Mobile Document Management System

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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. Currently, the project has accomplished the design of database, system diagram of some major functions and the design of user interface of the mobile application. All will be presented in this thesis. The further development directions will be focus on implementing the prototype application and investigating any new functions to be implemented.
Acknowledgment

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Chapter 1   Introduction

The burden of the high rent of Hong Kong offices causing every small and medium-sized enterprise in Hong Kong needs to utilize the offices space to boost their productivity. Unfortunately, without any digital document management system, those enterprises still required to make a room for documents storage instead of a new working room or new equipment. To maximize the working efficiency, a better way to store the files efficiently is required, and that is the motivation of developing the mobile document management system.

The mobile document management system is designed for small businesses and organizations in Hong Kong to digitize the documents by photo-taking of the documents and store those document records in a mobile application. Therefore, the user can save the space for storing files and time for transferring those documents and review their documents on their mobile devices at any time and place.

According to the schedule of the project, the design of the database, the design of the widget tree and user interface, and the system diagrams of the major functions of the system are set to be achieved before October 2018. Currently, the design of the database, the system diagrams of creating document folder and document record and the design of the user interfaces are ready for presentation.

The remainder of this thesis is organized as follows. In Chapter 2, it presents the methodology and some similar products of the project. In Chapter 3, It shows the status of the project. In
Chapter 4, the difficulties and limitations faced in development will be discussed. In Chapter 5, It closes with the thoughts on future research and development directions.

Chapter 2 Methodology & Similar Products

In this chapter, the methodology of the project and some similar products will be presented.

2.1 Methodology

In this section, it will present the methodology of the project from the view of development environment, including development platform and tools, and the requirements of hardware and software.

2.1.1 Development Environment

Android will be chosen as the developing platform for its openness and significant market share. Also, the cost of development is much lower compared to IOS as additional devices for IOS development are required for testing. Developing the IOS version would only be considered if the development of the Android version has accomplished and there is hardware device supporting the IOS development. Java will be chosen as the programming language for its SDK support and its external libraries which can support the different functions that will be implemented in the application.

2.1.2 Hardware and Software Requirements

The application is designed to work on any Android devices which have ARM processor with at least 1GB memory. The application only supports the Android version Lollipop, API level 21, version 5 or newer.
2.2 Similar Products

The mobile document management system is not the first mobile application aiming to digitalize the paperwork into the mobile application. Smart Receipts is a mobile application that allow users to save the receipts by taking picture or import from gallery and generate expense reports for user tracking the expenses\(^2\). Although there are some similar functions and features between Smart Receipts and mobile document management system, while Smart Receipts is mainly focus on receipt type documents for generating expense report and managing related affairs, mobile document management system aims to include and support all kinds of document for storing and transferring purpose.

Mobile Doc Scanner (MDScan) + OCR is another application that provide similar services as mobile document management system does. MDScan + OCR not only provides the Optical Character Recognition (OCR) and sharing the documents through email, Gmail and Skype, it also provides the cloud storage of Google Drive and Dropbox. Users can also use the image editor designed by the developers to edit the image “scanned”. Providing better and more service has its own price, users need to purchase MDScan + OCR with cost $38 HKD or they will face limitations like that the users can only “scan” 4 pages in each time with watermark printed. Although mobile document management system may not provide services as much as MDScan + OCR does, free of charge and no limitations may consider as the advantages of mobile document management system.
Chapter 3   Current Status

3.1 Design of Database

SQLite, which is an embedded Structured Query Language database engine for mobile application, is chosen to be the database engine of the system. Since the document management system requires the data that must be sifted and sorted, it is better to load the data into a Structured Query Language database engine and use queries to extract the data instead of implementing code of the same operations \[1\]. In addition, using a Structured Query Language database gives the mobile application greater flexibility for adding new columns quickly and easier\[1\].

There are two tables for storing the data of the document folders and document records respectively in the database. The table of the document folders has the following columns for storing the related data: “Name”, “Category” and “Description”. These data are stored in TEXT format in the table as their value should be string data type in the mobile application.

