

CHAPTER II LITERATURE REVIEW

2.1 Literature Review

(Ogbo & Ukpere, 2014) in their research entitled “The Impact of Effective Inventory Control Management on Organisational Performance: A Study of 7up of Bottling Company Nile Mile Enugu, Nigeria”, concluded maintain flexible inventory service aims to achieve optimal use of resources, cost reduction, increasing profitability, improve sales, transparency and accountability, easy storage and retrieval of stock.

Quoted from (Tsao & Tu, 2017) in their research of “Presentation of QR Code on Product Packages: Information Content from the Perspective of Cognitive Fit Theory”, including QR Codes on product packaging as a source of product-related information proves to be effective in helping consumers to obtain product information at any time and any place by leveraging internet technology, thereby facilitating purchase decisions.

Amrutkar, et al (2017) in their research of QR Code based Stock Management System concluded the development of the application provides accurate and easiness in retrieving informations in which leads to enhance efficiency and effectiveness of organization by reducing the amount of work employees need to apply. Writing information in tag for each items, asking personally to owners regarding price, calculating total price are not necessary after implements the application. The entire process of the system reduces the possibility in human errors and time consuming for each transaction as the employee is only

required to scan the barcode attached to get further informations of the seeking product.

Research by Bhagat, et al (2017) entitled “E-Restaurant Android Application Using Near Field Communication”, explained about how to implements a low-cost solution to increase customer satisfaction. Other benefit after implementing Android application is reducing large human resources which common leads to human errors while taking orders, resulting a greater time consuming. It is also stated the advancement in food ordering enhances one in restaurant business competition. They conclude by exploiting the advancement of mobile platform technology, have been successfully delivered high features of services and great solutions to restaurant industries.

Research about “Implementation of an Inventory Control System for a Computer Center Using QR Codes on Android Mobile Devices” by Castro, Martinez, et al (2017) results optimizing search time of articles and boosts the efficiency in inventorying the computer center. The QR Code itself is capable to store lots of informations required by the users, such as web pages URL, further informations of products, link to download application to be used by other end-users and etc. One of tools in developing the application above is ZXing (Zebra Crossing), an open library to encode or decode QR Codes with capability of auto focus in camera itself which will be implemented in this research as well.

In Table 1 displays the researches’ comparison against project that is going to be developed.

Table 1 Literature Review

<i>Authors</i>	<i>Title</i>	<i>Conclusion</i>
Ogbo, et al (2014)	The Impact of Effective Inventory Control Management on Organisational Performance: A Study of 7up of Bottling Compnay Nile Mile Enugu, Nigeria	By maintaining flexible inventory service aims to achieve optimal use of resources, cost reduction, increasing profitability, improve sales, transparency and accountability, easy storage and retrieval of stock.
Tu & Tsao (2017)	Presentation of QR Code on Product Packages: Information Content from the Perspective of Cognitive Fit Theory	QR Codes on product packaging as a source of product-related information proves to be effective in helping consumers to obtain product information at any time and any place by leveraging internet technology
Bhagat, et al (2017)	E-Restaurant Android Application Using Near Field Communication	The implementation of Android application successfully delivers high features of services, great solutions and able to compete with other restaurant business industries.
Amrutkar, et al (2017)	QR Code based Stock Management System	The development of mobile-platform application facilitates accurate and easiness in retrieving information in which leads to enhance efficiency and effectiveness of organization. All manual transactions are able to minimalize and reduce common human errors and time required to entry data transactions.

<i>Authors</i>	<i>Title</i>	<i>Conclusion</i>
Castro, et al (2017)	Implementation of an Inventory Control System for a Computer Center Using QR Codes on Android Mobile Devices	The application facilitates faster search time of articles and boosts the efficiency in inventorying the computer center with the help of QR Codes, capable in storing many information with different type of characters. In this research, ZXing library is being used as one of tools in developing the application.

Hence, author will develop a flexible inventory service which in this research, Android Application whereas reducing manual transactions that are being done by PT Bingas Manufacturing. The Android application will be built with two types of dimensional codes which are 1D Code (Barcode) and 2D Code (QR Code).

To retrieve the data encoded, the app uses ZXing library as being used in previous research by Castro, et al (2017). The implementation of two types of codes are requested by company itself with the reasoning of HSE policy and ISO standardizations.

2.2 Theoretical Basis

2.2.1 Information System

Information is an important element that running the operation of department and usually managed and arranged by system while system itself is a group of elements that are organized for common purposes (Mohammed & Hu, 2015). Information system is a total of elements or components to generate an effective information with purpose in enhancing productions, human-resources, managements and decision-making.

