APPLYING CLOUD STORAGE AND SEARCH ENGINE IN THE THESIS MANAGEMENT SYSTEM

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ABSTRACT

The objective of this thematic paper was to develop a system for collecting and searching thesis documents belonging to the Information Technology Management Division (ITM), Faculty of Engineering, Mahidol University. This system was developed based on SaaS (Software as a service), Google Drive technology, a kind of cloud service. This system would facilitate the storing of the theses into the Google system and the enrolled users could perform content searching using keywords. The developed system would call the Google search engine which was embedded in the Google Drive API. The system was developed as a web application in order to connect the service. The system obtained results from the Google Drive and showed the result via the webpage. The system was divided into 2 parts; the first part was the user part, used for; searching, viewing, and downloading. This part would check the authentication for limited access to files. Users who had authentication could view the whole thesis while the guest users could view only the first seven pages as a preview of the thesis. The second part was the staff part used for uploading the thesis file. The users tested and evaluated the system, and it was found to be good (4/5). This system was launched and integrated into the ITM e-Library system, of the Information Technology Management Division, Mahidol University.

KEY WORDS: ITM / E-THESIS / GOOGLE DRIVE API / FULL-TEXT SEARCH / CLOUD STORAGE

36 pages

การประยุกต์ใช้การเก็บข้อมูลและเครื่องมือการค้นหาบนคลาวด์ในระบบการจัดการวิทยานิพนธ์
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บทคัดย่อ

สารนิพนธ์ฉบับนี้มีวัตถุประสงค์เพื่อพัฒนาระบบเพื่อจัดเก็บและค้นหาเอกสารของกลุ่มสาขาวิชาเทคโนโลยีการจัดการระบบสารสนเทศ คณะวิศวกรรมศาสตร์ มหาวิทยาลัยมหิดล โดยพัฒนาต่อยอดจากเทคโนโลยี Google Drive ที่เป็น SaaS(Software as a Service) ซึ่งเป็นการให้บริการประเภทหนึ่งของคลาวด์ ซึ่งระบบนี้จะช่วยในการจัดเก็บไฟล์วิทยานิพนธ์ขึ้นระบบ Google และสามารถค้นหาคำที่ต้องการโดยใช้ความสามารถของ เครื่องมือค้นหาของ Google ที่มีอยู่ใน Google Drive API นำมาพัฒนาระบบในรูปแบบของเว็บแอพลิเคชันที่เชื่อมต่อกับ services เพื่อรับผลลัพธ์จาก Google Drive และมาแสดงผลบนเว็บไซต์ โดยระบบจะแบ่งเป็นสอง ส่วน คือ ส่วนแรกเป็นส่วนของผู้ใช้งานที่ใช้สำหรับค้นหาคำที่ต้องการ ดูไฟล์เอกสาร และดาวน์โหลดไฟล์ได้ โดยส่วนนี้จะมีการตรวจสอบสิทธิ์เพื่อจำกัดการเข้าถึงไฟล์โดยผู้ที่มีสิทธิ์สามารถดูวิทยานิพนธ์ได้ทั้งเล่ม แต่ถ้าเป็นบุคคลภายนอกจะสามารถดูได้ตั้งแต่ หน้าที่หนึ่ง-เจ็ดเท่านั้น ส่วนที่สองส่วนของเจ้าหน้าที่ สำหรับอัพโหลดไฟล์วิทยานิพนธ์ โดยให้กลุ่มทดสอบ ทดสอบระบบและทำแบบประเมิน ได้คะแนนโดยรวมอยู่ในระดับดี(สี่คะแนน จาก ห้าคะแนน)

ระบบนี้เริ่มมีการใช้งานและรวมเข้ากับระบบ ITM e-Library ของกลุ่มสาขาวิชาเทคโนโลยีการจัดการระบบสารสนเทศ คณะวิศวกรรมศาสตร์ มหาวิทยาลัยมหิดล

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CHAPTER I
INTRODUCTION

1.1 Problem Statement

Technology related to the data management began to play a role in everyday life because users can unlimited store data and access from everywhere just using the internet [1]. At the present, there is a model service which is SaaS (Software as a service) from each provider and Google Drive [2] is one of the tops of all options for users because Google has simply interface, no charge in the basic operation, and enough to use online capacity. Google Drive also provides APIs for a developer to develop an application that connects to exchange data between Google and developer such as full-text search for file contents or filename. Good manage document must categorize document for easy search, get a file to quickly and exactly usage. So, Google drive is suitable to use.

At present, Mahidol University Library website can search thesis only by thesis name or related metadata cannot search by full-text search because a file is the limit and cannot reveal all content in the thesis. Information Technology Management Division have many students in each year that make researcher see the way for students to search thesis for more knowledge or further development and for another person to search thesis.

Information Technology Management Division, Mahidol University store documents in 2 format are paper format and files format. According to files format, they are using ITM Google drive account to store by file name which identifiable of the file contents and can be categorized, such as Year, Student's name, Subject etc. However, only staff can search or download the file because of the restriction of Google. This restriction makes some useful document and can reveal to the public such as thesis, research, and documentary. Allow students, staff within the University and other person can search or download file to bring knowledge for reference or other. Normal usage of the Google Drive can search keyword but users must have permission to access files. If the owner allows another person who do not have permission access a files, The Google have a solution for access file using Service Account.

Therefore, the researcher applies the technology “SaaS”, which is the Google Drive, to developed and applied website for staff, good manage files, categories file correctly and allow third parties who interested can search keyword match with file or file name from a document. In this study, the students’ thesis is selected as the document domains. The researcher studies how to using Google Drive API, how to developed website for connecting with Google Drive API and developed website for support staff who can manage all files in drive and support users who can search, view and download files in a drive.

1.2 Objective

To develop a system for storage and search the document for Information Technology Management Division, Mahidol University such as Thesis, Research and etc. using Google Drive technology.

1.3 Scopes

1.Design and develop a website for support user are divided into 2 parts.

1.1. Front-end part for user to searching, viewing and downloading full thesis or previewing thesis depend on permission

1.2. Back-end part for staff to uploading full thesis and previewing thesis using Google Drive

2. System are divided user into 3 groups

2.1 Staff: can search, view, download full thesis and upload thesis

2.2 Teacher and student: can search, view and download full thesis.

2.3 Guest: can search, view and download preview thesis.

3. Related documents are thesis and thematic.

1.4 Expected Result

The expected benefit is to store thesis documents for ITM for the purposes of systematic, easily to full-text search, can be disseminated useful document to teacher, staff, student and another person from website and as a database for the knowledge and build or improve.

CHAPTER II
LITERATURE REVIEW

2.1 Cloud

Cloud is an online service in many ways such as processing, storage data, software and others. The advantage of cloud is to decrease cost of services, decrease time to install and setup network, can scale up as needs increase and then scale down again as demands decrease and can access in everywhere you need via connect the internet. Type of cloud service is varying and divided into three types are [3].

1. SaaS (Software as a Service) is a software or application service via internet. User unnecessary to setup, install, maintenance and decrease cost of maintenance system. For example, free email such as Hotmail or Gmail, Google App, Office 365.

2. PaaS (Platform as a Service) is a service platform such as if I want to develop an application and run on .Net framework, you can choose platform .Net to develop and unnecessary to setup and install system. PaaS service provider such as Google App Engine, Salesforce and Microsoft Windows Azure.

3. IaaS (Infrastructure as a Service) is a service of computer structure in virtualization form, flexible to adjust size and pattern of usability, decrease infrastructure costs and system administrator because service provider will provide and manage all of them. IaaS service provider such as Amazon EC2

Cloud types are shown in Figure 2.1.

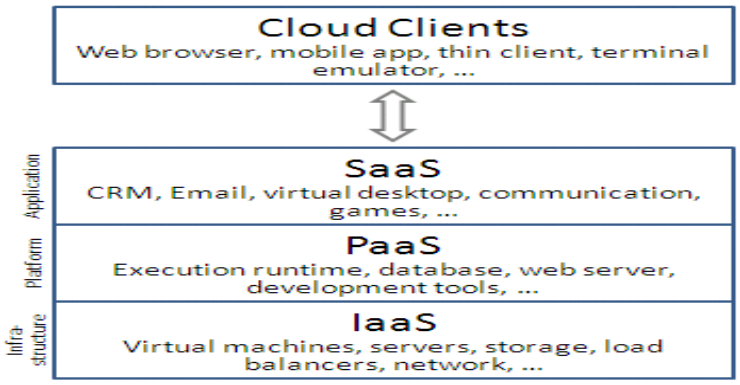


Figure 2.1 Cloud types

In 2014, from IMC Research about using public cloud in Thailand [4] found 46 percent using Cloud, the most using in IaaS (Infrastructure as a Service) SaaS (Software as a Service) is subordinate and last is PaaS (Platform as a Service).

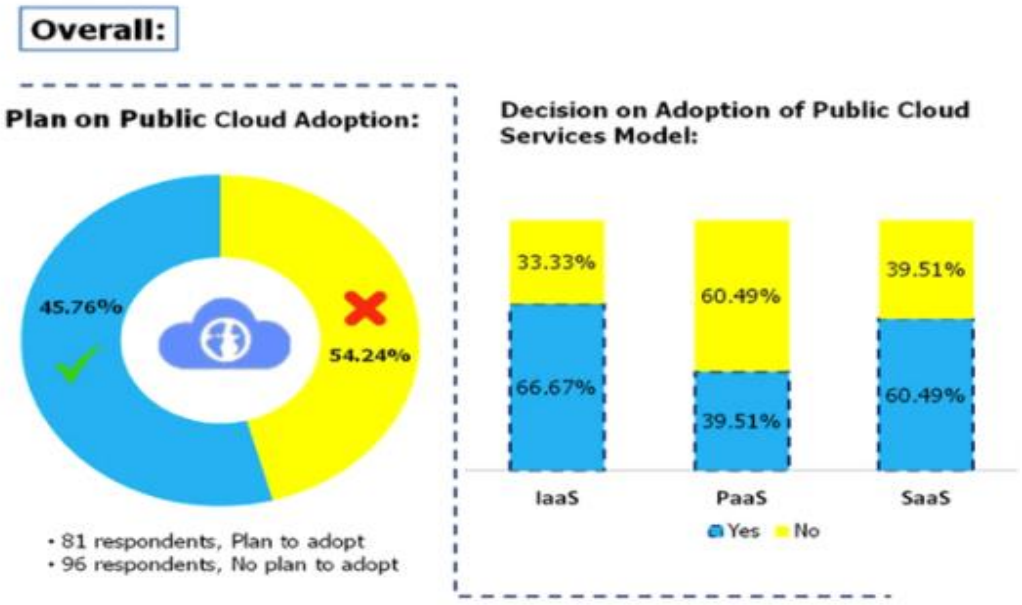


Figure 2.2 Public Cloud Adoption Plan (Total Respondents)

2.2 Google Drive

Google Drive is a service for storage file in Google Cloud and can access from everywhere via the internet. Step for use Google Drive is registry google account and get space 15 Gigabytes for storage file. User can upload file by website or mobile application. There are 2 functions are [5]

- Sharing

Share file to another person to use to by authentication in 3 types are user can edit file, can comment in file and only view file.

