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Smart Laundry System

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Abstract : With the continuous progress and innovation of science and technology, a human can manipulate everything with a smartphone. Continuous innovation of mobile applications and system brings a lot of convenience to mankind. However, the smart laundry system mobile application is not developed as other kinds of mobile applications. Furthermore, there is still exist of laundry management using manual way, which required constant checking by staff. Customers also faced many problems in using laundry services such as wasting a lot of time using laundry services, and limited way of payment methods. Hence, this study aims to solve the problems by designing and developing a mobile application that can provide a platform for customer and laundry owner to trade on and a system that allow laundry owner to manage their laundry efficiently. The methodology in the development of the One Source Smart Laundry System is the Rapid Application Development (RAD) Methodology. By using this methodology, a prototype of the One Source Smart Laundry System is being developed based on the requirements gathered. Then, the final prototype is evaluated by 32 respondents in terms of design, content, functionality, and usability. From the evaluation result, the respondents are satisfied with the One Source Smart Laundry System mobile application. This study contributes toward an understanding of the system requirements and user interface of a mobile application that can provide a platform for customer and laundry owner to trade on and a system that allow laundry owner to manage their laundry efficiently.

Keywords: Smart Laundry System, Laundry Service, RAD, Prototype, Laundry Management

1. Introduction

With the continuous progress and innovation of science and technology, it has brought a lot of convenience to mankind. Today's humans only need to use electronic devices to manipulate everything. Therefore, people began to rely more and more on technology [1]. There are many technologies that can benefit mankind in today's market, especially the continuous innovation of mobile applications and systems, which brings a lot of convenience to mankind. However, in the context of continuous

innovation in mobile applications and systems, the smart laundry system is not as developed as other systems such as food delivery platforms, car sharing platforms, and transportation platforms. This application is leading the way forward.

Washing clothes is one of the daily activities in order to keep hygiene. People can go for laundry more than one time a week [2]. The organization of laundry revolves around ideas of cleanliness and hygiene in relation to social and personal norms that are learned through cross-generational learning processes [3]. When using laundry shop to wash the clothes, there are several essential steps that will be involved. First, one will need to travel to the laundry shop. Next, one should change the laundry token to use the machine. After this, one will need to wait for the clothes to finish washing. Lastly, one only can collect the clothes and travel back home. Although its look like a simple steps, but it is time consuming and brought a lot of inconvenience.

Based on research, most of the laundry firms currently use a manual method for the management and maintenance of critical information that required constant checking by a staff. This type of manual method is not effective and causing management and maintenance work could not response fast [4]. Besides that, there are also some limitation in using laundry service, such as wasting a lot of time in using laundry services, and limited way of payment method. Based on the problems stated above, it can be concluded that although the laundry shop was risen to solve the problem of humans, it hasn't evolved to the most efficient way to help humanity as it is still time-consuming, not convenience, and wasting resources.

In order to solve these existing problems, there is a need of system that can provide a platform for customer and laundry owner to trade on, and a system that allow laundry owner to manage their laundry efficiently. Smartphone technology already become one of the essential part in our live [5]. The market for smartphone apps is expanding and worth billions of dollars. The typical mobile app user uses more than 20 different applications for more than 30 hours each month. That's a lot of people who are engrossed in their smartphones for extended periods of time [6]. Therefore, mobile application is the most suitable tool for this system to be launch and implement. This study aims to design and develop a mobile application for smart laundry system. As a result, One Source (Smart Laundry System), a prototype mobile application that providing a platform for laundry owner and customer to trade on, and a tool for laundry owner in managing laundry was developed and evaluated. By using this platform, customers can book for the machine and make payment through online payment. They can also choose to pick up the laundry by their own or call a rider to deliver for them. Then they can track their washing status easily by using this platform. Laundry owner also can use this platform to collect order, receive payment and manage on laundry machine when to track the errors. This study contributes towards an understanding the system requirements for such application and could be a reference model for developers and researchers to improve an electronic process for trading and managing laundry. The next section describes the background and related studies. Next, the section describes the design and development of One Source (Smart Laundry System). The subsequent section explains the usability evaluation of One Source (Smart Laundry System). The last section in this paper concludes the study and lists the future works.

