LaundryMama: Humanising Laundry Tasks using Laundry Management System and Laundry-On-Demand Mobile Applications

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Abstract. Laundry Management System and Laundry-On-Demand Mobile Applications are presented in this paper. Using conventional laundry service method, customer is not informed about the laundry process stage, does not have option to arrange the preferred laundry pick up time for the deliveryman to pick up the unwashed laundry from the address provided by customer and the laundry ordering paper forms are often lost in transit between customer and admin. Therefore, a laundry management system software and laundry on demand mobile application is demanded to solve the problems. The software development is performed using an open source developing platform Android Studio IDE and Firebase Real-time Database, Authentication, Cloud Messaging and Cloud Storage. The method used to develop the software is waterfall modelling and two characters are involved, which is admin and customer. The two characters functions are separated in two different applications. A Laundry Management System Software is developed for admin to manage, make order and monitor the business. A Laundry-On-Demand Mobile Application is developed for customer to make order and monitor the order. These both applications can receive notification from each other. The data can be correctly written and read from Firebase Real-time database, Firebase Authentication, Firebase Cloud Storage. The developed software and mobile application are evaluated in term of its functionality.

1. Introduction
Nowadays, most of the laundry firms are using traditional way to manage business which is manual system for management. Laundry management system and laundry on demand mobile application is to ease the customer and launderette business owner to manage and monitor their orders in a smart way. Laundry management system software is an application to help launderette business owner to manage and monitor the administrative activities effectively, such as checking the status of orders, receiving orders from customers, billing and inventory cost control measures, providing customer service and managing the shipment. In the other hand, laundry on demand mobile application is to help customer to manage and monitor their order such as schedule a pick up time, making order, tracking shipment and get informed when the clothes have been cleaned or ready for shipping [1, 2, 3, 4, 5].
2. System Description
Laundry Management System Software and Laundry-On-Demand Mobile Application are introduced in this paper as shown in Figure 1. As seen in Figure 1, Laundry Management System Software is dedicated for admin while Laundry-on-demand Mobile Application is dedicated for customer. These applications have the different functions and features which are developed with Firebase as back-end database. Android Studio is used as framework to build the both Laundry Management System Software and Laundry-On-Demand Mobile Application. Android Studio is the recommended IDE to develop Android apps and is available for free for anyone who develops professional Android apps [1].

Figure 1. Overall Case Diagram

Figure 2 shows the four functions of firebase (Cloud Storage, Cloud Messaging, Real-time Database, Email Authentication) are used to develop the two applications, Laundry Management System and Laundry-on-demand Mobile Application.

Figure 2. Functions Used in Firebase
SQLite is an open source embedded relational database. Rather than running independently as a standalone process, it symbiotically coexists inside the application it serves within its process space [2]. Figure 3 shows the SQLite that used in the development to create the database file, and then imported into the Android Studio project to store the laundry item data which added into the cart by user and then show in the data in the cart. These applications have the different functions and features which are developed with Firebase as back-end database as shown in Figure 4.

Figure 3. SQLite in Applications

Figure 4. Unified Modeling Language (UML)
2.1. Main Flowchart of Laundry Management System App

By referring to Figure 5 and Figure 6, all the functions and features in each flowchart can only be used after successfully signing in with the valid admin account in Laundry Management System Software application and signing in with the registered account with email in Laundry-on-demand Mobile Application. Laundry-on-demand Mobile Application also has the features of register account and reset password (forget password), in order for customer to register a new account and reset the password by receiving a unique link in the email.

The Android build system compiles application resources and source code, and packages them into Android Package (APKs) that you can test, deploy, sign, and distribute. There are two ways to configure the build which are package the project into APK or activate developer mode in the testing android phone and install directly by Android Debug Bridge (ADB). The way to configure the build by packaging the project into APK, through “Build APK(s)” in Android Studio. Then, copy the APK to the android phone and install in the android phone.

