

e-Commerce Stock Inventory via ScanCart: The Android Barcode Scanner

Sharifah Saon^{1*}, Abd Kadir Mahamad¹, and Muzammil Mudzakir¹

¹Faculty of Electrical and Electronic
Engineering,
Universiti Tun Hussein Onn Malaysia,
Batu Pahat, 86400, Johor,
MALAYSIA
sharifa@uthm.edu.my

1. Introduction

The usage of Android application was increased with the increment of smartphone per year, since user prefer internet to be one of the important infrastructure in their daily life. There are many applications for Android that has been released and some of them give great feedback in term of functionality and easy to used. Furthermore, it also very sustain in order to increase the productivity. Therefore, this is a great opportunity to create business based on mobile application. This project aims to develop an integrated Android barcode scanner with e-commerce system. This application allows user to scan a barcode and update quantity or create an order by using smartphone camera. Thus, the used of physical devices, were excessively reduced. Performances of developed Android application are evaluated based on survey by business and industrial partners.

Meanwhile, smartphone has become one of the most important electronic devices nowadays. With technology of internet has rapidly evolving, the functionality of the smartphone has become more convenience to the society due to lot of applications that may help people daily life such as surfing internet, messaging and also business management [1].

Online business is one of the electronic commerce (e commerce) that selling the goods or services. Several issues may cause delay in purchasing process, including separate or un-synchronising stocks quantities between online and retail, at the same time it's also cause the difficulty in monitor and update the sales. Therefore, motivation for this project is to develop interfacing application that support barcode scanner and may synchronize between physical stores (retail) and online for inventory purpose which can be monitored at any time, everywhere and real-time update.

This project involve several element which are E-commerce, Internet of Things (IoT) and also development of an application that compatible with Android operating system (OS) in order to connect the main website of database with barcode scanner of product to replace the existing barcode device [2].

2. Android Barcode Scanner for e-Commerce

Barcode is a machine readable representation of information in a visual format on a surface and it consist of printed parallel lines [3]. The development of barcode system was established a long time ago. It began with the design of the punch card system by Wallace Flint in 1890. However, the problems occur that the card reader equipment of the day was bulky and utterly unwieldy [4]. The first barcode system using glow under ultraviolet light was introduced by Bernard Silver in 1948 [5].

However, this system encountered problems which ranging from ink instability to printing costs. In 1970 Universal Product Code (UPC) has been widespread use of barcodes because it developed by the user community and continued by European Article Numbering System (EAN), and widely use today [6]. Meanwhile, in 2006, Wang and his colleges discovered 1D barcode reading using camera phones [3].

There are plenty types of barcode for 1D such as European Article Numbering (EAN-13) [7], International Standard Book Number (ISBN-Code) [8] and Universal Product Code (UPC) [6]. This work will be focusing on EAN-13 because it consists of numbers and support worldwide retail product marking. Figure 1 shows a typical EAN-13 Barcode.



Fig. 1 - EAN-13 Barcode [7]

In order to realised this idea, Android barcode scanner was integrated with other features of e-commerce system equipped with database and was connected via My Structure Query Language (MySQL). Open source e-commerce is a free of charge platform that can be installed in self-hosted. This type of e-commerce can be downloaded for free and user can easily access and redesign or modify the source code with help of community to understand the fundamental of the system. This system also provides wide variety of available extensions and it was a flexible system.

Meanwhile, data was logged into a database that arranged in table and structured. There are several others meaning of database, according to Silberchatz et. al. [9] the database is a set of data contains information on an entity, while Powell [10], described the database as an implementation or creation of physical data on a computer. However, Sumathi [11] interpret database as a collection of data that relate to and have a certain meaning which is stored properly and can be accessed in various ways and sequences.

There are three type of database tier; which are (1) First-Tier; developed for client that perform the task or services and it contain user interface and presentation services, (2) Second-Tier; a part for application server which contains the presentation code and the SQL statements for data access, while the (3) Third-Tier; data server that store the database. In general it can be concluded that all data stored either directly or indirectly depend on type of field. Thus, this work focusing on Multiple-Tier Architecture database which can provide the most benefits in terms of scalability, interoperability and flexibility.

3. A Framework of System Development

Figure 2 shows the project block diagram consist of barcode EAN-13 and Samsung Galaxy S4 mobile was used to scan the barcode. Internet connection was required in order to connect between Android application and server database via API. The website was designed using Opencart E-commerce, in order to set the product information and barcode EAN-13. Meanwhile, server database was used to store data information.

