can be eaten must come from goats slaughtered religiously in Islam [2], [3]. Another example is that Muslims should not consume food containing pork. These facts are reinforced by the fact that the content of pork carries the disease [4], [5]. For Muslim consumers, choosing halal food is a must, and it is a religious requirement based on Islamic beliefs. On the other hand, non-Muslim consumers value halal because of its health benefits, which are purely voluntary on individual decisions [6]–[8].

To determine whether a product is halal or not, the easiest way is to check the presence of a halal label on the product. Moreover, the halal labels can influence Muslim consumers' interest in buying these products [9]–[11]. Unfortunately, there is always the issue of products that are not halal circulating in the Muslim community. The circulation of products that are suspected of being non-halal in Muslim society has caused anxiety.

In Indonesia, the halal product industry is regulated and obliged to obtain halal certification from the Majelis Ulama Indonesia (MUI). There is the MUI Food and Drug Assessment Institute or LPPOM. Generally, every product that has been certified halal by the LPPOM MUI will include the halal certificate identity number on the product label. Every halal certification has expired validity and must be rechecked to continue the validity period. The problem is that consumers cannot find information about the halal status and its validity period easily and quickly from the LPPOM MUI.

This paper presents the design of an application system to quickly determine the halal certification status of a product circulating in Indonesian society using Quick Response (QR) code technology [12]. The QR code was developed by Denso Wave In 1994 to track car components during manufacturing and distribution processes [13]. Although the QR code was patent by Denso Wave, it is widely available and accessible. Its use has rapidly increased because it contains more information than a standard bar code in the 10th of the space and its high-speed omnidirectional scanning capabilities. It has been widely applied in various applications, one of which is traceability [14]–[16]. The increased availability of smartphones with cameras has led to QR codes being applied to a wide range of commercial applications, including marketing [17]–[20], education systems [21], [22], ticketing [23], and recent overgrowing, payment applications [24]–[26].

2. Materials and Methods

The system consists of recording the halal certification of products and the system for reading the product's halal certification status, as shown in Fig. 1. In the first part, the product halal certification recording system is built using PHP programming on a web-based platform. This system records the product's halal certification status from the LPPOM MUI and obtains an ID number for its product. Next, it generates a QR code as a code for the ID product's halal certification label. The QR code used is version 1 (21x21 modules) with correction level H (maximum allowable numbers are 17 numeric). The second part, the system used to scan the QR code ID product. It is designed using an android studio application based on Java programming. It functions to show the halal product information registered in the LPPOM MUI.
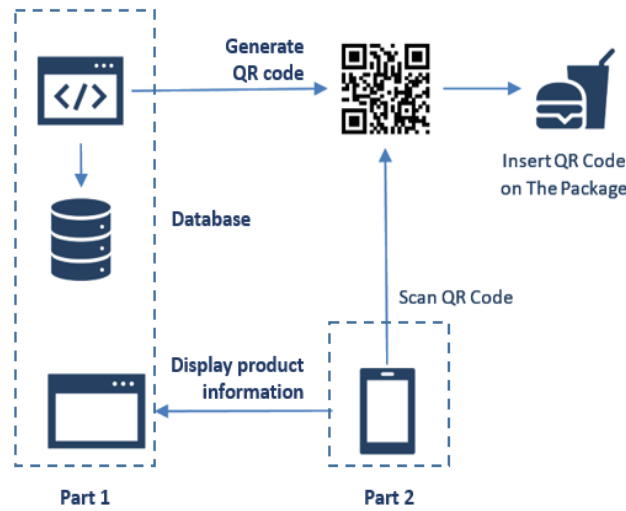
Fig. 1 The block diagram of the application system for checking the halal status of a product.

