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Augmented Tour Solution

BY

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A REPORT

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for the degree of

BACHELOR OF INFORMATION SYSTEMS (HONS)

INFORMATION SYSTEMS ENGINEERING

Faculty of Information and Communication Technology

(Perak Campus)

May 2015

DECLARATION OF ORIGINALITY

I declare that this report entitled "METHODOLOGY, CONCEPT AND DESIGN OF A 2-MICRON CMOS DIGITAL BASED TEACHING CHIP USING FULL-CUSTOM DESIGN STYLE" is my own work except as cited in the references. The report has not been accepted for any degree and is not being submitted concurrently in candidature for any degree or other award.

Signature: _____

Name : Loh Hwei Shien

Date : 14/8/2015

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ABSTRACT

This project is separate into two part, one is to develop a mobile application which increase the engagement both cognitive and emotional of user with the museum or gallery, enrich user interaction and enhance of experience. On the other hand is to develop a website for management side so that they could easily manage and modify the system in an effective way. The current available technologies for museum and gallery have their own attractive and special characteristics. However, there are also some limitations such as rigid, expensive and intrusive. This project is develop to overcome some of the limitations of existing technologies. This mobile application only require user to use their own mobile for manipulate, therefore it save lots of cost. One of the important feature is the accuracy of recognize image. While for the website, it also develop some features such as data collection and analytic framework for museum management. Manage server and database also the feature that created to easy the management. There will be a webpage for user to view more information to increase the interactive between user and the item.

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LIST OF ABBREVATIONS

QR Code	Quick Response Code
NFC	Near Field Communication
FM	Frequency Modulation
BLE Beacons	Bluetooth Low Energy Beacons
MoL	Museum of London
3G	Third Generation
HTTP	Hypertext Transfer Protocol
HTML	HyperText Markup Language
IOS	iPhone Operating System

CHAPTER 1: INTRODUCTION

1.1 Motivation

The purpose of doing this project is to proposed a solution for museum and gallery which uses image recognition to help visitors to recognize exhibit items using their mobile device's camera. With this solution, it could enrich and enhance the experience of visitors and attract their interest to the exhibitions.

In a report that written by Jody Evans and Kerrie Bridson entitled "Branding the public Art Museum Sector: A New Competitive Model" to assist the public art museum sector in crafting brand strategies has identified that art museums need to focus on creating experiences that encourage deeper levels of both cognitive and emotional engagement for a wider range of visitors (Jody, E. & Kerrie, B.).

In general, a gallery needs to continuously maintain its attractiveness with limited funding. Maintain the attractiveness of a museum or gallery is a very important section because it can attract more visitors to visit and bring opportunity and profit to gallery such as brand image. With an excellent brand image, museum have more chances to get the sponsorship. Funding are mostly come from the stakeholder, with the only limited funding, it is difficult to expand the business and it is better to spend less and earn more in a business. Using mobile application as a solution can save a lot of cost because nowadays almost everyone own a mobile phone, museum no need to spend extra expenses on devices. It is important to know its visitors' preferences to continue attract more visitors. It is equally important to attract exhibitors. By knowing the visitors' preferences, it is easier to arrange the positioning of exhibition. The number of exhibitors and the number of visitors are inter-dependent.

In summary, this project introduced the concept of low cost mobile application solution to conventional art gallery and museum with the focus on creating experiences that encourage deeper levels of both cognitive and emotional engagement for a wider range of visitors.

1.2 Problem Statement

1. **Costly approach which hire more staff to interact with visitors**

   In Jody Evans's report, he had suggested to hire more staff to interact more with visitors as a means of enhancing the visitor experience. Unfortunately this approach is costly. Hire more staff not only cost a lot of money but also time because need to give them training course and get familiar with the stuff in the museum.

2. **Interactive solutions are rigid and expensive**

   The existing technologies such as LM3LABS' interactive solutions for museum are rigid and expensive. It need to use a lot of sensors and hardware to support the whole system in order to make a perfect solution. They rely on camera the maintenance fee and upgrade are necessary for future evolution. Thus, it is an expensive technology, only suitable for those larger museum that can afford the price of purchase it.

3. **Intrusive and often inaccurate to capture visitors' feedback directly**

   Some visitors' perception and experience are different, it is difficult to directly get the accurate feedback from them. The group of visitors are different, some are real art lovers, some are exhibitions and some are just visit to the gallery and museum to spare their time. Most of the museum use survey or questionnaire to ask for feedback and it is inaccurate because there are no authentic data to prove their preference.

1.3 Project Scope

The scope of this project is to develop a solution for museum and gallery that could enrich and enhance the experience of visitors and attract their interest to the exhibitions by using image recognition which help visitors to recognize exhibit items using their mobile device's camera. This is a mobile application project which basically create an efficient and effective way for user to get additional information through the image recognition.

This project currently only develop on Android platform and targeted on the Android's users as the development cost is lower. IOS and Windows user are not able to use this application. The project is actually an integrated project which implement third party API and integrated it to become more powerful application that ease to use and convenient to user. Eclipse JAVA EE is the project development tools that use to develop this project and the language of development is JAVA.

1.4 Project Objectives

The objective of this project is to develop a complete gallery museum prototype mobile application that can bring benefits to both user and company by using existing open source.

1. **To create a low cost but good solution for gallery to enrich visitors to interact with gallery staff and exhibitors.**

   It is very important to have a good interact solution for gallery. With the good solution, it could enrich and enhance the visitor experience in the gallery and having more expectation and interested to gallery. However, a gallery needs to continuously maintain its attractiveness with limited funding. Therefore, this project is to create a solution in mobile application form with a low cost by using the third party open source.

2. **To design a framework for visitors-staff-exhibitors communication.**

   It is important to have a good communicate between visitors, exhibitors and staff. A good communication with visitors or exhibitors could know their preferences so that the staff able to suggest or recommend other relevant art for them to continue attract their attention. Having more interaction and communication with visitor and exhibitors could provide a better services and explanation for them to have a better understanding.

3. **To design a non-intrusive visitors data collection and analytic framework for museum management.**

   This is to develop a framework that will automatically collect the data based on user preferences and analyst the user favorite art in gallery. It will generate a report for management monthly base on the analyst data and information. This could resolve the stuffing issues, increase the accuracy of feedback of visitors and convenience for management to manage the annually report and enhance the positioning of exhibitions.

CHAPTER 2: LITERATURE REVIEW

2.1 Comparison of Existing Museum or Gallery Technologies

As time progress, technologies have become one of the important role in life. Most of the museum galleries are now using modern technologies to replace the traditional method of management. Table below show the technologies that use by some of the museums and galleries.

Table 2.1.1: Strengths and Weaknesses of Technologies That Use in Museum

Technologies	Strengths	Weaknesses
Mobile Application	- Ease to install and use - save cost (maintenance and future upgrade fee) - communicate with other (Social network: Twitter, etc.)	- Limited language - Depends on GPS location and QR Code - Need Wi-Fi high speed connection
LM3LABS	- Interactive, diversification - mass-proof / resistant - Non-intrusive and seamless	- Expensive (devices, future maintenance and upgrade fee)
Near Field Communication (NFC)	- Efficiency with only tap to the tag - Easy to use, convenient, faster	- Queue to wait - Depends on the chip, if tag spoil, system cannot be used.
Kinect	- Interactive - Full 3D human body scanning	- Expensive (sensor device)
Nintendo 3DS	- Portable - Clear direction guide	- Short battery life duration - Expensive (devices) - Small screen size
Frequency Modulation (FM) System	- Convenient to carry - Reduce background noise, clear to listen	- Limited distance range - Expensive (devices)
Bluetooth LE Beacons	- Locate user position precisely	- Slower (wait for connection) - Expensive (chips)

2.2 Strengths and Weakness

There are some mobile applications that create by the museum themselves to provide the details information of exhibition for visitors such as The Smithsonian in Washington DC, The Museum of Jewish Heritage in New York City, and Powerhouse Museum in Sydney Australia. Using mobile application to increase the interactive in the museum or gallery is the smarter choice because save cost, no need to worry about the future maintenance and upgrade fee. It is easy to use as well, visitors only need to download the application to their own mobile before start the tour in the museum. To have more communication and interaction between each other, Smithsonian application have a function which visitors could have their conversation via Twitter, discuss the art and sharing information.

The similarity of all these applications are most of them are use QR Code scanning to get the information, and base on the GPS to locate the visitors' position so that it could show to the visitors where they are. The museum of Jewish Heritage application use the GPS recognition and a map to produce a walking tour that give visitors a sight in to the subject of museum's fall exhibition which include 19 historic sites. Besides that, it is a challenge for museum to have a strong Wi-Fi signal connection because Nancy Proctor (head of mobile strategy) cites historic buildings like the Louvre, where gold leaf interior makes Wi-Fi radio signals bounce in certain areas as well as "concrete bunker"- style museum. It is too much for an application to include all the existing language in the world, so it have the problem of limited language in the application which only could use in some country (Alizasherman).

Figure 2. 2.1: The Museum of Jewish Heritage Mobile Application

Figure 2.2.2: The Smithsonian Mobile Application

Figure 2.2.3: Powerhouse Museum Application with QR Code

LM3LABS' interactive solutions for museum are based on Computer Vision technologies (proprietary, patented or patent-pending or licensed to LM3LABS). Those Computer Vision technologies can be ranked as finger tracking, body tracking, face tracking and image tracking. Computer vision technologies have multiple advantage as they are non-intrusive and seamless. They are not seen by users and integrate seamlessly in architecture. As they rely on camera, for future evolution, new features usually means software upgrade only because the hardware are for the purpose of capture and sense the motion.

They are scalable as well, the size of deployment can be personal or very large. The products of this technology are scalability as they could handle large amount of increased load and work when resources are added. For example some of the product such as the interactive table (iTable32), it have fast response time, large number of touches which able to handle the massive of touching on screen by the visitors. A system is known as scalability when its performance is improves after adding the hardware. For example the product Ubiq'window which could tracks fingers accurately when close to the flat surface. There is no physical connection between user and the surface, the cameras that installed at 3 meters far able to track fingers and "triangulate" their position maximum accuracy (2mm).

According to Interactive Museum article, the LM3LABS technology have create a pleasant experience for visitors to engage by creating an immersive discovery, Catchyoo, which use the floor as the object to put in the context of exhibition. The dynamic interactive contents are fast and easy, requires no flash and software coding. Catchyoo use digital contents to tracks bodies and create passive interactivity (The Interactive Museum).

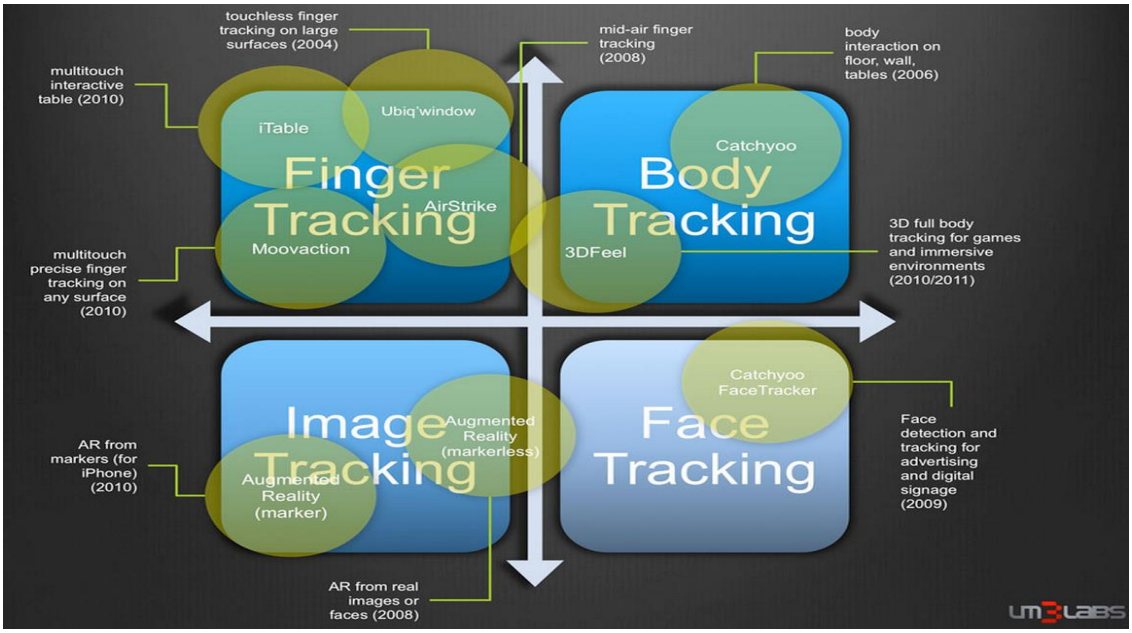


Figure 2.2.4: LM3LABS Computer Vision Technologies

Near Field Communication (NFC) technically isn't a new technology, it had been use in many different application for many years and different purpose. It is something same general idea with the QR code by scanning to get the information. It is a wonderful technology that invented partly by Sony, uses magnets or inductive coupling to send electricity and information to or from a near field communication (NFCNearFieldCommunication.org). This technology is use by the museum of London (MoL) which the first public institution that use this to enhance visitors' experience.

The NFC tag have placed around the museum that allow visitors to instantly 'like', 'follow' or 'check-in' in the social network. MoL include NFC tags in the actual exhibit had made many of their exhibits interactive. It is easy to use, convenient and even faster compare to other. Visitors only need to swipe their smartphone across the NFC tags or smart sports that had already embedded in an object of art in the museum. When the tag and phone are getting connected via NFC, visitors can get the audio or video guide or related information of that object (Timothy, B).There will be some problems face by MoL by using NFC. As it is depending on the tag, if the chip inside the NFC get damage or spoil, the information cannot reach to visitors when they swipe to the tag. Visitor need to wait for a long queue in order to tap the tag if there are many visitors especially when the peak season such as school holiday or weekend, many visitors will be visit to the museum.

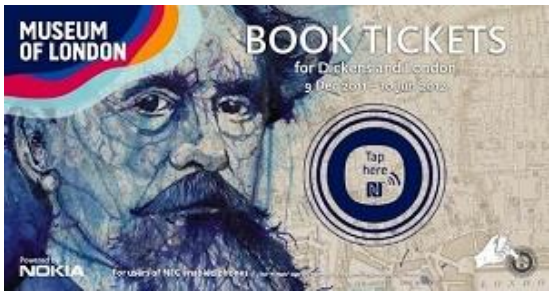


Figure 2.2.5: NFC Technology That Use By Museum of London

Figure 2.2.6: Visitors taps their smartphone to the NFC tag

Kinect basically is a motion sensing input device made by Microsoft for the Xbox 360 that picks up on movements, voices and following input gesture move on screen. It could also capture human body and instantly create a 3D model of the body for more interactive educational purpose. Kinect is a whole brand new technologies after the Nintendo 3DS that use by Louvre. Louvre museums have weaves Kinect into its revered galleries to increase the interaction between visitors and an exhibit titled "Spotlight on the Antinoe veil" without touch contact. With Kinect, visitors can manipulate the veil's unfinished artwork without touching the materials and allowing them to focus on various narratives painted on the veils. Certain sections of the veil are projected over the veil itself with high definition videos, visitors can pick up which narratives to watch by using Kinect. Although it is a very innovative idea, but implement the devices in the museum are slightly expensive (Griffin, M).

Figure 2.2.7: Kinect Sensor in Museum

Nintendo had join force with Louvre Museum to release audio guide Louvre by using the Nintendo 3DS device. The core feature of this technology is having a series of guided tours through the Louvre and artworks. The guided tours will create a recommend path for visitors. Whenever they reach the point on that path, the speaker will play the description of the exhibit when they hits on the icon of speakers in Nintendo. It do have a clear direction guideline to help visitor who have the first visit discover the museum and prevent them to get lost. Inside the Nintendo 3DS consist of over 600 photographs of artwork, over 30 hours of audio commentary and more than 400 photographs of the museum. The software unique feature includes 3D models and high resolution images of certain artworks. Visitors can view the 3D image of the artworks from every angle via the device without wearing glasses (Nintendo).

The device is expensive as one Nintendo 3DS already cost $200, can't imagine that if a museum need to buy a thousand of it and buy the new in future to replace the old one. After using the Nintendo 3DS, some visitors had complaint that the clumsy screen size because it is small, difficult to view, the download size is massive, has awful lot of very high resolution image file and voice. Nintendo 3DS support by battery, either charge or the replace battery, it is not a smart choice of use a device that support by battery because battery have short life duration. It is inconvenient and troublesome to change the battery if there are a peak season.

Figure 2.2.8: Visitors Use Nintendo3DS in Museum

Figure 2.2.9: Nintendo3DS Device

FM System come with 2 parts which is microphones and radio receivers. It work like a small radio station which transmit a low-power radio signal to FM receiver. It is convenient to carry inside the museum because small in size and also lightweight. Museum is a very big hall that exhibit lots of exhibition and have lots of visitors. Thus, it is useful to use FM system as it could reduce the background voice and visitors could listen to the tour guide clearly. There are somehow some defect in the system which it only have the audio to explain addition knowledge to visitor, it is not interactive enough because they are not useful to those deaf people. Without any visual display, they can only see the existing exhibition.

To buy the devices, there are another expenses. The profit can only get back if the number of visitors increase, else that would be a heavy losses. Not only the cost but also the limited on the device. It have limited distance range, which mean that the receiver could only pick up the signal if the transmission range is within 50 feet. If out of the range it not possible to listen the voice. Another problem is that some of the FM device use battery to operate and some are use electric to charge. Therefore, it need lots of battery to change in order to fulfill the demand of number of visitors and here comes another expenses. The device make up of few components, such as cables, leads, microphone, battery, if one of the component is spoil, it need to replace with another to make it work smoothly (Social Hearing).

Figure 2.2.10: FM Modulator That Use in Museum

Bluetooth is a good technology when user go indoor where GPS can't reach and no Wi-Fi connection. Louvre museum in Paris has implemented this technology to their museum due to the previous technology had fulfil the visitor satisfaction. It is cool to using this application as it have three main functions which are signal triangulation, item identification and zone identification (Geoff, S). By using BLE (Bluetooth Low Energy) Beacons, visitor could complete the tour by themselves without any guide or proper plan because the application will automatically triangulate their exact location, lead them to the destination that they wanted to and identify the exhibit that they are looking at then display the information. But first of all visitor have to download the official Louvre mobile application before enter to the museum (Ben, H).

However, there are some disadvantages will be faced by the museum. By using Beacons, there are a lots of chips needed to place around the museum so that the application can detected the signal. Although the battery inside the chips could stand for two years life, but eventually it will runs up after two years. Therefore, it could be a large amount of expenses if it have to change the battery of every chips that set up in the museum.

Figure 2.2.11: iBeacon Bluetooth Chips

2.3 Conclusion

In conclusion, all technologies that reviewed in this chapter have bring benefits to both parties (visitors and museums) which could enhance the visitors' experiences, giving more information and improve branding of museum. However, there are also some drawbacks on the technologies. Most of the existing solutions only focus on pushing more information to visitors but not bridging the communication between visitors and exhibitors. Moreover, the existing solutions not only expensive but also intrusive, gallery are requires to be completed revamped such as install cameras or sensors.

CHAPTER 3: ANALYSIS

3.1 Methodology

The methodology that used to develop this project is spiral model. Spiral model mostly use in large and complicated project. It is the combination of prototyping model and waterfall model features to its development process. One of the benefit of using spiral model is that it contain the risk analysis which shows the likely way of how to minimize the risk of non-effective architecture.

There are several prototype undergoing throughout the whole project before launching the complete project.

Prototype Version 1:

In prototype version 1, the project will first focus on the mobile section which is make sure the ability of scan on an image is working well and it can redirect user to a related information page of the image such as a video on a mobile phone.

Prototype Version 2:

In version 2, website is start develop, all pages are link and redirect well with connection to the database. Login and logout for administrator are done in this prototype.

Prototype Version 3:

In version 3, the functions of create HTML page for redirect, upload and delete file from server are done. All three functions are perform successfully.

Prototype Version 4:

In version 4, report is generated for user to view depends on the data they enter. Ranking, charts, table and analytics are all show on the report webpage. The function of manage database also done in this prototype such as add, update and delete data from/to the database.

Prototype Version 5:

This is the final version where alpha and beta testing is take place before the completion of whole project. Testing is take place to check whether errors or bugs are still exist.