2. Materials and Methods

The programming language that used to develop Smart Laundry System is Dart Programming Language. This application is available for Android platform. This study conduct Rapid Application Development (RAD) methodology in developing the One Source (Smart Laundry System). RAD is an agile software development methodology which pay more attention on the use of software and user feedback. It is very flexible and adaptable because developer can quickly modify or adjustment in the development process. It also encourage the reuse of code which manage to speed up the development process and output a prototype in a short period [7]. **Figure 1** below shows the phases in RAD.
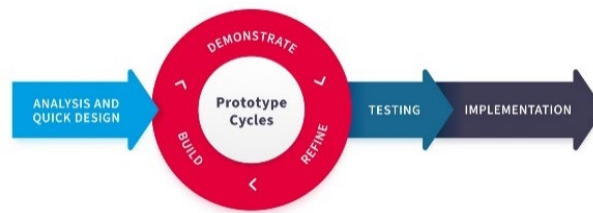
Figure 1: Rapid Application Development Methodology

2.1 Analysis and Quick Design

This phase is very important to ensure the project development can be done on time and comply with the objectives, scopes, and timeline. In this phase, a proposal will be prepared and the list of requirements or scope will be analyzed. In the proposal, some of the important elements will be prepared such as project objectives, project scope, and project timeline. The requirements are documented and visualized using Unified Modelling (UML) diagrams as blue print for design and specification of software system. UML diagrams included of use cases, activity diagrams sequence diagrams and class diagrams [8]. The user interfaces and navigation flow of this system also designed in this phase.

2.2 Prototype Cycles

In this phase, a prototype of the Smart Laundry System will be developed by using Dart Programming Language and MySQL for database. The system will be developed through various prototype iterations and refined on each cycle [9]. This phase will require the participation of stakeholders such as the developer and supervisor to provide feedback and make improvements to the prototype. It will be repeated until it satisfies the requirement of the developer, supervisor, and other stakeholders.

2.3 Testing

After the prototype of the Smart Laundry System has been done, testing process will proceed. All the flow of the system will be check closely to make sure the system fulfil the requirements and avoid on any error or bug that can lead to system fatal. The system will also tested by third party by providing beta version of system so that feedback can be collected efficiently.

2.4 Implementation

Once the system is done through the testing process, Smart Laundry System is ready to go live. The system will be deployed and provided to users to download and start using it.

3. Results and Discussion

3.1 The Evaluation Setting

In this evaluation of this system, the method used is quantitative method. Surveys and questionnaires will be used to collect quantitative data from respondents. In this case, Google Forms is the most suitable tool to be use. It is an online tool that can make this evaluation capable to reach respondents easily and effectively. Google Forms is a web-based survey that is cost effective and time effective. It is cheaper and save time in collecting responds from respondents. There are many alternatives to evaluate a system. However, the type of evaluation that used to test this system is Usability Evaluation. An .apk file of this system will be provided for respondents to install. Respondents will be given time to go through on this application. After that, a post-task questionnaire will be given in the form of online survey, Google Form. Respondents will need to answer all the question on Google Forms regarding experience in using this application. The questions in this survey were set regarding the usability evaluation, which included of design, content, functionality, and usability.In this work of

evaluation, the number of respondents participate was approximately 32 with no constraints on type of respondents. The age group was 13 years old to 31 years old and above, with any gender. This work of evaluation recruited the respondents by sending the questionnaire link to respondents via WhatsApp and asked them to distribute this evaluation to other respondents. In working with the evaluation, respondents have to follow the procedure, which is (1) install the system, (2) Watch video or read the file attached about explanation and the procedure for test the system, (3) interact with the system, (4) evaluate the usability of the system, and (5) answer the post-task questionnaire.

3.2 The Respondents' Demographic Information

Analysis of the respondents' demographic revealed that there are 17 respondents who tested this application with the role of customer, which corresponds to 53.1%. On the other side, there are 15 respondents, corresponding to 46.9% tested this application with the role of laundry owner. Next, there are 25 respondents (78.1%) in the age group of 19-24 years old. Besides that, there are 5 respondents (15.6%) in the age group of 25-30 respondents. For age group 31 and above, and 13-18 years old, there are 2 respondents (6.3%) and 0 respondent (0%) respectively. For gender, there are 17 (53.1%) male respondents, and 15 (46.9%) female respondents.

3.3 The Design of One Source Smart Laundry System

In this work, an analysis was conducted on the evaluation of respondents regarding the design of One Source Smart Laundry System. This section measures the respondents' perception towards the design of interfaces of this application. From the analysis result, there are 6 (18.8%) respondents agreed and 26 (81.3%) respondents strongly agreed that this application has attractive and comfortable interfaces. The mean value for this statement is 4.81, indicating this application has attractive and comfortable interfaces. There were no respondents who respond strongly disagree, disagree, or neutral to this question. Next, there are 14 (43.8%) respondents agreed that this application has a clean and neat layout. Then, 18 (56.3%) respondents strongly agreed that this application has a clean and neat layout. There were no respondents who respond strongly disagree, disagree, or neutral to this question. The mean value for this statement is 4.56, indicating this application has a clean and neat layout overall.