A use case diagram of the halal product information system (Fig. 2) explains the interaction between actors and the system. Two actors, namely the admin, can perform user management operations, data management, and users to scan the QR-Code. The QR code encoding functions to convert product ID data that the admin has managed into a QR-Code form. The QR code decoding is functioned for decoding QR-Code into information (for example, ID product). That information is used to connect to the server for getting detailed information product according to its ID. As an example in Fig. 3, the 14-digit product ID (07120027020615) is encoded into version 1 QR-Code (21x21 modules) with high error correction. The encoding process is conducted using the QR code library from PHP programming. Meanwhile, the decoding process is conducted on an Android-based smartphone application. This process utilizes the camera on the smartphone to capture the QR-Code. Then it will be decoded to find out the product ID.
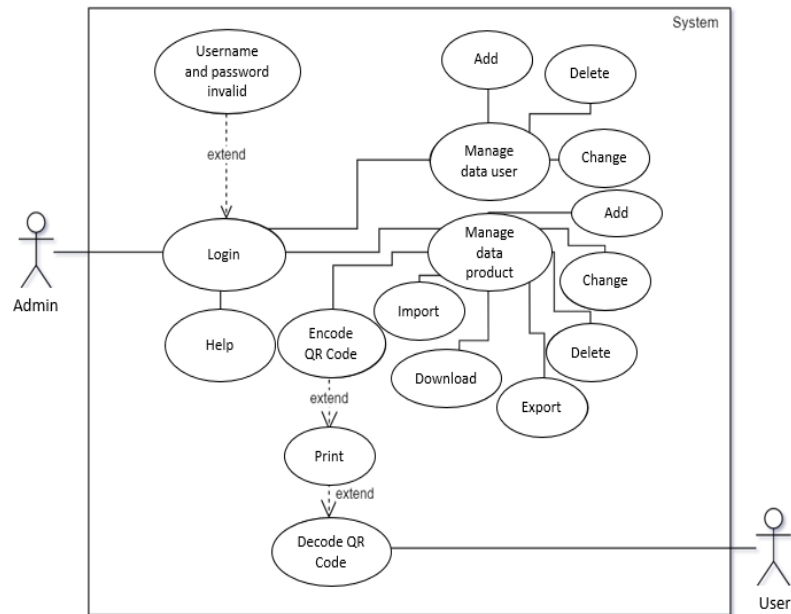
Fig. 2 Use case diagram of the halal product information system.
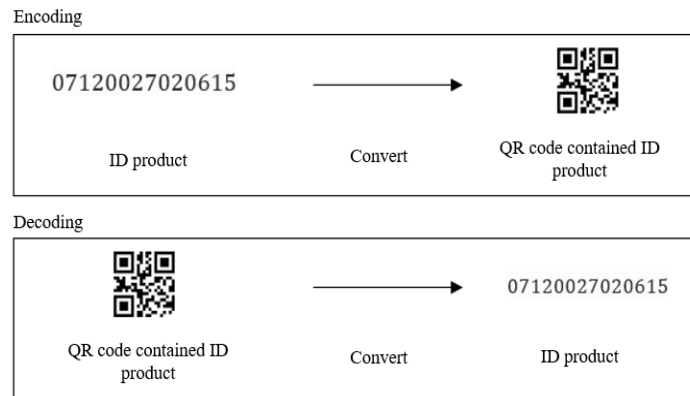
Fig. 3 Encoding and decoding ID product to QR code vice versa.

The QR code accommodates the product halal certificate number from the LPPOM, generated from the product halal certification recording system. Furthermore, the Android application will read the QR code to be read directly by the system without entering the number by the number on the certificate. After that, the number will be matched with the information in the product halal certification recording system. Further, the information found will be displayed on the android smartphone screen. The information displayed is the product's name, the product manufacturer, the status of the product's halal certification, and other information. The smartphone specifications used in this study can be seen in Table 1. The camera is needed for scanning QR codes.

Table 1 Smartphone specification

Hardware	Specification
Processor	Exynos 7870 Octa-core 1.6 GHz
RAM	3 GB
Internal Storage	32 GB
Android Version	9.0 Pie
Screen	720 x 1280 pixels, 16:9 ratio (~282 ppi density)
Battery	Li-Ion 3000 mAh, non-removable
Camera	13 MP