An information system which has integrated business processes into enterprise business logic, is one of dominant components that has increased business performances in dealing with any circumstances either external or internal a company has to withstand routinely or a continuing decision making (Lipaj & Davidavičienė, 2013).

Case study of information system in industry in the aspect of decision making, stated the result provides from decision making can contribute to assist the development of improvement programs that allows one to obtain better results in the future in which improve customers satisfaction (de Freitas, Martin, & Roman, 2017).

2.2.2 QR Codes

QR Code (Quick Response Code) is a matrix barcode or two-dimensional barcode, capable to store informations about item in four different types of characters, such as numeric, alphanumeric, binary/byte and kanji (Pal & Jha, 2017).

Due to its fast readability and storage to store informations, barcode has become popular and has been implanted by lots of businesses and industries, including advertising, entertainment and ticketing, code payments, website login and etc (Ozkeskin, 2016).

One of the most trending type of applications in implementing QR Code is mobile payment applications, in this case *Paytm*. It provides QR Code scan experience for decoding, enables user to read any messages, browse any website link, pay for purchase and browse products of merchant without having to install another QR Code app (Singh, 2016).

2.2.3 Android

Android is a platform for smart devices based on Linux kernel refined by Google, an open source software and is primarily in use for mobile devices with touch-screen features. Since Android is an open source software, updates day by day always occurs since its release due to fixing bugs and adding features with aim of providing comfortable user interface (Kirthika et al, 2015).

Advantages being provided by android itself are open-source – enables third-party for further developments and maximum the usage of each modules and functionalities, multi-tasking, flexible and can be virtualized – enables multiple operating systems to run simultaneously (Mohmedhussen, 2017).

Due to its benefits, it is stated in the research conducted in February 2015, the usage of Android has been increasing to 56%, compared to previous research in 2012, 53,6% in global market (Sharma, Kumar Dak, & Acharya, 2017).

2.2.4 Entity Relationship Diagram (ERD)

Entity Relationship Diagram is a set of entities where each of entity is described and interacted with each in a diagram. Entity Relationship Diagram also can be defined as an abstract and conceptual of data representation. Entity relationship is a method of database model use to provide conceptual schema for semantics data, where typically have relational database. While diagram is to view or draw Entity Relationship diagram called Entity Relationship Diagram or ER Diagram or ERD (Al-Masree, 2015).

ERD is a basic approach designed in a graphical way to select which database attributes like tables, fields and relation between tables will be the base of the

database. ERD not only provides a modeling features but also it is the starting point of a safe and high quality database design with all of its well defined semantics which hto be considered easy to understand for each of users, managers, analysts and database designers (Abdel-Salam Al-Btoush, 2015).

2.2.5 Unified Modelling Language (UML)

Definition quoted from Ogedebe & Silas (2015) about UML, one of accepted industrial language in expounding requirements, creates an analysis with design and illustrates programming architecture in object oriented programming.

While taken from Makkar & Sikka (2017), unified modelling language is a standard procedure in notation and construction model in which advance in specific way in the development of object oriented programming defined by Object Management Group, which is a group of expert in UML advancement.

UML is used to explain the data flow of a software, to portrait the structure in the system, to document and build up – it is an expression that mocks up the blueprint. UML itself is used in several of handling to support analyzing software development.

Various patterns of UML which are:

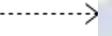
1. Use Case Diagram

According to Ogedebe & Silas (2015), use case diagram is a representation of sequence of transactions executed by actors from external. Use case diagram is often used by analysts with the reasons of its simplicity to understand, helps in defining the boundaries of the system and is useful for

communicating current system knowledge to the users (Aleryani, 2016).

Several symbols in use case diagram are shown below (Refer Table 2).

Table 2 Symbols in Use Case Diagram

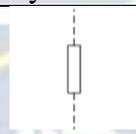
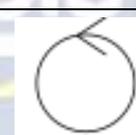
No	Symbols	Name	Description
1		Actor	Specify acts of actor in interacting with use case
2		Dependency	Relation of modification in which if dependency element is altered, then will also change the value of independent element
3		Generalization	Relation of in which descendent share function or behavior from the upper level of element (ancestor)
4		Include	Specify the source of use case explicitly
5		Extend	Identify use case target in which cover the source of use case
6		Association	Identify relation of object with another
7		System	Specify packet which display system boundary
8		Use Case	List of action in which returning value to the actor
9		Collaboration	collaboration between procedures and elements in providing bigger function or behavior
10		Note	Physical element that exist when compile, use to describe elements

2. Sequence Diagram

Kumar & Singh (2015) define Sequence Diagram as a diagram in describing interaction between objects, sort by the occurrence of each interaction.

