Android-based member card "DigiCard" storage application

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Abstract. The purpose of this research is to develop mobile application that can store cards to digital form base on Android, that being used by user which have member card as a media to getting rid from the card being damaged or stolen. In the making of this application, literature review and questionnaire are being used as data colletion methodology and extreme programming is being used as research methodology. The goals in making this application is the application can store a physical card into digital form, scan barcode from member card, show realtime promo, online registration, and showing nearest retail location using Android Studio with Java programming language. The conclusion of this research is, this application can help the user as media to avoid careless user in using the card in physical form.

Keywords : application, member card, physical card, barcode, promo, online registration, retail location

1. Introduction
In the digital era as it is today, ever-evolving technology makes it easy for humans in various aspects of life. One example is the presence of smartphones that are increasingly affordable and have a significant impact on society, ranging from getting the latest information and entertainment, to doing work that used only to be done with personal computers.

Based on data from the Indonesian Internet Service Providers Association (APJII) in 2017, more than 50% or 143.26 million people in Indonesia connected to the internet network. Half of these internet users, or more precisely, 50.08% use smartphones or tablets. Besides, this data is supported by an article from Tech In Asia in 2014, which estimates there will be more than 100 million smartphone users in Indonesia in 2018. As a result, online shopping trends are increasingly in demand. According to Bambang Brodjonegoro as Minister of National Development Planning (PPN) / National Development Planning Agency (Bappenas), as many as 50 million Indonesians love to shop online [1].

Indeed, for the time being, the effects of online shopping have not had a significant impact on retail businesses [2]. But seeing the trend of online shopping that is increasing every year, retail companies also began to implement some specific strategies, one of which is through membership.

Cardholder members will get special treatment such as getting prizes, points, discounts, or special prices. This is a strategy of retailing to attract and retain customers. With the membership card, customers are encouraged to shop because they get benefits in the form of direct prizes or sweepstakes that are held, collect points to exchange for something provided by retail, get discounts where discounts are not given if the customer does not have a member card, and prices specifically which can...
only be obtained if you have a member card [3]. The process of using it is relatively easy. Customers only need to bring the member card at the retail member card provider, find out the ongoing promos, and hand over the member card to the cashier to be processed after shopping. Automatically, direct benefits are given to customers and receive back member cards.

Having a lot of cards and various members may indeed provide a distinct advantage for cardholders, but also not escape from weaknesses such as requiring more storage or loss of cards due to poor card management from the card owner. The card registration also requires prospective users to come to retail locations, fill out the required information, and pay the price of making the member card if needed. Finding the nearest store or retail to use the card and also know the ongoing promos, tend to be difficult if the user is in a place that has never been visited.

Seeing the problems discussed earlier, the author developed a mobile application that aims to help users with various features that make it easy for users. Mobile apps, especially the Android platform, were chosen because of the higher smartphone or tablet penetration when viewed from the data of the device used to access the internet [4] and the magnitude of the dominance of Android devices in the mobile market in Indonesia [5]. This application will store card data such as retail names, card owner names, and card numbers in digital form that can be accessed easily. The advantage is proper card management because everything is in one application, so there is no need to carry multiple cards. The app can also display card numbers in the form of numbers and barcodes. Card registration will also be more accessible because it can be done online without having to come to retail locations. The application also has a feature to display the nearest retail site and also presents ongoing promos. With the development of this application, hoping it can help users to manage member cards and maximize the user experience in using cards with the features that this application provides.

Based on the background above, the formulation of the problems produced in this study are to develop an Android application that can store member card numbers or barcodes and display them again with existing card data, that can register member cards without needing data to related retailers, and also that can help users find the nearest retail location, inform users about retail promos, and secure data inside the app. The aim of this research is to create an Android-based DigiCard application that can store member cards from a physical form into digital form by scanning barcodes and manual input as well as displaying information related to the card owned, register for a member card online, show the nearest retail location to the user using Google Maps, and shows promotions from ongoing retail, with secure applications from misuse using PIN and fingerprint codes.