Figure 2.3 The sharing setting on Google Drive

- File viewing

User can open file on website in vary type such as .docx, .xlsx, .jpg and .mpeg.

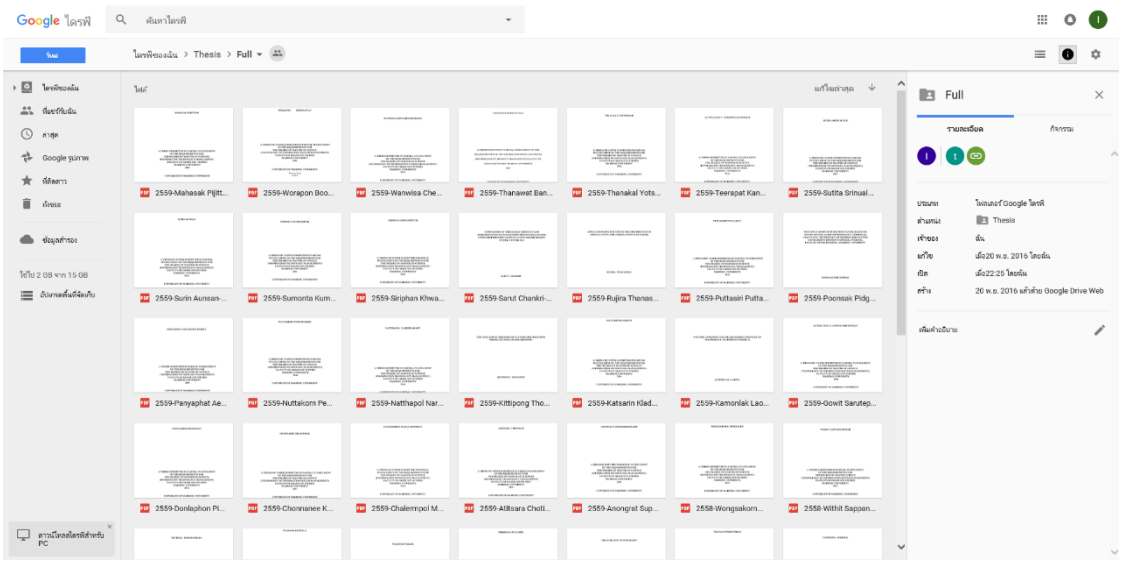


Figure 2.4 View file on Google Drive

- Search

Search files like Google search and search by keyword that user required.

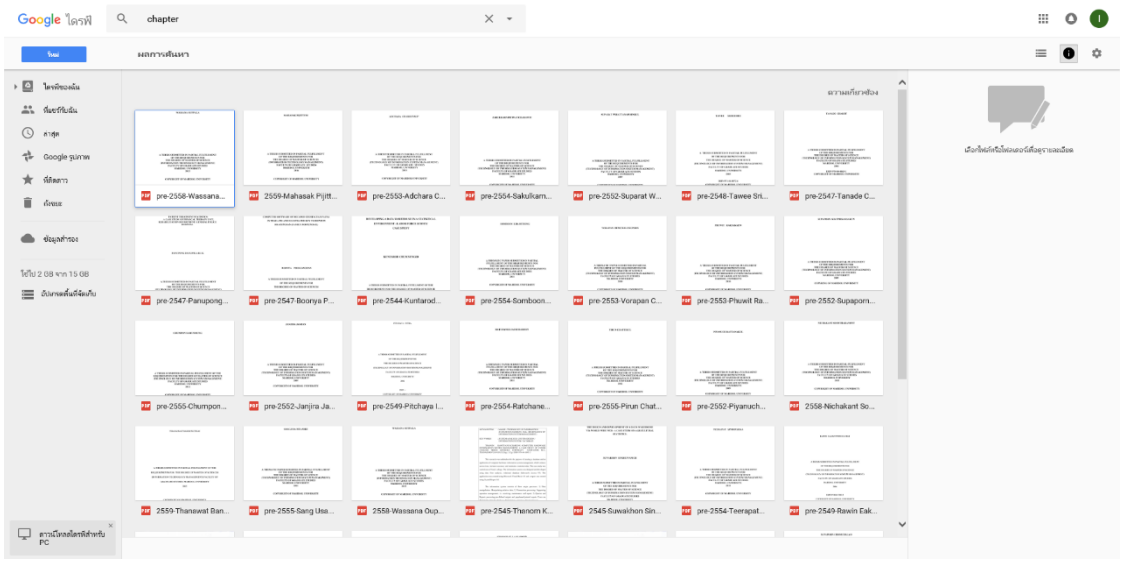


Figure 2.5 Search file on Google Drive

2.3 Dropbox

Dropbox is a service for online upload and sync file on Cloud. User can access a file via computer application, mobile application or Dropbox website. Initial space for Dropbox is 2 Gigabytes [6]. There are 2 functions are

- Sync file

When place file in Dropbox folder, program will sync file immediately to a server when connecting to the internet.

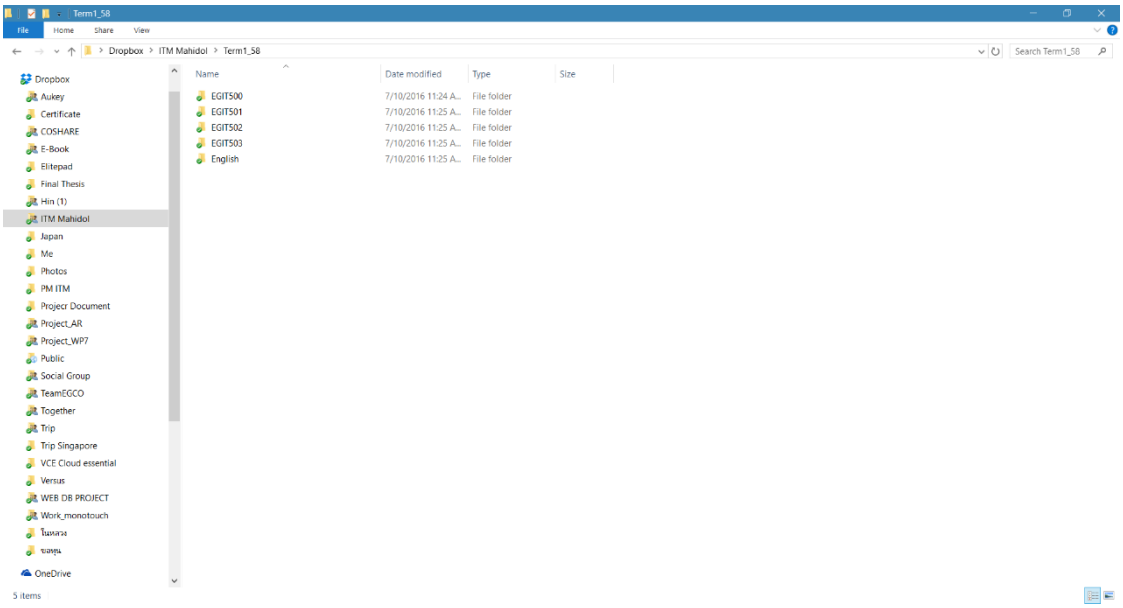


Figure 2.6 Folder for sync file with Dropbox

- Sharing

User can share file or folder on Dropbox server to another person and allow another person to access file or folder by invite or send direct link

-

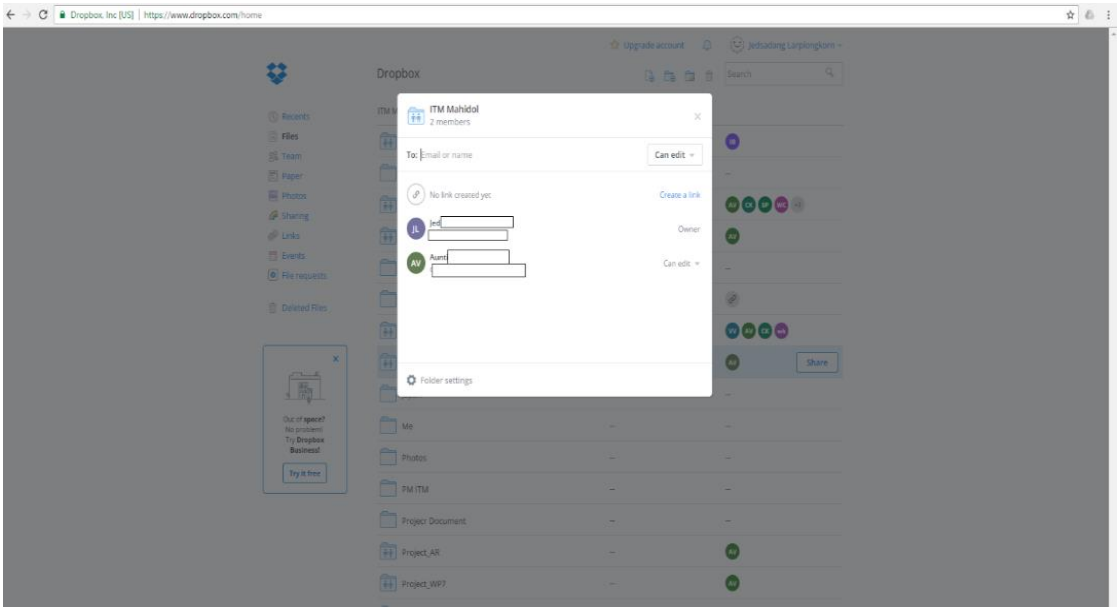


Figure 2.7 Sharing setting on Dropbox

- Backup online

Dropbox has a function to backup data on the server. If user has problem to access data via computer or a problem with hard disk, user can access data via Dropbox website.