3. Results and discussion

In the first part of the system, the system has two main menus, namely the User Data and Product Data menus and a help menu, as shown in Figure 4. This menu is required to register users who are entitled to operate this system and also to register product data IDs or halal certificate IDs. Admin will register a list of users who can operate this system. Admin can also input product information with product ID or certificate ID. User data and product data will be stored in the database. Figure 5 and Figure 6 respectively show the display of the User Data menu and the Data product menu. This information is needed to make it easier for managers to manage or update information related to user data and product data.
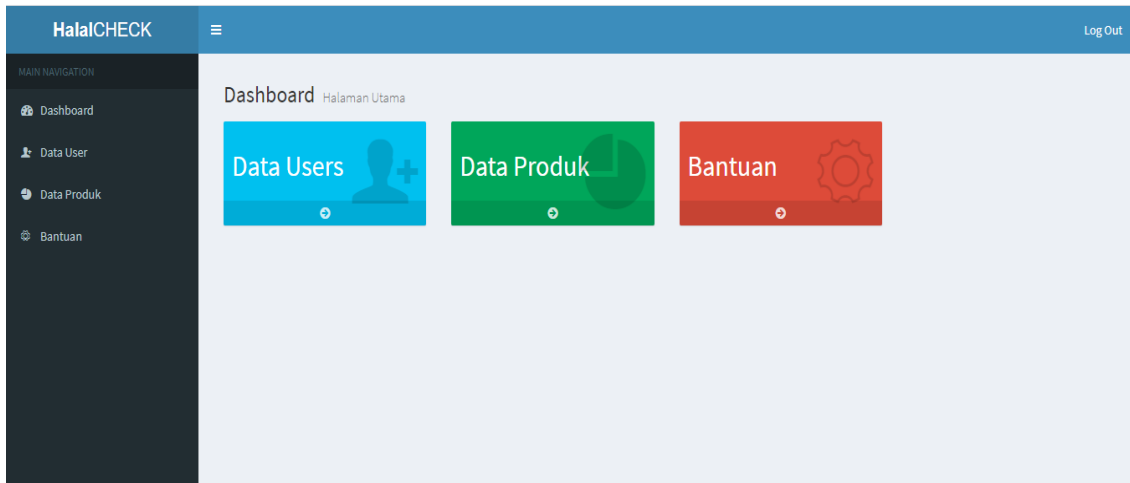
Fig. 4 Display of dashboard menu.
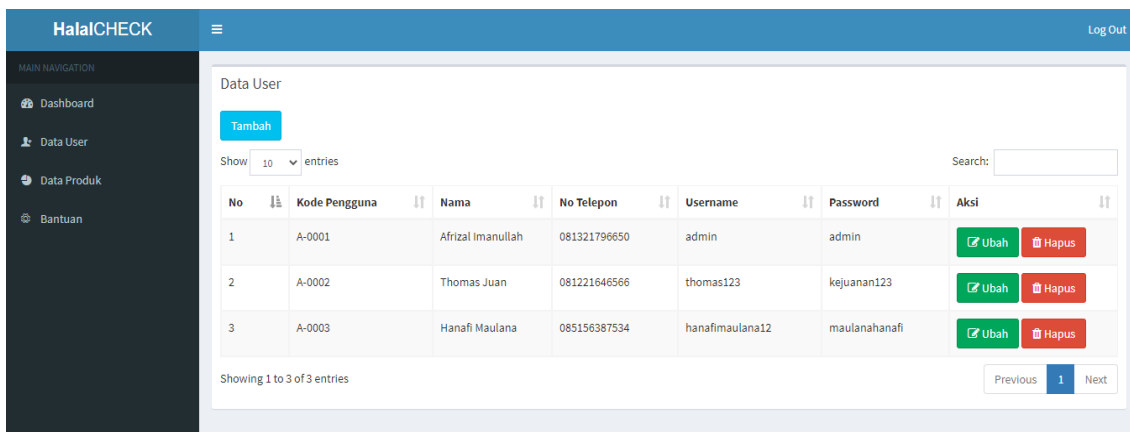
Fig. 5 Display of data user menu.
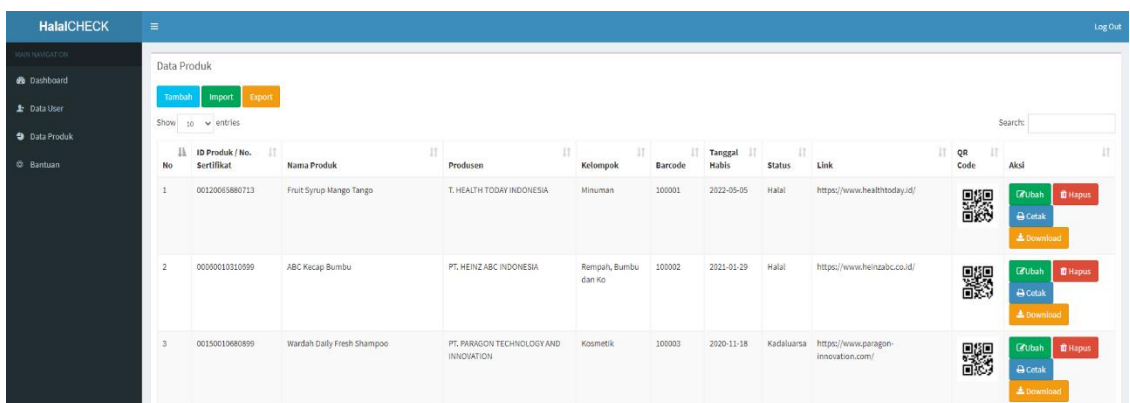
Fig. 6 Display of product data menu.