3.2 System Overview

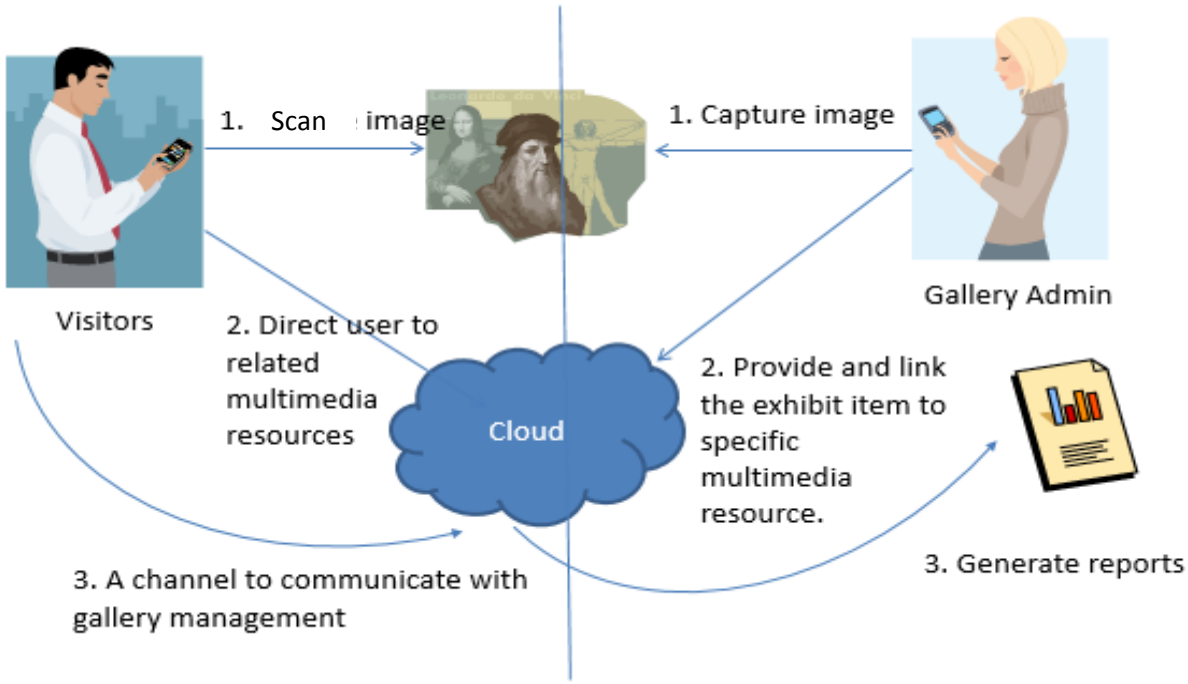


Figure 3.2.1: System Overview

Figure above show the photo of how the overview system process. There are two type of user in the application which is management purpose for admin and viewing purpose for visitor. On the admin management side, admin have to capture the images that wanted to exhibit in the gallery or museum. After capture the images, admin need to upload those images by using an uploader. Besides that, admin also needed to provide the multimedia source that related to the exhibit item and link them in html file which will upload to the cloud afterward. The system could reduce the burden of admin as it will generate the statistic report weekly or monthly depends on the requirements.

On the visitor side, they only need scan on the images that exhibit inside the museum. After scan the image, the browser will direct them to the related site to view more multimedia resource and other description of the image. It is user friendly as it is easy to use and have a simple interface. As the system can automatic generate the statistic of the viewing, it give a channel for visitor to communicate with gallery management by scanning the exhibit images, liking the images or comment on the Facebook or multimedia resource site that directed. This is helpful to management side because they will know the preferences of visitors and have more related images to exhibits in the museum to attract the visitors.

3.3 Activity Flow Diagram

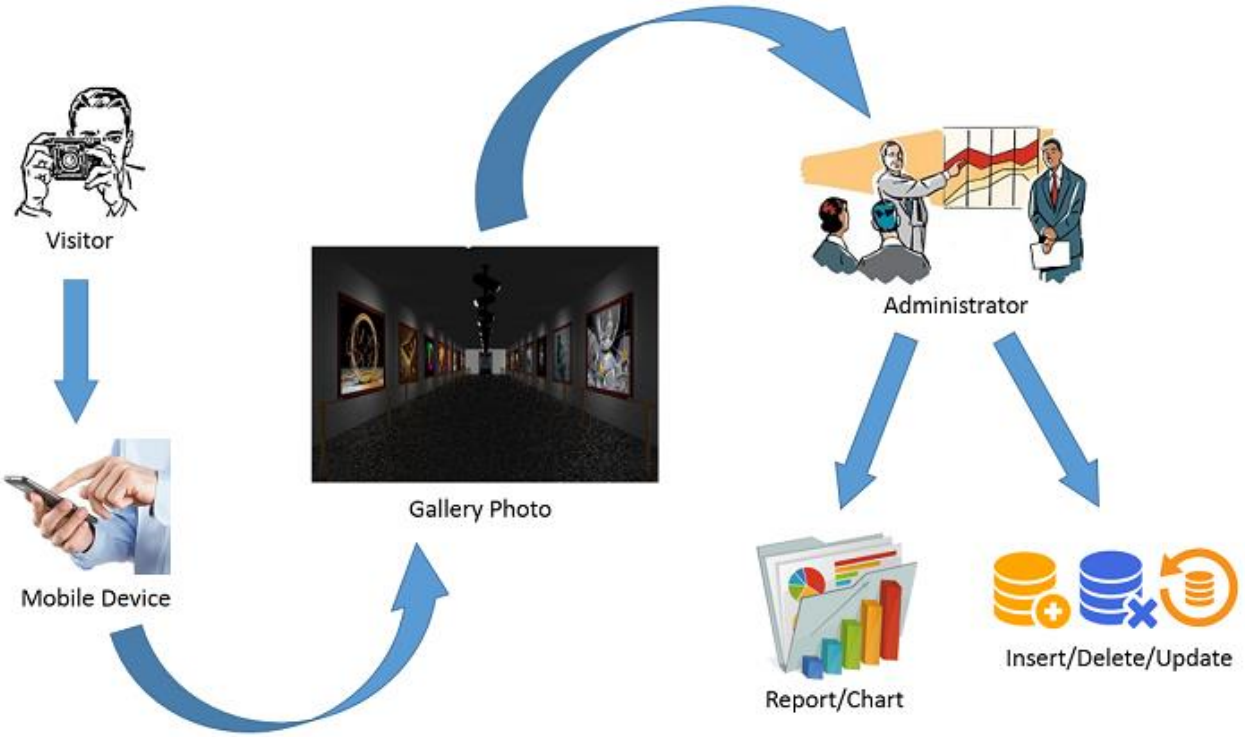


Figure 3.3.1: Activity Flow Diagram

This is the block diagram that show the flow of the system. When visitor come to the gallery and they wanted to know more detail information about the photo that hang on the wall of the gallery, the first thing they need to do is download the application from the Google play store and install it. After install and open the application, visitor only need to point their mobile phone's camera to the photo and it will redirect user to a webpage that provide the information of that photo.

On the other side, when visitor scan on the photo, administrator will know which photo he/she had scanned. Through the analytic, administrator can easily generate the weekly or monthly report together with the statistic, ranking and chart. Besides that, admin is able to insert new files and upload to server by using the system. They can also delete the unwanted file or update the record of the images through the system.

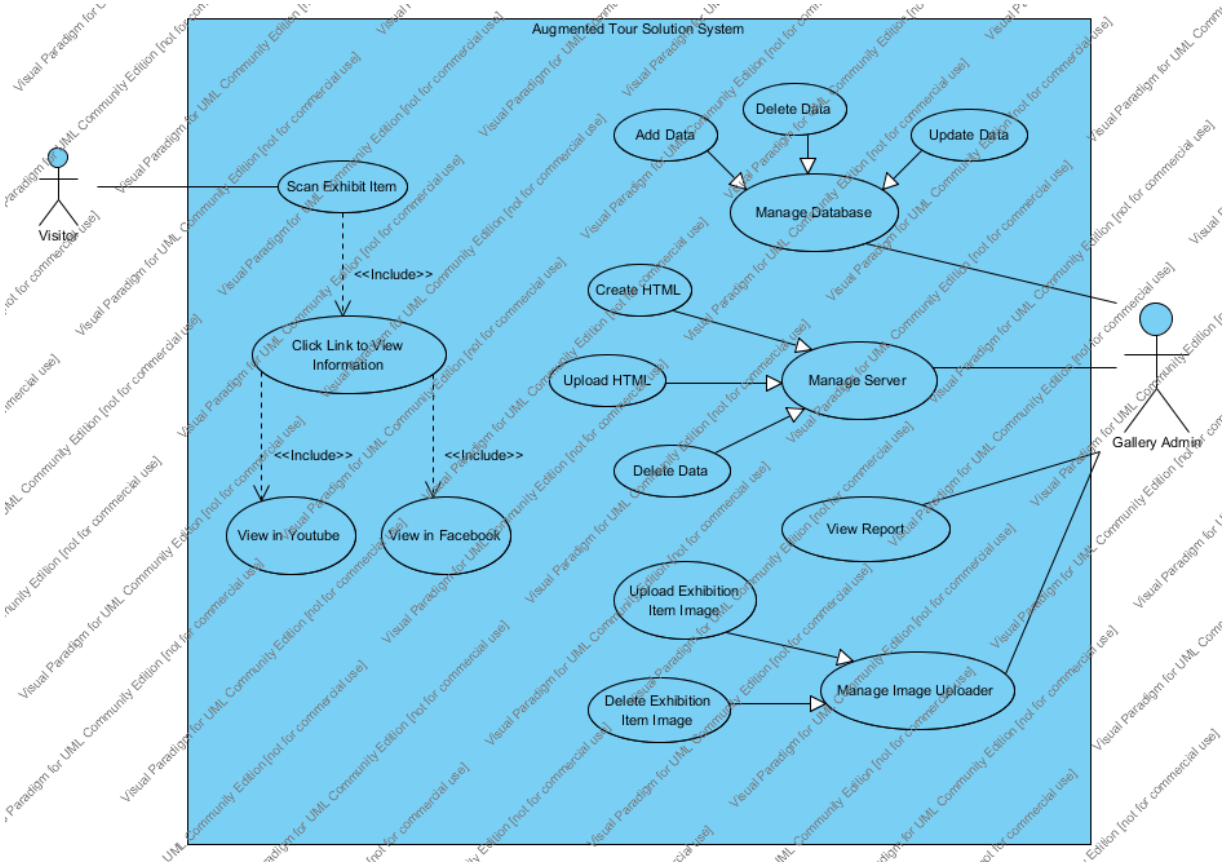


Figure 3.3.2: Use Case Diagram

Table 3.3.1: Scan Exhibit Item Use Case Description

Use Case Name: Scan Exhibit Item	ID: 1	Importance Level: High
Primary Actor: Visitor	Use Case Type: Detail, Essential	
Stakeholders and Interests: Visitor – Scan exhibit item mobile devices and get additional information.		
Brief Description: Visitor able to get additional information of the exhibit item by scanning it through their mobile device.		
Trigger: Visitor want to know more details about the exhibit item. Type: External		
Relationships: Association: Include: Click Link to View Information, View in YouTube, View in Facebok Extend: Generalization:		
Normal Flow of Events: 1. Visitor scan the exhibit item by their own mobile device. 2. System search and recognize the item image in database, redirect to browser and return result to visitors. 3. Visitor receive related exhibit item's information. 4. Visitor click on the link to view another details information. 5. IF visitor select to view in YouTube. S-1 Link to YouTube will be perform. 6. IF visitor select to view in Facebook. S-2 Link to Facebook will be perform. 7. IF visitor wants to scan exhibit item again. The S-3 Reselect will be perform. 8. ELSE 9. Visitor close the application. 10. ENDIF		

Sub Flows: S-1 Link to YouTube: 1. Browser redirect to YouTube site. S-2 Link to Facebook: 1. Browser redirect to Facebook page. S-3 Reselect 1. Return to the first step in normal flow.
Alternate / Exceptional Flows: 1-E: Application stop process, visitor close and reopen it.

Table 3.3.2: Manage Serve Use Case Description

Use Case Name: Manage Server	ID: 2	Importance Level: High
Primary Actor: Gallery Admin	Use Case Type: Detail, Essential	
Stakeholders and Interests: Gallery Admin – Manage server on server side.		
Brief Description: Gallery admin can create HTML and manage the file in the server such as upload, delete.		
Trigger: Admin want to create or add file to the server and create new HTML. Type: External		
Relationships: Association: Include: Extend: Generalization: Upload HTML, Delete HTML, Create HTML		
Normal Flow of Events: 1. Admin log in to the website. 2. Website check authorization and allow admin to access to the server.		

3. Admin select task to perform. 4. IF admin wants to upload HTML. S-1 Upload HTML will be perform. 5. IF admin wants to delete HTML. S-2 Delete HTML will be perform. 6. IF admin wants to create HTML. S-3 Create HTML will be perform. 7. IF admin wants to reselect task to perform. S-4 Reselect will be perform. 8. ELSE 9. Admin log out from website. 10. ENDIF
Sub Flows: S-1 Upload HTML: 1. Server run the upload process and complete uploaded the file. S-2 Delete HTML: 1. Server run the delete process and complete delete the file. S-3 Create HTML: 1. Admin insert iframe and file into textbox and click on “Save” button. 2. HTML that created will be downloaded automatically. S-4 Reselect: 1. Return to the step three in normal flow.
Alternate / Exceptional Flows: Not applicable

Table 3.3.3: Manage Database Use Case Description

Use Case Name: Manage Database	ID: 3	Importance Level: High
Primary Actor: Gallery Admin	Use Case Type: Detail, Essential	
Stakeholders and Interests:		

Gallery Admin – Manage Database in MySQL.
Brief Description: Gallery admin can manage the data inside the database such as insert, update, delete.
Trigger: Admin want to add, making changes and delete data to/from MySQL database. Type: External
Relationships: Association: Include: Extend: Generalization: Add Data, Delete Data, Update Data
Normal Flow of Events: 1. Admin log in to the website. 2. Website check authorization and allow admin to access to the server. 3. Admin select task to perform. 4. IF admin wants to add data. S-1 Add data will be perform. 5. IF admin wants to delete data. S-2 Delete data will be perform. 6. IF admin wants to update data. S-3 Update data will be perform. 7. IF admin wants to reselect task to perform. S-4 Reselect will be perform. 8. ELSE 9. Admin log out from website. 10. ENDIF
Sub Flows: S-1 Add data: 1. Database connection is open and process the data added. 2. Database connection close. S-2 Delete data: 1. Database connection is open and process the deleted data.

2. Database connection close. S-3 Update data: 1. Database connection is open and process the data added. 2. Database connection close. S-4 Reselect: 1. Return to the step three in normal flow.
Alternate / Exceptional Flows: Not applicable

Table 3.3.4: Manage Image Uploader Use Case Description

Use Case Name: Manage Image Uploader	ID: 4	Importance Level: High
Primary Actor: Gallery Admin	Use Case Type: Detail, Essential	
Stakeholders and Interests: Gallery Admin – Mange the images inside the uploader.		
Brief Description: Gallery admin use the uploader to manage the exhibition item's images that needed to scan by the visitor.		
Trigger: Gallery admin wants to manage the images inside the uploader. Type: External		
Relationships: Association: Include: Extend: Generalization: Upload Exhibition Item Images, Delete Exhibition Item Images		
Normal Flow of Events: 1. Admin open the uploader and log in. 2. Uploader check authority and allow admin to access.		

3. Admin select task to perform. 4. IF admin wants to upload image to the uploader. S-1 Upload will be perform. 5. IF admin wants to delete image to the uploader. S-2 Delete will be perform. 6. IF admin wants to perform the task again. S-1 Reselect will be perform. 7. ELSE 8. Database synchronize the task that perform and return result to admin. 9. ENDIF
Sub Flows: S-1 Upload: 1. Images are uploaded to the uploader and synchronize with database. S-2 Delete: 1. Images are deleted from uploader and synchronize with database. S-3 Reselect: 1. Return to the step three in normal flow.
Alternate / Exceptional Flows: Not applicable

Table 3.3.5: View Report Use Case Description

Use Case Name: View Report	ID: 5	Importance Level: High
Primary Actor: Gallery Admin	Use Case Type: Detail, Essential	
Stakeholders and Interests: Gallery Admin – View statistic report		
Brief Description: The system allow gallery admin to view statistic report.		
Trigger: Gallery admin wants to view report.		

Type: External
Relationships: Association: Include: Extend: Generalization:
Normal Flow of Events: 1. Admin log in to the website. 2. Website check authorization and allow admin to access to the server. 3. Admin click on the "Report" section. 4. System retrieve statistic and data from database. 5. Admin select analytic statistic. 6. IF admin wants to view full analytic. S-1 Full analytic will perform. 7. IF Admin wants to view analytic clicks. S-2 Analytic clicks perform. 8. IF admin want to write comment for the report. S-3 Add comment. 9. ELSE 10. Admin logout from the website. 11. ENDIF
Sub Flows: S-1 Full analytic: 1. Process, retrieved from database and return full analytic value to webpage. S-2 Analytic clicks: 1. Process, retrieved from database and return analytic clicks value to webpage. S-3 Add comment: 1. Textbook is appear for admin to write remarks.
Alternate / Exceptional Flows: Not applicable