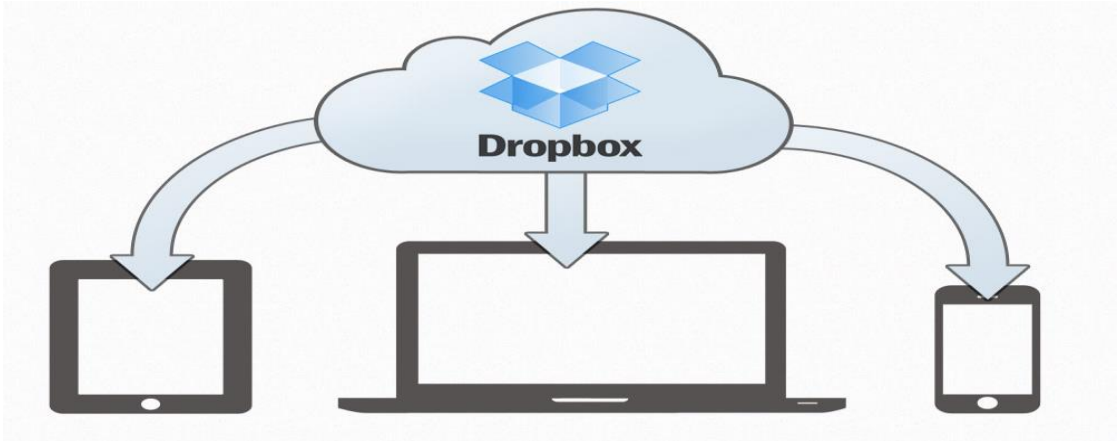


Figure 2.8 Cloud for Dropbox can access multi device

- Recovery files

Dropbox has a history function for any change, user can recovery delete file within 30 days.

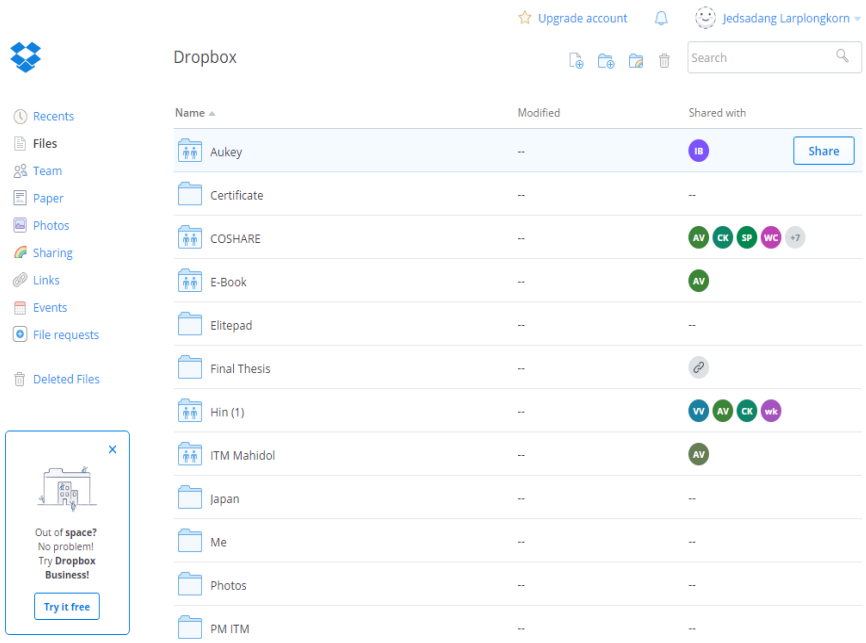


Figure 2.9 History file on Dropbox

2.4 Related works

This research will review applications about full-text search.

1. Alfresco

Alfresco is a solution ECM and software open source that occurs on 2005. This software is easy to use, easy to implement and cheap cost [7]. There are 2 license versions are

1. Alfresco Enterprise pays for license base on CPU and unlimited user.
   - Using with Commercial Database such as Oracle, SQL Server, DB2.
   - Using with Commercial Web Server such as Oracle WebLogic, IBM Web Sphere.
   - Support by Alfresco.com
2. Alfresco Community is not license but limited.
   - Using with Open Source Database such as MySQL, PostgreSQL
   - Using with Open Source Web Server such as Tomcat
   - Support from Alfresco Community

Alfresco has 2 important components are

1. Alfresco Explorer for manage content and interface like Window Explorer. This component emphasizes is convenience to using and manage content.

2.Alfresco Share for manage content and develop in collaboration function. This component has an interface like portal.

Alfresco can search documents in 2 formats are [8]

1. Search by an index set of documents such as customer name or project name.

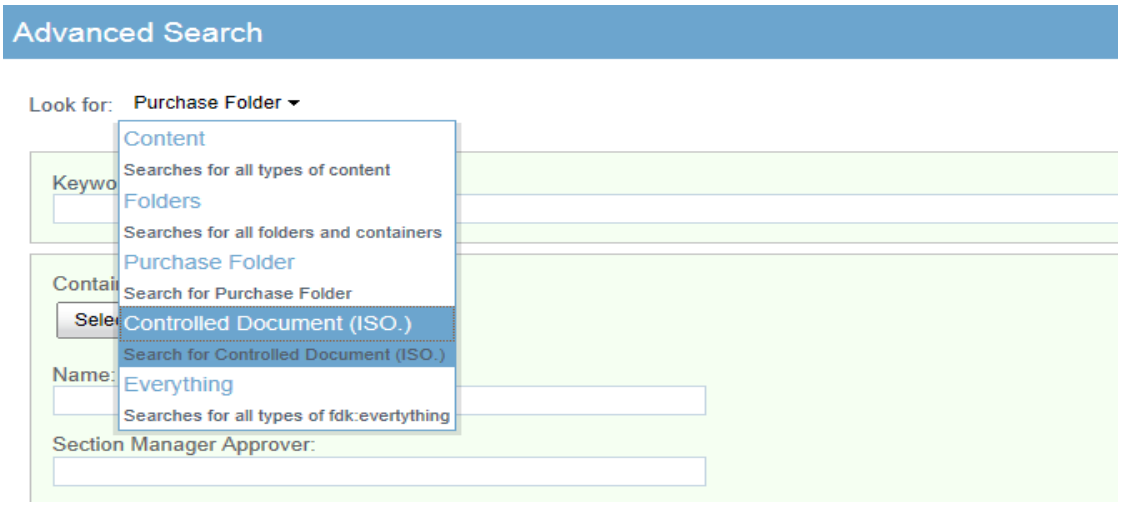


Figure 2.10 Search document by index

2. Search in document content of full-text search by using the search engine is Solr that popular open source engine and high performance. When entering Alfresco program, a process for build index will run as background process.

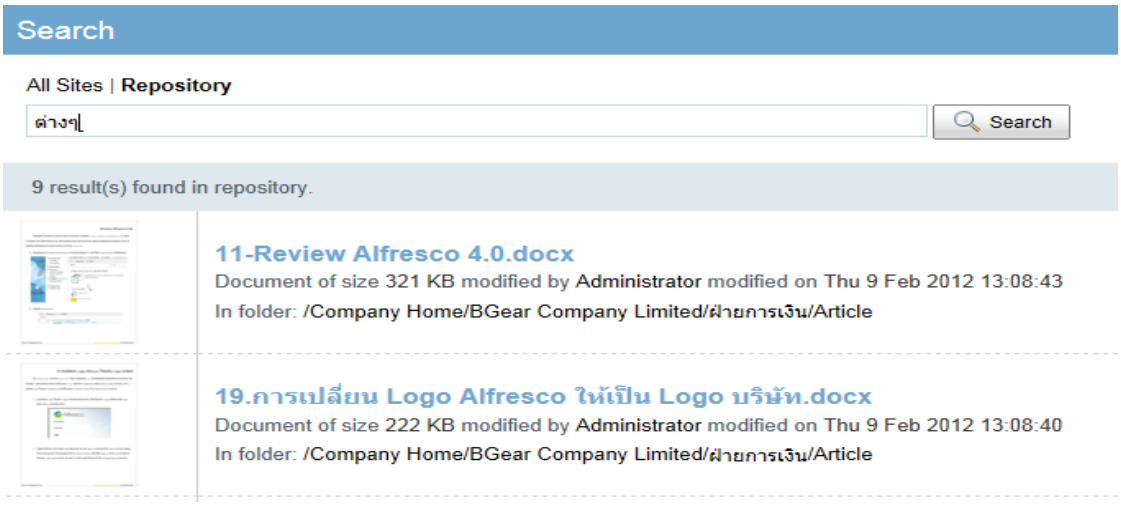


Figure 2.11 Search document with full-text search

- Advantage

The application is an open source software, user-friendly and no license for standard functions.

- Limitation

Limit usability in standard level such as database engine must be open source only and in commercial level with support must pay license fee based on the number of CPU

2. UltraFileSearch

UltraFileSearch is a program for search file, folder, and text in computer, network, DVD, CD-ROM, USB Hard disk or Flash Drive. Program allow simultaneous search in multiple file or folder, can sort result and search file by one or multiple words or sentences [9]. Important function is

- File Searching Capabilities is search file or folder in NTFS or FAT File System in Hard disk
- Searching Parameters is specifying easy file name or using wildcards.
- Export of Results, can export result file in .TXT/.TAB/.CSV/.HTML/.XML and encoding format: ASCII/ANSI/Unicode/Big-Endian Unicode/UTF8/UTF8 No BOM