On the other hand, there are 7 (21.9%) respondents agreed and 25 (78.1%) respondents strongly agreed that this application used a suitable font size. This indicates this application has used a suitable font size with a mean value of 4.78. There were no respondents who respond strongly disagree, disagree, or neutral to this question. Lastly, 17 respondents agreed that this application has a consistent interface design, and 15 respondents out of 33 respondents strongly agreed with this statement. There were no respondents who respond strongly disagree, disagree, or neutral to this question. The mean value for this statement is 4.47, which means that this application has a consistent interfaces design.

3.4 The content of One Source Smart Laundry System

After analyze on the evaluation of respondents regarding the content of One Source Smart Laundry System, the analysis results show that there are 10 (31.3%) respondents who agreed and 22 (68.8%) respondents strongly agreed this application used a suitable title and content. The mean value is 4.69, which indicates this application used a suitable title and content. There were no respondents who respond strongly disagree, disagree, or neutral to this question. Next, the product information in this application is enough for customer users to understand as there are 8 (25%) respondents agreed and 24 (75%) respondents strongly agreed with this statement. There were no respondents who respond strongly disagree, disagree, or neutral to this question. The mean value of this statement is 4.75, which indicates that this statement is mostly agreed upon by respondents.

Then, there are 13 (40.6%) respondents agreed that the service range provided in this application is enough. On the other side, there are 19 (59.4%) respondents strongly agreed with this statement. There were no respondents who respond strongly disagree, disagree, or neutral to this question. The mean

value for this statement is 4.59, which indicates this application provided enough service range. Finally, the content of this application is clear and easy to understand. There are 9 (28.1%) respondents who agreed and 23 (71.9%) respondents who strongly agreed with this statement, with no one strongly disagreed, disagreed, or stay neutral to this statement. The mean value is 4.72.

3.5 The functionality of One Source Smart Laundry System

This section, post-task questions regarding functionality of One Source Smart Laundry System is given to 32 respondents. From their response, there are 3 (9.4%) respondents who agreed and 29 (90.6%) respondents strongly agreed that they can place an order using this application or receive a new order from the customer if they tested using the laundry owner role. There are no respondents who strongly disagree, disagreed with, or stayed neutral on this statement. The mean value of this statement is 4.91, which is near 5, indicating that the place order and receive order function can perform well. Next, for the function of tracking the order and updating the order status for the laundry owners, there are 11 (34.4%) respondents who agreed and 21 (65.6%) respondents who strongly agreed. There are no respondents who strongly disagree, disagreed with, or stayed neutral on this statement. The mean value is 4.66, which indicates this function of tracking orders and updating order status can perform well.

Furthermore, for the function of all buttons, there are 2 (6.3%) respondents who stayed neutral for this function, which means some buttons may not perform as they expected. On the other side, there are 14 (43.8%) respondents agreed that all buttons successfully perform the desired action, and 16 (50%) respondents strongly agreed with this. The mean value for this function is 4.44, which indicates that all buttons can perform the desired action. Lastly, there are 6 (18.8%) respondents agreed that order history was loaded successfully, and 26 (81.3%) respondents strongly agreed. There are no respondents who strongly disagree, disagreed with, or stayed neutral on this statement. The mean value for this function is 4.81, which indicates this function can perform well for both customers and laundry owners.

3.6 The usability of One Source Smart Laundry System

This section shows the evaluation results from respondents' perception towards the usability of One Source Smart Laundry System. From the evaluation result, there is 1 (3.1%) respondent stayed neutral that this application is easy to use although he/she is the first time user. There are 6 (18.8%) respondents who agreed, and 25 (78.1%) respondents strongly agreed that this application is easy to use for a first-time user. The mean value for this application is 4.75, which indicates that this application is still easy to use for first-time users overall. Next, for the statements "This application helps me be productive", "This application helps me easier in managing laundry", and "I would introduce this application to others", the evaluation results are the same. 10 respondents agreed and 22 respondents strongly agreed, corresponding to 31.3% and 68.8%. There are no respondents who strongly disagrees, disagreed with, or stayed neutral with these statements. The mean value for these statements is 4.69, which indicates that the usability of this application is high.