<table>
<thead>
<tr>
<th>Name</th>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example_folder</td>
<td>Report</td>
<td>It is an example</td>
</tr>
</tbody>
</table>

Fig 3.1: Illustration of an example of the document folder table.

The table of the document records has the following columns for storing the related data: “Name”, “Category”, “Description”, “FilePath” and “Date”. These data are stored in TEXT format in the table as most of their value should be string data type in the mobile application. For the column “Date”, although the user input numbers for the date, it is easier to extract the year,
month and day from the date if it is saved as a string data type in the mobile application and TEXT format in the table.

<table>
<thead>
<tr>
<th>Name</th>
<th>Category</th>
<th>Description</th>
<th>FilePath</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example_record</td>
<td>Report</td>
<td>It is an example</td>
<td>Photo\img000.jpg</td>
<td>30/11/2018</td>
</tr>
</tbody>
</table>

**Fig 3.2:** Illustration of an example of the document record table.

For the images of the documents, according to the original plan, the image of the document should be converted into BASE64 format and stored in SQLite database. Keeping images in the database has a few advantages. First, it simplifies the process of deleting the image, as deleting the image’s entry in the database automatically deletes the image itself, separate step that requiring image deletion from the device file system is omitted. Furthermore, the database backup tool will back up the images if images are saved in the database. There is no need to back up the images separately.

However, there are a couple of reasons against storing images in the database. The main problem is that images usually have the large data size. Saving them into the application database will cause the mobile application to consume much more memory space comparing to storing images in device file system, and the target and potential users may not want to download a memory-consuming application in their device. In addition, backing up and restoring the database will take longer because of backing up large data size objects. Considering the benefits and drawbacks, it is more suitable to save the images in the device file system instead of application database.
3.2 System Diagrams of Major functions

System diagrams are diagrams which showing the operation sequence of the system. The diagrams help the developers understand the responsibilities and the operations of different actors in the system and thus creating those diagrams can enhance the developing efficiency.

3.2.1 Creating Document Records by Photo-taking

![System Diagram](image)

**Figure 3.3**: System diagram of creating document record by photo-taking.

Figure 3.3 is showing the system diagram of creating document record by photo-taking. Document record is the data object of the mobile document management system representing a document. When the user try to create a document record, it will trigger the createDoc() function and the user will need to decide the source of the image of the document from the selectMethod() function. Since system diagram is aimed to demonstrate the most frequent situation, it is assumed that the user selects to take a photo of the document. The system will then redirect the user to the
camera page to take photo of the document and then redirect to the create document record page. User will need to enter the name, category, description and date for the enterInfo() function to create a document record.

Figure 3.4: System diagram of creating document folder.

3.1.2 Creating Document Folder

Figure 3.4 is showing the system diagram of creating document folder. Document folder is a data object holding and managing document records in the system, just like a folder holding documents in real life. There must be at least one document folder in the system if the user wants to add any new document records through the application. When the user try to create a document folder, it will trigger the createFolder() function and the system will redirect the user to the create document folder page and the user will need to enter the name, category and description for the enterInfo() function to create a document folder.
3.3 Design of User Interface

Currently, all the interface design of basic functions of the mobile application is finished. Other user interface designs for extensive functions are still working in progress when writing this thesis.

Figure 3.5 is showing the user interface design of the home page of the mobile application. It shows all the document folders stored in the system with their names and folder icons. If the user taps on the folder icon, the application will open the related folder page for user to view what document stored in that folder. There is a floating-button in the down-right corner, which will start the creating document folder process when the user taps on it. Setting a floating-button in the home page will help the user to create a new document folder more quickly. On the
application bar, the page name “MDMS” is an indicator to notice that the current design is for prototype development. It will be changed in further development. There is a menu icon on the right side of the application bar for user to click on it and show the menu of the application, the content of the menu has not yet decided.