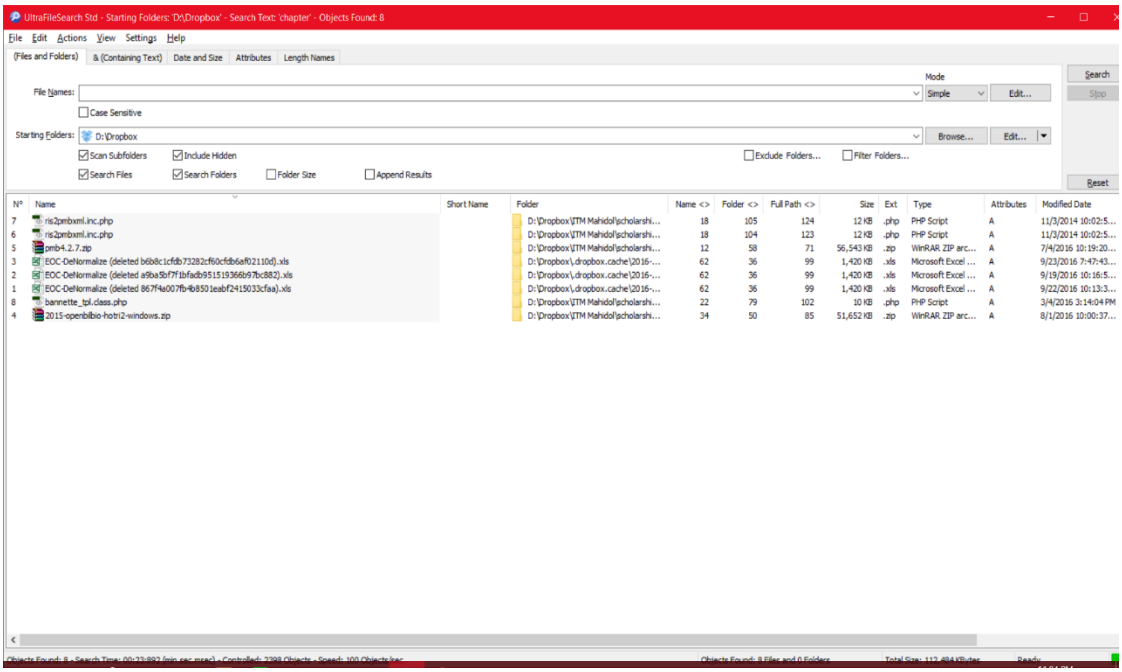


Figure 2.12 Search by Files and Folders

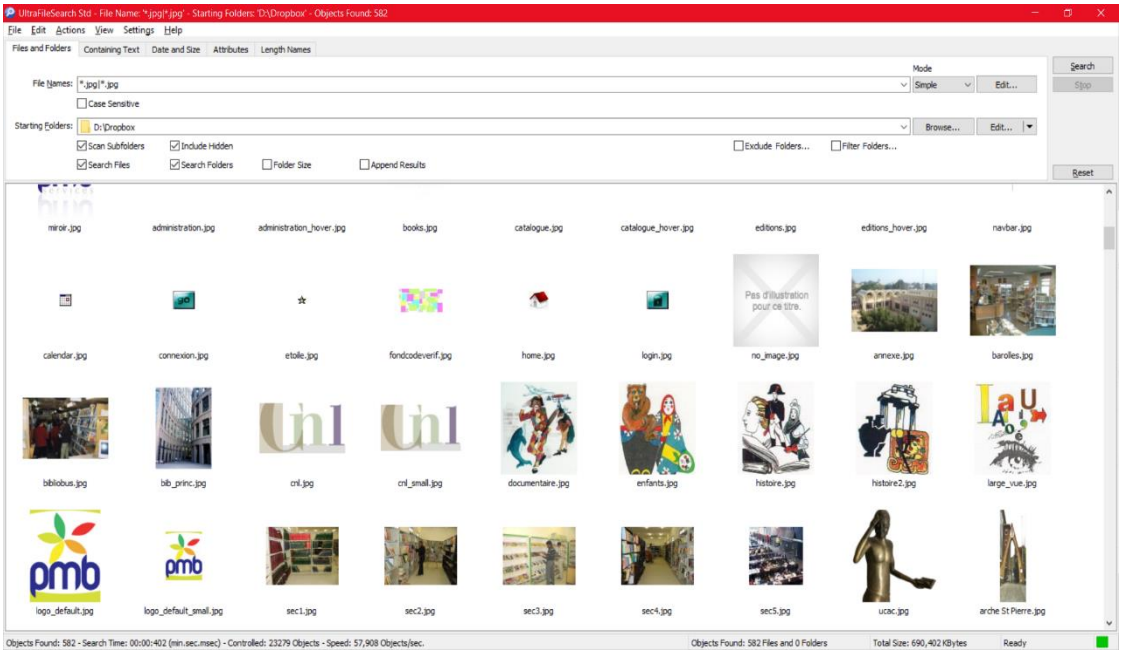


Figure 2.13 Thumbnails View

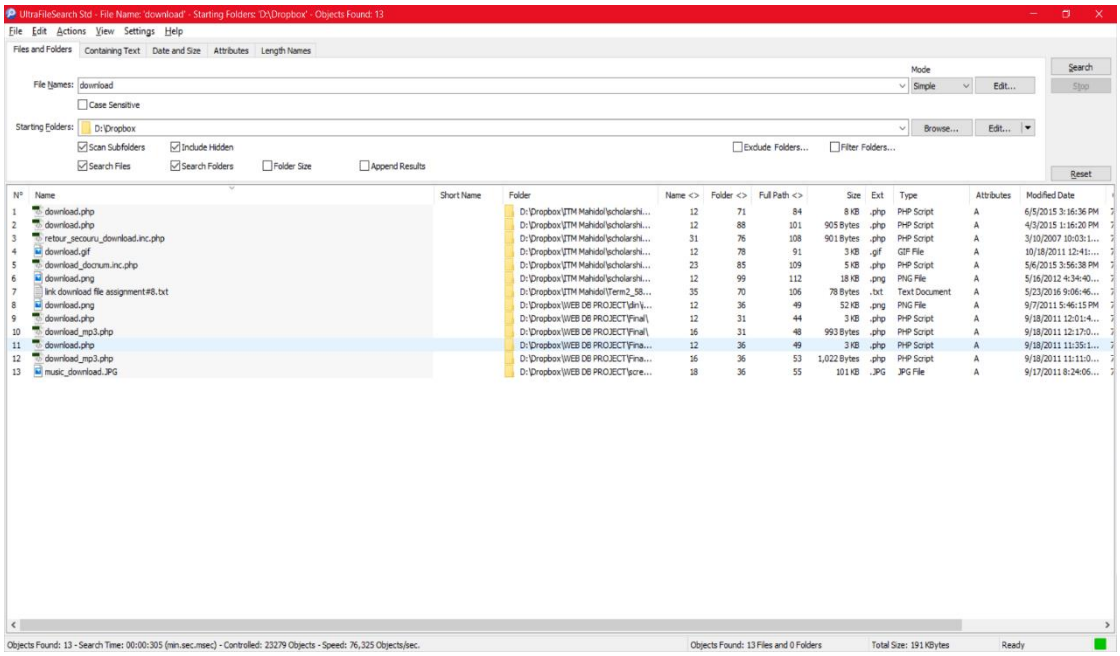


Figure 2.14 Search by Containing Text

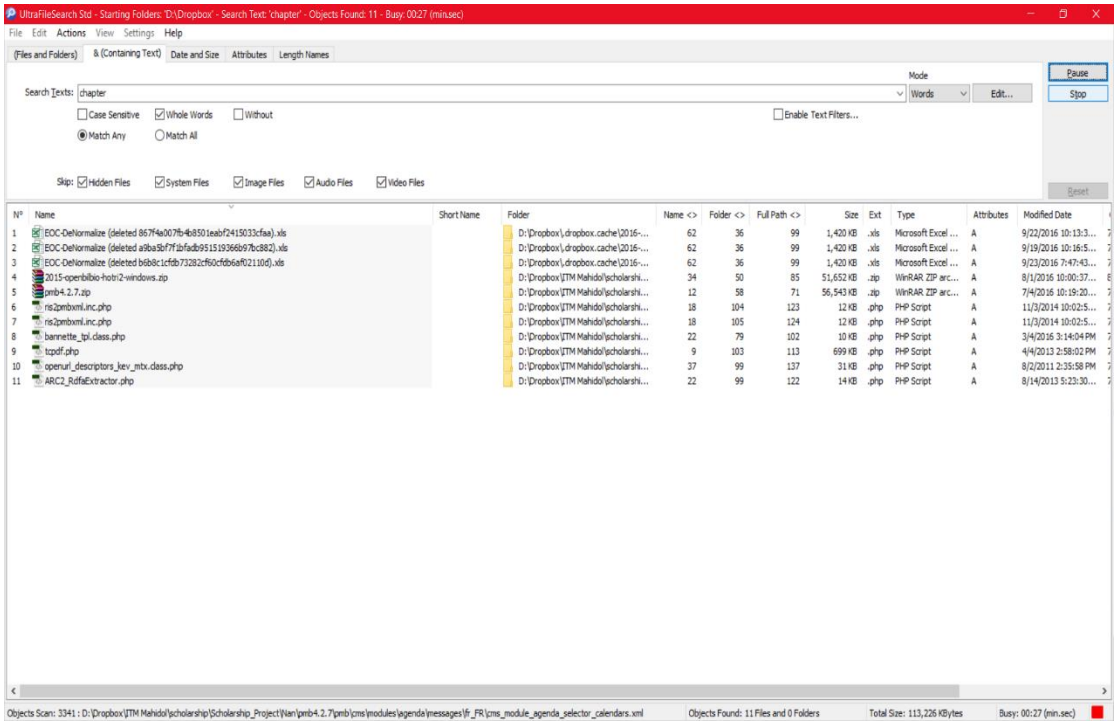


Figure 2.15 Search by Containing word

- Advantage

The application is freeware and user-friendly.

- Limitation

Work in standalone, cannot develop to web application and pay for a license in full function.

CHAPTER III
RESEARCH METHODOLOGY

3.1 Study about user requirement

From interview and collection of data of teacher, staff and student want a system for search thesis with keyword by full-text search to access file content, not search only file name or related metadata for the best result.

3.2 Study how to using Google Drive API

This research is the further development system from Google Drive Technology and study how to using Google Drive API from https://developers.google.com/drive/v3/web/quickstart/php

3.3 Analyze and Design application

This step is to apply data requirement to analyze and find appropriate method or procedure in Use Case Diagram [10] as shown in Figure 3.1. The sequence of interaction between user, web server and Google Drive is shown as Activity Diagram [11] in Figure 3.2.

