NoReceipts
A Mobile Document Management System for Receipts

Final Report

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Abstract

While currently there is no any digital document management system, allocating spaces for storing documents and working is a serious problem faced by thousands of small business operators in Hong Kong. Therefore, there is need for a document management system which can provide a platform for user to digitalize their documents and free up the storage space. In this project, a model of a mobile document management system will be investigated, and a mobile application based on this model will be developed.

With limited time and manpower, only several key features suggested are implemented in the new application. Designs of system architecture, database, and user interface have been completed. The Android mobile application are delivered in an incomplete state.
Acknowledgements

I would like to express my sincere appreciation to my supervisor Dr. Vincent Lau who provided the opportunity and supports on this project. This project cannot be completed without the effort from them.
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1. Introduction

1.1 Objectives

This project aims to implement a mobile document management system for projects named NoReceipt, which helps users to save their documents in their mobile devices and provide several features to manage those documents. The system targeted users are individual or small-scale companies in Hong Kong. Limited space is a serious problem in Hong Kong. By providing a convenient way to manage documents in mobile devices, space and time can be saved for storing and transferring documents.

A mobile application will be available to users for accessing the system. For mobile application, only an Android application will be developed due to the limitation of manpower in the project group.

1.2 Background and Motivation

The small and medium-sized enterprise in Hong Kong is suffering from lacking an efficient way to balance the space of working and storing.

Although the Government has provided some subsidies and low-rent offices to start-up companies, those supports do not last long and those companies are needed to face the burden of the high rent of Hong Kong offices (see Figure 1). To cover the cost of renting, utilizing the offices space to boost their productivity is needed and thus digitalizing the documents in the mobile application to minimize the storing area will be a solution. Therefore, small-sized businessmen are chosen as the start-up targets of the system.
The efficiency is low when storing documents in physical form. Not only rooms are required to make additional rooms and facilities for documents storage, when the documents are needed to be reviewed, time are wasted in searching and transferring from place to place.

Moreover, the documents to be stored may have different sizes, from a receipt to a A4-sized contract. Different tools like trays, folders and stands are needed to separate the documents and fit the documents’ size. Purchasing those equipment is an extra cost to those small-scale enterprise and individuals.

Therefore, we aim to develop a mobile application to hopefully relieve these problems.
1.3 Deliverables

<table>
<thead>
<tr>
<th>Phase</th>
<th>Deliverable</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Inception</td>
<td>Project Plan</td>
</tr>
<tr>
<td></td>
<td>Project Website</td>
</tr>
<tr>
<td>2. Elaboration</td>
<td>Interim Report</td>
</tr>
<tr>
<td></td>
<td>Android Application (prototype)</td>
</tr>
<tr>
<td>3. Construction</td>
<td>Final Report</td>
</tr>
<tr>
<td></td>
<td>Android Application</td>
</tr>
</tbody>
</table>

Table 1: Deliverables.
1.4 Timeline

2018
Oct

Phase 1 Project Plan
- Submit Project plan
- Design Project website

2018
Nov

Research and System Design
- Review on existing/similar applications or systems
- System design

2018
Dec

System Implementation and Development
- Database design
- Implementation of core functions
- User interface design

2019
Jan

Phase 2 Report and Presentation
- Interim presentation
- Interim report

2019
Feb-Apr

System Implementation and Extension
- Implement additional features
- Optimization and testing

2019
Apr

Phase 3 Report and Presentation
- Final report and application source code
- Final presentation
- Poster Design

Table 2: Project schedule.
2. Review of Existing Products

2.1 Examples of Mobile Document Management System

2.1.1 MrReceipt

MrReceipt is a mobile application that allow users to digitalize the receipts by taking picture and help user to tracking the expenses. The application allows user to import images from gallery or take photos to digitalize the receipts. It also can **generate a statistic report** to show the expense of each pre-defined category and the total expense, according to all the receipts record created by the user [1].

A major characteristic of MrReceipts is that it adopts the **Optical Character Recognition** in scanning, which will get the words/data on the photo through scanning and the user no need to type the entry. There is no payment or limitation of such services, but the recognition quality is not really satisfied, usually the data recognised is unfit to the entries.

Furthermore, this application does not provide features like **transferring the documents** or **edit the document** again.
Figure 2: Statistics page on MrReceipt, it shows the expense of each category and the total expense with pie chart.
2.1.2 Smart Receipts

**Smart Receipts** is another mobile application that allow users to digitalize the receipts by taking picture or import from gallery and allow user to generate expense reports for tracking the expenses [2]. Smart Receipts allows user to select from over 20 different default data types (including dates, price, tax, receipt categories, comments, payment methods, etc.) to generate the **finance tracking report** in PDF, CSV or ZIP format.