2. Research Methodology
Data collection methods used in writing this study is by using questionnaire method, as a data collection technique that is done by giving a set of questions or written questions to respondents to be answered. The design method used is the Extreme Programming (XP) method. XP is a software development methodology aimed at improving software quality and speed of response to changing customer needs. This type of software development is intended to increase productivity and introduce checkpoints where new customer requirements can be adopted.

The stages of Extreme Programming consist of planning such as understanding user criteria and development planning, designing such as prototype and display design, coding including integration, and finally testing [6].

3. Result and Discussion
From the results of our application testing, it is divided into several sections. This test uses three methods. The three modes of examination are Black-box testing, Eight golden rules, and five measurable human factors.

3.1 Black-Box Testing
The black-box testing result is tabulated in Table 1.
Table 1. Black-Box Testing Result

| ID  | Description | Test requirement | Steps to be executed | Expected result | Result |
|-----|-------------|------------------|----------------------|-----------------|--------|
| T-01 | Open the available retail list page | Press the plus button (+) on the main page | The application displays a retail list page | Pass |
| T-02 | Add a card (Existing Member) | Already have a member card from the related retail | 1. Choose a retail one from the retail list page 2. Select "YES, ADD EXISTING MEMBER CARD" from the dialog that appears | The application displays the form on the add card page (Existing Member) | Pass |
| T-03 | Add a card (Online Registration) | Don't have a member card from the related retailer and want to make a card | 1. Choose a retail one from the retail list page 2. Select "NO, REGISTER NOW" from the dialog that appears | The application displays the form on the add card page (Online Registration) | Pass |
| T-04 | Leave the add card form blank (Existing Member) | Select "YES, ADD EXISTING MEMBER CARD" on the previous page | 1. Leave the field in the form blank 2. Select the "DONE" button | The application displays a message informing that the related field must be filled | Pass |
| T-05 | Using a Barcode Scanner | Located on the form page on the add card (Existing Member) | Select "SCAN BARCODE" button | The application opens the camera for scanning | Pass |
| T-06 | Fill in the add card form (Online Registration) | Select "NO, REGISTER NOW" on the previous page | 1. User Fill in the fields in the form 2. Select the "DONE" button | The application displays a message informing that the card has been created | Pass |
| T-07 | Fill in the add card form (Existing Member) | Select "YES, ADD EXISTING MEMBER CARD" on the previous page | 1. User Fill in the fields in the form 2. Select the "DONE" button | The application displays a message informing that the card has been created | Pass |
| T-08 | See card details | Already have a card in the application | 1. Being on the main page 2. Select the card you want to see | The application displays the card details page | Pass |
| T-09 | See the | Must have a | Select the location | The application | Pass |
| ID | Description | Test requirement | Steps to be executed | Expected result | Result |
|----|-------------|------------------|----------------------|----------------|--------|
| nearest retail location | GPS and internet connection | button on the card details page | displays a location page that contains the nearest retail list and also a marker on the map view | Pass |
| T-10 | Start Navigation to the selected retail | Has the Google Maps application | Choose the retail one you want to visit | The application will open the Google Maps application which immediately starts navigation from the user's current location | Pass |
| T-11 | Add notes to the card | Already have a card in the application | 1. Select the "ADD NOTES" button 2. Fill in the notes in the fields provided 3. Select the "DONE" button | The application will store user records | Pass |
| T-12 | Change the card alias | Already have a card in the application | 1. Choose a card alias 2. Fill in the notes in the fields provided 3. Select the "DONE" button | The application will save the alias changes | Pass |
| T-13 | See Barcodes | Already have a card in the application | Select "SHOW BARCODE" button | The application displays the Barcode and also the card number | Pass |
| T-14 | Remove the card | Already have a card in the application | 1. Select the delete button on the card details page 2. Select the "YES" button in the dialog that appears | The application removes the card and displays a message that the card has been deleted | Pass |
| T-15 | See the promo list | | Select the "Promo" button on the main page | The application displays promo pages containing ongoing promos | Pass |
| T-16 | See the promo list | Being on the promo list page | Choose the promo you want to see | The application displays a promo detail page | Pass |
| T-17 | Sign in using a Google account | Already have a Google account and haven't signed in | 1. Select the overflow button in the upper right corner of the main page 2. Select the "ACCOUNT" button 3. Select the "SIGN IN" button on the account page | The application displays the user's self data page | Pass |
| ID   | Description                      | Test requirement                        | Steps to be executed                                                                 | Expected result                                                                 | Result |
|------|----------------------------------|-----------------------------------------|--------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|--------|
| T-18 | Restore card data                | Have done a backup on the Google Drive  | Perform the sign-in stage as in Test Case T-17                                       | The application will restore the card data into the application                  | Pass   |
| T-19 | Card data backup                 | Already have a Google account and have signed in | Press the "BACK UP" button on the account page                                        | The application will process the card data backup into the application folder provided by Google Drive | Pass   |
| T-20 | Sign out                         | Already signed in                       | Press the "SIGN OUT" button on the account page                                       | The application displays the main page                                             | Pass   |
| T-21 | Add Security Code               |                                          | 1. Select the overflow button in the upper right corner of the main page              | The application will save the security code and install the security code when the application is opened | Pass   |
| T-22 | Incorrect re-enter the Security Code in the Add Security Code section | Already entered the first security code | Re-entered the wrong security code                                                   | The application will display a message that the re-entered security code is different from the first one | Pass   |
| T-23 | Open the application with Security Code | Already added security code            | 1. Open the application 2. Enter the correct security code                          | The application will display the main page                                        | Pass   |
| T-24 | Open the application with the wrong Security Code | Already added security code            | 1. Open the application 2. Entering the wrong security code                       | The application will display a message that the security code entered is incorrect | Pass   |
| T-25 | Open the application             | Already added the security              | Stick the finger on the fingerprint sensor                                           | The application will display the main page                                        | Pass   |
| ID     | Description                          | Test requirement                  | Steps to be executed                                           | Expected result                                                                 | Result |
|--------|--------------------------------------|-----------------------------------|----------------------------------------------------------------|--------------------------------------------------------------------------------|--------|
|        | with Fingerprint                     | code and the device has a fingerprint sensor | page                                                           |                                                                                   |        |
| T-26   | Open the application with Fingerprint the wrong way | Already added the security code and the device has a fingerprint sensor | The application will display a message that the fingerprint was not read properly and to repeat the process again | Pass                                                                           |        |