In this section, respondents' feedback also collected in order to improve on One Source Smart Laundry System. Respondents are able to provide feedback based on their perceptions. A brief analysis, there are several feedbacks that provided by respondents for this application to improve in the future. The first feedback is text of this application is not responsive to fit all type of phone. There are also 3 respondents' feedback to add remember email function at the login page, and improve the change language function of this application. 1 respondent feedback to make the withdraw function complete. Then, there are 2 respondents feedback that the order loaded is not correct. There are also respondents that feedback that the setting page and account page need to be improve. For the setting page, the button need to relate to the desired page, however for the account page, the update gender, birthday and profile picture page need to be improved. There are also respondents' feedback that the design is nice. But there are also 1 respondent feedback that the design is too much words in order details page. There are also 1 respondent reported that calculate total price function have error.

From the overall evaluation result, One Source Smart Laundry System is still usable to achieve the objectives and to bring benefits to customers and laundry owners. It fulfills the respondents' perceptions in overall towards the design, content, functionality, and usability. However, there are also some errors and bugs detected after giving to respondents to test. In the maintenance phase, there are some features that will be improved and fixed, such as improving the account and setting page, fixing the calculated total price function, and updating the design of some interfaces.

4. Storyboard and Prototype

The prototype's storyboard and snaphost of the selected interfaces are shown in **Figure 2** and **Figure 3**.
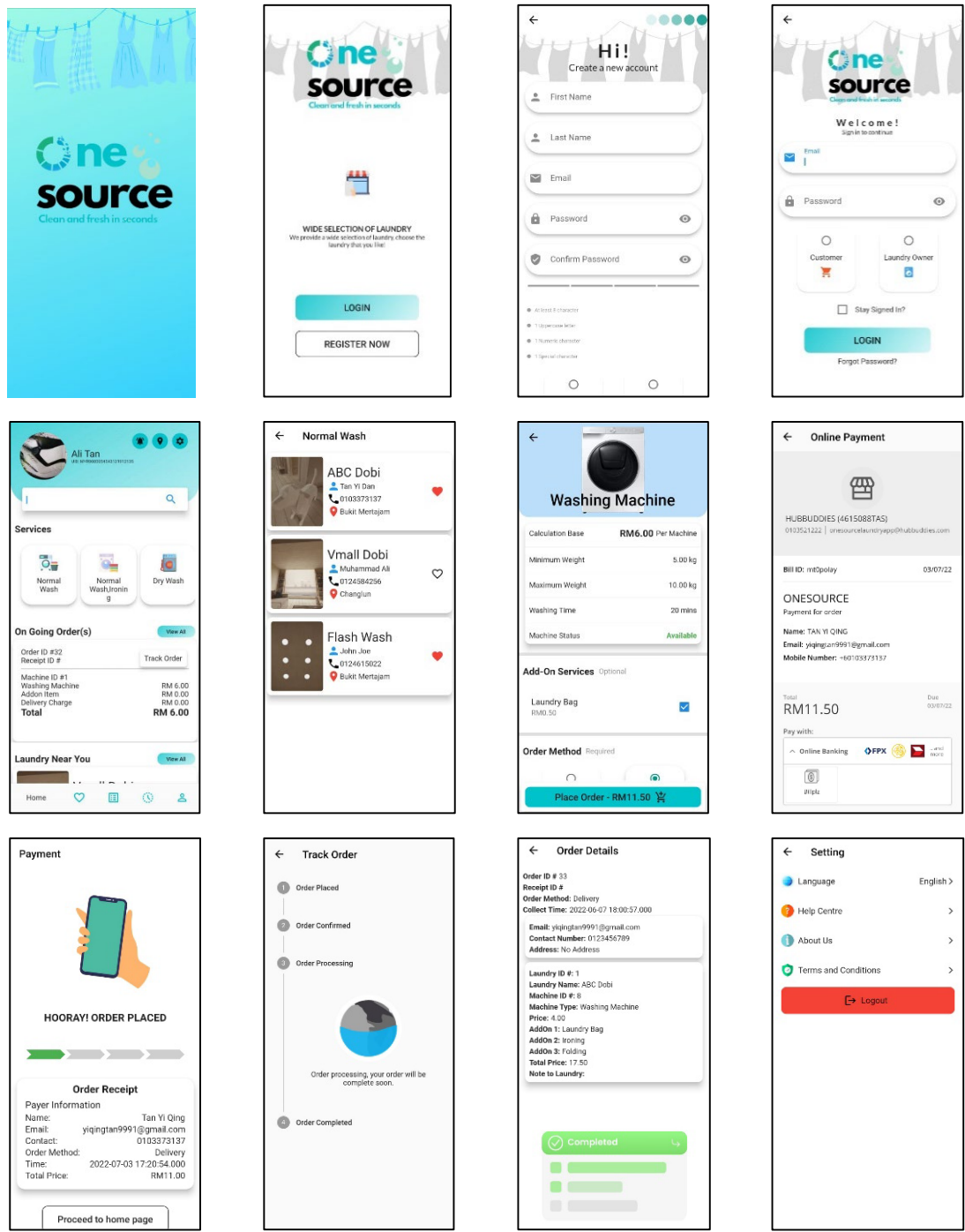

