The development of information system for garments industry using the android platform

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Abstract. Nowadays, almost all cellphones are connected to internet and they are referred to as smartphones. Smartphones can be utilized by the garment industry to assist monitoring the production and financial management processes. The purpose of this study is to develop an Android-based mobile application in the "X" garment industry which is integrated with the existing web-based information systems. The application was developed using the Rapid Application Development (RAD) software development method. The program code for the mobile application was created using Android Studio 3 and database access (MySQL DBMS) on the server via Web Service (REST API). Application evaluation was done by two methods, namely System Usability Scaling (SUS) and Black Box Test. The Black Box Test results showed that all application functions were running appropriately, and value of the System Usability Scaling (SUS) test was 83.5. This indicates that the application is feasible to be implemented in the "X" garment industry.

1. Introduction
In this era, almost all industries have utilized computer technology as a tool in managing their companies. The use of computers in the industrial sector has been practiced for years by developed countries to control the production process and financial information systems. However, most of the application of information systems in the industry is still limited to the area of local networks.

The globalization era posts some challenges including the increasing level of competition; thus, access to information in local networks is not sufficient. There is a need to build an application for wireless devices that can be used to access information through the internet network.

Information technology especially the internet has brought a rapid impact in all areas of people’s lives, as well as in the business competition. The internet is a computer network that can provide information faster and more efficiently to the public. Nowadays, internet technology has been embedded in various hardware devices such as cellphones which are referred to as smartphones. Smartphones are mobile phones with enhanced computing abilities and interactivity.

Smartphones have played a pivotal role in almost every aspects of human life. Smartphones have an impact on important fields such as business, education, health and social life [1]. Smartphones are not only used as a communication media but also as a media to access data such as websites, e-mail, sending pictures and videos. The rapid development of telecommunications and computer technology
makes smartphones an important tool for communication, entertainment and business. In other words, smartphones provide many benefits in the lives of modern society.

One of the Operating Systems (OS) on smartphones which is growing rapidly and the most widely used today is Android. Android operating system becomes one of the most important smartphones platforms with its openness and good portability. According to the IDC website, in 2018 Android holds a market share of 85.1%. The share is far ahead of its rival iOS (14.9%) and it is predicted to remain superior until 2023 [2]. Many people are interested in using Android, ranging from children to adults. This is due to the increasing number of applications and games offered on Android.

Access to information in the shortest possible time is considered as something very crucial for smartphone users. The mobile application on the Android platform allows users to increase work productivity by completing work from wherever they are [3]. This condition continuously encourages the development of smartphone applications that provide benefits to the community.

The internet has been widely used by the Small and Medium Enterprises (SMEs). The garment industry ‘X’ as the place in which this research is carried out has a web-based information system. The information system is used to handle purchases, management of production and inventory processes, and financial management. However, referring to the recent vast development of information technology, a mobile application needs to be developed in order to monitor the production process and financial management of the company. This study aims to create an android-based mobile application that is integrated with existing web-based information systems. This mobile application is expected to assist garment industry managers in decision making process.

2. Methodology

This application is designed using Rapid Application Development (RAD) software development method. RAD is useful in developing applications whose requirements are reasonably stable and well understood [4]. RAD enables the development of applications that are fast and safe, and can increase user satisfaction [5]. RAD has four phases: requirements planning, user design, construction, and cutover, as shown in Figure 1.

![Figure 1. The four phases of the RAD](image)

2.1 Requirements planning phase

Identification was carried out at this stage to obtain information from users about requirements in application development. This phase involved meetings with the garment industry management to determine the purpose and scope of work, and discuss potential problems needed to be addressed during application development. There were three basic things done at this stage, namely the problem’s formulation, determining requirements for application development, and final agreement on
requirements with the approval of the company’s management. The results of this stage were used as a basis for the system design.

2.2 User design phase
User design is a process of developing models and prototypes. During this stage, users were involved to ensure the system’s working model met the company’s expectations. The process involving prototype design, testing by users, and communicating the achieved results was done repeatedly. Design modeling and application structure was built using the Unified Modeling Language (UML). UML contains standard diagram to define, illustrate, and map visually or model the design and structure of software systems [6]. UML can shorten the gap between software design and implementation and the complexity of the development of the mobile application [7]. UML is illustrated in the form of a use case diagram. A use case diagrams visually represents an interaction between users and the information system [8].

The application developed in this study has several functions which are described by the use case diagram as shown in Figure 2.

![Diagram use case](image.png)

**Figure 2.** Diagram use case

2.3 Construction phase
The Construction Phase involved the final revision of the prototype developed in the previous phase. This stage focused on programming and application development. The coding was created using Android Studio.
2.4 Cutover phase
At this stage, an evaluation was carried out to determine the reliability of the application. System Usability Scaling (SUS) is used to test the usability of the application [9] and Black Box Test is used to test its functionality.

3. System Architecture
The garment industry has an information system to handle purchases, production process management, inventory management, sales and marketing, payroll and wage systems, and financial report. This information system is web-based system using a MySQL database. The Android-based mobile application is developed with the purpose to assist company management in the process of assessing mobile information about production orders, inventory of raw materials and products, and financial reports. This information is accessed through smartphone and it can help managers to make decisions in order to improve their performance and productivity.

The system architecture can be seen in Figure 3. Data is stored in a MySQL database. The mobile application accesses the database (MySQL DBMS) on the hosting server through the Web Service. Web Service is a service based on XML and HTTP, its communication protocol is SOAP and the service is described by Web Service Definition Language (WSDL) [10]. The existence of a Web Service enables data communication between different application platforms [11,12]. There are two methods for implementing Web Service with the SOAP protocol and the REST (Representational State Transfer) architecture. The use of the REST method is better than SOAP for the implementation of Web Service [13], especially in terms of latency, bandwidth usage and overall system durability [14].