A major characteristic of Smart Receipts is that it adopts the **Optical Character Recognition** in scanning. However, payment is required for such convenient service. Users need to purchase quota to use the service of OCR auto-scanning, HKD$ 8.00 for 10 scans or HKD$ 38.00 for 50 scans.

Smart Receipts also does not provide features like **transferring the documents** or **edit the document** again.

![Figure 3: The user interface of Smart Receipts shows some the list of receipts and some statistic of a monthly record.](image-url)
2.2 Findings

It shows a significant possibility that most of the mobile application for receipts management provides features like generating expense report as attributed to the management system nature. However, features like transferring the document to others, or edit the recorded receipts are not supported.

Although the Optical Character Recognition (OCR) is commonly used in the scanning of the receipts to get the data on it, either the service is free but in unsatisfied performance, or it requires to pay. I do doubt that the necessity of applying OCR in scanning the receipts. For individual, the entries to be input are not too many and it is unwise to waste money on using the service of OCR. For organization, it requires high accuracy of the data entries, with unsatisfied performance, it is better for users to type the data by themselves.
3. Key Features

This chapter introduces the key features of NoReceipt, which targets at small-scale business and individuals, and takes references of the findings mentioned in the last chapter. Due to limited time and manpower, not all planned features are implemented in the final product.

3.1 Sending Receipt to Others

Normally, for individuals, the receipt records are confidential for the user to track their own expense reports, thus there is no necessity to have a feature of sending the receipt record to others. However, for the company users, they may often need to apply for reimbursement through handing in the receipts, if there is a feature of sending the receipt to the person in charge of reimbursement, it will greatly reduce the time of administration.

At first, it is planned to build a server for the system, and each user can send the receipt record to other users through the server, to ensure the authorization and authentication issue. However, due to the limited manpower and resource of the project, this planned, consist of building server protocol and authorization and authentication security system, is impossible to be achieved. Instead of sending the records through the system server, a simpler way is chosen, which is sending through the mail and the image of the receipt is appended (see Figure 4).
Figure 4: sending email with appending the receipt image.
3.2 Creating local copy of images

Normally, will the principle that not taking too much the storage space of the user device, the receipt records should be stored in the system server database and recorded with user ID. And the record information will be sent to the user application when the user required. However, as stated in section 3.1, no server will be built in the project and thus all the record will be saved in the user device. The meta data will be saved in the SQLite database of the application, and the image will be saved in the external or internal storage space of the user device.

Even there would be a server for the application, having copies of the images and records in the user local device can be a safeguard to some special situation. If the application server collapsed, and all online records are lost or cannot access during the repairing, user can still create receipt records locally or get the back the records which may lost in the collapse.

Figure 5: Local image copies in internal storage.
4. Methodology

4.1 Use-case

4.1.1 Main Success Scenario

1. A user starts the receipt create process in home page.
2. The user takes the photo of the receipt.
3. The user fills in the metadata of the record.
4. The user is redirected back to home page.
5. The user needs to search the newly created record if the user needs to review the record.
6. The user is satisfied with the record image and the metadata shown in review page.
7. new expense report is generated after adding a new record.
8. The user can send the report or record to others when reviewing.

Figure 6: Flow diagram of the Main Success Scenario.

4.1.2 Extensions

6a. The user wants to add additional information or modify the metadata of the record.
   1. The user modifies the metadata of the record in the editing page.
   2. Back to Step 4

6b. Conflict: the user is not satisfied with the record
   1. the user deletes the record in the review page of that record.
   2. Back to Step 1.
4.2 Database Design

Figure 7 shows the design of the database tables.

<table>
<thead>
<tr>
<th>Column</th>
<th>Data Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>id</td>
<td>INT</td>
</tr>
<tr>
<td>name</td>
<td>TEXT</td>
</tr>
<tr>
<td>category</td>
<td>TEXT</td>
</tr>
<tr>
<td>date</td>
<td>TEXT</td>
</tr>
<tr>
<td>last modify date</td>
<td>TEXT</td>
</tr>
<tr>
<td>expense</td>
<td>REAL</td>
</tr>
<tr>
<td>comment</td>
<td>TEXT</td>
</tr>
<tr>
<td>filepath</td>
<td>TEXT</td>
</tr>
</tbody>
</table>

*Figure 7: Database Design Diagram.*

4.3 User Interface Design

Here is the overview of UI flow designed (see Figure 8).