This study uses 100 product information data that have halal certification status sourced from the LPPOM MUI halal certification data attachment. The data is used to test the performance of the system that has been designed. Each product entered has a product ID or halal certificate ID. Then the ID number will be used as data in the QR code so that the QR code contains the product ID number. Fig. 7 shows the pieces of data used in the system. Android application testing is conducted by scanning several QR code sizes, namely 0.6x0.6cm2, 0.7x0.7cm2, 1x1cm, 1.5x1.5cm2 and 2x2cm2. The scanning is conducted at several different distances until the maximum scanning distance is known. The display of the android application can be seen in Fig.

8a. Fig. 8b shows an example of scanning a printed QR code, and Fig. 8c shows an example of product information from a scanned QR code.

id_produk	nama_produk	produksi	barcode ▲ ₁	tanggal_habis	status	kategori	link
00120065880713	Fruit Syrup Mango Tango	T. HEALTH TODAY INDONESIA	100001	2022-05-05	Halal	Minuman	www.healthtoday.id
00060010310699	ABC Kecap Bumbu	PT. HEINZ ABC INDONESIA	100002	2021-01-29	Halal	Rempah, Bumbu dan Ko	https://www.heinzabc.co.id/
00150010680899	Wardah Daily Fresh Shampoo	PT. PARAGON TECHNOLOGY AND INNOVATION	100003	2020-11-18	Kadaluarsa	Kosmetik	https://www.paragon-innovation.com/
00160103190320	Air Mineral Nestle Purelife	PT. ANIMO RESTO PRIMERA (MUJIGAE)	100004	2022-03-17	Halal	Minuman	https://www.mujigae.com/product
15200004420120	AIR MINERAL AQUA	PPBISMG DEPASTRY HOMEMADE	100006	2022-01-21	Halal	Minuman	
00250041070706	Delisia Strawberry Jam	PT Bintang Jaya Baharriski	100007	2020-09-04	Kadaluarsa	Selai dan Jelly	www.bintangjb.com
00250084330817	Strawberry Jam	Ltd Green Juice (Tianjin) Co.	100008	2021-09-17	Halal	Selai dan Jelly	
01011037630309	Rolade Ayam-Choice L	CV. Fiva Food & Meat Supply	100008	2021-05-28	Halal	Daging dan Produk Da	https://www.fivafood.com/
17010055420720	Dendeng Balado Uni Etty	Dendeng Balado Uni Etty	100009	2020-07-22	Kadaluarsa	Daging dan Produk Da	
00240082120417	Ektrak Nabati	CV. Ocean Fresh	100010	2021-03-31	Halal	Ekstrak	http://www.oceanfresh.id/
00290104620620	Joyday Coconut Salted Egg	Chomthana Co., Ltd	100011	2022-06-16	Halal	Es Krim dan Bahan Pe	http://www.chomthana.com/