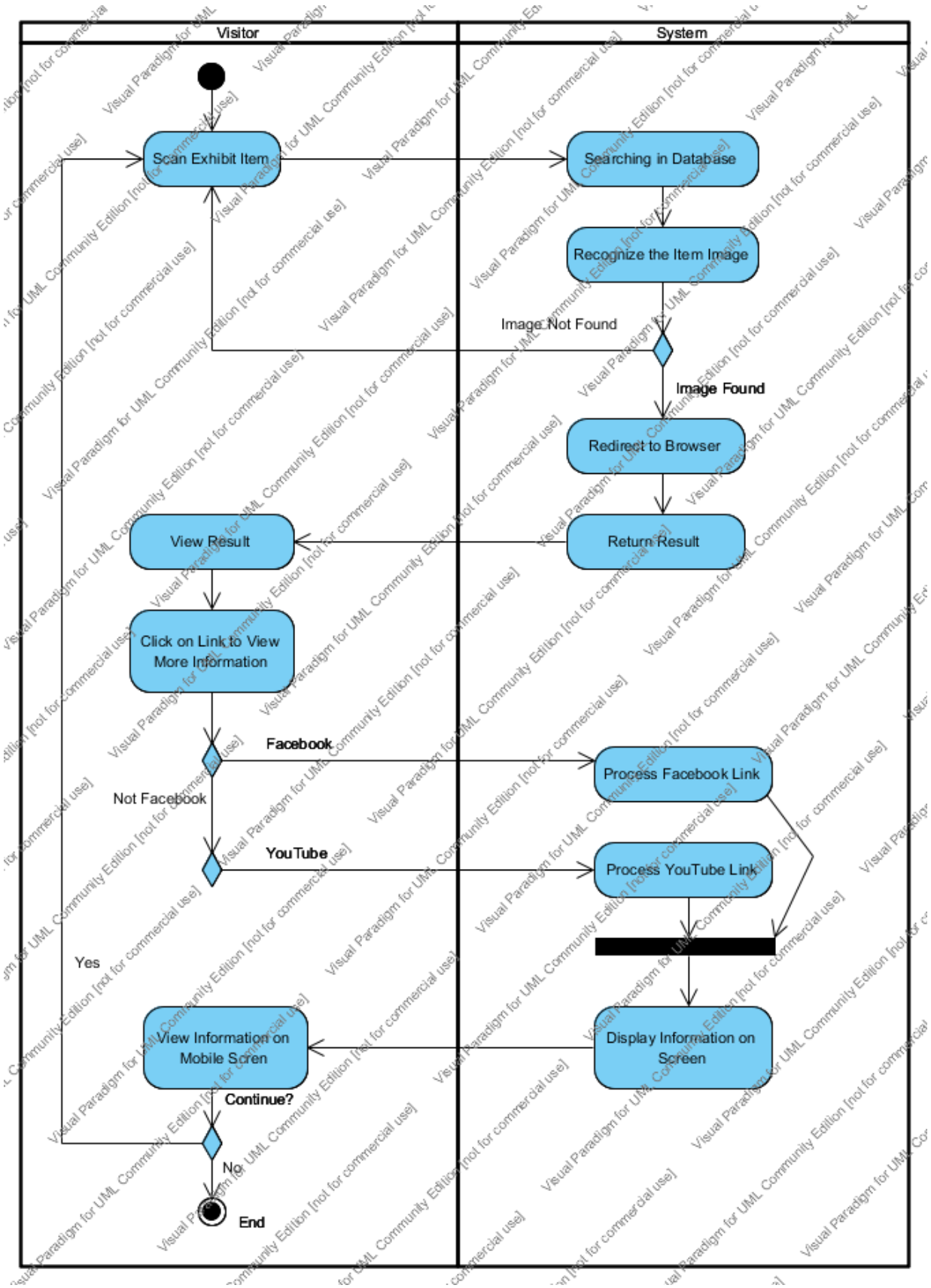


Figure 3.3.3: Scan Exhibit Item and View more Information Activity Diagram

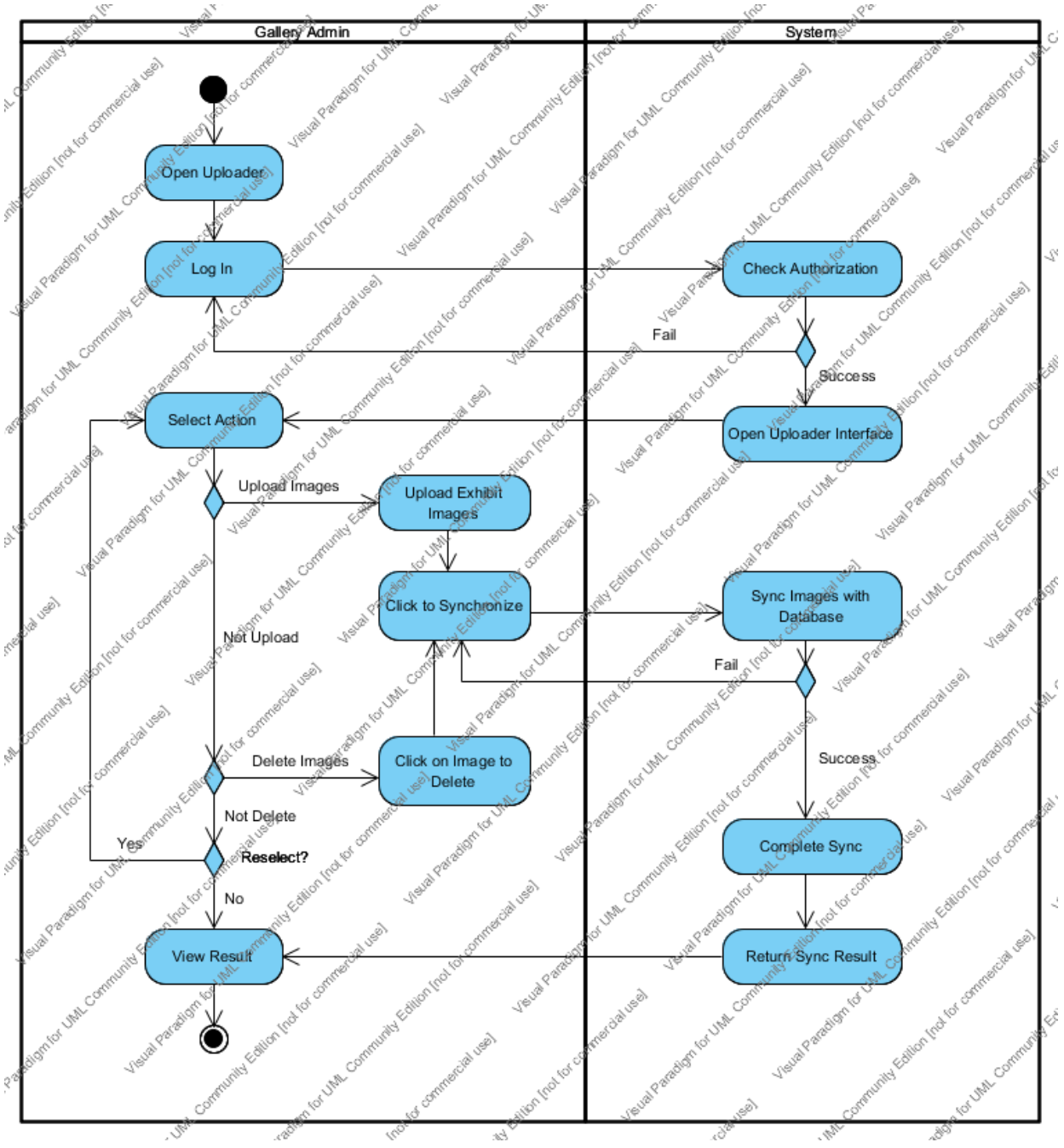


Figure 3.3.4: Mange Image Uploader Activity Diagram

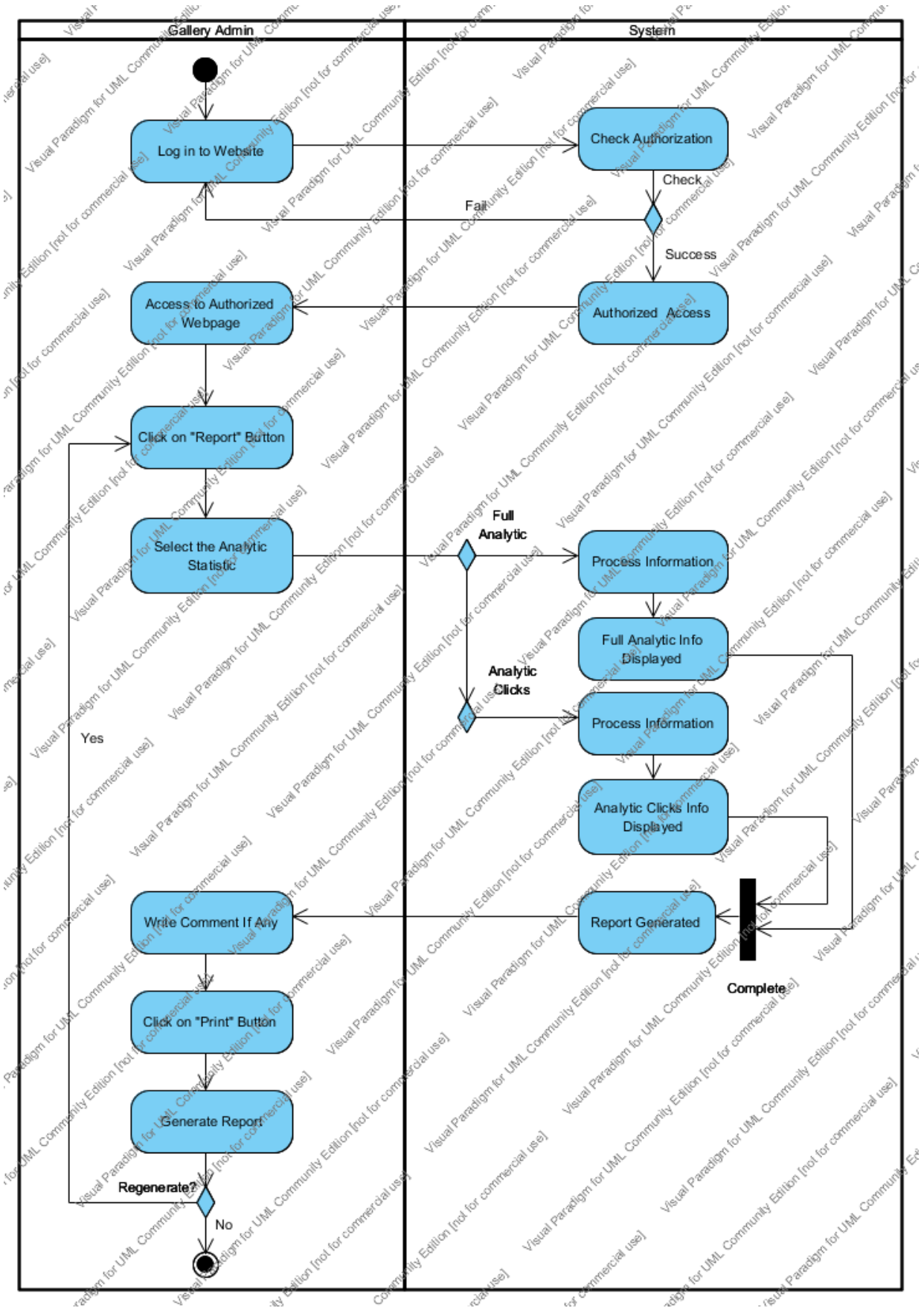


Figure 3.3.5: View Report Activity Diagram

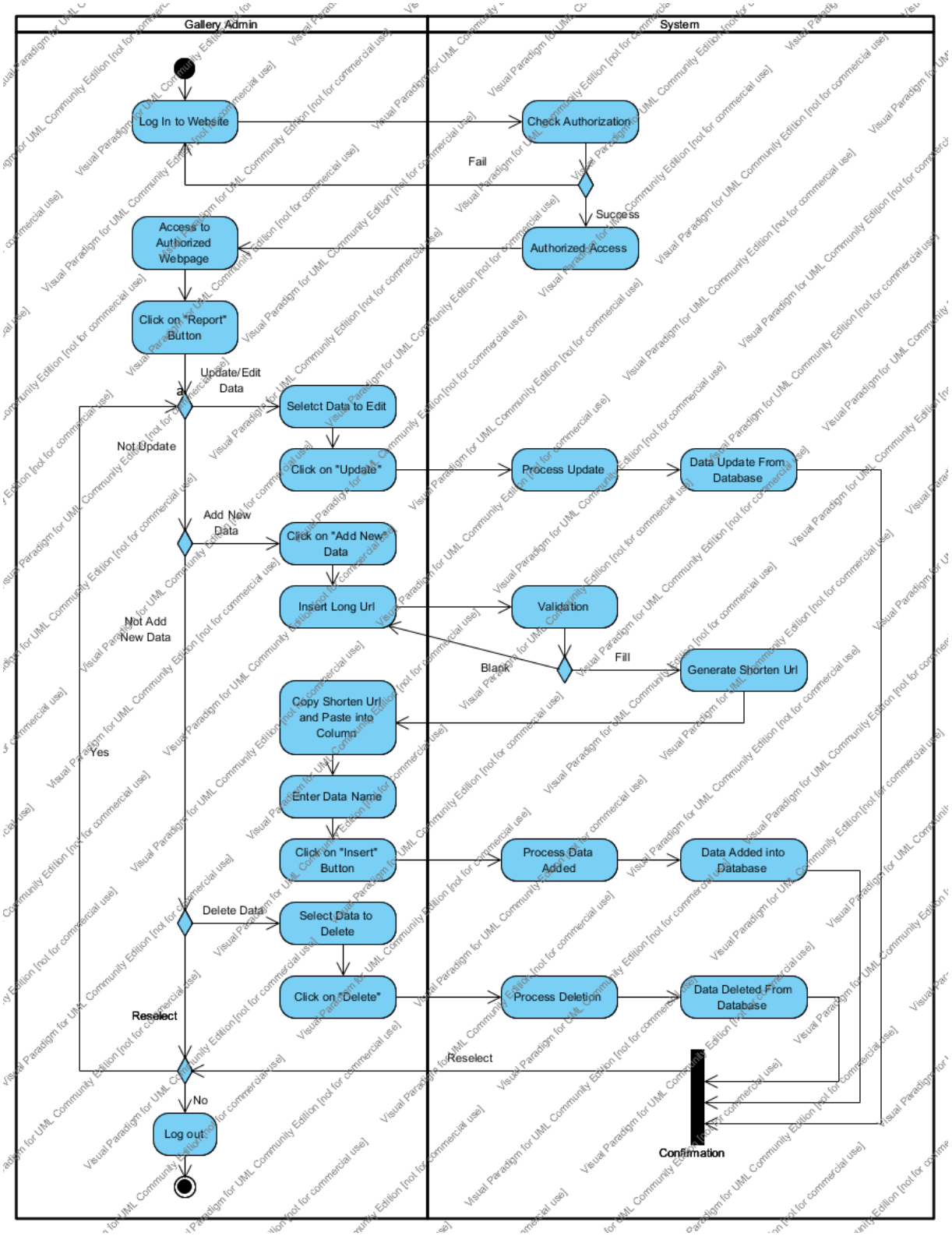


Figure 3.3.6: Manage Database Activity Diagram

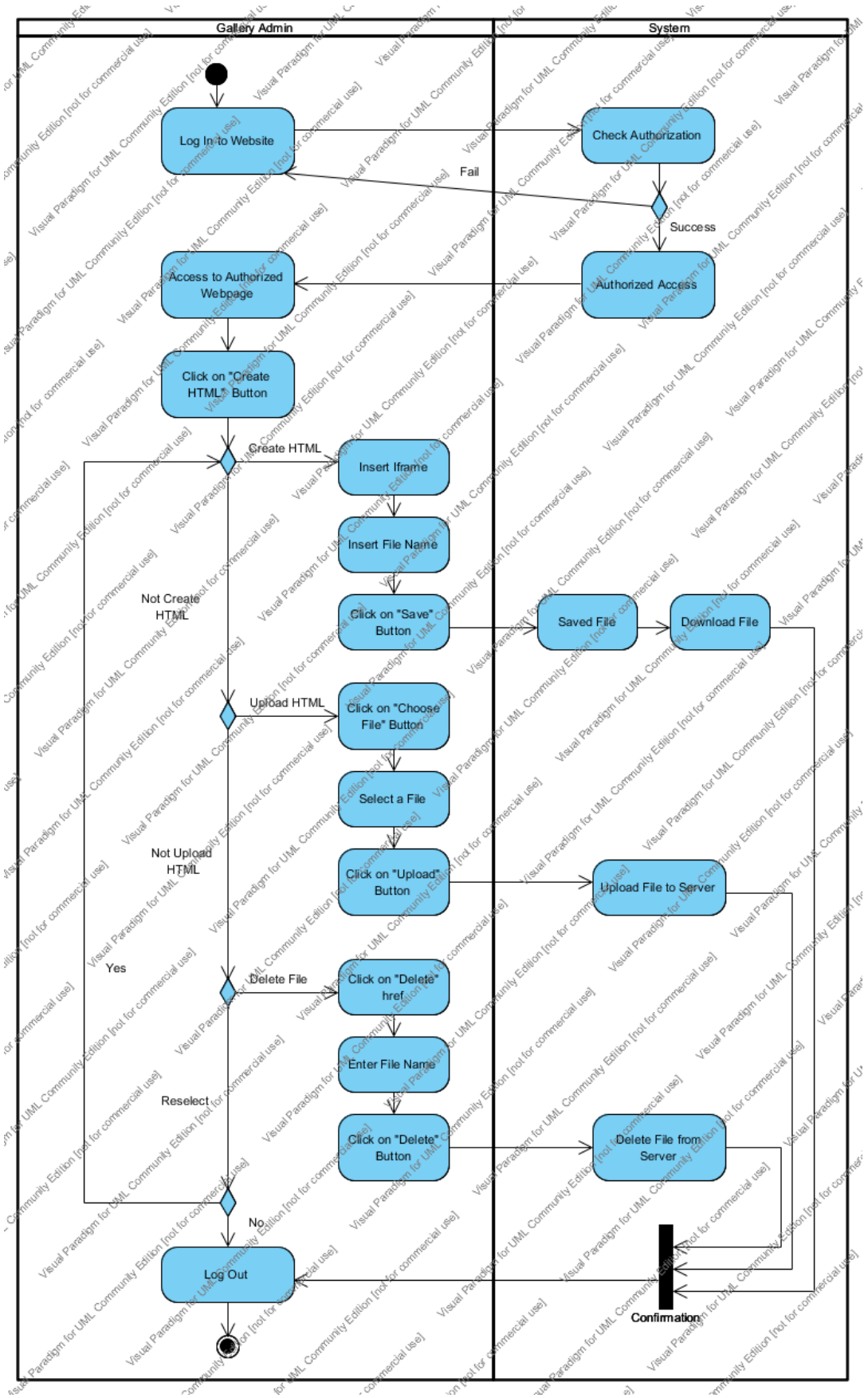


Figure 3.3.7: Manage Server Activity Diagram

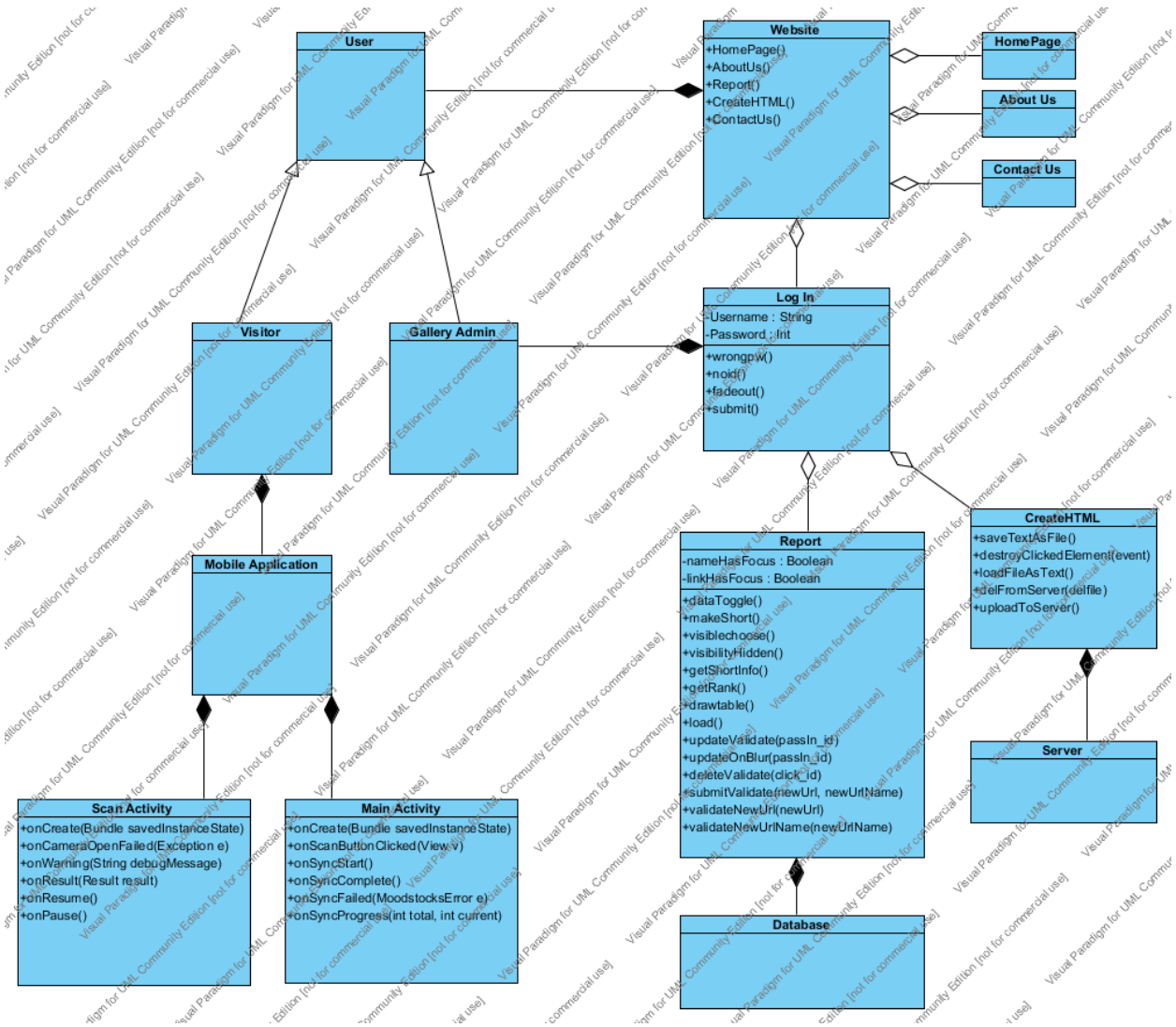


Figure 3.3.8: Class Diagram

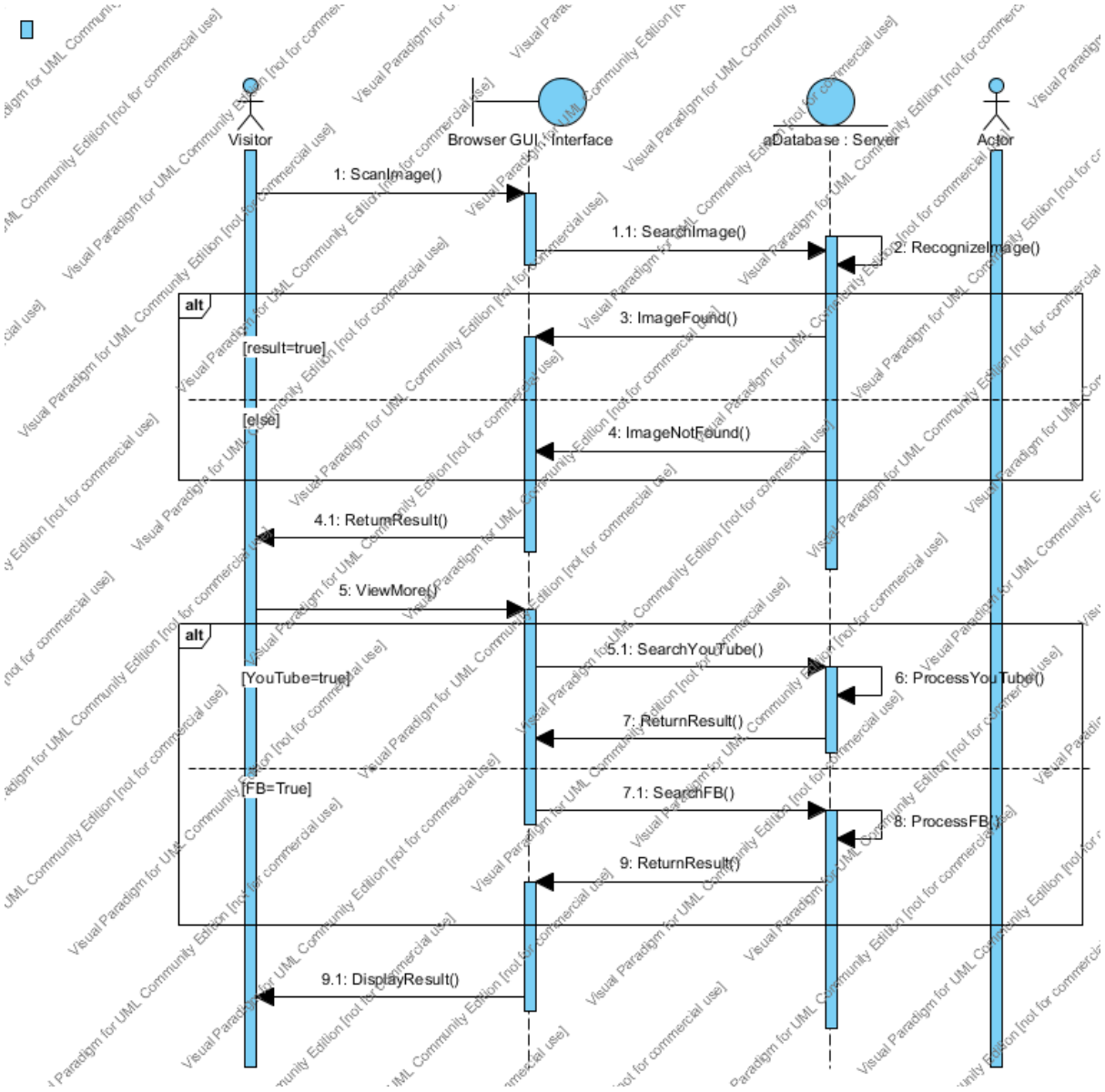


Figure 3.3.9: Scan Exhibit Item and View more Information Sequence Diagram

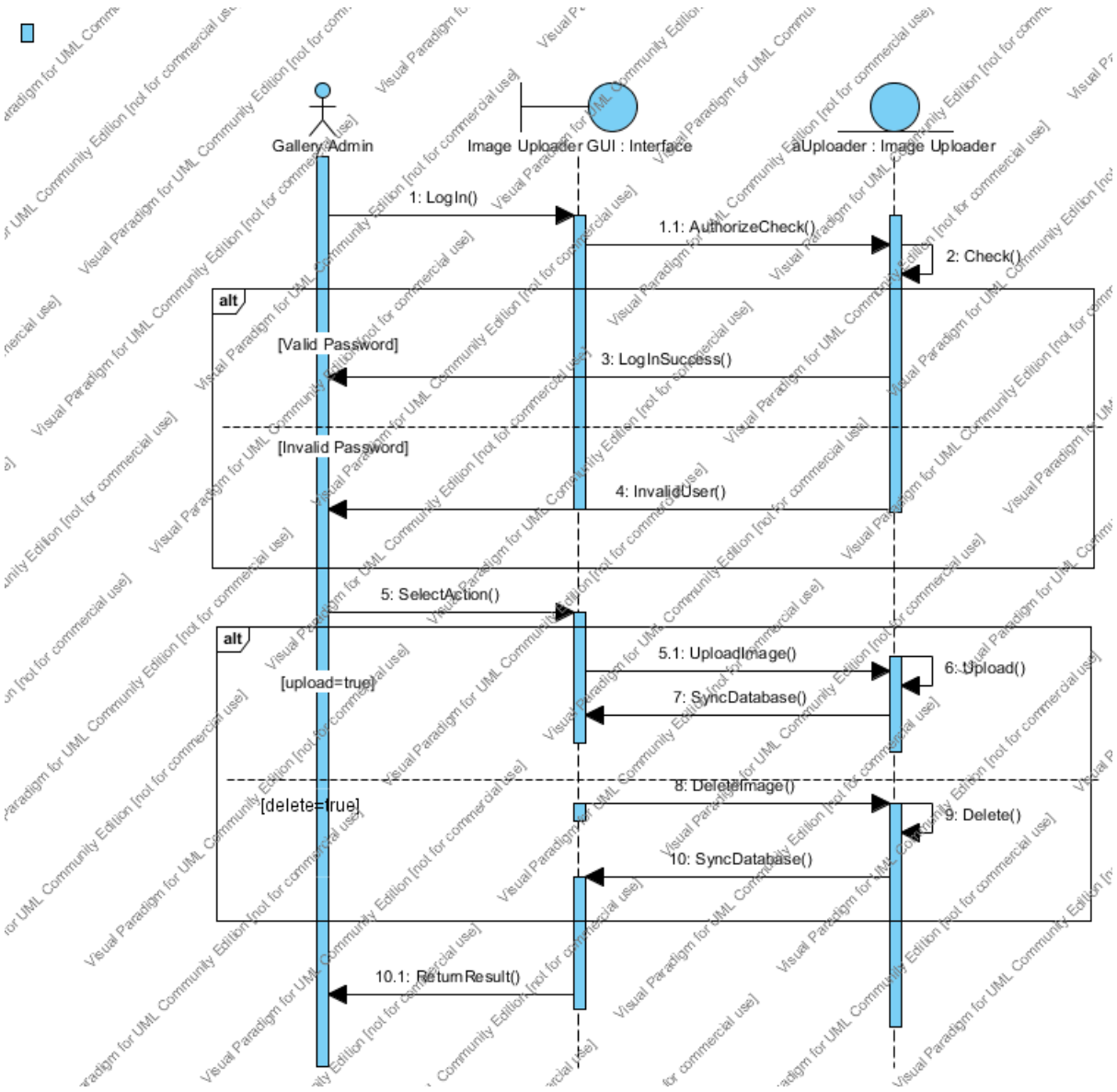


Figure 3.3.10: Manage Image Uploader Sequence Diagram

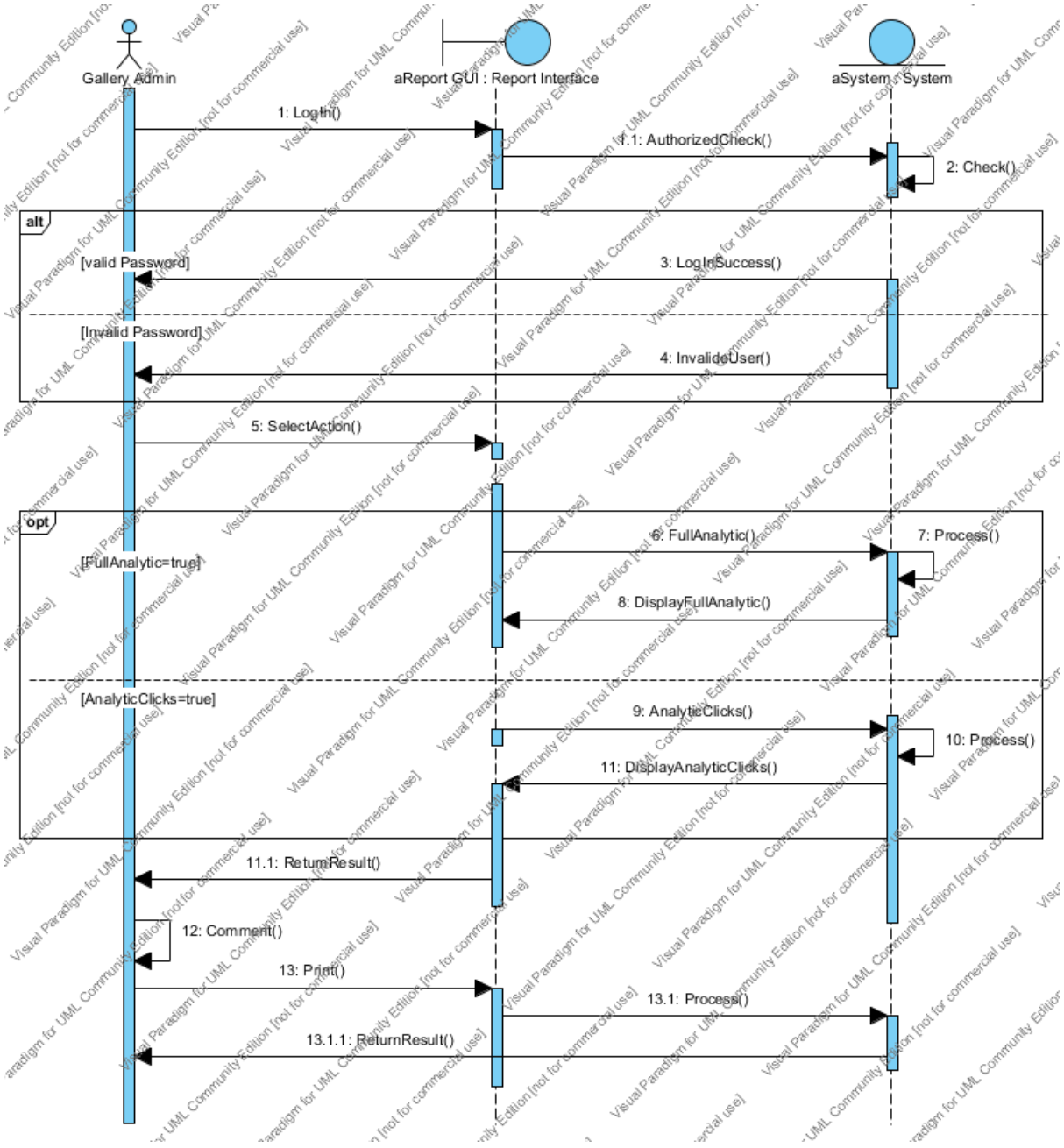


Figure 3.3.11: View Report Sequence Diagram

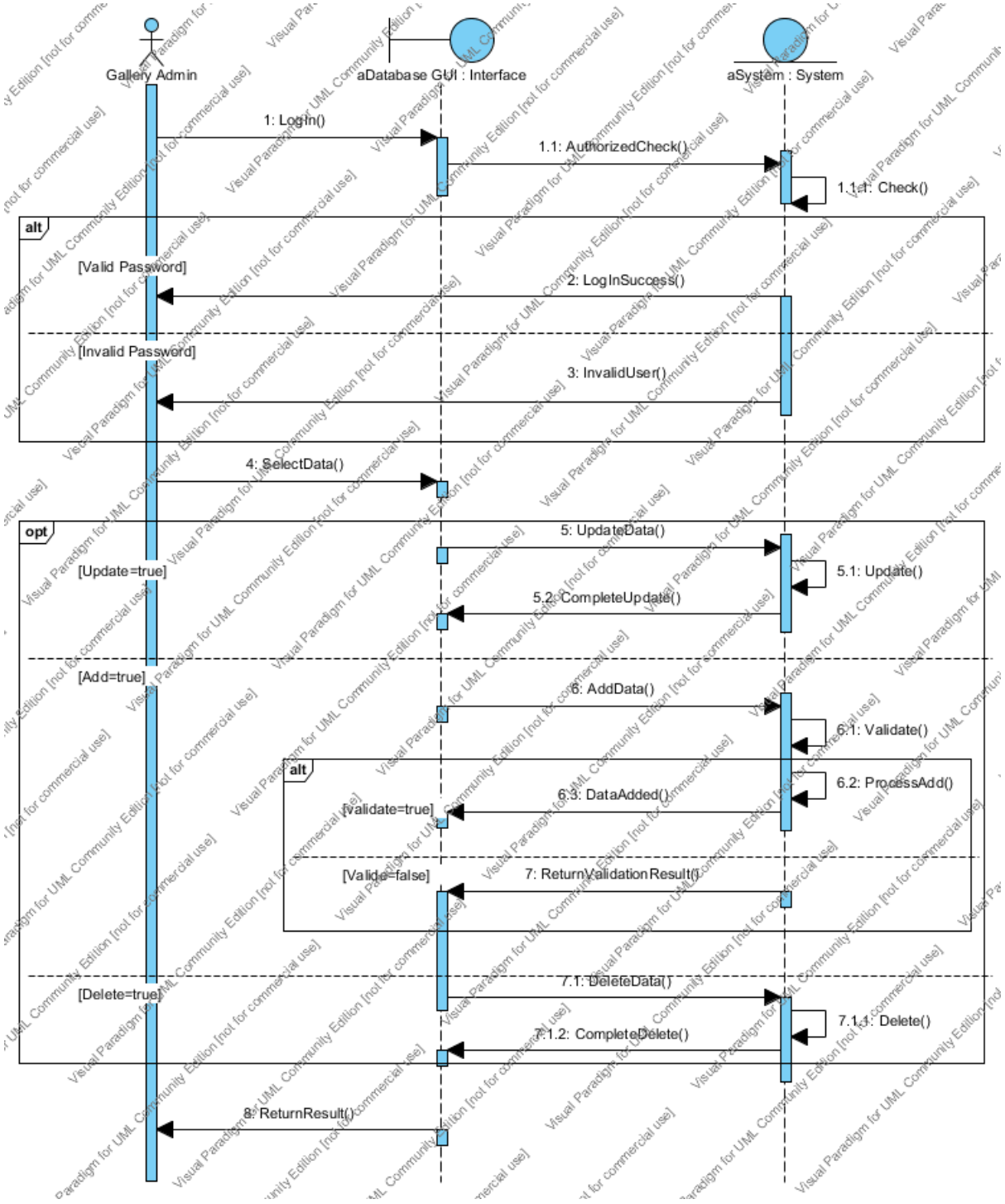


Figure 3.3.12: Manage Database Sequence Diagram

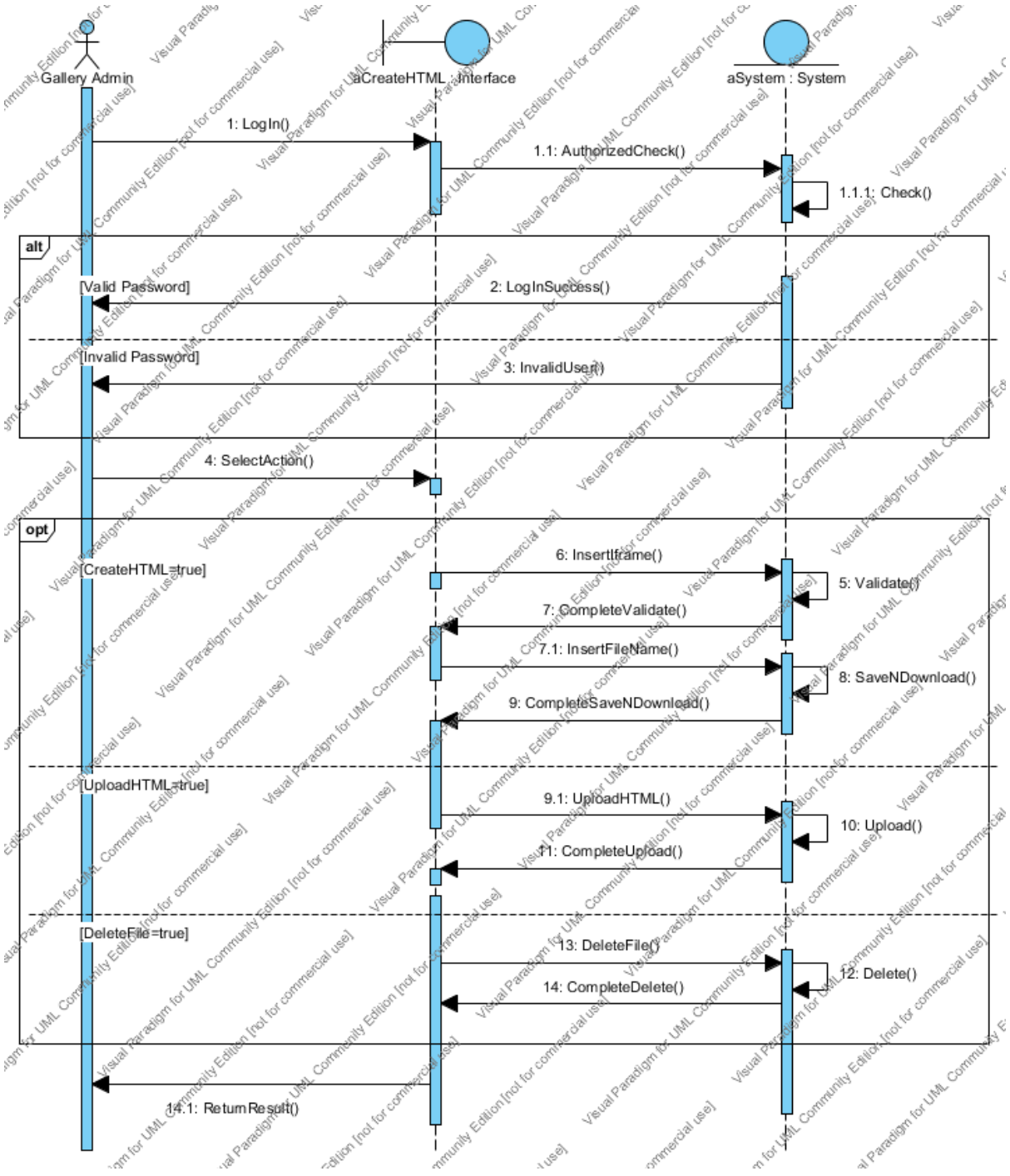


Figure 3.3.13: Mange Server Sequence Diagram

3.4 Limits and Exclusions

- Internet Connection:
  The application will not be function if there is no internet connection. If the internet connection signal is weak, the application will probably function slower. For example take more time to browse a video or description.