*Figure 8: The flow diagram of mobile application UI.*
Figure 9: The user interface for Home Page with one testing record.

Figure 9 shows the home page of the application. At the top, there is search bar for users to search the name of the receipt records. The main body of the home page is the list of search results. Each time the users first open the application, or the users do not type search string in the search bar. All receipt records will be shown. For each shown record, only the name, date expense and the category will be shown. To see the details of the record, the users can tap on the records and will direct the user to the specific receipt record details page. There is a floating action button in the right bottom corner. It is a menu button and there are two functions. One is adding a new receipt record and will direct the users to take photo page; the other is view the statistic report and will direct users to show statistic report page.
Figure 10A shows the create receipt page of the application. Five entries are required to be filled. Name, the name of the receipt record, which will be used for search in the home page. Date, the date of creating the record. The application will automatically set the current day as the Date (see Figure 10B). Users can still adjust it. Expense, the expenditure of the receipt. The data type is double and thus supports decimal number. Category, the category of the receipt, there are 12 pre-set categories for users to select, if there is not suitable category, the user can use “Other” as the category. Description, user can type any description of the receipt, including notice, comment, etc. This field support multiline input. Once the users confirm all data, they can tap on the create button and the receipt record is created.
Figure 10B: The user interface for Create Receipt Page that the date is pre-filled.
Figure 11A: The user interface for Receipt Detail page.

Figure 11A shows the receipt detail page of the application. It shows the data of the receipt including name, category, date, expense and the description. In addition, there are 4 functions in this page. For review receipt image, user will be directed to review image page to check the receipt image (see Figure 11B). For the edit receipt record, user will be directed to edit receipt page to edit the data of the receipt (see Figure 11C). For send email function, user will be directed to send email page to send the email appended with receipt image (see Figure 11D). For the delete record function, there will be an alert dialog pop out which is confirming the delete action of the users, when the users click the button. After users click yes on the alert dialog, the record will be deleted in the database and the image will be deleted in the file system. And the user will be directed to the home page.
Figure 11B: The user interface for review receipt image. It is showing a Parking Shop receipt.
Figure 11C: The user interface for Edit Receipt Record page.

Figure 11C shows the Editing page of the application. Its display seems like the create receipt record page, but all the entries are already filled by the system. User can edit the value of those field and press the save button to update the receipt record.
Figure 11D: The user interface for Send Email page.

Figure 11D shows the send email page of the application. It has three entries, the target email address, subject of the email, and the message. Like the Description text box in create receipt record page and edit receipt record page, the message text box in here supports multiline text string input. Although all the inputs in those entry will be sent to the Gmail sender and pre-filled in the same entries, it is not a must for user to enter those entries before pressing the send button. User can type those entries in the Gmail sender. The image of the receipt will be seen to be appended to the email.
Figure 12 shows the statistic report page of the application. At the top of the page, the total expense of the user will be shown. The total expense is the sum of expenses in all records. Below the total expense is a list of all category. For each category, there will be a sub-total expense, representing how much money is spent in such category.
5. Problems Encountered and Mitigation

5.1 Business Risks

5.1.1 Insignificant Number of Target User

With incomprehensive service and features as planned, target users, mainly the company clients, may not trust the application can acts as a system helping them to boost productivity and refuse to use the application. With current resource and manpower, this problem is hard to mitigate. At least more time are needed to implement the addition features of the receipt management system. Once the service and features are completed, aggressive advertisement will be needed to attract the target user and rebuild their trust to the application.

5.2 Technical Challenges

5.2.1 Resolution Problem of Image

The resolution problem is the most perplex problem faced during the development. With the standard procedure provided by Android, the quality of resolution of the image is unacceptable (see Figure 13). Time and resources are spent to solve this issue as the quality of the image is essential for a mobile document management system, if the image is too blur, the image cannot represent the original document and the whole system lost its meaning. The problem is solved in around late March by getting solution online. The resolution finally come to normal standard (see Figure 11B), but too much time is spent in solving the problem and lead to very limited time in development.
5.2.2 Android API Version

Since Android API often upgrades, some packages or online resource implemented with some old methods or old packages may depreciated when new versions are launched. The application may crash or unstable in different versions of Android. It demands times and manpower to study the reason behind the issue and implement different methods or logics for different version.

Instead of facing the problem of fast change Android version, with limited resources and time, not all Android running devices are covered in the testing.
5.2.3 Android Version Testing

The application has been tested under different versions of Android. All user interface has been visited according to the defined Use-Case.