00110064900413	White Chocolate, Chocolate Flavored Compound (Whit...	Barry Callebaut (Suzhou) Chocolate Co., Ltd.	100012	2022-06-09	Halal	Cokelat, Konfeksione	https://www.barry-callebaut.com/en
07120045200118	Caramel Syrup	PT. Delifru Utama Indonesia	100013	2022-06-18	Halal	Minuman	
00210062190812	Btp Campuran Pengemulsi (Tbm) "R&W"	CV. Karya Anugerah 1	100014	2022-07-21	Halal	Bakery Ingredient	http://www.karyaanugerahjaya.co.id/
00090016450701	Migelas Soto Ayam Protevit Dengan Potato Kres Kres	Dellifood Sentosa Corpindo, PT	100015	2022-05-05	Halal	Mi, Pasta dan Produk	
00330062360812	Super Bubur Kari Ayam	Dellifood Sentosa Corpindo, PT	100016	2022-06-02	Halal	Nasi dan Lauk Pauk	
00190071560115	Capsicum Oleoresin (Series)	Aafud Industry (Zhuhai) Co., Ltd	100017	2022-06-30	Halal	Tumbuhan Olahan	www.aafud.com/
00190104480620	Good Loop Herbal Exctracts	Ambitn Lifesciences	100018	2022-06-09	Halal	Tumbuhan Olahan	ambitn.in
05190014860518	Asinan Salak	Asinan Pku	100019	2022-06-29	Halal	Tumbuhan Olahan	
01191247660520	Portobello Sauce	CV. Berkah Food Lestari	100020	2022-05-12	Halal	Tumbuhan Olahan	
01191247880720	Ilmi Wijen Sangrai	CV. Srijaya	100021	2022-07-07	Halal	Tumbuhan Olahan	
00190103950520	Mix Dried Fruit	Dellifood Sentosa Corpindo, PT	100022	2022-05-12	Halal	Tumbuhan Olahan	
00190010450898	Hotei 107 Oz Canned Pineapple Choice Tidbits 6 In ...	PT Great Giant Pineapple	100023	2022-06-09	Halal	Tumbuhan Olahan	
00190084190817	Lemon Puree	Green Juice (Tianjin) Co., Ltd.	100024	2021-09-24	Halal	Tumbuhan Olahan	
00190104300620	Instant Black Tea Powder (Mbb802	Hangzhou Mingbao Bio-Tech Co., Ltd.	100025	2022-06-02	Halal	Tumbuhan Olahan	mingbao.en.alibaba.com
01121245011219	Teh Hitam Original Merk "Since 1906 Takokak Win's ...	Harmoni Nirwana Lestari, PT	100026	2021-12-04	Halal	Tumbuhan Olahan	arthagraha.net
01221043711009	Tepung Tapioka Cap Pempek Pa.lembang	CV Boga Jaya	100027	2022-07-07	Halal	Tepung, dan Produk T	bogajaya.co.id
00220079271016	Tapioka "Alco", Dekstrosa (Gula Donat) "R&W"	CV. Karya Anugerah 1	100028	2022-07-07	Halal	Tepung, Pati dan Produk Turunan	www.karyaanugerahjaya.co.id/
15220017181015	Premium Mutiara Tapioka Merah/Premium Red Tapioca ...	CV. Sinar Jaya Abadi	100029	2022-07-10	Halal	Tepung, Pati, dan Produk Turunan	cv-sinar-jaya-abadi.indonetwork.co.id/
15220050450520	Tepung Beras M272300	CV. Tizam Sejahtera Abadi	100030	2022-05-15	Halal	Tepung, Pati, dan Produk Turunan	

Fig. 7 List of data product information.