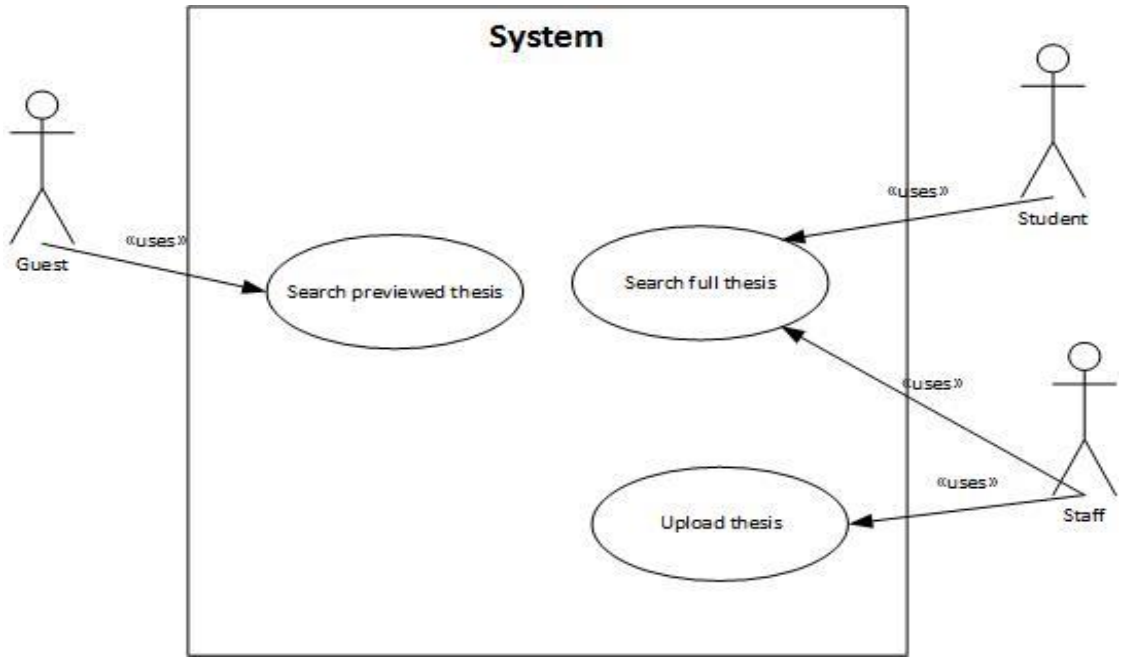


Figure 3.1 Use Case for website

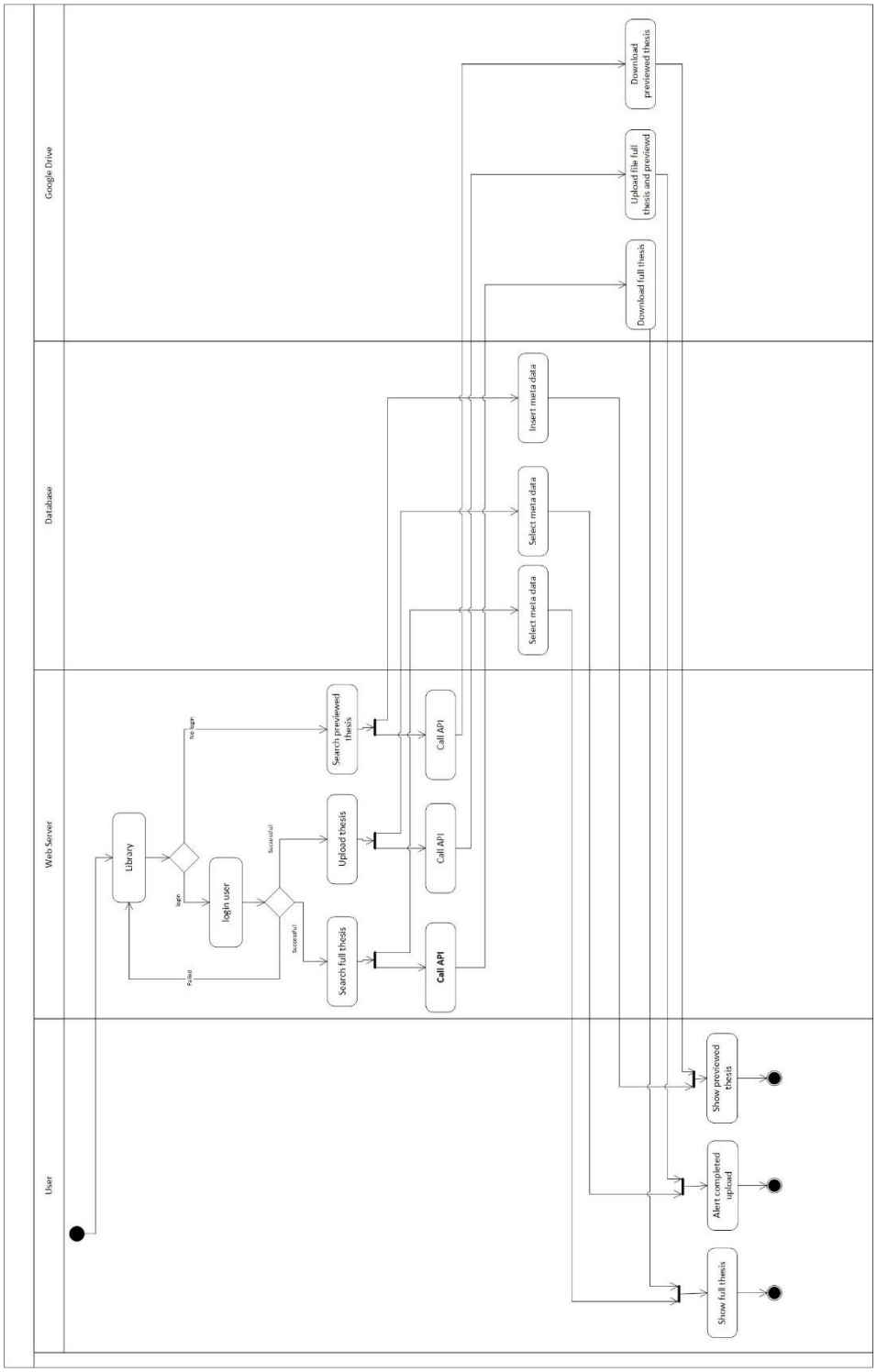


Figure 3.2 Activity diagram for website

Store related data in database as shown in Table 3.1

Table 3.1 Table for database about information thesis

No.	Attribute name	Type	Description	Example
1	thesis_name	TEXT	name of thesis shown in system	DEVELOPMENT OF AN INTERACTIVE MULTIMEDIA PROGRAM ON ELECTROSTATIC DISCHARGE AWARENESS FOR EMPLOYEE SUPERVISORS IN ELECTRONIC ENTERPRISES
2	file_name	TEXT	name of thesis file stored in system	2542-Kamchai Puangpairoj-Monthree Chulasamaya-A.pdf

This research is a developed website that run on Apache and connected with google by Google API. This system is divided into two parts

1. Search file

This part is gathering with library system of Information Technology Management Division. User can search file by keyword and select document type between books and thesis. If user selects thesis, system will parse keyword via Google Drive API and show result page. The user can open or download interested file from Google Doc.

2. Upload file

This part is developing for staff to support, convenient to upload a document and categorize the document. The website can be able to specify required category for upload document and store into Google Drive by call Google Drive API.

3.4 Development

Using PHP and Maria DB to develop and store data. Website runs on Apache server and connected to Google for call Google Drive API.

3.5 Testing application

Testing system in three parts are:

1. Unit Testing

Testing in individual functions is fit for required design and logic.

2. Integration Testing

Testing in individual functions are combined and test as a group are fit for required design and logic.

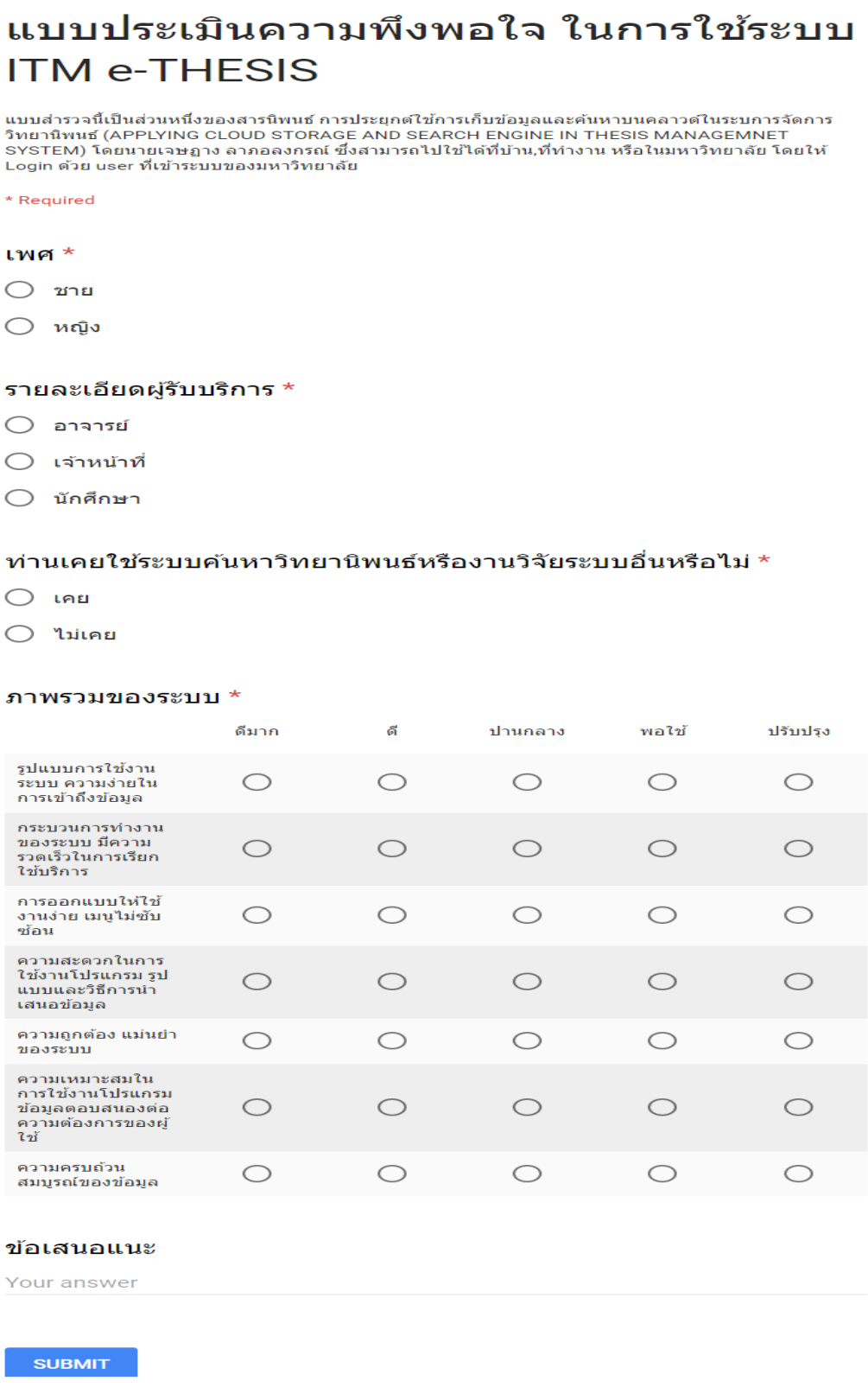
3. System Testing

Testing function from start to end process are fit for require design and logic.

3.6 Evaluation

The evaluation is to prepare website evaluation testing and usability satisfaction from a requirement in analysis and design procedure for feedback application that orderly store document and store type are suitable. User can search and view document easily and another person can use system in a specific type.

Evaluation by creating evaluation form on Google Form and evaluation topic is shown in Figure 3.3. Representative sample for evaluation are teacher, staff and graduate students of Information Technology Management Division, Mahidol University. Representative sample amount 60 persons for calculating and send evaluation link to user via Google Form.