- Communication :
  The interaction of communication for visitors only can communicate with each other and share their experiences on certain platform.

- Language:
  The solution that create in this project have limited languages which is only some mutual language that often use.

- Multimedia source:
  The overall multimedia source are not included in the solution, admins of museum are responsible to manage the multimedia source and images but not programmer.

- Scanning:
  The solution can only scan one object each a time.

3.5 Technology Involved

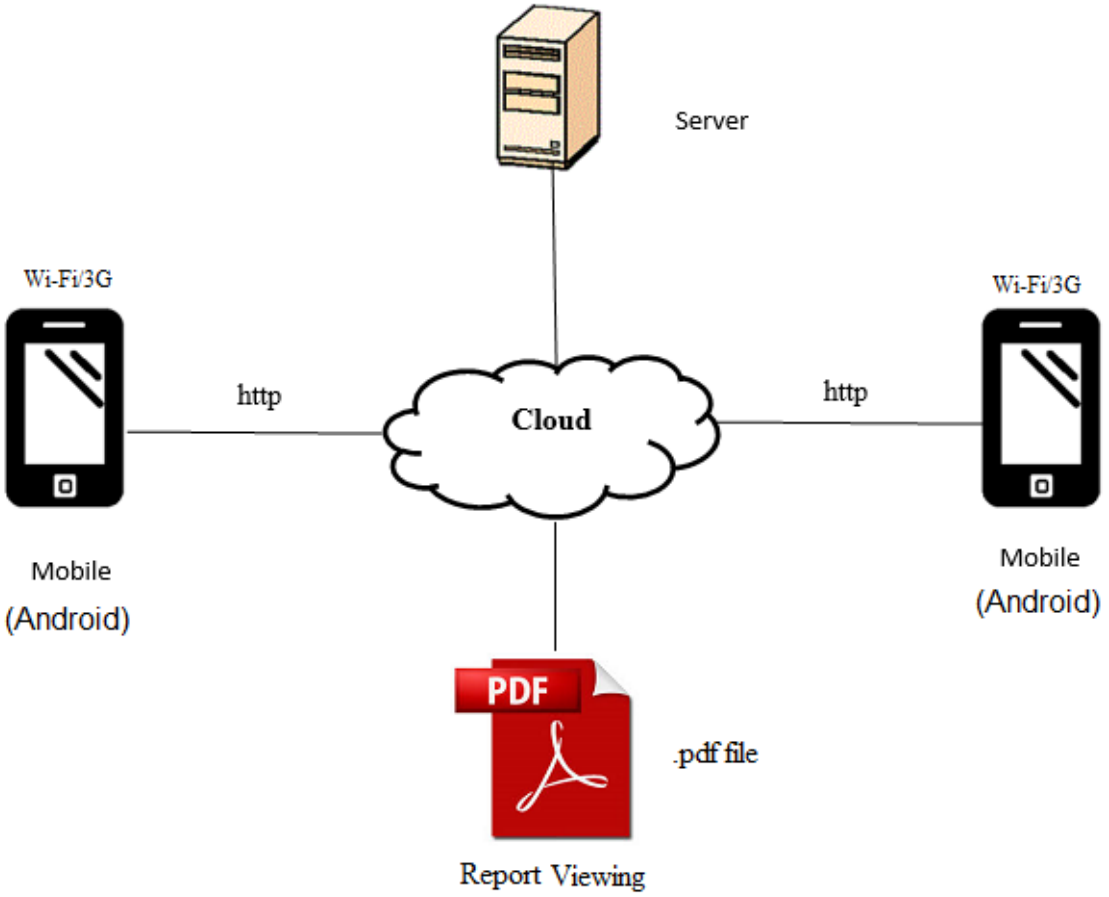


Figure 3.5.1: Technology involved Diagram

Wi-Fi/3G:

Wi-Fi is local area wireless computer networking technology while 3G is the third generation of mobile telecommunication technology. Both are able to let user connect to internet with their mobile device. 3G is much faster than Wi-Fi. Wi-Fi depends on the access point or hotspot to get the connection and it is less secure. 3G based on the Telecommunication Service Provider's mobile internet service. With these technologies, user could access to internet and use our application.