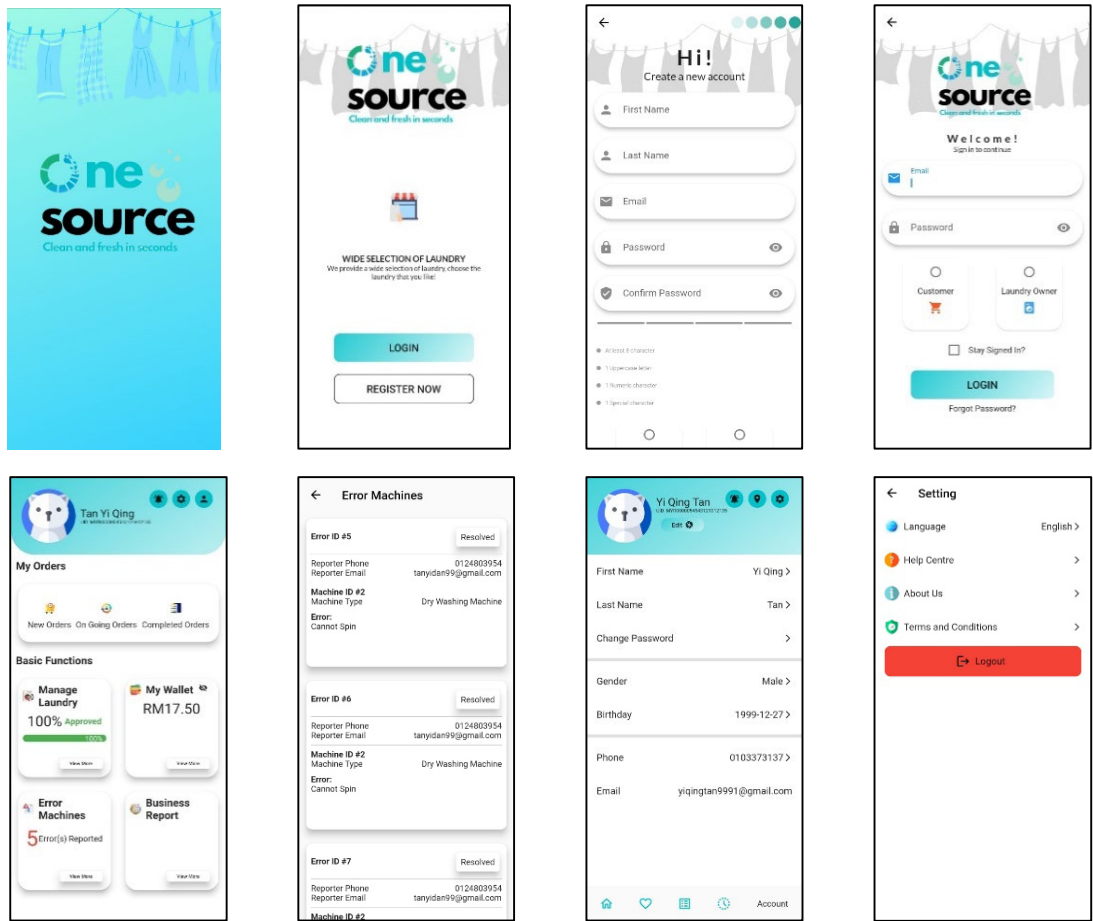**Figure 2: Storyboard of Smart Laundry System (Customer)**

Figure 3: Storyboard of Smart Laundry System (Laundry Owner)

5. Conclusion

This paper described the design and development of a mobile application that can provide a platform for customer and laundry owner to trade on and a system that allow laundry owner to manage their laundry efficiently. There are many related studies on this field. From all of the studies, there are many aspects that can be integrate and well use in order to achieve a higher efficiency of smart laundry system. From the evaluation participated by 32 respondents, their feedbacks and responses is very precious to this work. All of the feedbacks and responses will be take account in the future work. In the future, One Source Smart Laundry System plan to be commercialized and expand to larger field of business.

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