![Figure 3.6: User interface of folder page.](image)

Figure 3.6 is showing the user interface design of the folder page of the mobile application. It shows all the document records stored in the current folder with their names and document icons. If the user taps on the document icon, the application will open the document view page of that document record. There is a floating-button in the down-right corner. When the user taps on it, it will pop up three buttons for the user to select the source of the image of the document record, then it starts the creating document record process. Setting a floating-button in the folder page will help the user to create a new document record more quickly. All button will lead to the
create document record page, however, if the user taps on the button “IMPORT”, it will change to a file selection page for user to select the import folder first; if the user taps on “PICTURE”, it will change to a photo taking widget for user to take the photo first. On the application bar, the page name will be the folder name, which help the user to know what the current viewing folder is.

Figure 3.3 is showing the user interface design of the create-folder page of the mobile application. It shows all the data entry for creating a document folder. User needs to enter the name of the folder, chooses the category of the folder from the preset categories and writes some description of the folder. Once the user taps on the confirm button, a document folder will be created. Figure 3.4 is showing the user interface design of the create document record page of the mobile application. It shows all the data entry for creating a document record. User needs to enter the
name of the record, chooses the category of the record from the preset categories, enters the date of creating and writes some description of the record. Once the user taps on the confirm button, a document record will be created.

Figure 3.9: User interface of document viewing.

Figure 3.9 is showing the user interface design of the document viewing page. It shows the picture of the document record. Currently it only supports showing one picture.
Chapter 4  Difficulties and Limitations

The biggest problem in the current progress is that the planned features of the application is too simple when compare to other mobile documents management applications. Other applications may have implemented features like OCR and sharing documents through emails, which are the planned features of this project. Besides, those applications may also support features like Google Drive or Dropbox cloud storage and image editor. As a personal final year project, the remaining time and manpower of the project may be not enough to implement all those features in the applications. Thus, a new and special feature will be needed to stand out other applications. Time will be needed to get a new inspiration.

For the coding problem faced in the development, it is hard to implement the “multiple shot” function of camera to create a document record with more than one photo. Investigation of the related code has been done around the late December 2018, but the “multiple shot” function still cannot work properly when writing this thesis, the main issue usually is that the photo-taking widget do not return to the home page after taking “multiple shot”. Further investigation will be carried out in the coming month.

The time spent on the development is also longer than the expectation in proposal due to the heavy workload of other courses in final year. To catch up the scheduled progress, more time will be spent on the implementation.
Chapter 5  Conclusion and Future Work

To store the files efficiently and minimize the storage space used, the mobile document management system is designed to store the document in mobile devices by taking a photo of the documents. This paper has presented the current progress of the development of the system, including showing some user interface designs of managing the documents, explaining the design of the database structure, and demonstrating the system diagrams of creating document folder and document records.

Unfortunately, due to the bad time management and unknown bugs in the implementation, the current progress is far behind the original schedule. Apart from that, it is needed to consider a new and special feature for the application to compete with other similar applications. Therefore, fixing bugs and catching up the planned progress will be the most urgent issue in the coming development. After accomplishing the implementation of the prototype application, collecting and analyzing feedback of the prototype will be in priority.
## Schedule

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<td>Studying Java and Android System</td>
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<tr>
<td>Oct 2018 - Nov 2018</td>
<td>Design of Database, System Diagram and UI</td>
<td>Completed</td>
</tr>
<tr>
<td>Nov 2018 - Dec 2018</td>
<td>Development of Prototype</td>
<td>In progress</td>
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<td>Before the end of Jan 2019</td>
<td>Deliver Prototype</td>
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<tr>
<td>Feb 2019</td>
<td>Collect and Analysis the feedback</td>
<td>Pending</td>
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<tr>
<td>Mar 2019</td>
<td>Adjust functions/interface according to feedback</td>
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<tr>
<td>Feb 2019 - Apr 2019</td>
<td>Optimization and Testing</td>
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<tr>
<td>Apr 2019</td>
<td>Deliver Finalized tested implementation</td>
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Reference