HTTP:

The usage of HTTP is for file transfers from a webserver into a browser window to view a web page that is on the Internet. Files are transported only from server onto workstation's browser with HTTP. The files are transferred but not downloaded, therefore not copied into the memory of the workstation (Globalscape).

Server:

The server store the database of user and photos, when user wanted to know any data, the data will retrieved from the server.

PDF:

PDF is the short form of Portable Document Format, a type of file extension that captured all the element such as fonts, document text and images from variety application. Files available at any viewing location because it can embed type fonts. To view this type of file format need the Adobe Reader which is a free application that can easily download (John. V). Reason why using this file extension is because it doesn't allow user to make any changes to the file.

3.6 Gantt Chart

ID	Task Name	Start	Finish	Duration
1	**Mobile Application: Augmented Tour System**	**12/1/2015**	**4/9/2015**	**236d**
2	**Final Year Project I**	**12/1/2015**	**22/3/2015**	**70d**
3	Research on Related Information	12/1/2015	14/1/2015	3d
4	Research on Related Software tools	15/1/2015	17/1/2015	3d
5	Installation of Software tools	18/1/2015	18/1/2015	1d
6	**Planning**	**19/1/2015**	**24/1/2015**	**6d**
7	Summary Plan	19/1/2015	19/1/2015	1d
8	Feasibility Analysis	20/1/2015	20/1/2015	1d
9	Produce System Flow	21/1/2015	22/1/2015	2d
10	Meeting and Discussion of System	23/1/2015	24/1/2015	2d
11	**Analysis**	**25/1/2015**	**3/2/2015**	**10d**
12	Problem Analysis	25/1/2015	29/1/2015	5d
13	Preliminary Scope Statement	30/1/2015	3/2/2015	5d
14	**Implementation**	**4/2/2015**	**20/3/2015**	**45d**
15	Report	4/2/2015	13/2/2015	10d
16	Prototype	14/2/2015	28/2/2015	15d
17	System Integration	1/3/2015	8/3/2015	8d
18	Prototype Testing	9/3/2015	15/3/2015	7d
19	Review Prototype	16/3/2015	20/3/2015	5d
20	**Completion**	**21/3/2015**	**22/3/2015**	**2d**
21	FYP 1 Report Submission	21/3/2015	21/3/2015	1d
22	FYP 1 Oral and Prototype Presentation	22/3/2015	22/3/2015	1d
23				

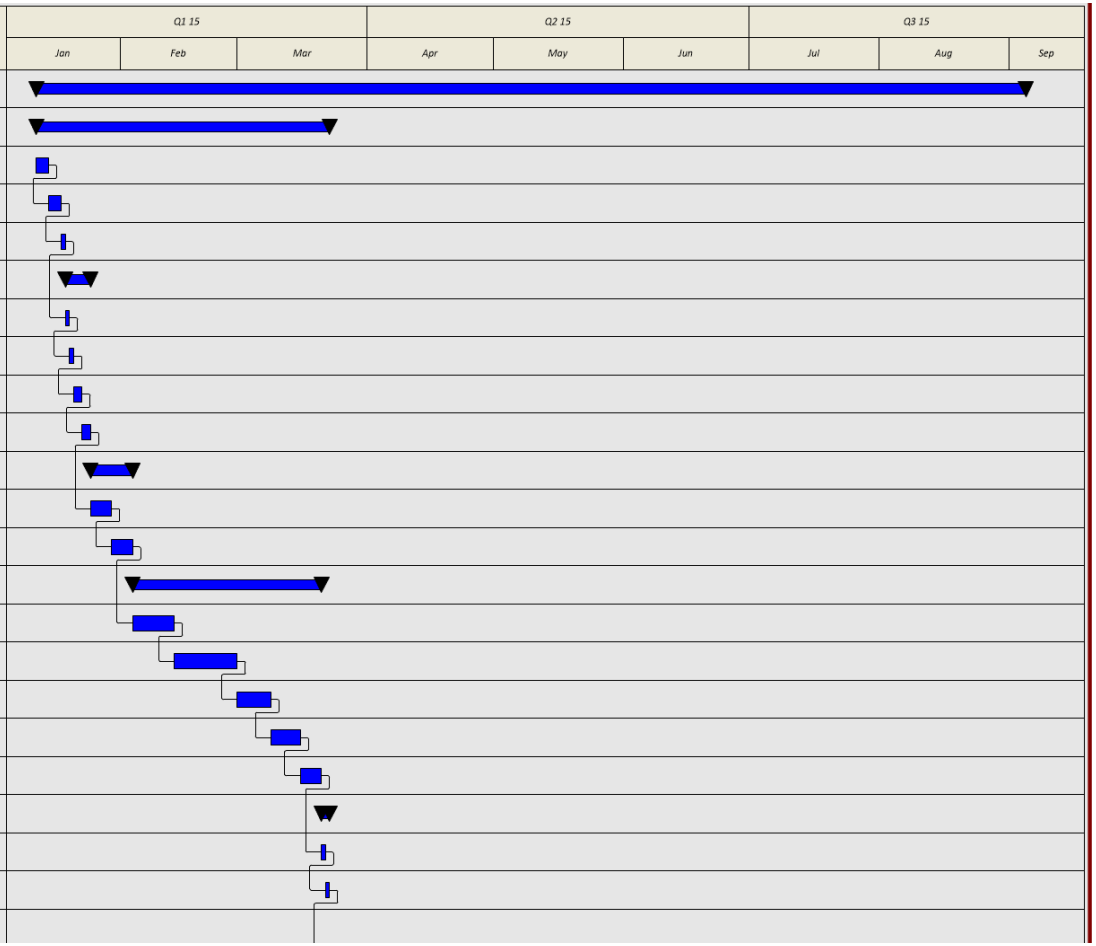


Figure 3.6.1 Gantt Chart (a)

24	**Final Year Project II**	**23/3/2015**	**4/9/2015**	**166d**	
25	Review FYP 1 Report	23/3/2015	1/4/2015	10d	
26	FYP 2 Report Preparation	2/4/2015	11/4/2015	10d	
27	**Analysis**	**12/4/2015**	**11/5/2015**	**30d**	
28	Analysis Problem	12/4/2015	26/4/2015	15d	
29	Analyst FYP 1 Prototype	27/4/2015	11/5/2015	15d	
30	**System Design and Testing**	**12/5/2015**	**2/9/2015**	**114d**	
31	Interface Development	12/5/2015	26/5/2015	15d	
32	Main Feature Development	27/5/2015	25/6/2015	30d	
33	Additional Feature Development	26/6/2015	20/7/2015	25d	
34	Monitoring Feature Development	21/7/2015	4/8/2015	15d	
35	System Integration	5/8/2015	16/8/2015	12d	
36	Unit Testing and Error Testing	17/8/2015	26/8/2015	10d	
37	Review System Demo	27/8/2015	2/9/2015	7d	
38	**Completion**	**3/9/2015**	**4/9/2015**	**2d**	
39	FYP 2 Report and System Submission	3/9/2015	3/9/2015	1d	
40	FYP 2 Presentation and System Demo	4/9/2015	4/9/2015	1d	

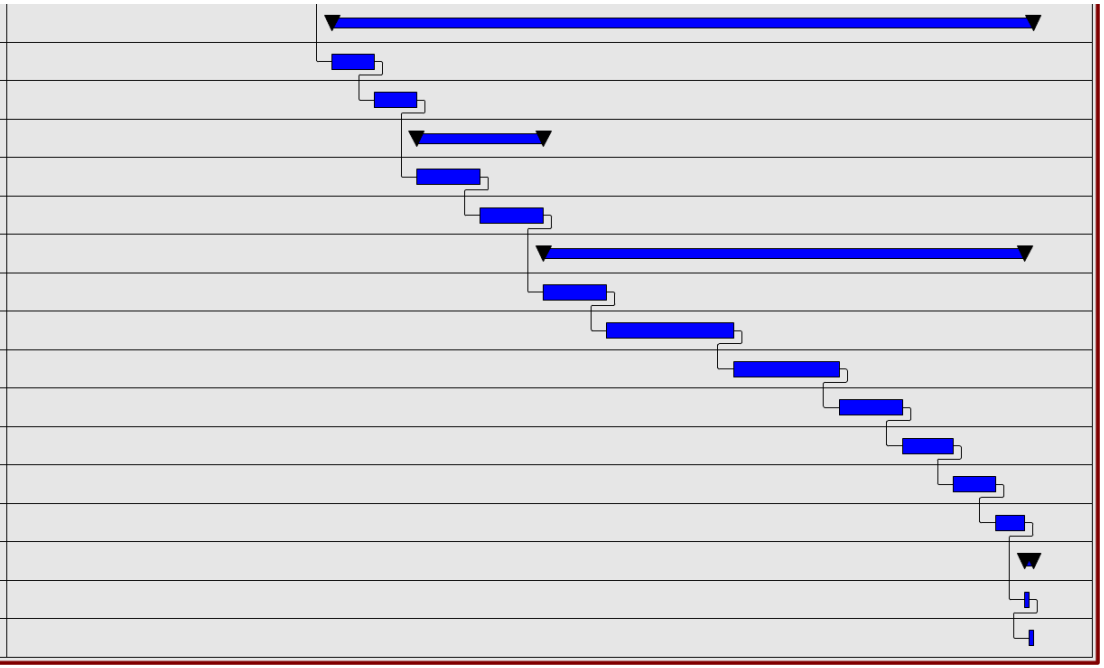


Figure 3.6.2: Gantt Chart (b)

Chapter 4: Implementation and Testing

4.1 Graphical User Interface (User Guideline)

Visitor (Mobile Application)

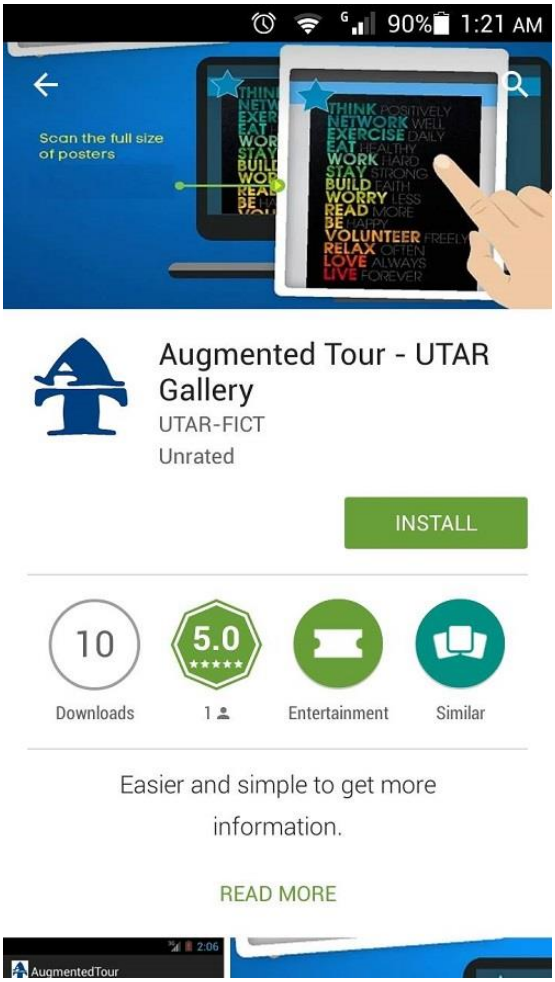


Figure 4.1.1: Google Play Store Interface

Step 1: Go to Google Play Store search on "Augmented Tour", download and install the application.

Figure 4.1.2: Application Main Page

Step 2: Open the downloaded application, press on scan button to scan the photo that wanted to view.

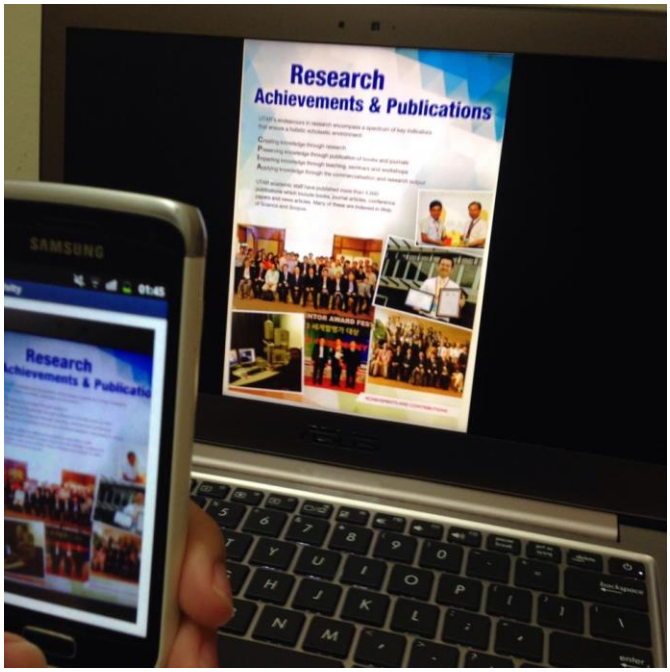


Figure 4.1.3: Poster in Gallery

Step 3: Scan on the photo/ poster that have instruction allow for scanning.

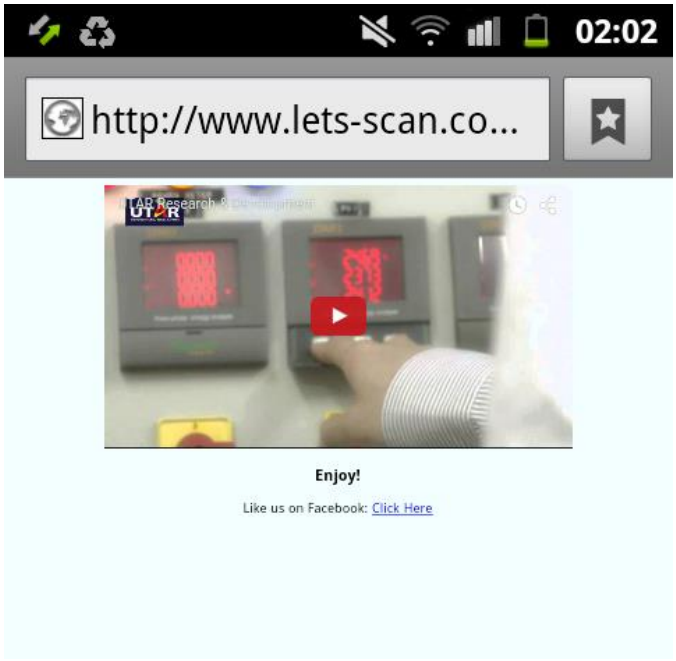


Figure 4.1.4: Redirect Page

Step 4: Redirect to the details information page after scan the photo

Administrator (Website)

Step 1: Install Moodstocks image uploader in order to use this system.

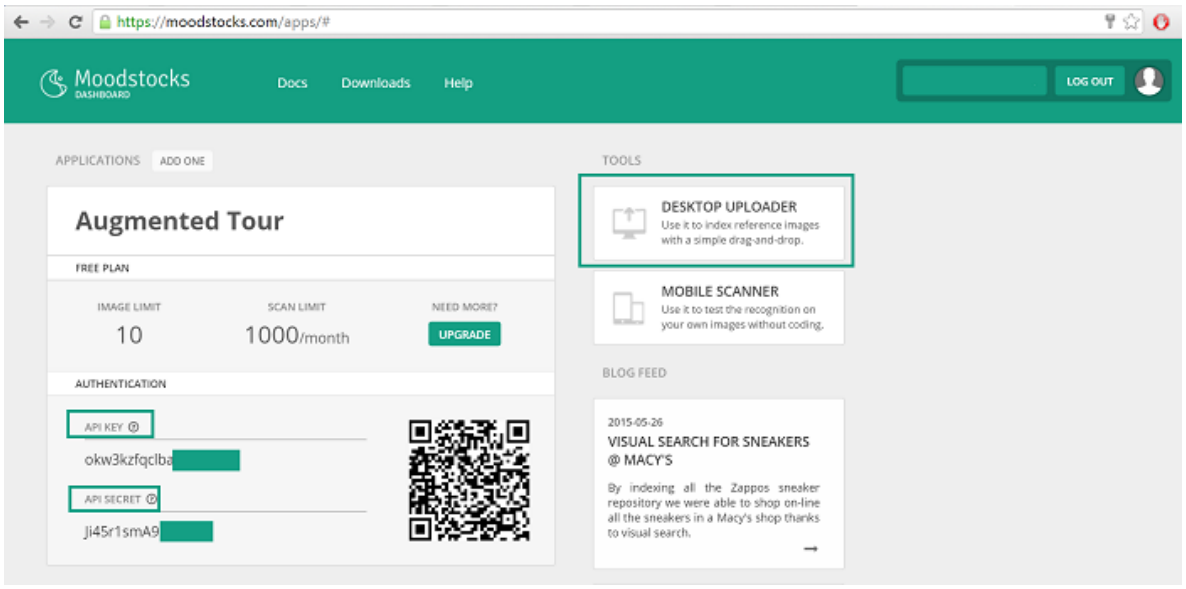


Figure 4.1.5: Moodstocks Dashboard Interface

1.1: In order to download Moodstocks image uploader, admin have to create an account at https://moodstocks.com. After create the account, click on dashboard and the interface as shown in the photo above will appear and click on "Desktop Uploader".

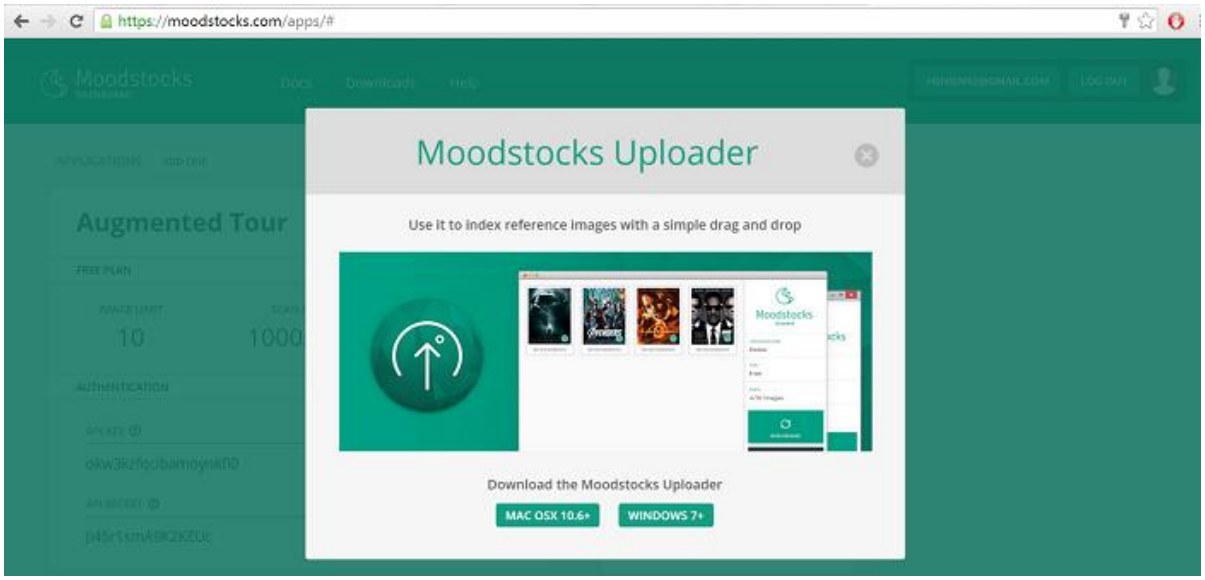


Figure 4.1.6: Moodstocks Download Uploader Interface

1.2: After click on "Desktop Uploader", admin have to choose which operating system they are using and select.

QtGui4.dll	24/2/2015 6:25 PM	Application extension	8,165 KB
QtNetwork4.dll	24/2/2015 6:25 PM	Application extension	1,001 KB
select.pyd	24/2/2015 6:25 PM	PYD File	10 KB
shiboken-python2.7.dll	24/2/2015 6:25 PM	Application extension	106 KB
unicodedata.pyd	24/2/2015 6:25 PM	PYD File	671 KB
uploader	24/2/2015 6:25 PM	Application	422 KB
uploader.exe	11/3/2015 10:19 PM	Text Document	5 KB
w9xpopen	24/2/2015 6:25 PM	Application	49 KB

Figure 4.1.7: Moodstocks Folder Interface

1.3: When the file is successfully downloaded, click into the downloaded folder and find the "uploader" application as shown in the photo above to open the uploader.