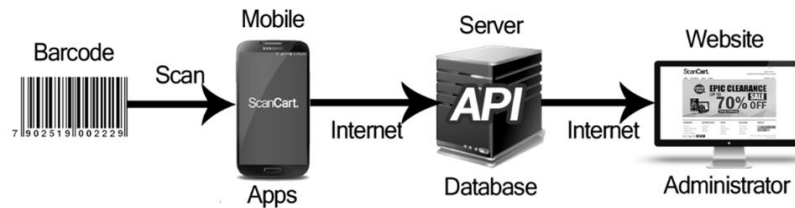


Fig. 2 - Project Block Diagram

In this work, Android barcode scanner application was designed using Android Studio, as shown in flowchart as in Figure 3. Once the application started, the start screen with ScanCart logo was popup. Thus, the login page with credentials field has been displayed on screen. All credentials are required, or else system will display wrong password, username or domain. Moreover this system work best with internet connection, otherwise the no internet connection information will be displayed.

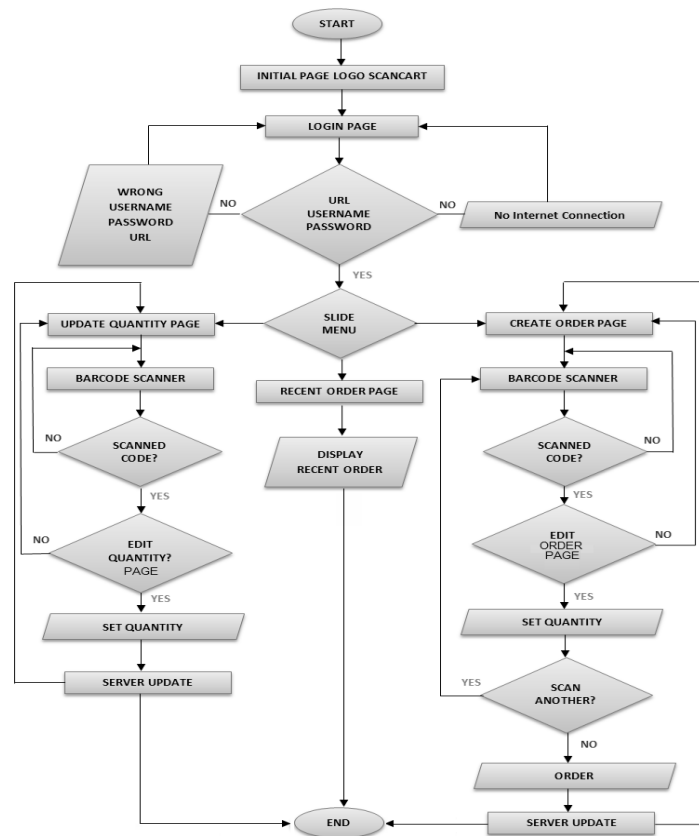


Fig. 3 - Flowchart of Android Barcode Scanner

4. Results and Discussion

ScanCart is a brand named for this application, comes with three features which are updating quantity, create order, and recent orders. Updating quantity is the main feature while create order and recent order are an additional features. Internet connection is required to ensure system can be operated, due to the data is stored in server database. User credentials can be create by the administrator of the website backend. Figure 4 shows the developed of initial start-up application, login page and main menu.



Fig. 4 - (a) Initial start-up application; (b) login page and; (c) main menu

Update quantity page is very crucial in order to show the current quantities and it also can be used to add or deduct the quantity from the database. By using the barcode scanner, EAN-13 Code format was scanned, and the information of barcode been stored in the database to retrieve and edit the quantity value. The step-by-step process flow is shown as in Figure 5, which are; (a) ScanCart application page, (b) Android barcode scanner application to scan the barcode, (c) key in the quantity of order, (d) by clicking the OK button, order are added to the chart, (e) chart view of order, and (f) order was successfully recorded.