3.2 Eight Golden Rules

a. Consistency

![Figure 1. Display Consistency of Design](image)

![Figure 2. Display Meets Universal Needs](image)

Figure 1a and 1b show the consistency of the application design, especially in the navigation bar where several buttons for moving pages are located. The navigation bar also shows the user's current position through the name of the page that is always in the middle of the navigation bar.

b. Meet Universal Needs

The selection of symbols in the application also follows a design that is familiar to the user such as the use of location symbols on the navigation bar, trash can symbol, and the symbol of the colon in figure 2 that shows the functions to open the location view, delete, and view the menu display.

c. Give Informative Response

Every action taken by the user will display the feedback in the form of a dialog or message. It is to view information about the results of the work that will or has already been carried out, as an example in Figures 3a and 3b.
d. Dialog Design to Signify the End of the Process
The application gave the response also signifies the process that the user goes through, such as whether the user has succeeded in removing a card or a particular action that the user must take. Figure 3c illustrates the end of the process of adding a security code.

e. Prevention of Errors
The application must be able to prevent mistakes made by the user and give a short but clear message about the prevention, as shown in Figure 3d.

f. Easy to Undo Previous Action
The application allows the user to cancel the action that has been done efficiently, as shown in Figure 3e where if the user presses the delete button, a confirmation dialog will appear where the user can cancel the delete action.

g. Making the User Full Interface Holder
All views that appear to the layer occur because of a command from the user as a controller through actions taken. In Figure 3f, it shows the barcode of the card if the user presses the "SHOW BARCODE" button.