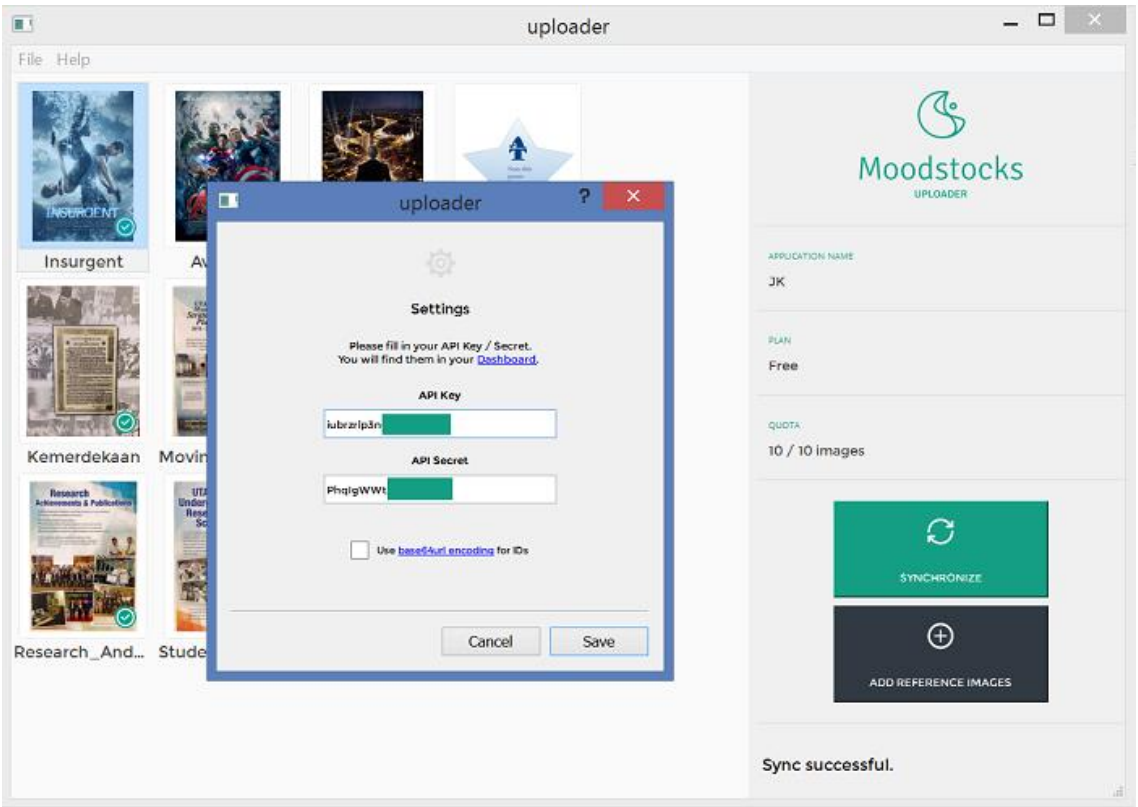


Figure 4.1.8: Moodstocks Uploader Interface

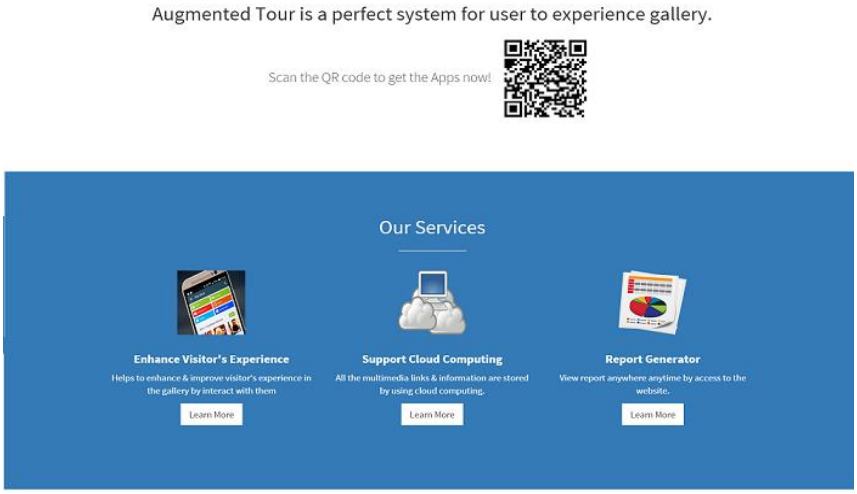
1.4: When the uploader is open, click on "File→Preference" then insert the API Key and API Secret in order to upload photos to the database. The API Key and API Secret must be match with the keys that create previously. To upload the preference images, either click on the "Add Preference Images" button or drag the photos that wanted to upload into the uploader and click on "Synchronize" button. Those photos will be synchronize to the database, a green tick will appear if it sync successfully.

Step 2: Log in to the website.

Figure 4.1.9: Website Home Page

2.1:

This is the main page of the website. There is a sidebar on the top-right corner. Click on the menu icon to open it. The sidebar contain six sections: Home, About, Service, Portfolio, Contact, and Login. In order to view the content, just click on the section. Click on the log in section to log in. The website link is www.lets-scan.com.



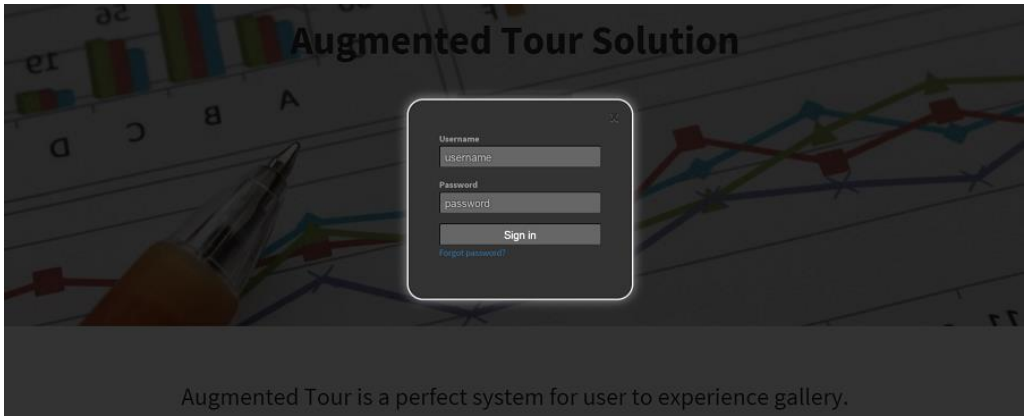


Figure 4.1.10: Login Page

2.2: After click on the login, a login box will appear to ask admin enter username and password in order to access to the authorized webpage.

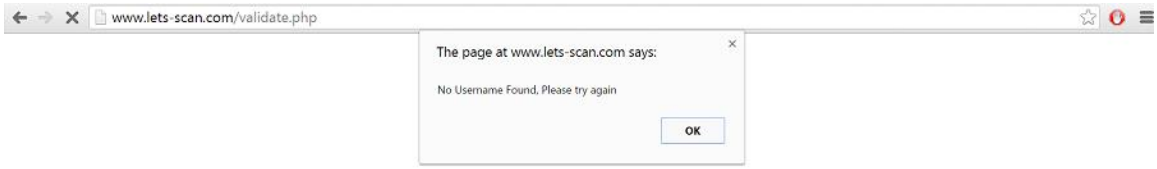


Figure 4.1.11: Login Validation

2.3: An alert is shown if the username and password are wrong. User will be redirect back to the main page.

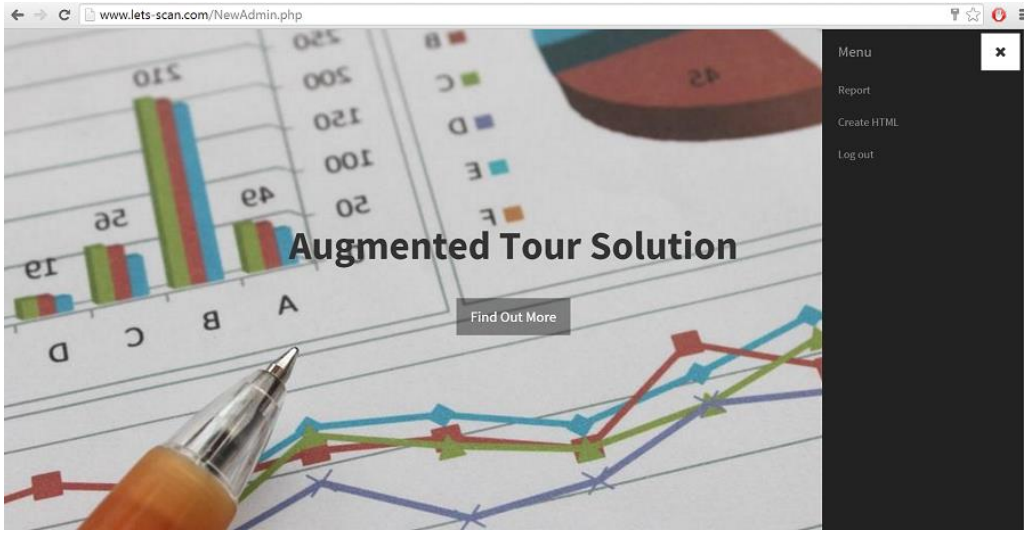


Figure 4.1.12: Admin Page

2.4: If the username and password are correct, admin will be redirect to the authorized webpage and the sidebar will have different section for admin to choose an action to perform.

Step 3: Manage server by create, upload and delete HTML page

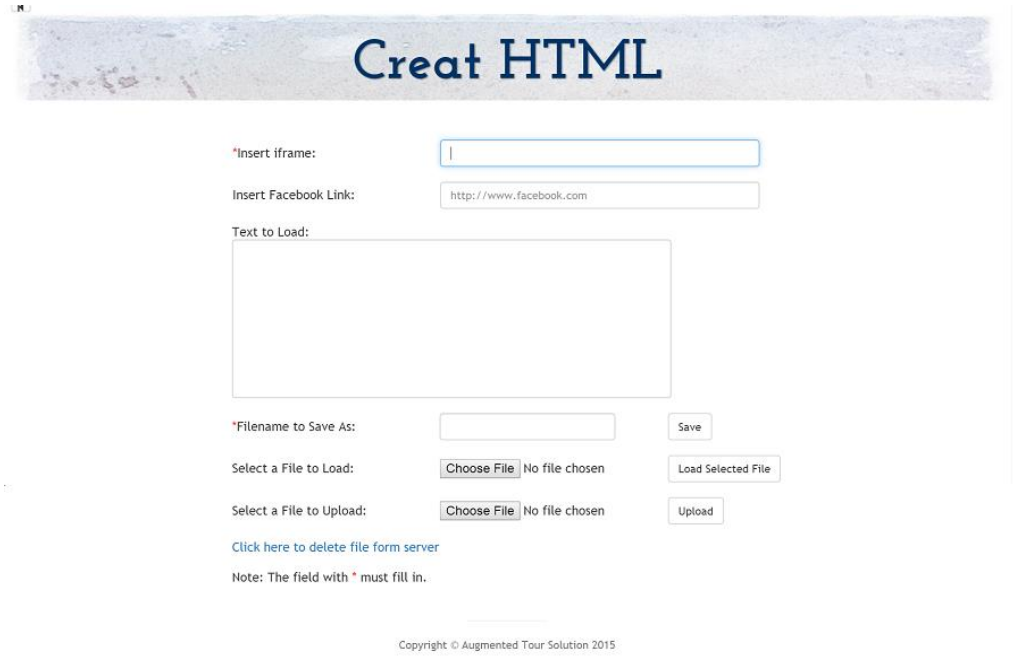


Figure 4.1.13: Create HTML Page

3.1: This is the Create HTML page for admin to create the html page that used for visitor to view after they scan on the photo.

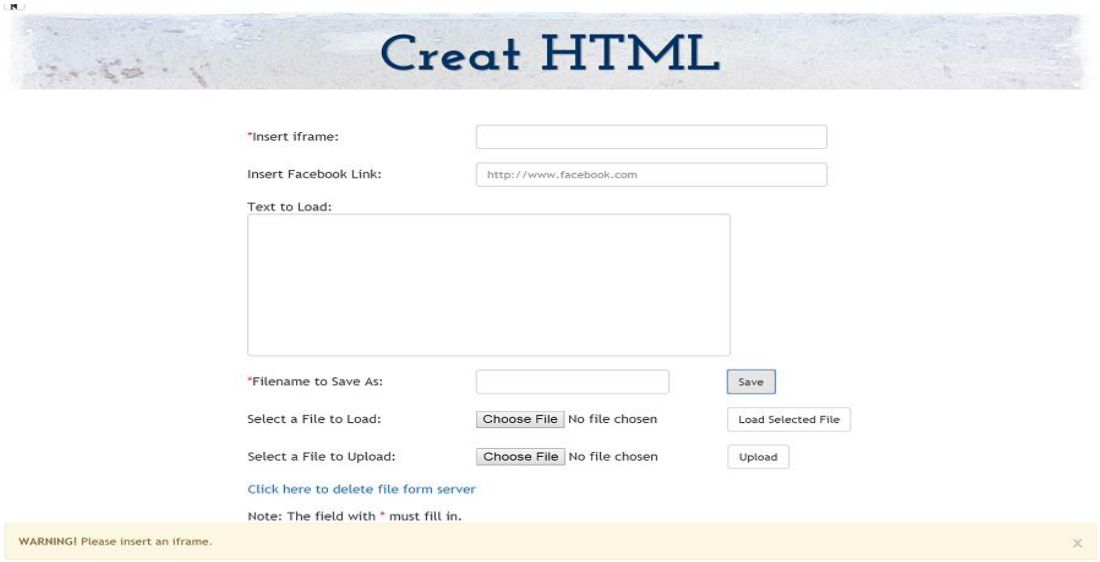


Figure 4.1.14: iframe Validation

3.2: “iframe” and “Filename to Save As” are compulsory field to fill in by admin while “Insert Facebook Link” is optional. If either one of these field did not fill in, an alert message will prompt out to show that it must be fill in (Yellow bar).

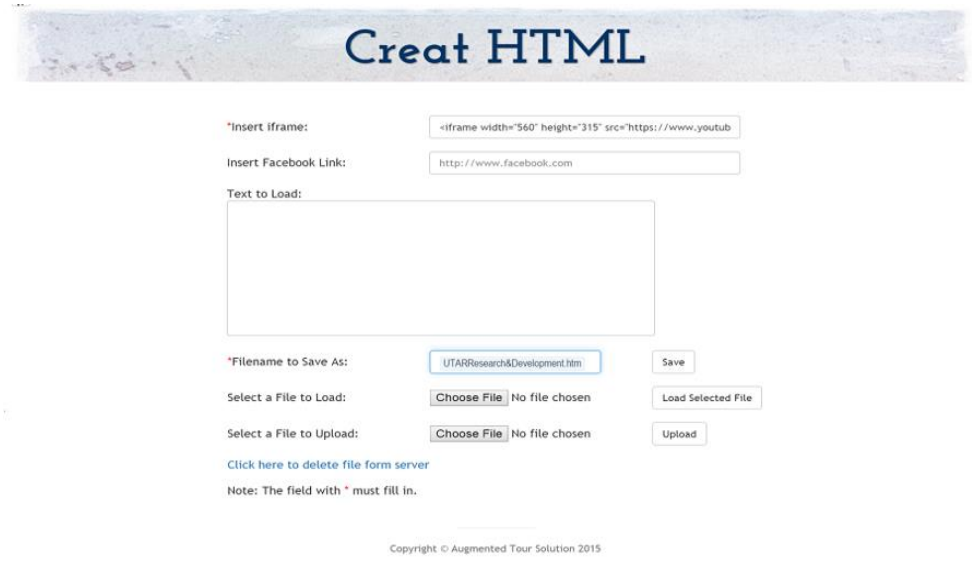


Figure 4.1.15: Save File

3.3: "iframe" is the YouTube embedded link that need to put into the html page that create. While "Filename to Save As" is the file name of the file that wanted to save. File name that insert cannot have space between the words.

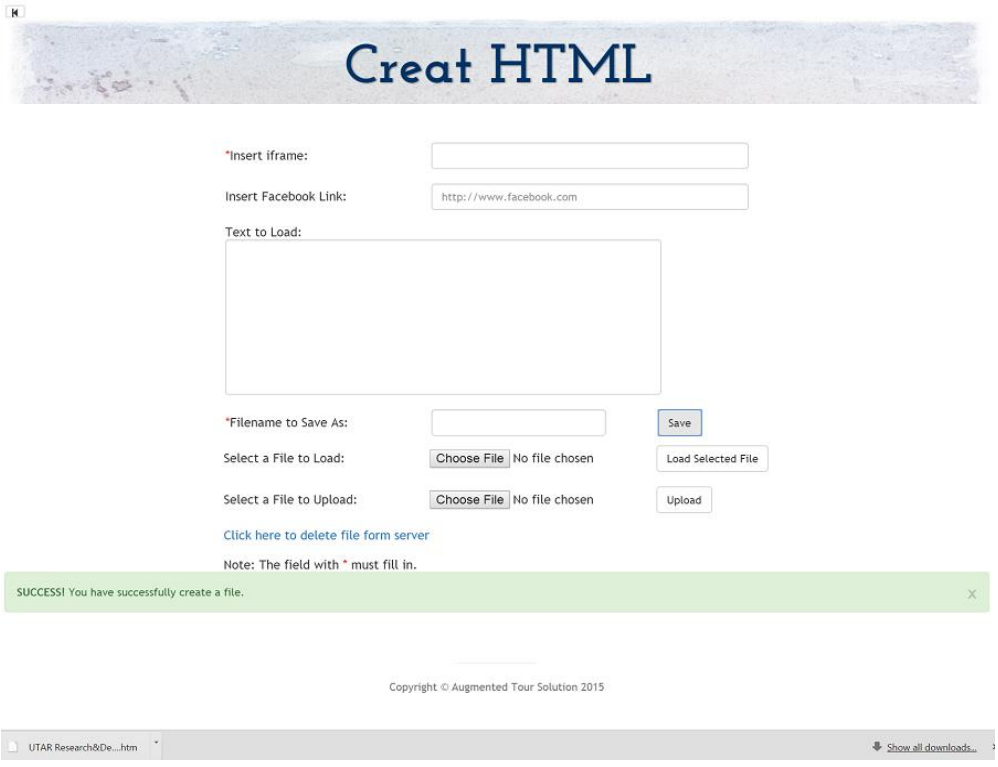


Figure 4.1.16: File Save Successful Alert

3.4: When admin click on the "Save" button, an alert (Green bar) will appear to let admin know that the file is saved and the file will be download automatically.

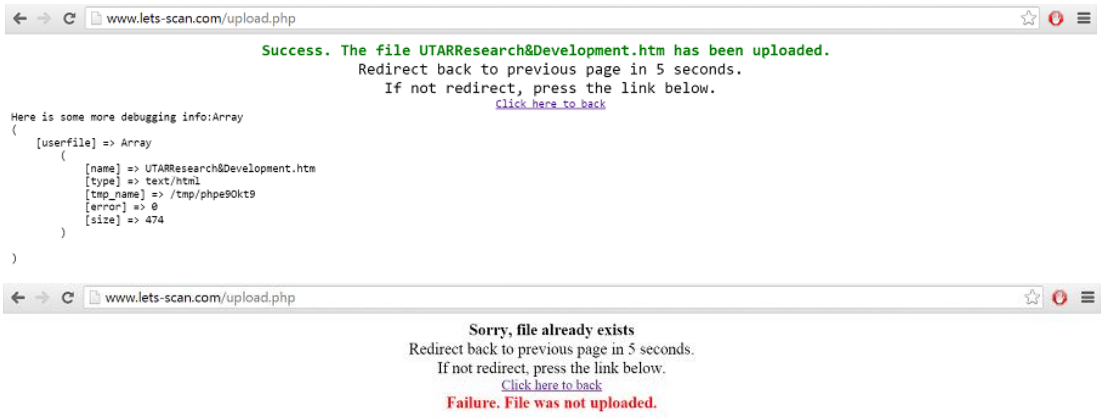


Figure 4.1.17: HTML Upload Error Message

3.5: Click on "Choose File" button in "Select a file to upload" row to select the file that previously upload or other html file. Click on "Upload" button to upload the file. If the file successfully uploaded to the server, a success message will be showed and redirect back to the Create HTML page after 5 seconds. Else if upload fail, a failure message will be show as well.