Effortless, sequence diagram is a design of explaining interaction step by step, that should be done by one in a logic way. Several symbols in sequence diagram are shown in Table 3.

Table 3 Symbols in Sequence Diagram

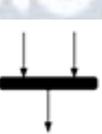
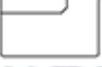
No	Symbol	Name	Description
1		Life Line	Entity of object, interaction between interfaces
2		Actor	Specify user
3		Message	Specify message of object happens in each occurrence of transactions
4		Boundary	Specify form
5		Control Class	Create connection between boundary and database table
6		Entity Class	Describe activity which to be occurred

3. Activity Diagram

Ogedebe & Silas (2015) define activity diagram is a diagram which concern with activities and actions that drives event or object from one to another

state. Activity diagram views all important steps carried out during execution of a single activity (Kumar & Singh, 2015). Several symbols in activity diagram are shown in Table 4.

Table 4 Symbols in Activity Diagram

No	Symbol	Name	Description
1		Start	Represents the beginning of the process or workflow in an activity diagram.
2		Activity	Indicates the activities that make up a modeled process and the main component of an activity diagram.
3		Connector	Arrow line that shows the directional flow / control flow of the activity.
4		Join (synchronization bar)	Combines two concurrent activities and re-introduces them to a flow where only one activity occurs at a time and can be represented vertically or horizontally.
5		Decision	Represents the branching or merging of various flows with the symbol acting as a frame or container.
6		Note	Allows the diagram creators or collaborators to communicate additional messages that don't fit within the diagram itself.
7		Receive signal	Demonstrates the acceptance of an event.
7		Send signal	A signal is being sent to a receiving activity, as seen above.
9		Option loop	Used for modeling a repetitive sequence within the option loop symbol.

No	Symbol	Name	Description
10		Flow final	Shows the ending point of a process' flow.
11		End	Represents the completion of a process or workflow.

2.3 Development Tools

2.3.1 Android Studio

Android studio is announced in 2013 at Googel I/O conference as an officially integrated development environment for development of Android platform (Rojatkar, Jengathe, Khairnar, & Lengure, 2016). New features are introduces widely with each announcement and still available in up-to-now version, such as:

- a) Gradle-based build support,
- b) Built-in debugger, enabling developer to refactoring codes script and quick fixed in bug spotting,
- c) Fast and rich-feature layout editor, enabling developer to easily drag-and-drop components to specific layout,
- d) Integrating with support of Google Cloud Platform, enabling developing messaging apps in an instant.

2.3.2 Javascript Object Notation (JSON)

JavaScript Object Notation or JSON is one of widely used format for communication among software applications and devices. The reason JSON are

often used for exchanging information among various applications / devices is its size and interoperability (Padda & Gupta, 2016).

2.3.3 Java

OAK, the very first-release name before Java, was developed at Sun Microsystems. Code syntax of Java is kept simple by limiting data types with high complexity such as operator overloading; however its syntax itself is being modified in every major JDK announcements with purpose improving Java language. It is designed to enable developers to compile Java code to run in every platforms, omitting recompilations in each different platforms. Regarding speed, Java is a little slower since it waits the program to run to machine code until run time, with results high performance without disrupts the run-time (Fatima, 2016).

2.3.4 Hypertext Pre-Processor (PHP)

Hypertext Pre-Processor or being well-known with the name of PHP, is a server side scripting language, basically formed for generating dynamic pages. It is widely used as scripting language in generic objectives, able to contain HTML with embedded code ready to be executed in client side without being spotted the underlying codes and can be transformed by a web server which integrates with PHP processor module in generating the web pages (Adebukola & Kazeem, 2014).

2.3.5 MySQL

Every web application, available in stores, starts with simple to complex applications, requires a database for storing data collections. It's widely used, related with web applications, as an open-source database server and can be used to call desired information, continue by returning the available information itself by

querying on the server side (Walia & Gill, 2014). MySQL ables to save bits of information in differents available tables and relates those tables in one. Each bit of information is represented by separate fields in specific table.

2.4 Testing Methodologies

These are following methodologies fir software testing (Chaudhary, 2017):

1.4.1 White Box Testing

In this testing, internal contents and architects of sytem or software is pointed out. Hence, it is exceedingly proficient in recognizing and fixing issues, because breakdowns or system's flaws can be spotted even before they are discovered generating further causes. It is an approach for spotting breakdowns in which the analyzer has complete insight of how the software elements work and communicate.

2.4.2 Black Box Testing

A black box method is used when internal details and working are not understood or accessibility is not granted to its user. The main aim of this test is to check how well the software goes with the specified requirements.

2.4.3 Gray Box Testing

It is a testing method used when the analyzer has some knowledge over the internal working of the system and its underlying code.