a	b	c
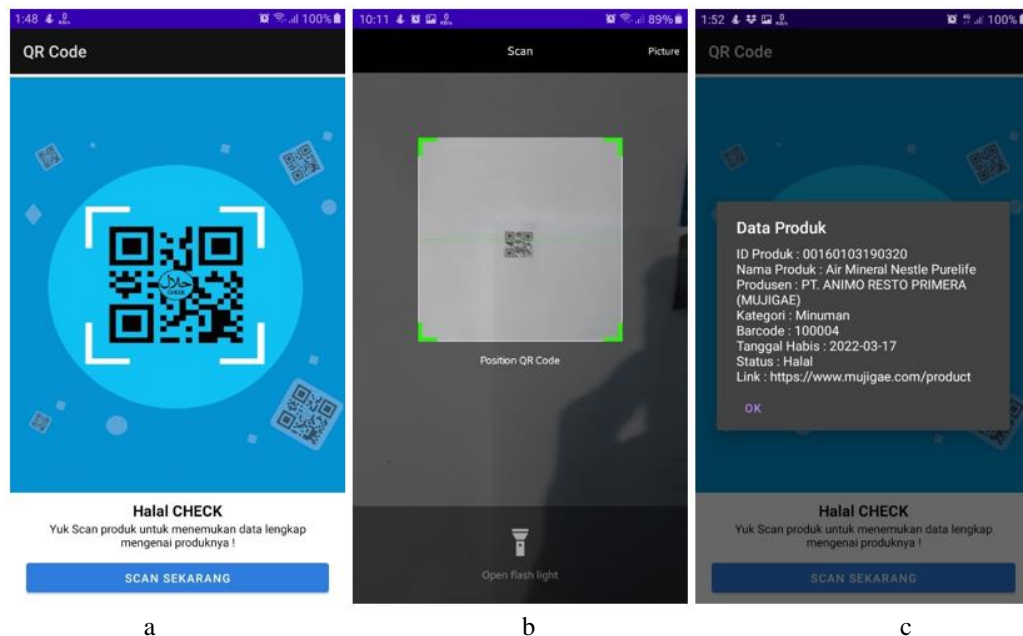
Fig. 8 Halal CHECK android application, (a) Main display, (b) QR code scanning, and (c) Information halal product.

Table 2 shows that the minimum size of QR code version 1 that the system can still scan is 0.6x0.6cm^2. The maximum reading distance for that size is 13cm. In addition, the maximum print size of the QR code version 1 in this study is 2x2cm^2. The longest distance for scanning that size is 95cm. This provides an option for the user to specify the print size of the QR code to be affixed to the product label. For small products, the smallest size can be chosen, namely 0.6x0.6cm^2. For large product sizes, users can print a QR code with a larger size to make it easier for the system to scan.

Table 2 Testing of maximum distance for scanning the QR code by different sizes

No	Size in cm²	Max. distance In centimetre	Result
1	0.6x0.6	13	[✓] success
2	0.7x0.7	26	[✓] success
3	1x1	34	[✓] success
4	1.5x1.5	59	[✓] success
5	2x2	95	[✓] success

Table 3 Testing of QR code reading example

No	Product ID	QR-Code	Result	No	Product ID	QR-Code	Result
1	00120065880713		[✓] success	13	00090016450701		[✓] success
2	00060010310699		[✓] success	14	00330062360812		[✓] success
3	00150010680899		[✓] success	15	00190071560115		[✓] success
4	00160103190320		[✓] success	16	00190104480620		[✓] success
5	152000044220120		[✓] success	17	05190014860518		[✓] success
6	00250041070706		[✓] success	18	01191247660520		[✓] success
7	00250084330817		[✓] success	19	01191247880720		[✓] success
8	01011037630309		[✓] success	20	00190103950520		[✓] success
9	17010055420720		[✓] success	21	00190010450898		[✓] success
10	00240082120417		[✓] success	22	00190084190817		[✓] success
11	00290104620620		[✓] success	23	00190104300620		[✓] success

The scanning tests using the android application were also conducted on 26 QR codes. The scanning distance is adjusted to the maximum distance as shown in Table 2. The results in Table 3 show that the scanning results have successfully displayed each product information correctly.

The results show that the system that has been designed can perform adequately. The use of QR code technology in this application system is expected to make it easier for consumers to find information on the halal status of products from the LPPOM MUI.