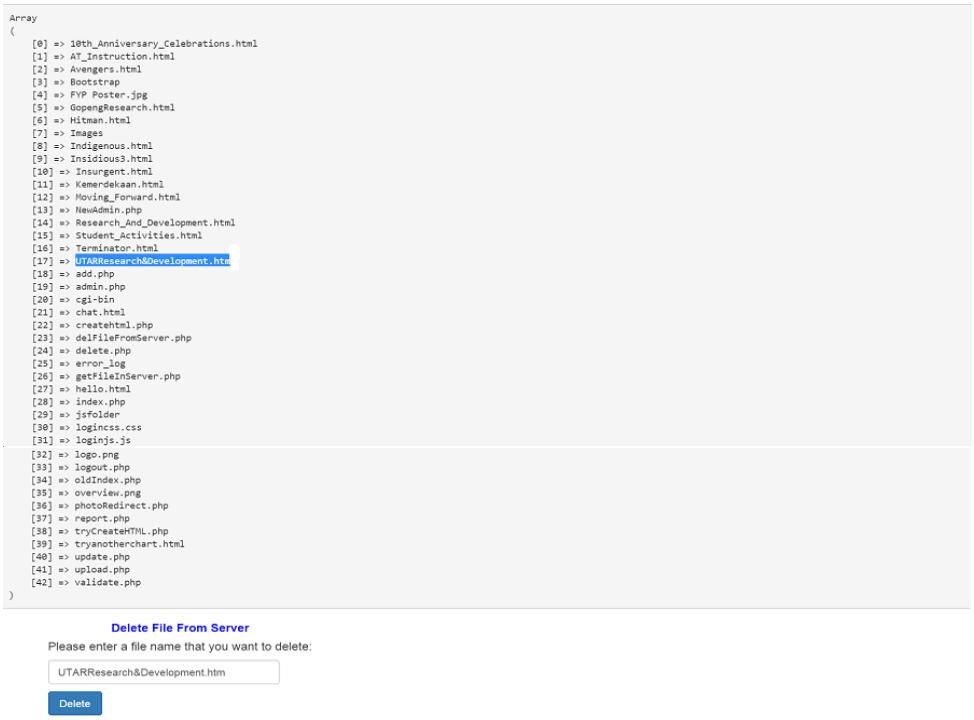


Figure 4.1.18: HTML Deletion Page

3.6: To delete html file from server, click on "click here to delete file from server", it will redirect admin to a page that contain all file in the server. Copy the file name and paste on the delete textbox and click on the "Delete" button. File will be deleted from server after refresh the page.

Step 4: View Report

Figure 4.1.19: Report Page

4.1: Admin can view analytic information by click into the "Report" section in the menu sidebar. Analytic information such as Ranking and analytic statistic of html page will be show.

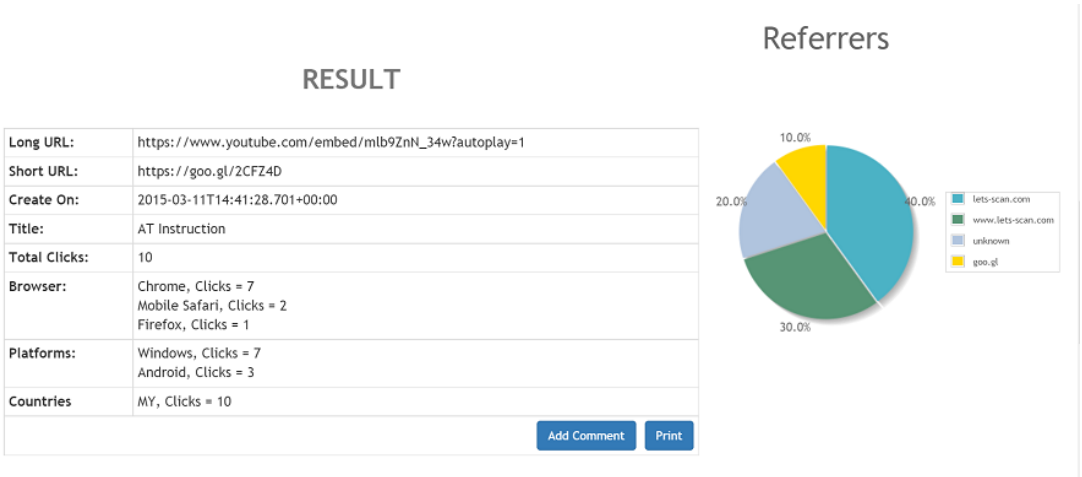


Figure 4.1.20: Full Analytic Result

4.2: To view the full analytic information, click on the "Full" button. Information will appear after click.

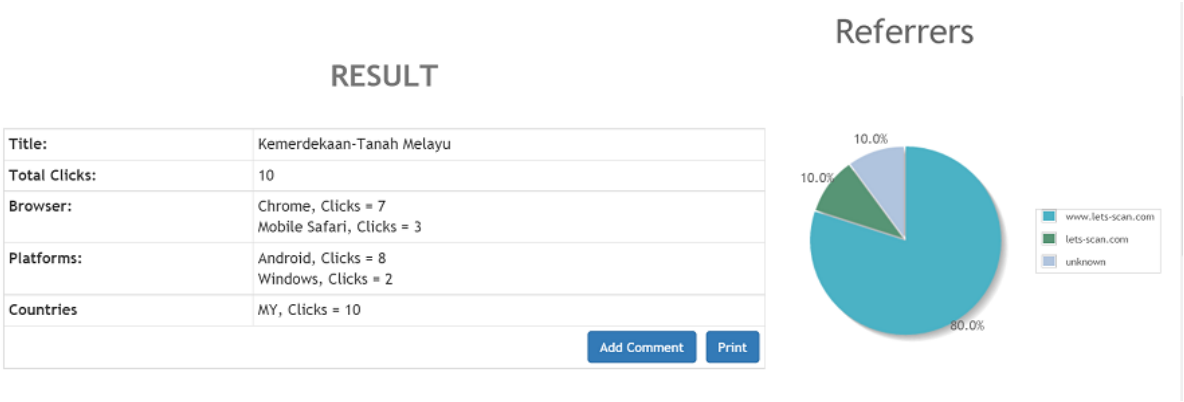


Figure 4.1.21: Analytic Clicks Result

4.3: To view only analytic clicks, click on “Analytics_Click” button.

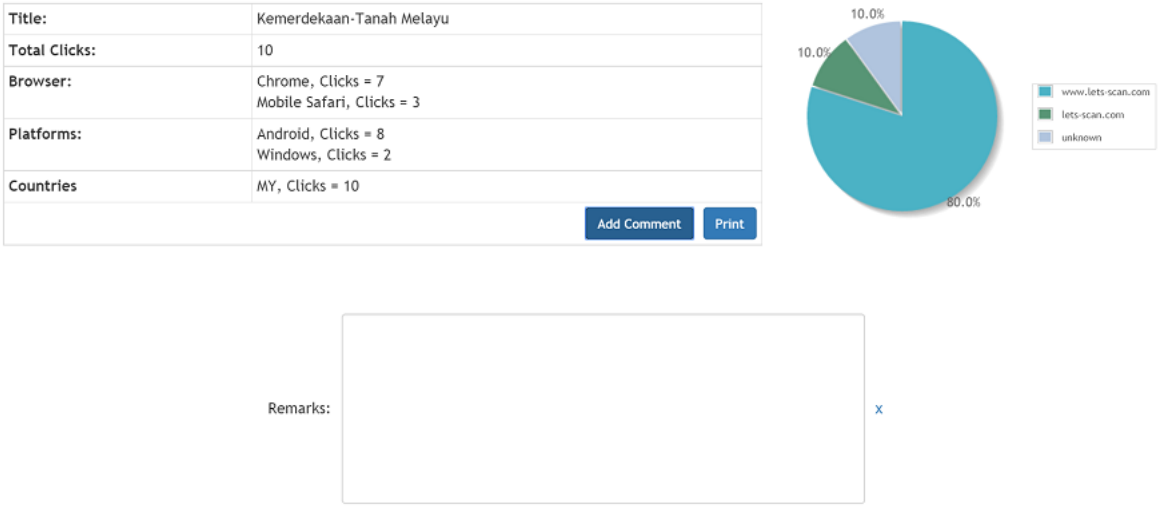


Figure 4.1.22: Analytic Comment

4.4: If admin want to add comment for certain analytic, click on “Add comment” button, a textarea box will appear and admin can write some remarks in it. Click on “x” to close the comment box. If want to print the report, click on “Print” button.

Step 5: Manage Database (Add)

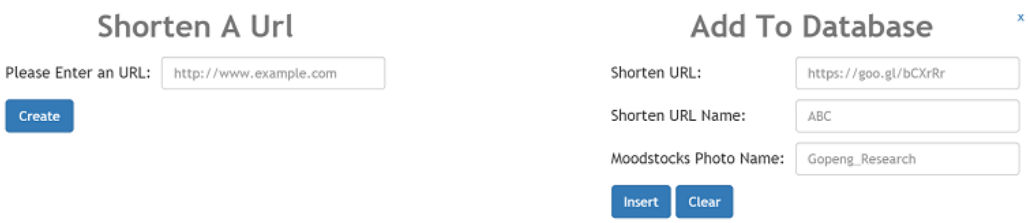


Figure 4.1.23: Add Data Figure (1)

5.1: To add a new data into the database, click on "Add New Data" link that in the analytic table (previous image), two form will be shown as image above.

Figure 4.1.24: Add Data Figure (2)

5.2: First, admin have to insert the url link (image above) into the left side form and click on "Create" button. After click, "Long to Short Result" table will show.

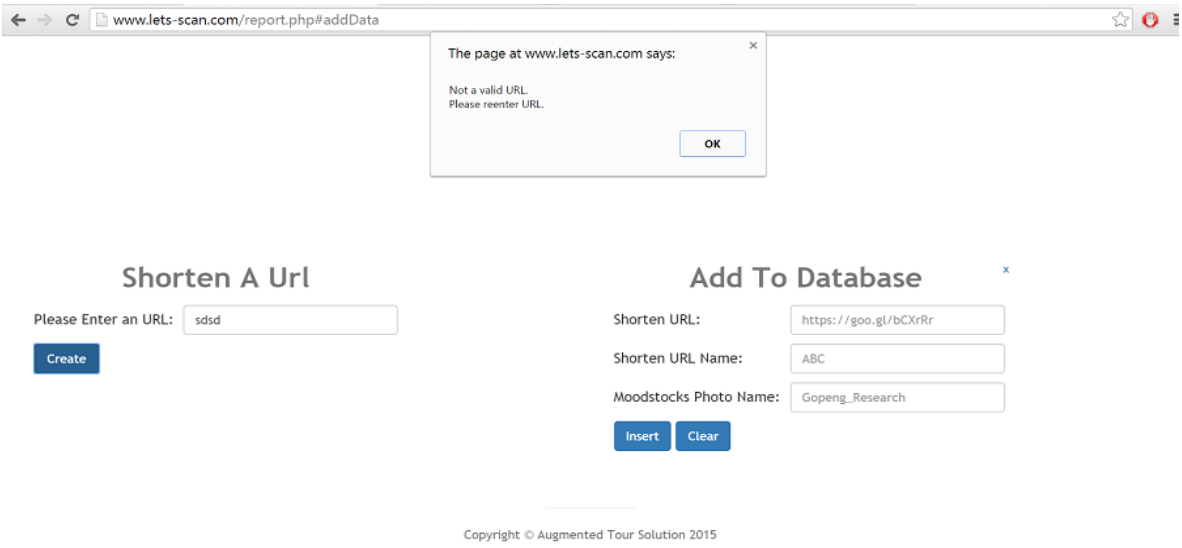


Figure 4.1.25: Add Data Figure (3)

5.3: If the input textbox is not a url link, an alert will prompt to ask user enter again.

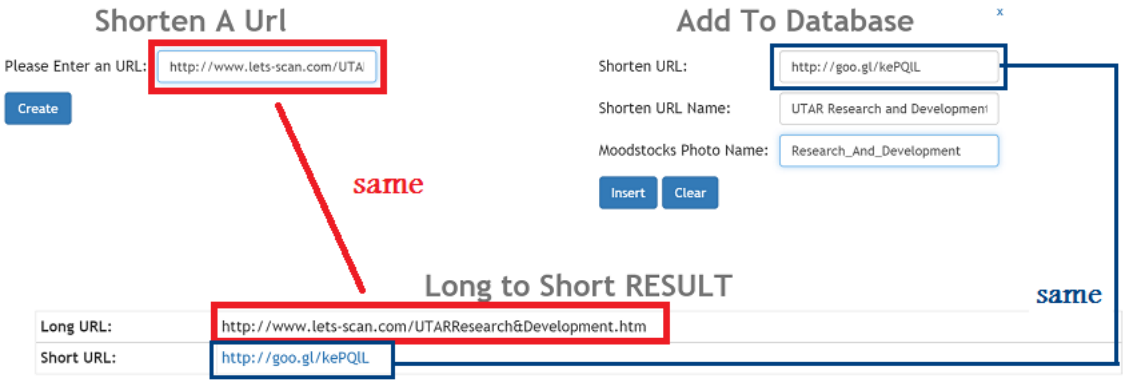


Figure 4.1.26: Add Data Figure (4)

5.4: Second, copy the short url that already shorten in the “Long to Short Result” table and paste into “Add To Database” table “Shorten URL” input textbox. Third, Give a name for the shorten url in “Shorten URL Name” that past in previous step.

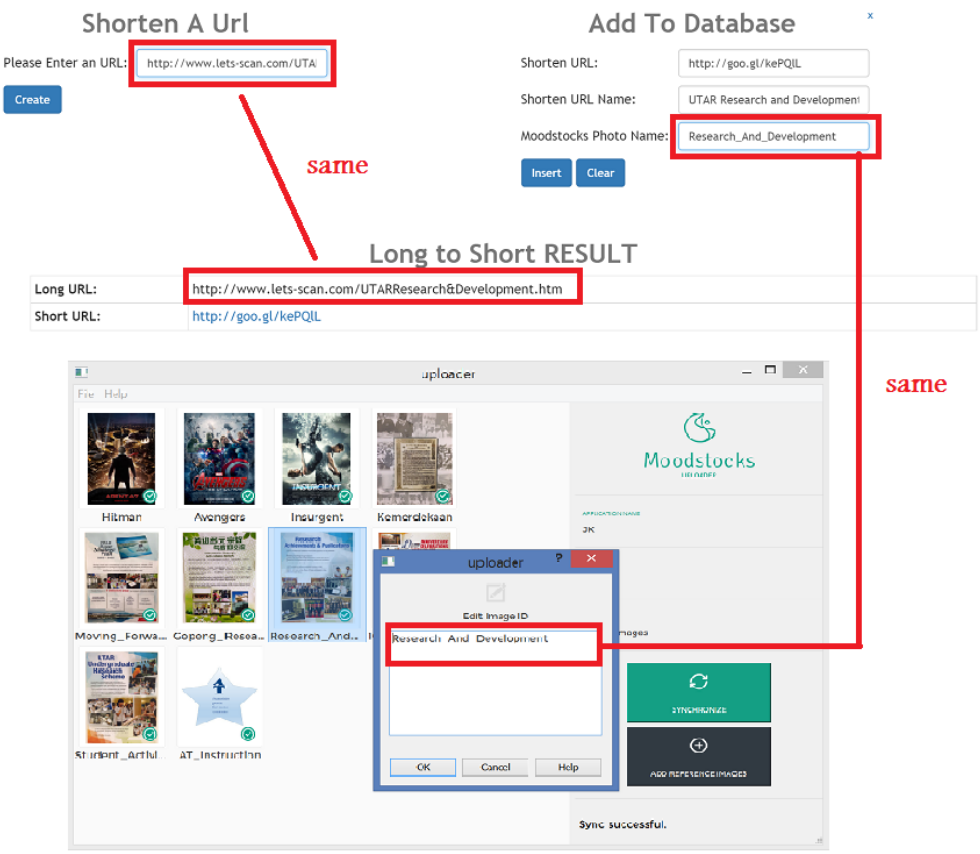


Figure 4.1.27: Add Data Figure (5)

5.5: Third, enter the name again for photo but this time is follow the exact name that given in the Moodstocks uploader.

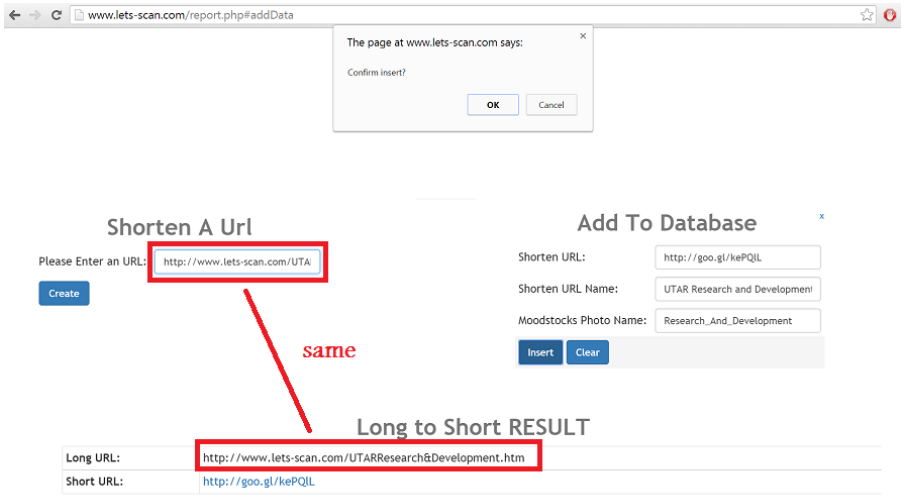


Figure 4.1.28: Add Data Confirmation Alert

5.6: After fill in all the field, click on “Insert” button to insert. An alert will prompt out to ask for confirmation of adding data.

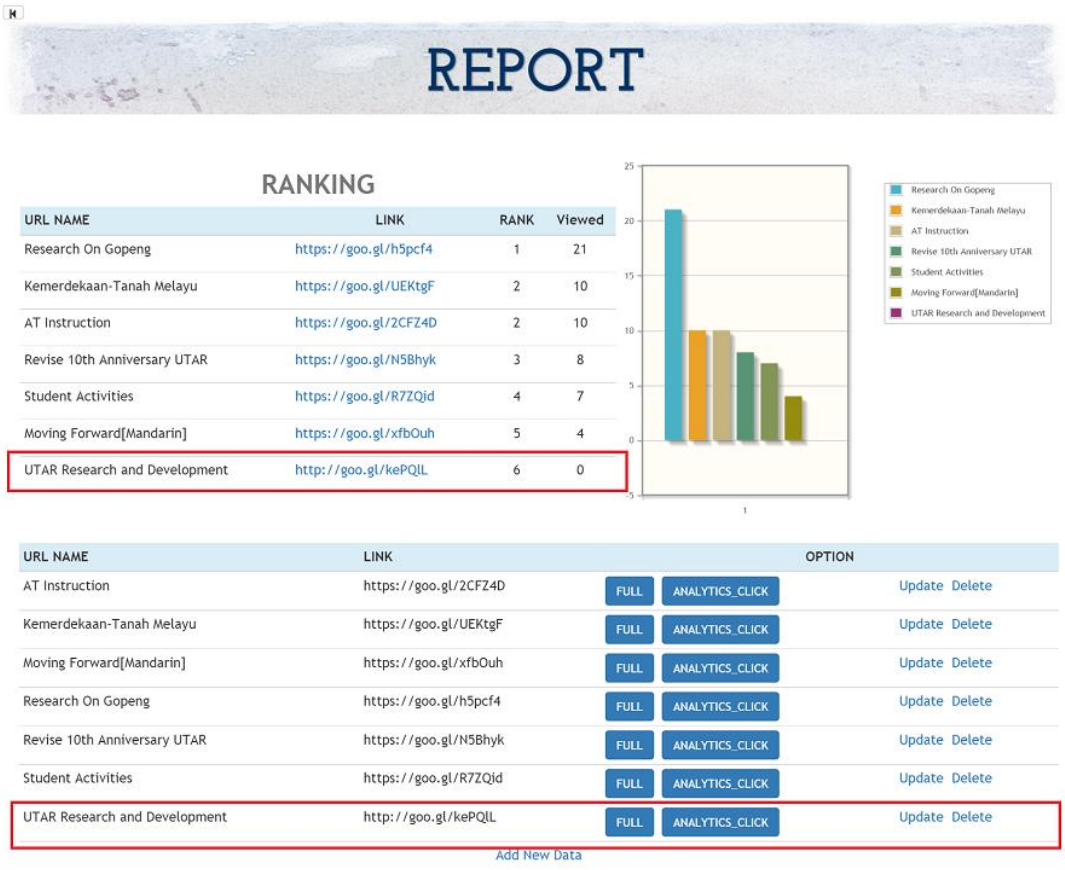


Figure 4.1.29: Add Data Successful

5.7: Data had successfully been updated to the database. Due to it had not been view by visitor yet, therefore the full analytic and analytic clicks is not show when click on those button for the “UTAR Research and Development data”.