![System Architecture Diagram]

**Figure 3. System Architecture**

Web Service in this study was made using CodeIgniter. Codeigniter enables faster software development [15] and can be adapted to previously developed research to maintain consistency. In Codeigniter there is a REST Server library that is used to develop the REST API. The library works by reading data in the database, turning it into JSON. Data access is done using HTTP protocol, such as GET to read data, POST to add data, PUT to update data, and DELETE to delete data.
The Android application reads JSON data generated by the Web Service using the GET method as shown in Figure 4.

The process of sending data from the application is carried out by the POST method which can be seen in Figure 5. Data inputted by the user is changed to JSON format, then it is sent from the application to be mapped and saved to the database.

4. Result

4.1 System Implementation.
The coding of this android application was created in Android Studio. Some of pages of this android application can be seen in Figure 6.
4.1.1. Login Page. This page is used to check permission to use the application. If the user has the access, the user is directed to the main page. In order to use this application for the first time, the web service address must be first filled in via Settings link.

4.1.2. Main Page. This main page consists of a menu that is owned by Android applications, including: Production order, inventory, accounting, financial statements, change password, and logout.

4.1.3. Production Order Page. This page displays a list of current production orders. The order list contains information including order id, date order, customer name and address, and production progress.
4.1.4. Inventory Page. There are two inventories, namely material inventory and product inventory. The user selects one inventory to display. The inventory list will display information about the code, the name of the material/product, and the amount of available stock.

4.1.5. Financial Statements Page. Financial statements are displayed per month according to the selected month and year. The financial statements that can be created are: Trial Balance, General Ledger, Profit and Loss, and Balance Sheet.

4.2 System Evaluation.
In this study, application testing has been done using 2 methods, i.e., System Usability Scale (SUS) and Black Box Test. SUS was used for application usability tests and black box test was used to find out whether the application is running in accordance with its functions.

4.2.1. System Usability Scale (SUS) Test. One of the advantages of System Usability Scaling (SUS) is that it can be used on small sample sizes with reliable results. SUS is also able to effectively distinguish between systems that can be used and cannot be used. Testing of android applications in this study was conducted with 5 respondents from the industry who were considered as prospective application users. The test results are shown in Table 1. Based on the calculation of the SUS value, the average score was 86.5. The assessment results are in good category [16], which means the respondent agrees that the application meets the usability requirements.

| No | Question                                                                 | User 1 | User 2 | User 3 | User 4 | User 5 |
|----|--------------------------------------------------------------------------|-------|-------|-------|-------|-------|
| 1  | I think that I would like to use this system frequently                  | 4     | 4     | 5     | 5     | 4     |
| 2  | I found the system unnecessarily complex                                | 3     | 2     | 3     | 2     | 2     |
| 3  | I thought the system was easy to use                                    | 5     | 5     | 4     | 5     | 4     |
|    | I think that I would need the support of a technical person to be able   | 1     | 1     | 2     | 2     | 1     |
|    | to use this system                                                      |       |       |       |       |       |
| 4  | I found the various functions in this system were well integrated        | 5     | 4     | 4     | 4     | 4     |
| 5  | I thought there was too much inconsistency in this system               | 1     | 2     | 2     | 1     | 1     |
| 6  | I would imagine that most people would learn to use this system very    | 4     | 4     | 4     | 5     | 4     |
|    | quickly                                                                  |       |       |       |       |       |
| 7  | I found the system very cumbersome to use                                | 1     | 2     | 1     | 1     | 1     |
| 8  | I felt very confident using the system                                  | 4     | 4     | 5     | 4     | 4     |
| 9  | I needed to learn a lot of things before I could get going with this    | 2     | 2     | 1     | 2     | 2     |

4.2.1. Black Box. Application testing involving five employees of the industry was carried out objectively. Black box test was used to evaluate fundamental aspects of an application. This test was used to determine whether the application is good or not. Tests were carried out by testing each function regardless of the application’s internal logic structure. Based on the testing results as shown in Table 2, the functionality of the android application system has met the expectation.
5. Conclusions
The Android-based mobile application that was developed is integrated with the web-based information system owned by the 'X' garment industry. This mobile application is used to monitor the production process (production orders, inventory of raw materials and products) and corporate financial management. Applications were built using the Rapid Application Development (RAD) software development method. The coding of mobile application was created using Android Studio 3 and database access (MySQL DBMS) on the server through the Web Service.

Application testing was done using 2 methods, namely System Usability Scale (SUS) to test the usefulness of the application and the Black Box Test for testing its functions. The SUS test results showed that the usability value of the respondents was 83.5. The Black Box Test results showed that the various functions in the application were running well.

6. Acknowledgment
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Table 2. The Result of Black Box Test

| Cluster Test          | Test Items                        | Test Result |
|-----------------------|-----------------------------------|-------------|
| Login Page            | Verification of username and password | valid       |
| Production Order Page | Display data                      | valid       |
|                       | Search data                       | valid       |
| Inventory Page        | Display material inventory data    | valid       |
|                       | Display product inventory data     | valid       |
|                       | Search data                       | valid       |
| Accounting Page       | Display Opening Balance            | valid       |
|                       | Display General Ledger             | valid       |
| Financial Statements Page | Enter the report date range      | valid       |
|                       | Display Trial Balance in PDF file format | valid |
|                       | Display General Ledger in PDF file format | valid |
|                       | Display Profit and Loss in PDF file format | valid |
|                       | Display Balance Sheet in PDF file format | valid |

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