4. Conclusions

The system for checking the status of product halal using QR-Code on Android and Web-based has been built properly. Part one of the system has been built using PHP programming in web-based. It can store product data that have registered and have a halal certificate from the LPPOM MUI. In addition, it generates a unique QR code for that product ID with size 20x20 modules (QR code version 1). The QR code must be printed on the product label to easily check the validity of the product's halal status via the android application on the second part of the system. The second part of the system has been built using android studio. So, its application is run on android based. The apps can scan the QR code via a smartphone camera and connect to the server to get product information, including the validity period of the product's halal status and display it on the smartphone screen. The camera can scan the QR code until 13cm for the smallest size $0.6x0.6cm^2$. and until 95cm for size $2x2cm^2$. By this system, we hope consumers can quickly get information about the halal product status.

References

[1] M. I. A. M. Kashim *et al.*, "Principles regarding the use of Haram (Forbidden) sources in food processing: A critical Islamic analysis," *Asian Soc. Sci.*, vol. 11, no. 22, pp. 17–25, 2015, doi: 10.5539/ass.v11n22p17.

[2] A. Wibowo, W. Panpipat, S. R. Kim, and M. Chaijan, "Characteristics of Thai native beef slaughtered by traditional Halal method," *Walailak J. Sci. Technol.*, vol. 16, no. 7, pp. 443–453, 2019, doi: 10.48048/wjst.2019.4689.

[3] Z. A. Aghwan, A. U. Bello, A. A. Abubakar, J. C. Imlan, and A. Q. Sazili, "Efficient halal bleeding, animal handling, and welfare: A holistic approach for meat quality," *Meat Sci.*, vol. 121, pp. 420–428, 2016, doi: 10.1016/j.meatsci.2016.06.028.

[4] M. Mataragas, P. N. Skandamis, and E. H. Drosinos, "Risk profiles of pork and poultry meat and risk ratings of various pathogen/product combinations," *Int. J. Food Microbiol.*, vol. 126, no. 1–2, pp. 1–12, 2008, doi: 10.1016/j.ijfoodmicro.2008.05.014.

[5] N. Pavio, T. Merbah, and A. Thébault, "Frequent Hepatitis E Virus Contamination in Food Containing Raw Pork Liver, France," *Emerg. Infect. Dis.*, vol. 20, no. 11, pp. 1925–1927, 2014.

[6] V. N. Mathew, A. M. R. binti A. Abdullah, and S. N. binti M. Ismail, "Acceptance on Halal Food among Non-Muslim Consumers," *Procedia - Soc. Behav. Sci.*, vol. 121, pp. 262–271, 2014, doi: 10.1016/j.sbspro.2014.01.1127.

[7] M. W. Wibowo and F. S. Ahmad, "Non-Muslim Consumers' Halal Food Product Acceptance Model," *Procedia Econ. Financ.*, vol. 37, no. 16, pp. 276–283, 2016, doi: 10.1016/s2212-5671(16)30125-3.

[8] H. A. Tama and B. H. Voon, "Components of Customer Emotional Experience with Halal Food Establishments," *Procedia - Soc. Behav. Sci.*, vol. 121, no. September 2012, pp. 272–280, 2014, doi: 10.1016/j.sbspro.2014.01.1128.

[9] K. A. Umah and S. Herianingrum, "The Influence of Halal Label, Promotion and Price Toward Purchasing Decision on Over the Counter Medicine," *SSRN Electron. J.*, 2018, doi: 10.2139/ssrn.3122192.

[10] D. Maison, M. Marchlewska, D. Syarifah, R. A. Zein, and H. P. Purba, "Explicit versus implicit 'Halal' information: Influence of the halal label and the country-of-origin information on product perceptions in Indonesia," *Front. Psychol.*, vol. 9, no. MAR, pp. 1–7, 2018, doi: 10.3389/fpsyg.2018.00382.

[11] S. H. Yang, "Do traditional market consumers care about the halal meat label? A case study in Taiwan," *Int. Food Agribus. Manag. Rev.*, vol. 22, no. 5, pp. 781–794, 2019, doi: 10.22434/IFAMR2018.0102.