<table>
<thead>
<tr>
<th>Version</th>
<th>Codename</th>
<th>Result</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Android 5.0</td>
<td>Lollipop</td>
<td>FAIL</td>
<td>Sometimes tapping on the searched record do not redirect to detail page</td>
</tr>
<tr>
<td>Android 6.0</td>
<td>Marshmallow</td>
<td>FAIL</td>
<td>Sometimes tapping on the searched record do not redirect to detail page</td>
</tr>
<tr>
<td>Android 7.0</td>
<td>Nougat</td>
<td>PASS</td>
<td></td>
</tr>
<tr>
<td>Android 8.0</td>
<td>Oreo</td>
<td>PASS</td>
<td></td>
</tr>
<tr>
<td>Android 9.0</td>
<td>Pie</td>
<td>PASS</td>
<td></td>
</tr>
</tbody>
</table>

Table 3: Application testing results.

5.3 Recommendations

During application testing, one major issue was observed for older version of Android. For Android 6.0 or lower, when tapping on the searched record on the home page, it does not react to the clicking action. Under normal circumstances, clicking the record will direct the user to the detail page of that record. It is suggested to the upgraded library and package of cardview and recyclerview may not support the old version Android, but further studying is needed to find out the answer. It is better to find another way to show the search results and allow user to get the details of that record.
6. Conclusion

A mobile document management system had been introduced which focus on the receipt type document and targeting the individual and small companies’ market.

This thesis describes several key features of the application, such as the sending the images through email for user to apply reimbursement, allowing users to create local back-up records in their own device.

It is important to expand the existing functions and features of the application as the future work to provide a more comprehensive user experience. The current application only focuses on individual and small companies as the starting target. However, with the limited features of the application, it would be difficult to retain the first-tier targets to continue using the application. Thus, extra resource and manpower would be crucial for such extension.

One of the major business risks is that small companies may refuse to use the application since the application only provides with limited features and functions in the first delivery. More time and manpower are needed to provide a relatively comprehensive and workable receipt management system to the target.

A major technical issue is that the service performance is unstable in different versions of Android API, it is difficult to ensure the efficiency and stability on all Android versions with limited time and manpower.

There is a large room for enhancing the service provided by the application, including some are mentioned in the coming chapter. With limited manpower, either user interface or service
performance should be possibly improved to provide a better user experience, and some extra feature should be implemented.

7. Future Developments

This chapter providing several suggestions and reflection on the features or function that can be enhanced in the future development if resource and manpower are enough.

7.1 System Server

System server with database and secure protocol, like Secure Sockets Layer (SSL), should be set up for extending more possible service of the application. Without a server database, currently the application saves the images in the user device, which consume large storage space, even though it can be a back-up source if the server collapsed. Many existing document management systems in mobile application or computer application, are supported with strong server and the data of those document can be save in the server and release the storage burden of the users. With secure protocol, the uploading receipt record information can be more secure when sending over the Internet, which packages can be attacked if without any encryption. Moreover, establishing a server can help to implement the instant communication system for data and information transactions between users.

7.2 Enhancement on Statistic Report

Statistic Report takes an important role in the data analysis feature in a document management system. With a comprehensive statistic report, the users can understand their expense styles or problems more deeply. More customize filtering or statistic calculation functions should be available to users. The user interface of showing the report can also be enhanced for more clear numbers and category.
7.3 Extension of Receipt Record

The image capacity of the record has a large room for expanding. If the image capacity increase, the application can support more different types of receipts, for example, buying a self-constructing computer usually has a long receipt or few receipts showing all components the consumers purchased.

The record should also support multiple categories as it is common for products or services involving more than one category. It will be inaccurate to show the nature of the receipts in such situation, especially if the image capacity increase in the future development.

7.4 Instant Communication System

To enhance the experience of users applying reimbursement, an instant communication, which extremely reduce the time for transferring document and waiting decision, is a great selling points for employees. In addition, communication done through the system provided by the application can protect the interests of users. The chat record can be useful on judging any conflict happened in the communication. The communication system should provide a chat room which supports text or video chat and appending the record.

7.5 Multi-Language and Currency Support

Currently the application user interface only shows English instructions and information. More resource can be spent on translating those instructions and information into other languages, such as simplified and Traditional Chinese, for attracting the large potential Chinese language zone users to use the product. Not only language, currency using in the application should also able to fit different currency. Thus, the application should contain
other languages string packages for displaying the suitable language base on users’ configurations.

7.6 User Settings

Settings should be added to the application for user to adjust the using experience. For example, the user can decide how the receipt image should be display on the review image page, in horizontal or vertical.

8. References