Figure 3. Display of (a, b) informative response, (c) design dialog to signify end of process, (d) prevention of error occurrence, (e) easy to undo previous action, and (f) the display makes the user a full interface holder.
h. Reduce Short Term Memory Burdens
   This application does not do a lot of page movement; the aim is to facilitate navigation.

3.3 Five Measurable Human Factors
The following are the results of the questionnaire conducted by 34 people, divided from various ages from 18 to 50 years. These results were obtained using a written survey, summarized in Table 2.

| Table 2. Percentage of Ease of Use of Applications |
|---------------------------------------------------|
| Human factors                                    | Question and responses (n= 34 respondents) | Yes (%) | No (%) |
| Study Time                                       | Ease of Use of Applications                | 91.2 %   | 8.8 %  |
| Learning Ease                                    | Does this application work easily in a short learning time? | 91.2 % | 8.8 % |
| The Level of Error Users Make                    | Difficulties in Using the Application      | 2.9 %    | 97.1 % |
| Error Message                                    | Is the message that appears if you make a mistake clear and correct? | 79.4 % | 20.6 % |
| Clarity of Dialogue                              | Can any user undo actions easily be taken?  | 73.5 %   | 26.5 % |
| Ease of Action Cancellation                      | Has the dialog helped you in using this application? | 91.2 % | 8.8 % |
| Memory                                           | Display Clarity                            | 100 %    | 0 %    |
| Ease of Navigation Between Pages                 | Is it easy for you to navigate to other pages? | 94.1 % | 5.9 % |
| Performanc speed                                 | Suitability of Application Response        | 82.4 %   | 17.6 % |
| Subjective Satisfaction                         | Display Consistency                        | 88.2 %   | 11.8 % |

It can be observed from Table 2 that the DigiCard application is highly easy to use, and it takes short learning time to use (>90% positive responses). Only a few (<3%) finds difficulty using the DigiCard application, with very clear dialogue (>90%), although quite a number (20-26%) experiences unclear notification and relatively difficult to undo some actions. Moreover, the Digicard application has a strong tendency to be memorized by users, as it scores very high in display clarity and easy navigation between pages (>90%). Overall, the performance speed is quite acceptable (>80%), with >85% users are satisfied with the display consistency of the DigiCard application. The detail for the performance speed of the DigiCard application and the display satisfaction is shown in Tables 3 and 4, respectively. The speed is scored to be normal (around 40%) to fast (>50%), while almost 80% of respondents feel satisfied with the DigiCard application.
Table 3. The Percentage of Application Response Speed

| In your opinion, is the response given by this application fast? |  |
|---------------------------------------------------------------|---|
| Very fast                                                     | 5.9 % | 2 respondent |
| Fast                                                         | 52.9 % | 18 respondent |
| Normal                                                        | 41.2 % | 14 respondent |
| Slow                                                          | 0 % | 0 respondent |
| Very slow                                                     | 0 % | 0 respondent |

Table 4. Percentage of Satisfaction of Application

| How satisfied are you with this application? |  |
|----------------------------------------------|---|
| Very satisfied                               | 2.9 % | 1 respondent |
| Satisfied                                    | 79.4 % | 27 respondent |
| Normal                                       | 17.6 % | 6 respondent |
| Dissatisfied                                 | 0 % | 0 respondent |
| Very dissatisfied                            | 0 % | 0 respondent |

4. Conclusion
Based on the development process and the results of the evaluation analysis that have been carried out in this study, it can be concluded that:

a. The DigiCard application can assist users in storing and managing their member cards, as well as getting information related to card data so that physical card usage can be reduced.
b. DigiCard application can help users to register cards easily because of the online registration feature, so users can register cards without the need to come to the relevant retail.
c. The DigiCard application can provide information about the nearest retail location, so users can easily find out the closest retail location that can be reached.
d. The DigiCard application can inform users about ongoing retail promos.
e. The DigiCard application has security features in the form of a PIN code and fingerprint that can prevent application misuse.

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