แบบประเมินความพึงพอใจ ในการใช้ระบบ ITM e-THESIS

แบบสำรวจนี้เป็นส่วนหนึ่งของสารนิพนธ์ การประยุกต์ใช้การเก็บข้อมูลและค้นหาบนคลาวด์ในระบบการจัดการวิทยานิพนธ์ (APPLYING CLOUD STORAGE AND SEARCH ENGINE IN THESIS MANAGEMNET SYSTEM) โดยนายเจษฎาง ลาภอลงกรณ์ ซึ่งสามารถไปใช้ได้ที่บ้าน,ที่ทำงาน หรือในมหาวิทยาลัย โดยให้ Login ด้วย user ที่เข้าระบบของมหาวิทยาลัย

* Required

เพศ *

- ชาย
- หญิง

รายละเอียดผู้รับบริการ *

- อาจารย์
- เจ้าหน้าที่
- นักศึกษา

ท่านเคยใช้ระบบค้นหาวิทยานิพนธ์หรืองานวิจัยระบบอื่นหรือไม่ *

- เคย
- ไม่เคย

ภาพรวมของระบบ *

	ดีมาก	ดี	ปานกลาง	พอใช้	ปรับปรุง
รูปแบบการใช้งานระบบ ความง่ายในการเข้าถึงข้อมูล	○	○	○	○	○
กระบวนการทำงานของระบบ มีความรวดเร็วในการเรียกใช้บริการ	○	○	○	○	○
การออกแบบให้ใช้งานง่าย เมนูไม่ซับซ้อน	○	○	○	○	○
ความสะดวกในการใช้งานโปรแกรม รูปแบบและวิธีการนำเสนอข้อมูล	○	○	○	○	○
ความถูกต้อง แม่นยำของระบบ	○	○	○	○	○
ความเหมาะสมในการใช้งานโปรแกรมข้อมูลตอบสนองต่อความต้องการของผู้ใช้	○	○	○	○	○
ความครบถ้วนสมบูรณ์ของข้อมูล	○	○	○	○	○

ข้อเสนอแนะ

Your answer

SUBMIT

Figure 3.3 Questionnaire for evaluate system e-THESIS

3.7 Implementation

Install Xampp (Apache and MySQL) on Windows Server and configuration web apache for access to website, place source code on web server and create production database instance for restore database from test environment to import preliminary necessary data.

Upload thesis in initiated by Google Drive Website and categorize type of thesis such as Previewed thesis, Full Thesis, plan and year.

3.8 Timeline

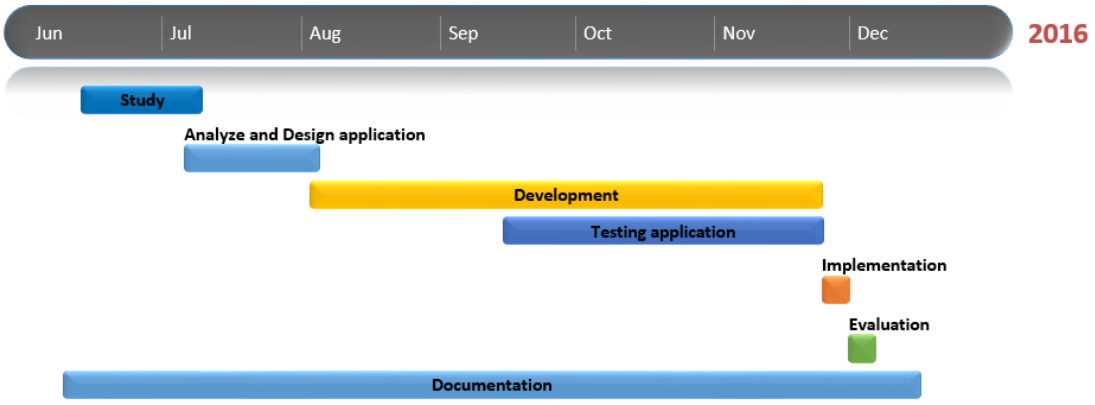


Figure 3.4 Time line for development

CHAPTER IV
RESULTS

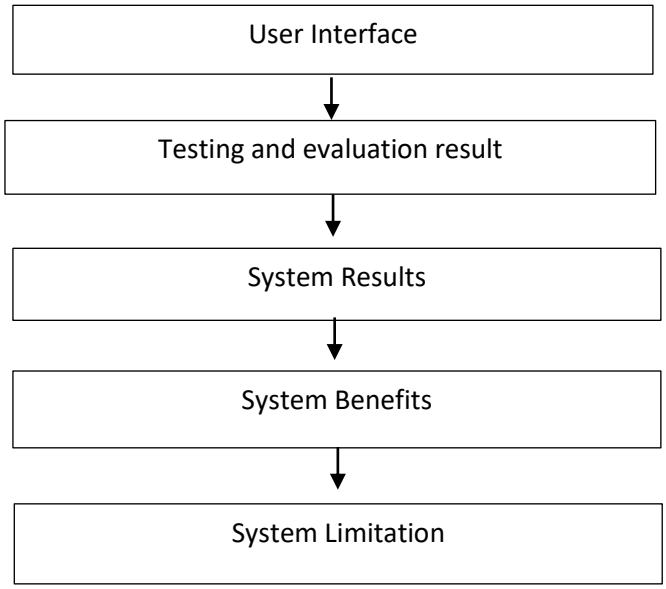


Figure 4.1 Topic in this chapter

4.1 User Interface

Design application will refer to ITM Library system format due to integrating ITM e-THESIS with ITM Library, system divided into 2 parts are

Part 1 Front End, separate to multiple.

Page OPAC page is a page to separate with ITM e-THESIS and ITM Library, this page for user search keyword as shown in Figure 4.2

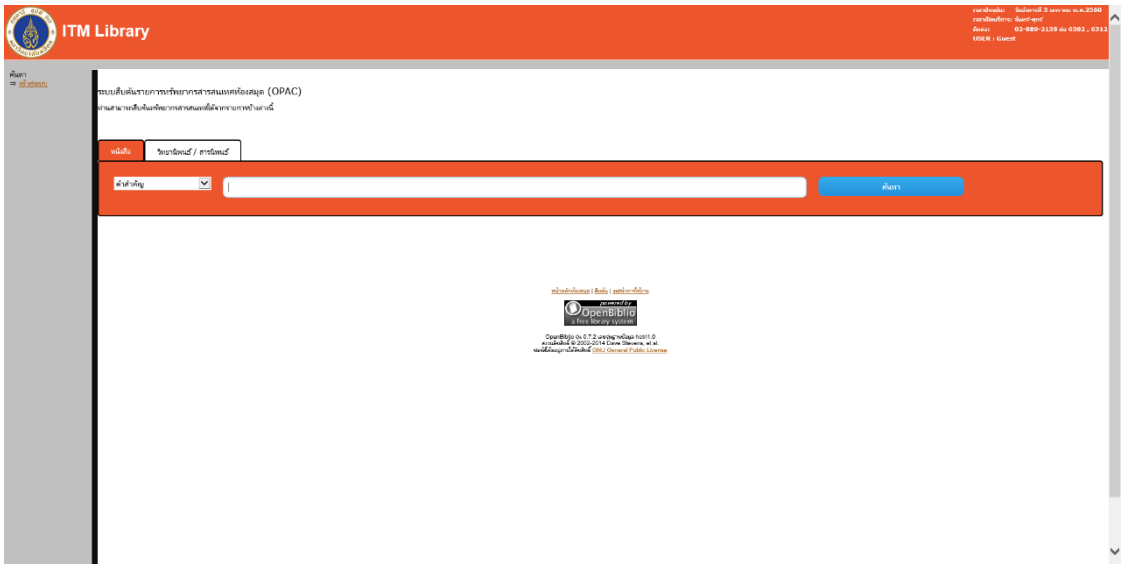


Figure 4.2 Page for search thesis with Guest User

Login page for user to login system using only Mahidol University's account as shown in Figure 4.3

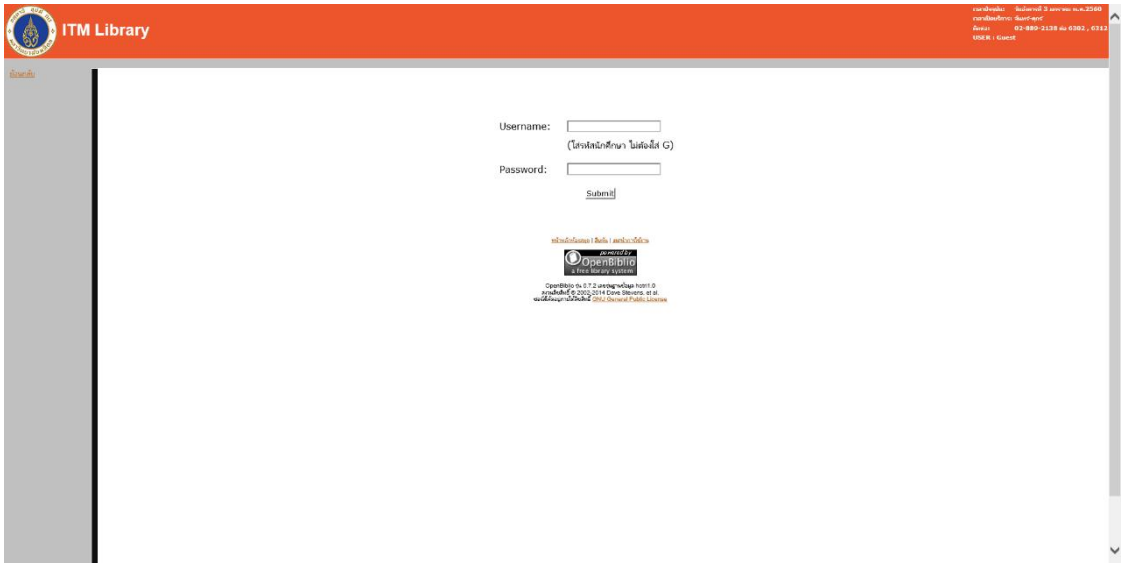


Figure 4.3 Login page

OPAC page for user login to search keyword, this page to separate with ITM e-THESIS and ITM Library as shown in Figure 4.4.