![Figure 5. Flowchart of Laundry Management System Software without Signed in](image)

![Figure 6. Flowchart of Laundry Management System Software with Signed in](image)
3. Using LaundryMama

3.1. Testing

For testing stage, User Acceptance Testing (UAT) will be conducted. In the UAT, the actual software users test the software application to make sure it can handle required tasks in real-world situations, according to the specifications. The one of the purposes doing UAT is to find out the error of the software application by setting several different scenarios. Several test cases are created in order.

| Test Case ID | Test Scenario                                      | Expected Result                                      |
|--------------|----------------------------------------------------|------------------------------------------------------|
| TC1          | User clicks category list                          | Navigate to laundry item list page                   |
| TC2          | User clicks float button                           | Display dialog of adding category                     |
| TC3          | User clicks YES in the dialog of adding category without entering name | Display error message                               |
| TC4          | User clicks YES in the dialog of adding category without selecting an image | Display error message                               |
| TC5          | User clicks YES in the dialog of adding category without uploading an image | Display error message                               |
| TC6          | User clicks YES in the dialog of adding category with entering name, select and upload an image | Display message successfully adding new category     |
| TC7          | User clicks action bar                             | Display options Refresh and Contacts                 |
| TC8          | User clicks Refresh in action bar                  | Reload and display latest category list              |
| TC9          | User clicks Contacts                               | Navigate to contact page                            |
| TC10         | User clicks navigation bar button                  | Display navigation bar and the user’s name           |
| TC11         | User clicks add admin account button in navigation bar | Navigate to Check Secured Word page                 |
| TC12         | User clicks Making order for client button in navigation bar | Navigate to make order for client main page         |
| TC13         | User clicks order button in navigation bar         | Navigate to order status page                       |
| TC14         | User clicks order history button in navigation bar | Navigate to order history page                      |
| TC15         | User clicks customer list button in navigation bar | Navigate to customer list page                      |
| TC16         | User clicks feedback button in navigation bar      | Navigate to feedback page                           |
| TC17         | User clicks about LM. Management button in navigation bar | Navigate to about LaundryMama page                 |
| TC18         | User clicks sign out button in navigation bar      | User sign out and display welcoming page            |
3.2. Result from Laundry Management System Software

As shown in Figure 7, after starting the Laundry Management System Software, the application should have shown the welcoming page with title, business slogan and a button to proceed to the next page which is sign in page as shown in Figure 8.

After admin successfully sign in with the correct ID number and password, the main page of the application is shown in Figure 9. In the Main page, a Recycle View category list is shown with title, action bar and float button. The action bar in the main page has two functions which are Refresh and Contacts. Refresh function is to load again the category list and the Contacts function is shown the contact information of the developer as shown in Figure 10.

The float button in the main page has the function to let admin add new category as shown in Figure 11. In the dialog as shown in Figure 11, the new category name and an image are needed to add new category.
into the list. The image can be chosen from the gallery and upload to Firebase Cloud Storage as shown in Figure 12. After successfully uploaded, the new Uniform Resource Locator (URL) is provided to link the location of the image and turn the button of “SELECT” to “IMAGE SELECTED” then the button “YES” in the dialog is to proceed the new category adding step while “NO” is to cancel adding new category.

The features in the navigation bar as shown in Figure 13, including Making Order for Client. In this feature, the admin can create order without customer account, this is meaning that the customer needs to approach to the laundry shop without registering any account in the Laundry-on-demand Mobile Application. In the category list as shown in Figure 14, the admin can choose the category and laundry item.
To add the laundry item to the cart, the admin is required to choose the laundry item and the laundry item detail is shown in Figure 15. The admin may increase or decrease the item number and the float button is to add the chosen item and the item number to the cart. The admin can now view the added item in the cart page as Figure 16 shown by pressing the float button in the category list.

After successfully place the order for customer, the admin can view the order list and order history. The both of the order list and order history can proceed to view the order detail and order history detail. The admin can edit the orders by updating the order status and remove the order from the list. Only the order list can be edited, the order history is not allowed to be edited. The orders made by customer using Laundry-on-demand mobile application can be viewed in the feature of Orders and Order History. As the previous feature, the admin can edit the orders by updating the order status and remove the order from the list. Only the order list can be edited, the order history is not allowed to be edited. Once the order status has been updated by the admin, the customer should have received a notification to remind the customer that the order status has been updated.