[12] S. Tiwari, "An introduction to QR code technology," in *Proceedings - 2016 15th International Conference on Information Technology, ICIT 2016*, 2017, vol. 1, pp. 39–44, doi: 10.1109/ICIT.2016.38.

[13] DENSO WAVE, "QR Code development story," *Denso Wave*. https://www.denso-wave.com/en/technology/vol1.html.

[14] L. Tarjan, I. Šenk, S. Tegeltija, S. Stankovski, and G. Ostojic, "A readability analysis for QR code application in a traceability system," *Comput. Electron. Agric.*, vol. 109, pp. 1–11, 2014, doi: 10.1016/j.compag.2014.08.015.

[15] Y. G. Kim and E. Woo, "Consumer acceptance of a quick response (QR) code for the food traceability system: Application of an extended technology acceptance model (TAM)," *Food Res. Int.*, vol. 85, pp. 266–272, 2016, doi: 10.1016/j.foodres.2016.05.002.

[16] S. Zhu and P. Tang, "The design and implementation of eggs' traceability system based on mobile QR code," *Adv. J. Food Sci. Technol.*, vol. 7, no. 2, pp. 99–101, 2015, doi: 10.19026/ajfst.7.1274.

[17] I. Albăstroiu and M. Felea, "Enhancing the shopping experience through QR codes: The perspective of the romanian users," *Amfiteatru Econ.*, vol. 17, no. 39, pp. 553–566, 2015.

[18] A. A. Mostafa, "The Effectiveness of Product Codes in Marketing," *Procedia - Soc. Behav. Sci.*, vol. 175, pp. 12–15, 2015, doi: 10.1016/j.sbspro.2015.01.1168.

[19] S. Demir, R. Kaynak, and K. A. Demir, "Usage Level and Future Intent of Use of Quick Response (QR) Codes for Mobile Marketing among College Students in Turkey," *Procedia - Soc. Behav. Sci.*, vol. 181, pp. 405–413, 2015, doi: 10.1016/j.sbspro.2015.04.903.

[20] S. Okazaki, A. Navarro, P. Mukherji, and K. Plangger, "The curious versus the overwhelmed: Factors influencing QR codes scan intention," *J. Bus. Res.*, vol. 99, no. November 2016, pp. 498–506, 2019, doi: 10.1016/j.jbusres.2017.09.034.

[21] S. Goyal, S. Yadav, and M. Mathuria, "Exploring concept of QR code and its benefits in digital education system," in *2016 International Conference on Advances in Computing, Communications and Informatics, ICACCI 2016*, 2016, pp. 1141–1147, doi: 10.1109/ICACCI.2016.7732198.

[22] S. N. Abdul Rabu, H. Hussin, and B. Bervell, "QR code utilization in a large classroom: Higher education students' initial perceptions," *Educ. Inf. Technol.*, vol. 24, no. 1, pp. 359–384, 2019, doi: 10.1007/s10639-018-9779-2.

[23] C. Upendra Reddy, D. L. S. Vara Prasad Reddy, N. Srinivasan, and J. Albert Mayan, "Bus Ticket System for Public Transport Using QR Code," *IOP Conf. Ser. Mater. Sci. Eng.*, vol. 590, no. 1, pp. 1–6, 2019, doi: 10.1088/1757-899X/590/1/012036.

[24] J. Lu, Z. Yang, W. Yuan, L. Li, C. C. Chang, and L. Li, "Multiple Schemes for Mobile Payment Authentication Using QR Code and Visual Cryptography," *Mob. Inf. Syst.*, vol. 2017, pp. 1–13, 2017, doi: 10.1155/2017/4356038.

[25] L. Y. Yan, G. W. H. Tan, X. M. Loh, J. J. Hew, and K. B. Ooi, "QR code and mobile payment: The disruptive forces in retail," *J. Retail. Consum. Serv.*, vol. 58, no. January 2020, p. 102300, 2021, doi: 10.1016/j.jretconser.2020.102300.

[26] L. Lou, Z. Tian, and J. Koh, "Tourist satisfaction enhancement using mobile QR code payment: An empirical investigation," *Sustain.*, vol. 9, no. 7, pp. 1–14, 2017, doi: 10.3390/su9071186.