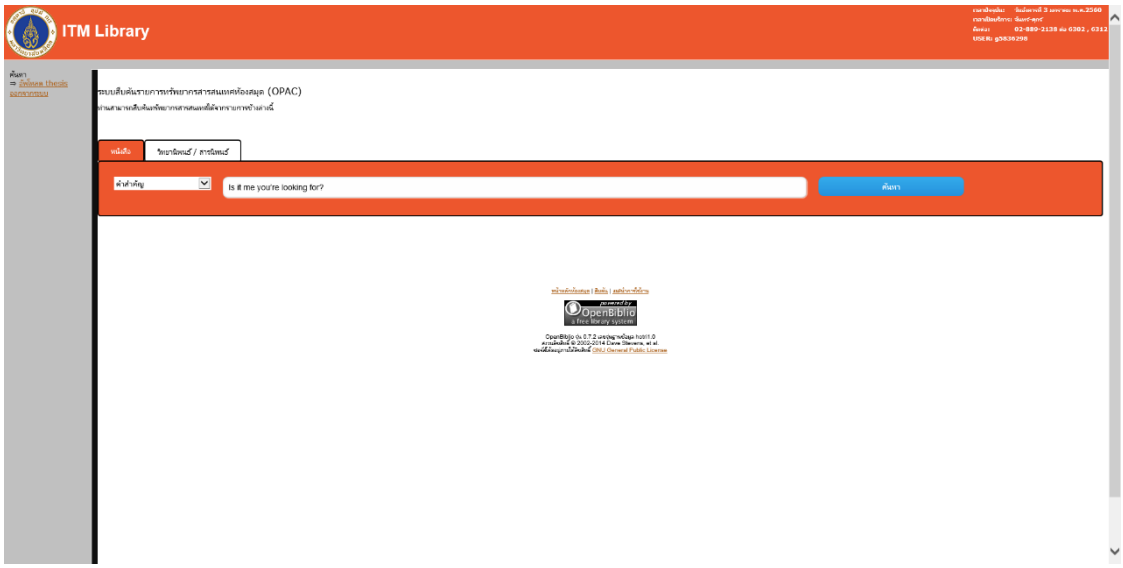


Figure 4.4 Page for search thesis with grant User

Result page for show 10 result from search keyword in each page and user login can click on thesis name for view full thesis via Google Drive as shown in Figure 4.5 but guest can view only preview thesis as shown in Figure 4.6.

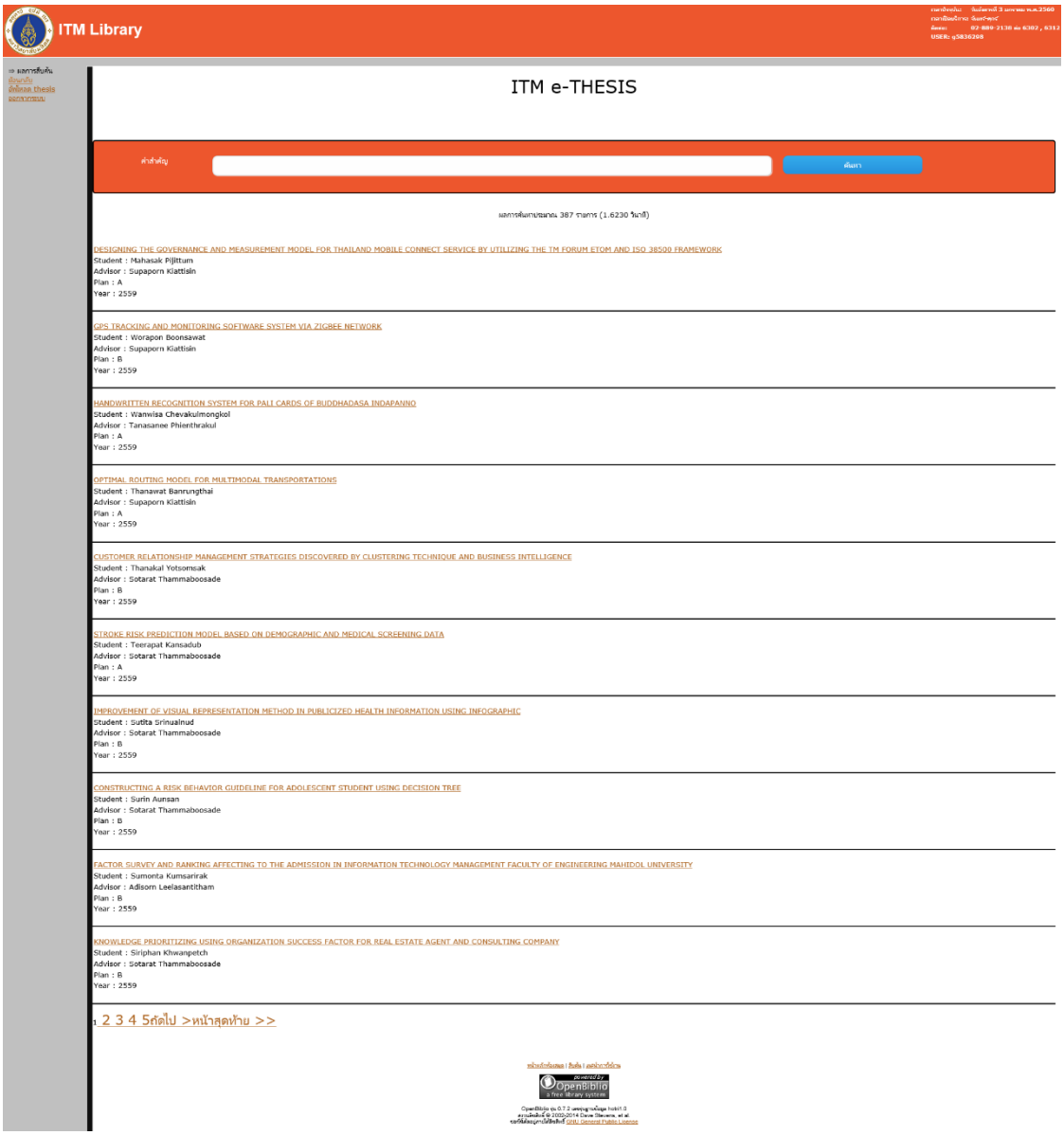


Figure 4.5 Result page for search thesis with grant user

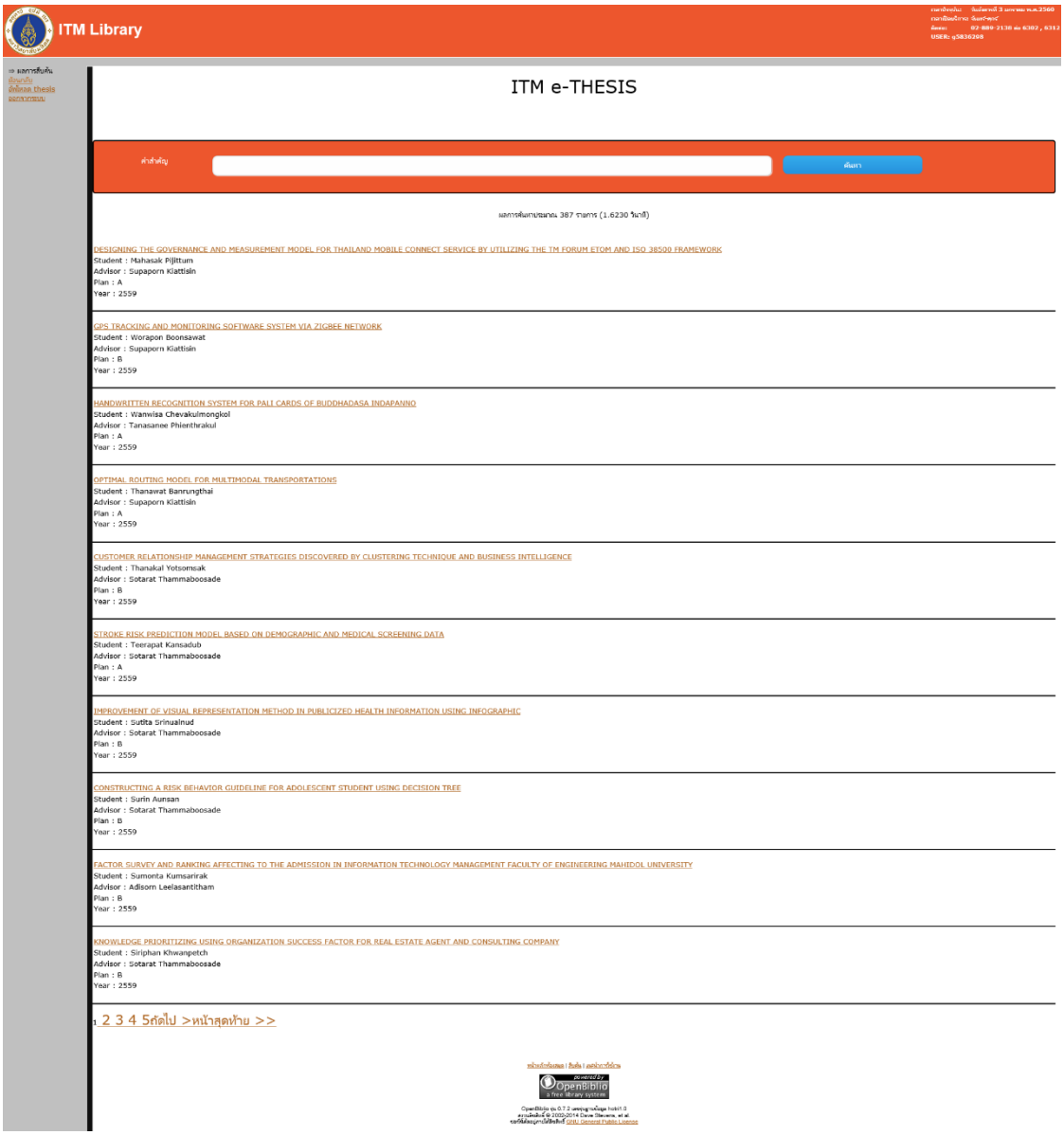


Figure 4.6 Result page for search thesis with guest user

View thesis page from Google Drive that link from result page incase guest only page 1-7 as shown in Figure 4.7 and user login can view full thesis as shown in Figure 4.8