The rest of the features includes Add Admin Account, Customer List, Feedback, About LM Management and Sign out. The feature of Add Admin Account is to add a new admin to the system. To add a new admin to the system, a secure word is needed to proceed to the next step which is to add new admin by ID number, name and password. After successfully adding the new admin account, the current admin can now sign in to the new account after signing out from the current account. For the feature of Customer List is to view the list of current registered customer. The Feedback feature in Laundry Management System Software is to view or remove the feedback given by the customer. The feature of About LM Management is for admin to view the detail information of the application. Last but not least, the sign out feature is to sign out from the current account then it will be redirected to the main page of the application as Fig.6 shown.

3.3. Result from Laundry-on-demand Mobile Application
After starting Laundry-on-demand Mobile Application, the application should have shown the welcoming page with title, business slogan and a button to proceed to the next page which is page for sign in or page for register. In the Register page, after valid information filled in and hit the button of “Register”, an email will be received and it needs customer to verify the account through the given link in the email. After succeed verified, the customer can sign in to the account using the Laundry-on-
demand Mobile Application as shown in Figure 17. The forget password button in the sign in page is for customer to reset password by entering the registered email. An email is sent to customer’s mailbox after successfully entering the registered email in the page of forget password. An email is also sent to customer’s mailbox after successfully registered the Laundry-on-demand Mobile Application account to verify the account.

Customer can make order by using Laundry-on-demand Mobile Application with choosing the category list in the main page as shown in Figure 18, then choose the laundry item in the next page (laundry list). Choose the wanted laundry item and add the item to the cart by pressing the float button in the laundry detail page. Before adding the laundry item to the cart, the customer can increase or decrease the wanted item in the laundry item detail page. The items which are added to the cart can be viewed in the cart page. The unwanted items in the cart can be deleted by long press the specific item in the list then the action dialog is shown for customer to delete the item. To place order of the chosen item in the cart, some information is needed to enter in the dialog before place the order. After entering the information into the dialog, the “YES” button in the dialog is bringing to another dialog with asking whether customer agree to pay surcharge. The order is successfully made after customer pressing “YES” button to agree with the surcharge in the dialog.

When the order is successfully made by the customer in Laundry-on-demand Mobile Application, the notification is received by the admin in Laundry Management System Software. The navigation bar in the main page of Laundry-on-demand Mobile Application is “Order” which is navigated the customer to the order list page. In the order list, the customer can view the order detail by pressing the “Detail” button in the order list page then navigated to the order detail page. The customer can also view order history page which navigated from the navigation bar. From the view order history page, the customer can also proceed to view order history detail page.

The new orders which made by customer in Laundry-on-demand Mobile Application are shown in the order list page which is navigated from the navigation bar in the main page of Laundry Management System Software. The order list is shown in the order status page. The order editing function is only dedicated for Laundry Management System Software. The admin can view the specified order detail by pressing the “Detail” button in each order. The admin can also update and remove the order. After admin
successfully updated the order status, the notification is received by the customer in Laundry-on-demand Mobile Application. Besides, the admin can also view the order history and order history detail.

The rest of the features in Laundry-on-demand Mobile Application including View and edit profile, change account password, About LaundryMama, Feedback and Sign out. The third feature shown in the navigation bar of main page is view and edits profile. From the navigation bar in the main page the customer can view the profile page. In each of the edit button beside the customer personal information, it is brought to each page to edit the personal information such as name, phone number, IC number, address and postcode.

In change password page, the customer can change password by entering the new password. After successfully changing password, the customer can sign in with the new password after signing out from the current account. The customer can view about application information in the page of About LaundryMama which is including the detail information of the application and the application release date. The customer can also give feedbacks. The feedbacks can be viewed by the admin and the action to delete feedbacks can only be taken by the admin in the Laundry Management System Software.

4. CONCLUSION
A Laundry Management System Software is developed for admin to manage, make order and monitor the business. A Laundry-On-Demand Mobile Application is developed for customer to make order and monitor the order. These both applications can receive notification from each other. The data can be correctly written and read from Firebase Real-time database, Firebase Authentication, Firebase Cloud Storage. The developed software and mobile application are evaluated in term of its functionality.

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