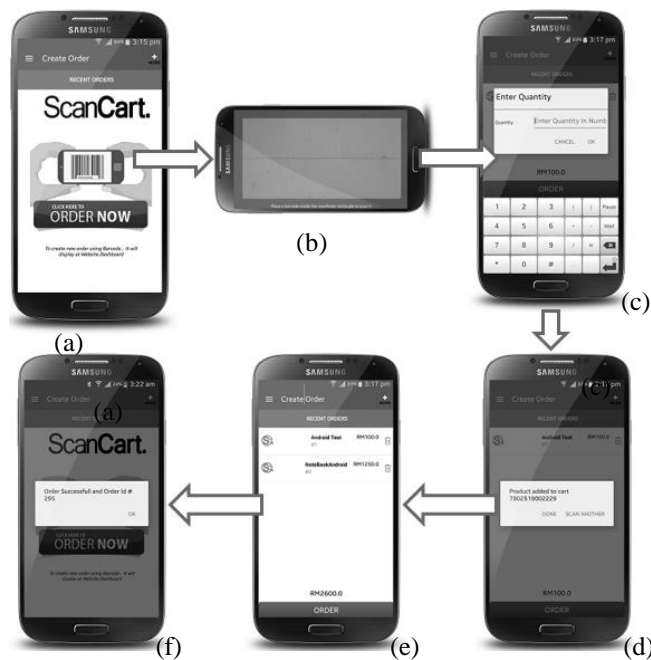


Fig. 5 - Step-by-Step of Order Process

The performance of Android application has been tested using Samsung S4 with Android Lollipop (5.0.1) OS, and Nexus 5 with Android Marshmallow (6.0.1) OS. All performance test was done by running the application operation for approximately three hours. The test are consist of battery consumption, RAM/ROM usage, data usage and connectivity between Android application and server. The result of this test showed that the performances of this application is in good condition with great battery consumption and minimal RAM and ROM usage. Table 1 summaries the performance comparison between this two devices.

Table 1 - Comparison Galaxy S4 and Nexus 5 for application performance

| Samsung Galaxy S4 | | | | Nexus 5 | | | |
|-------------------|----------|---------|--------|----------|----------|---------|-------|
| RAM | ROM | Battery | Data | RAM | ROM | Battery | Data |
| 27.40 MB | 13.77 MB | 0.2 % | 341 KB | 31.99 MB | 14.55 MB | 0.3 % | 60 KB |

This system successful connected and communicated with website backend, website frontend and database. Frontend was designed using minimalist due to market demand for E-commerce. Figure 6 show the frontend page of website that consists of slideshow, wording and icons.



Fig. 6 - Frontend Website

While, Figure 7 shows the category section for product that has been selected as category 'Baru'. The minimalist website is the best as it helps customer to understand the concept of the webpage. The backend website is used purposely for administrator to manage the system. This backend consist of user administrator account, sales, statistics, track customer information, product information, customize the structure of the web and manage payment, as in Figure 8.