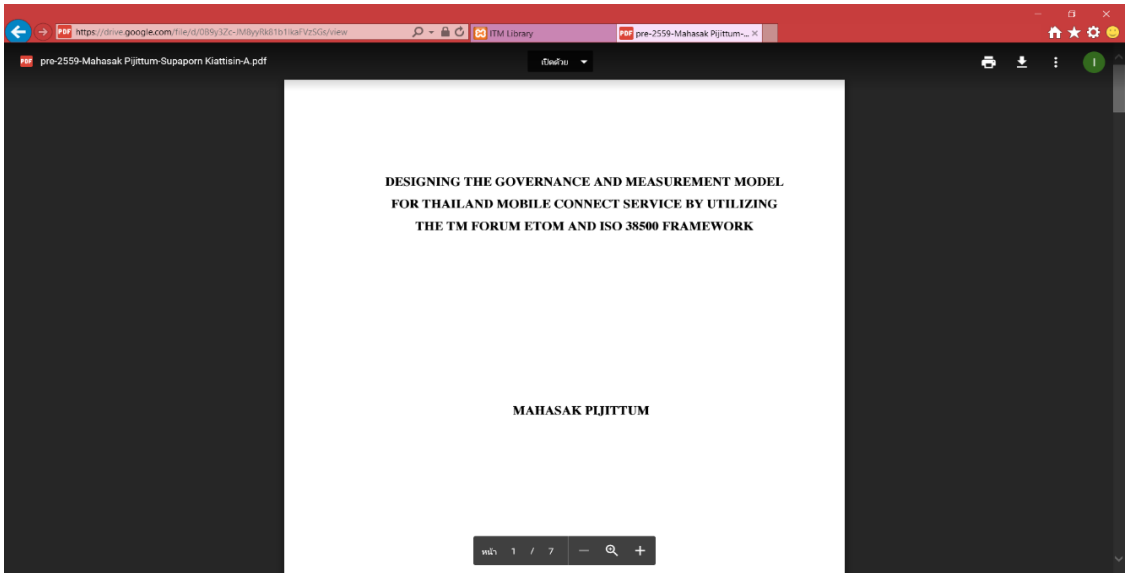


Figure 4.7 Previewed thesis

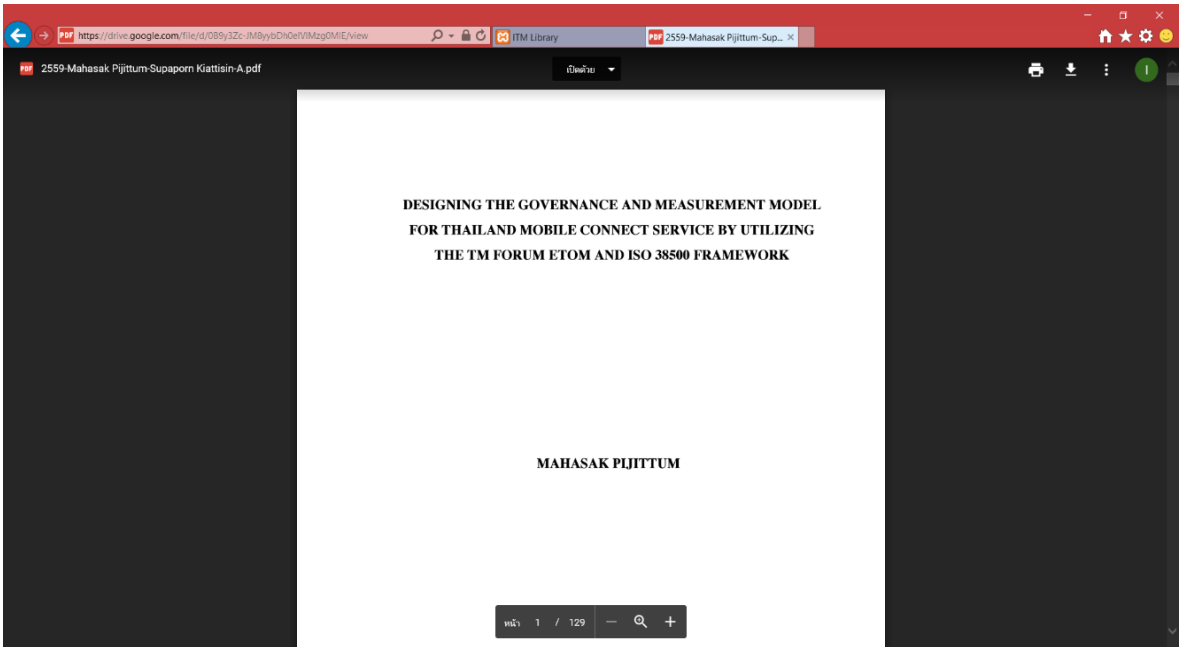


Figure 4.8 Full thesis

Part 2 Back End, separate to multiple pages

Page for staff to upload both full thesis and preview thesis, this page must identify necessary data for upload thesis are thesis's name, student name, advisor, graduate year and plan for show in search thesis part as shown in Figure 4.9. When staff select a file, completed input and after click submit button system will upload a file to Google Drive and show "upload file completed" alert to staff as shown in Figure 4.10.

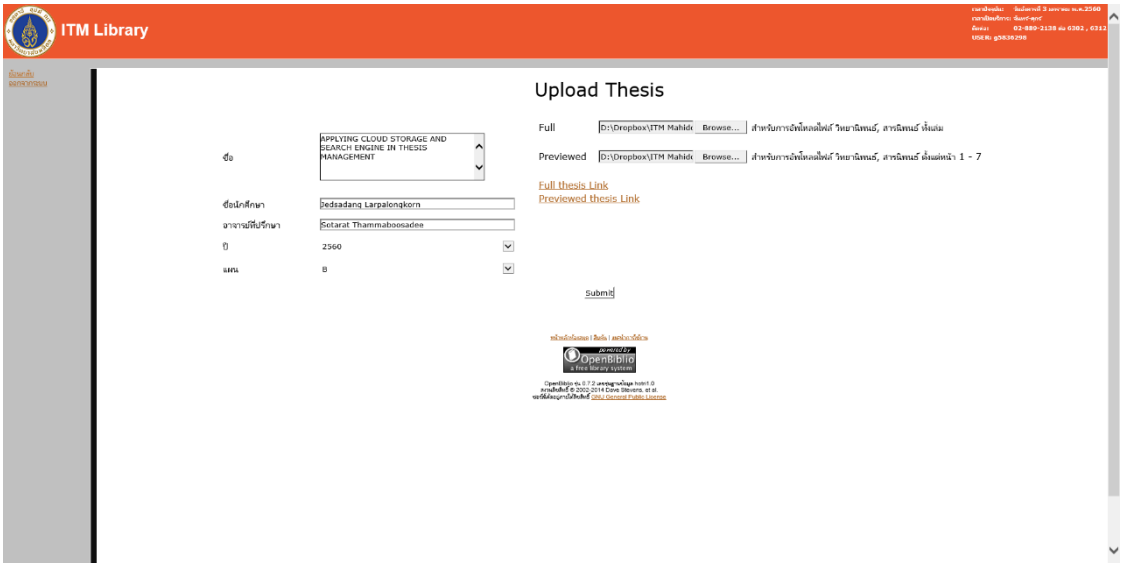


Figure 4.9 Upload thesis page

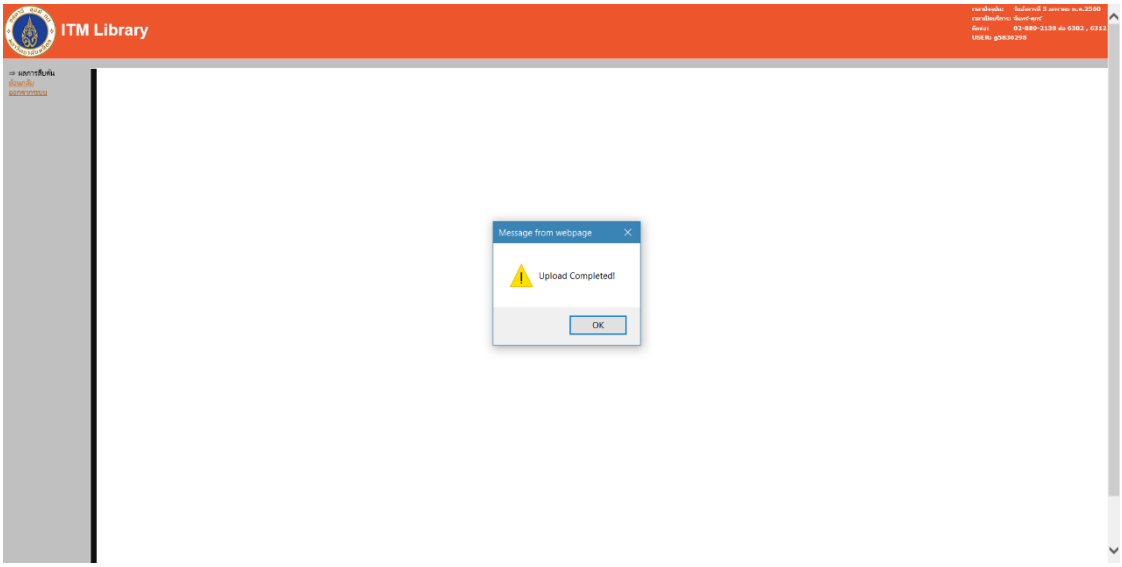


Figure 4.10 Upload thesis completed

4.2 Testing and evaluation result

- Testing result

System can search thesis and thematic paper uploaded on Google Drive by permitted user or guest. The permitted user can search, view, and download full thesis while guest can search, view and download preview thesis that shows only first seven pages.

- Evaluation result

The evaluation has been sent to 60 users containing teachers, staff and graduate students of ITM Division, Mahidol University. Total 55 responses from 5 faculties and 55 graduate students. Evaluation result gets score in each point as shown in Table 4.1 and overall result is in good level.

Table 4.1 Satisfaction levels for ITM e-THESIS

Evaluation point	**Score (Max 5, Min 1)**	**Satisfaction levels**
Easy to access data system	4.13	Good
System process is quick to call	4.21	Good
User interface are friendly and menu not complicated	4.23	Good
Ease of use format and present data	4.12	Good
The accuracy of the system	3.96	Good
Suitability to use system and data response to user requirement.	4.15	Good
Completeness of data	4.06	Good
Total	4.12	Good

4.3 System Results

- Problem

Internet speed of server affected to search and upload thesis speed because both process calls Google Drive API.

- Solution

Should be used internet which sufficient speed for system process minimum 5 Mbps.

4.4 System Benefits

The benefit of the ITM e-Thesis is to symmetrically, regularly, and easily collect, search, and propagate useful documents to teacher, staff, student and another person via website to use as the database for research or improve knowledge. The document searching was developed using search engine's ability of Google Drive API that search as full-text and make system to precision and quick search keyword.

CHAPTER V
CONCLUSION

5.1 Conclusion

ITM e-THESIS system is a system that developed from document or file storage on Cloud storage too easy to access in everywhere, do not worry file lost if computer or server have a problem. Researcher study and compare cloud story in each service provider have difference strength and weakness but Google has the system for search required file using Google engine that user accepts in search performance then researcher select Google Drive. A researcher using Google Drive for download data via Google Drive API and developed system from Google technology such as upload thesis file for storage in Google Drive, search keyword by full-text search can search with efficiency and quick to show a result. Because full-text search is a search keyword in file content that match with user requirement more than search only text in file name or related metadata. ITM e-THESIS system developed collaborate with ITM Library of Information Technology Management Division, Mahidol University. In login part for access to system and can view full thesis but guest can view preview thesis that shows only page 1-7. After developing system to successful than 55 users to testing system from 60 people and evaluation after testing. The evaluation results in good.

ITM e-THESIS system will help to storage document to systematic, regularity, easy to search and propagate useful document to another person via website to use as database for research or improve knowledge.

5.2 Limitation

System does not have the statistical report for show storage data statistics or total user to access system and system depended on Google, if Google change structure or internal functional mechanism of the API for calling to Google Drive, system have modified for support new Google API.

5.3 Recommendation and Future work

The system can be developed to store and search other document types that used in the division such as documentary or document which want to propagate to other communities.

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BIOGRAPHY

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