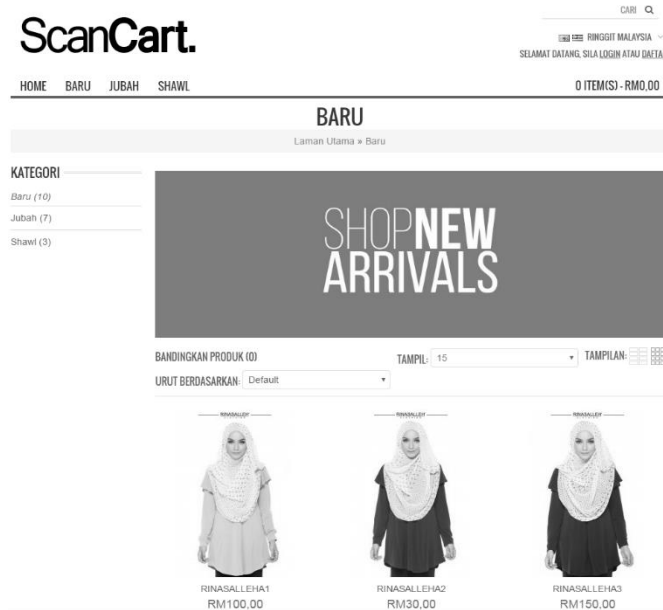


Fig. 7 - Category Section

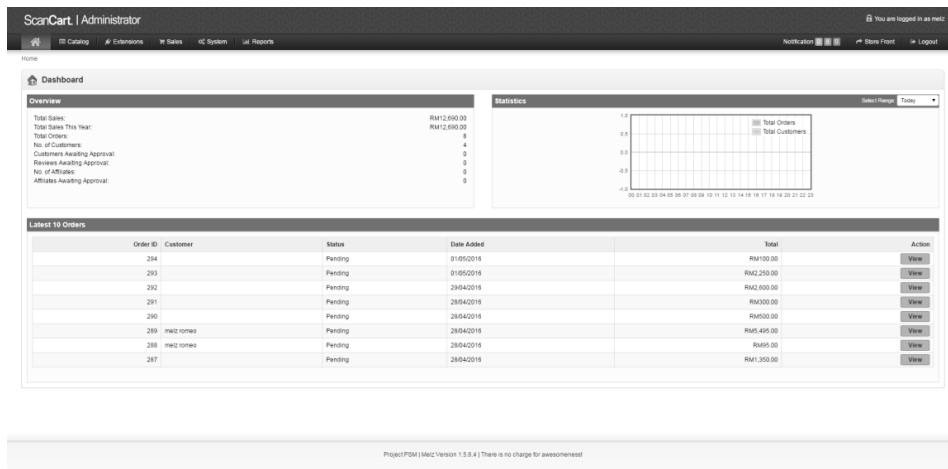


Fig. 8 - Backend Page

The database are visualized by using phpMyAdmin. This user interface display the table of database that has been created at website backend. Figure 9 shows the registered content for database table of product.

Another important factor in order to improve the quality of product or businesses, is the user and customer feedbacks. Therefore, three main points of feedback have been assessed which are design and user interface, system functionality and satisfaction. The respondent feedbacks are summaries as in Table 2. Based on the feedback analysis, the developed system is consider meet the user and customer requirement, with positive recommendation for features improvement.

| ← T → | product_id | model | ean | quantity | price |
|---|------------|--------------|---------------|----------|----------|
| <input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete | 70 | Naerlofa2 | 9556135152165 | 15 | 95.0000 |
| <input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete | 71 | Naerlofa03 | 2356135152328 | 99 | 90.0000 |
| <input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete | 58 | RinasallehA1 | 7902519002229 | 150 | 100.0000 |
| <input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete | 59 | RINA3 | 8902519009784 | 27 | 150.0000 |
| <input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete | 60 | 12345 | 1234567891023 | 22 | 111.0000 |
| <input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete | 61 | RINA2 | 5287039873026 | 29 | 30.0000 |
| <input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete | 62 | RinasallehA6 | 9876543210128 | 50 | 30.0000 |
| <input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete | 67 | BotolDesa | 9556135185002 | 25 | 2.0000 |
| <input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete | 69 | Naelofar01 | 9556135132525 | 115 | 90.0000 |
| <input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete | 53 | 1234 | 3702519002229 | 50 | 22.0000 |
| <input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete | 54 | ABCFGH | 9550631080816 | 100 | 99.0000 |
| <input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete | 55 | 45454 | 2902519002224 | 40 | 69.0000 |
| <input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete | 56 | 232232 | 5944519002221 | 25 | 35.0000 |
| <input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete | 57 | 12345 | 1902519002225 | 20 | 22.0000 |
| <input type="checkbox"/> Edit <input type="checkbox"/> Copy <input type="checkbox"/> Delete | 52 | ABC123 | 8302519002226 | 49 | 180.0000 |

Fig. 9 - Database Table view

Table 2 - User and Customer Feedback in Percentage (%)

| Criteria | Good (5) | Above Average (4) | Average (3) | Below Average (2) | Poor (1) |
|----------------------|-------------|-------------------------|----------------|-------------------------|-------------|
| Installation Process | 17 | 50 | 33 | 0 | 0 |
| User Friendly | 41 | 35 | 24 | 0 | 0 |
| Design Features | 37 | 38 | 25 | 0 | 0 |
| System Performance | 55 | 36 | 9 | 0 | 0 |
| System productivity | 50 | 30 | 20 | 0 | 0 |

5. Conclusion

As a conclusion, this ScanCart, integrated Android barcode scanner with E-commerce system and database was successfully tested and verified by entrepreneurs, founder and industry; which are Rinasalleh boutique founder and their co-founder, BellamAmmara, Hijriahome and CloudHouze founder, Manager from Koperasi University Tun Hussein Onn Malaysia (UTHM) and Melaka ICT Holding Sdn. Bhd. (MICTH) with positive results in term of functionality, feedback, and integration.

Based on survey feedback and comment, we believed, this system are useful for Small-Medium Enterprise (SME) to enhance their productivity and update their stock inventory easily. Hopefully, this system is able to be upgrade and commercialize in future.

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