Step 6: Manage Database (Update)

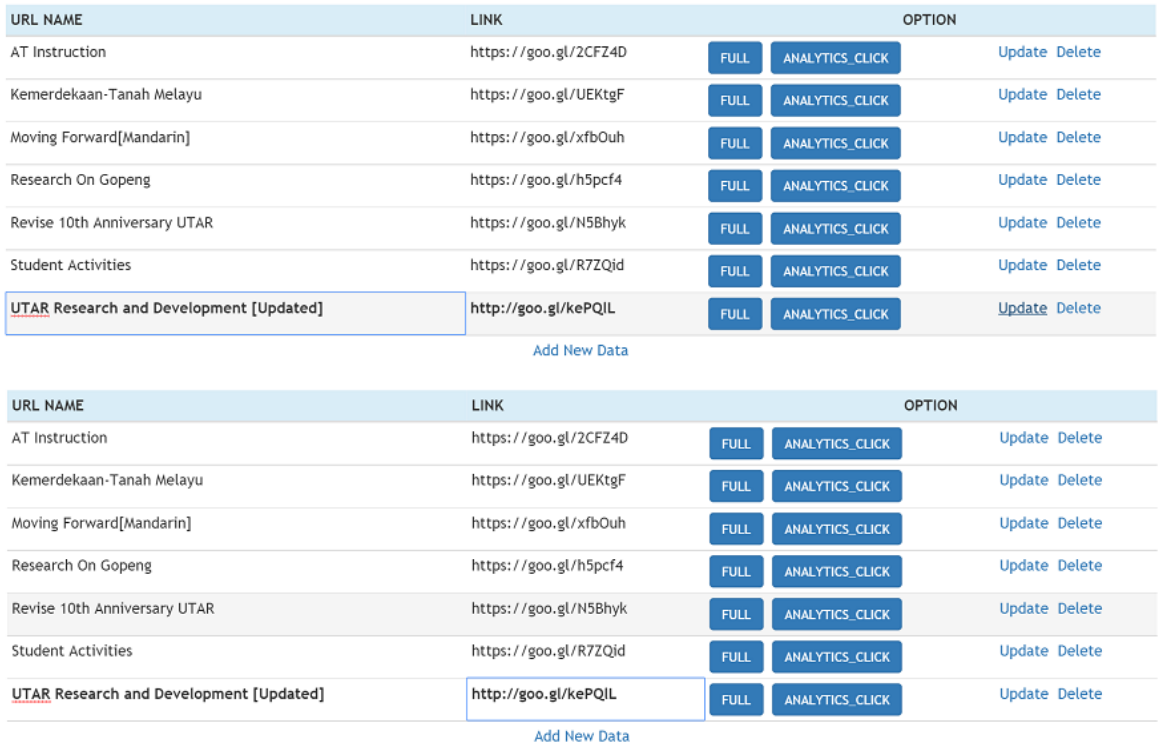


Figure 4.1.30: Update Data Figure

6.1: To edit data, click on "Update" link. Admin can choose to edit either url name or url link. Enter or append new text or url that want to add to the input textbox.

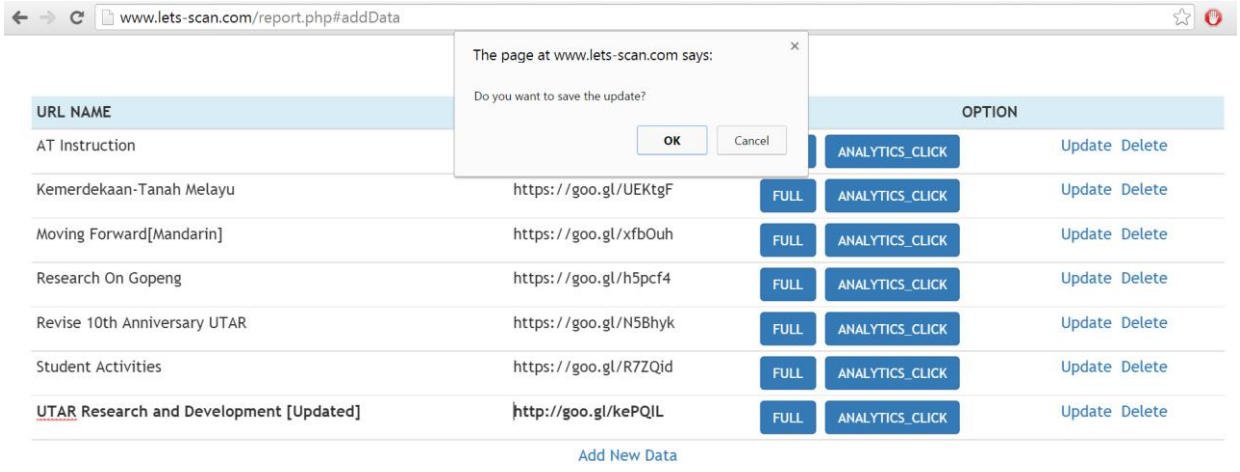


Figure 4.1.31: Update Data Confirmation

6.2: A confirmation will be ask whether want to update the data.

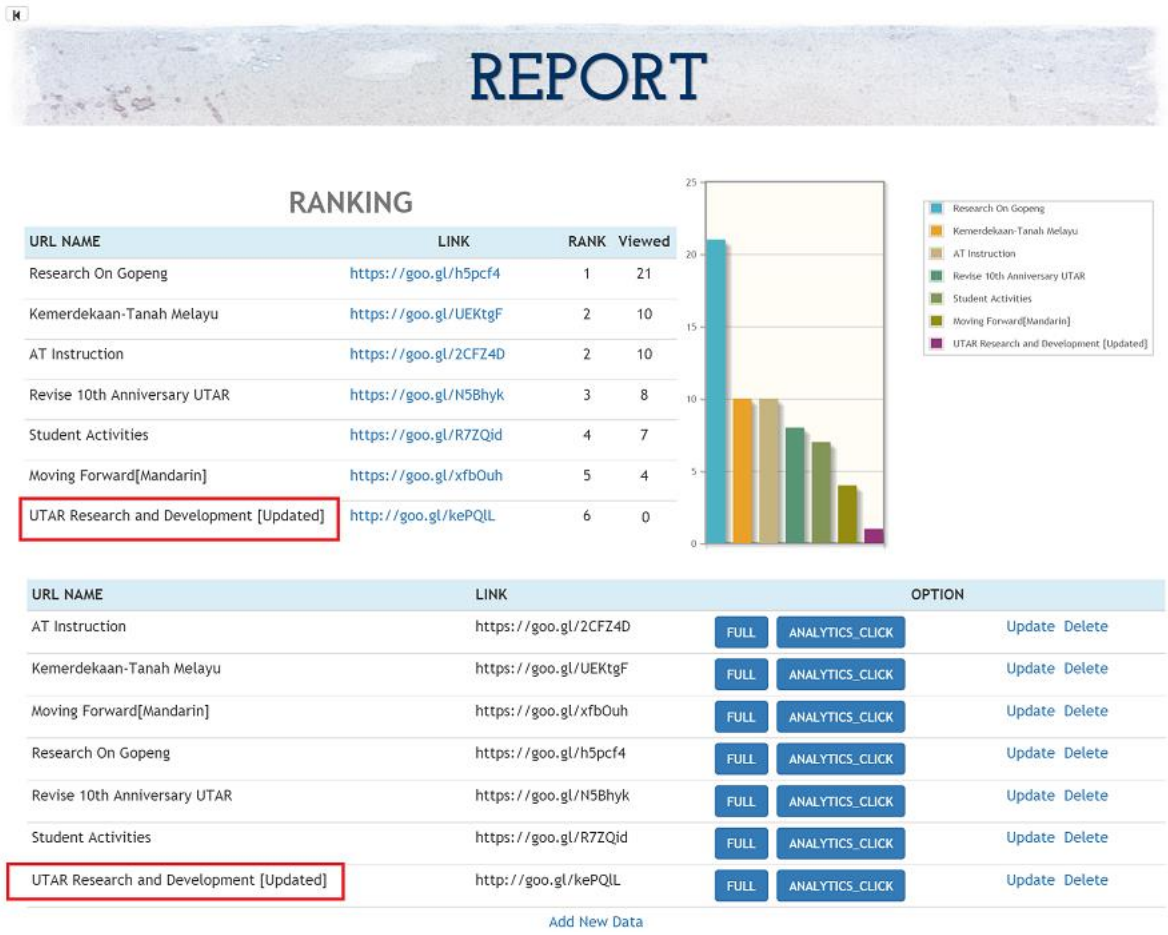


Figure 4.1.32: Update Data Successful

6.3: Data update successful.

Step 7: Manage Database (Delete)

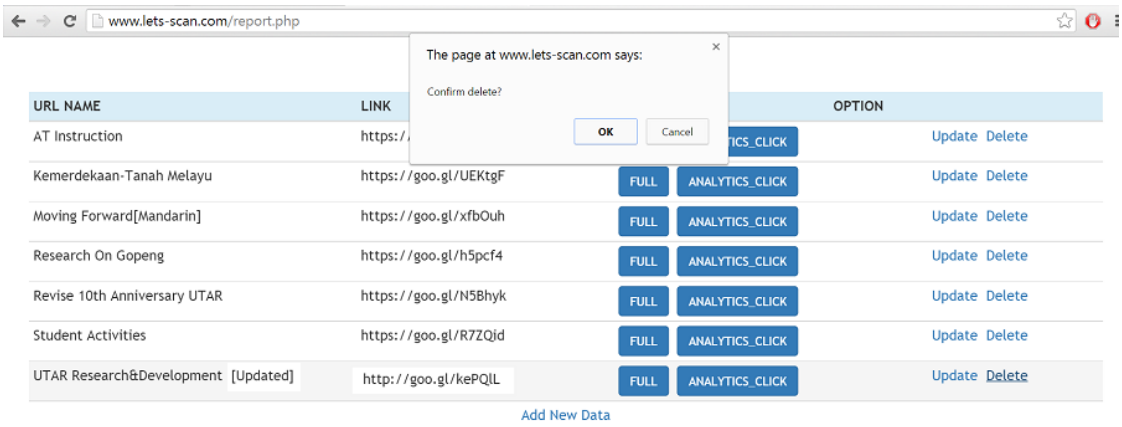


Figure 4.1.33: Delete Data Confirmation

7.1: To delete the unwanted data, click on the "Delete" link in the analytic table. An alert message will prompt out to ask confirmation of deletion.

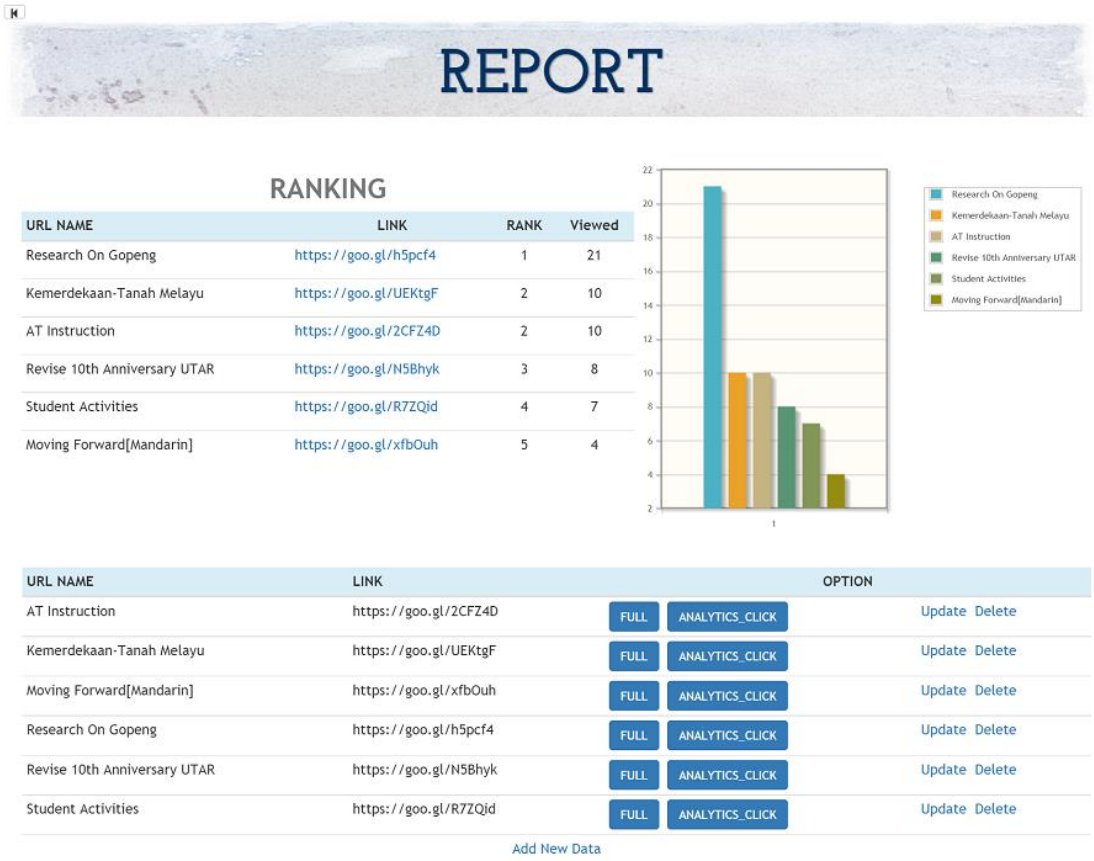


Figure 4.1.34: Delete Data Successful

7.2: Selected data is deleted after confirm.

4.2 Testing Platform

- Mixed browser supported (Internet Explorer, Firefox, Google Chrome)
- Dekstop PC
- Mobile phone (Android OS)

4.3 Alpha Testing

Alpha Testing is the preliminary testing that usually test the program whether it is completely perform well or still have some bugs and error that need to be correct. All the features in system had been go through one by one to check its functionality, such as createHTML, report, and log in, update, add, and delete. Each function are tested to find bug.

Most of the testing are to test the validation such as data entry, data format, etc. There are several bugs found during testing.

- User enter a not URL type data and click on the submit button, the data still process and saved into the database. The bug had been solved by adding the URL type validation to the data entry.
- The displayed pie chart percentage index are weird and different with the data showed in the table. This bug had been fixed by adding the parseInt() method to the data that needed to calculate the percentage index. It occurred due to the retrieved data from database are in String data type and haven't change to Integer data type.
- The ranking show in an unordered sequence when displayed in the table. When it have same ranking index the ranking sequence will goes wrong. For example, the ranking index 2 overlap twice then it will become 1-2-2-4-5. This had been solved by apply mathematic formula.
- If some visitors who already downloaded the application previously, they cannot scan the poster. The bug had been solved by switch on the WIFI or mobile internet to let the application synchronize with its database so that the data is up-to-date.
- Visitor scan on poster and redirect to a webpage, when he/she return back to the application scan activity from webpage, they cannot scan other poster. It happened due to the session had stopped and this bug had been solved by added a clickable button to let session resume.

4.4 Beta Testing

Beta testing usually will be done before the product is launch to test the overall performance of the system and check whether achieve the objectives. For this project, the system had uploaded to the cloud and can be test by people who can access to internet. The beta testing for visitor and administrator are separate platform, one is on mobile and another one is on website.

For visitor part, the .apk file of the Android application had been published on the Google play store for user to download and try it. This application had been use to test in UTAR gallery (Block A), the testers are the visitors who visit to UTAR gallery. Visitor download the application from google play store and scan on the poster that had mark a star icon on it and follow the instruction to use the application. Visitor have been told that not all the object or photo can be scan by using the application that they downloaded, only certain photos that inside the database can be scan. The application had tested that it can successfully scan on the photo and redirect to a webpage that contains more info for user to refer.

Through this part of testing, the first project objective "**To create a low cost but good solution for gallery to enrich visitors to interact with gallery staff and exhibitors"** had been achieved because what visitors need was their own mobile phone to interact. The name of the application is "Augmented Tour", it can be found by click on the link below. https://play.google.com/store/apps/details?id=com.utar.fyp&hl=en.

For administrator part, it tested by friend who also from FICT UTAR to find whether it can perform well. There are a column which display the analytics, ranking and chart for admin to see the statistic of which poster have the highest view and details. This had achieved the third project objective "**To design a non-intrusive visitor data collection and analytic framework for museum management**". The functions add, update, delete are all perform well that data can successfully synchronize with database. The link of the website is www.lets-scan.com.

The overall testing had achieved the second project objective which is "**To design a framework for visitors-staff-exhibitors communication"**.

CHAPTER 5: CONCLUSION

5.1 Conclusion

The intention of improve the system of museum or gallery and creating more interactive, augmented and experience for visitors, museum and gallery willing to take any cost to make the improvement. It could enhance and enrich the experiences of visitors that encourage deeper level of both cognitive and emotional engagement. Beside of benefits to visitors, the brand image of museum also will become popular if the technology they use are recognized by visitors. Technology allow individual immersed in a particular story or experience, a good solution can attract interest of more visitors and make things better for them. The solution in this project use image processing which only need to scan the image or object in museum by using their own smartphone with the downloaded application. It is easy to use, understandable and save cost. The sector now faces strong competition which branding is very important to them. A museum or gallery need to become braver, more proactive and innovative if seek to improve their image and technologies. They need to understand the visitor's needs so that can fulfil their happiness.

At the end of the Project II, overall functions that proposed in Project I have successfully created and perform well. Both visitor and management side using different platform to perform their task. For the future update improvement, the interface of the website for both management and client side need be improve to make it more perfect and good looking. More functionality will be add into the system to increase the user friendly and efficiently of the system. The mobile image recognition need to be more specific, could focus on the image even if it has some distance between the camera and the image. Zoom in and out feature should be added as well to improve the efficient when scan on the image. The design and position of the chart and table display in report webpage need to adjust to make it more precisely and look tidy when report is printed.

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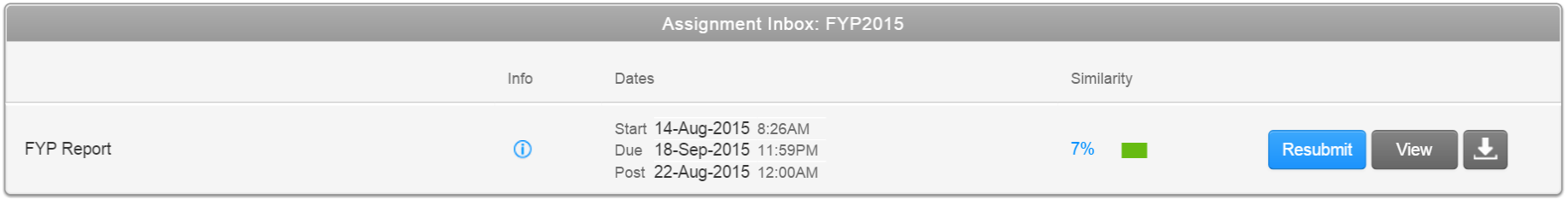
APPENDIES

TURNITIN



Weekly Report

Trimester: Year3, Trimester 2	**Study Week No. :** 1
Name: Loh Hwei Shien **SID:** 13ACB00492	
Supervisor: Dr. Ooi Boon Yaik	
Project Title: Augmented Tour Solution	

1. WORK DONE

- Android platform application had successful let users scan photo and redirect to a html page that contain information according to the photo that user scan.

2. WORK TO BE DONE

- Get the full analytic to show on a html page and come out with a report.

3. PROBLEMS ENCOUNTER

- Unable to get the total clicks and other information from the Google URL Shortener API

4. SELF EVALUATION OF THE PROGRESS

- Learned how to use the Google URL Shortener API to get the analytic

Supervisor's signature

Student's signature

Trimester: Year3, Trimester 2	**Study Week No. :** 3
Name: Loh Hwei Shien **SID:** 13ACB00492	
Supervisor: Dr. Ooi Boon Yaik	
Project Title: Augmented Tour Solution	

1. WORK DONE

- Successful get the full analytic by using Google URL Shortener API and created the html page to display on it.

2. WORK TO BE DONE

- The arrangement of the html page have to design more nicely and apply the log in on the website for administrator. Which mean that only admin can be login to see the report while user only can see the normal website page.
- PHP is needed for redirect to the information page when the mobile application is detected the recognize photo so that do not hardcode on the Android coding instead of use database.

3. PROBLEMS ENCOUNTER

- Does not know how to use PHP to deal with the database log in and get data from database table as doesn't learn before.

4. SELF EVALUATION OF THE PROGRESS

- Slightly understand the format and pattern of using PHP to call the function, declare variable, and writing the code to open database to get the data from it.

Supervisor's signature

Student's signature

Trimester: Year3, Trimester 2	**Study Week No. :** 5
Name: Loh Hwei Shien **SID:** 13ACB00492	
Supervisor: Dr. Ooi Boon Yaik	
Project Title: Augmented Tour Solution	

1. WORK DONE

- Previous work such as log in and Android code have done and work successfully. The design of the website have also make some changes.

2. WORK TO BE DONE

- Apply Boostrap into the website to make it look more nicely and tidy with the table form and some function such as hover, color, etc.
- Draw and plot chart to display in the report so that it will not seem too simple and blank.

3. PROBLEMS ENCOUNTER

- Unable to get the correct value from database and pass in to the chart drawing function.
- Due to wrong data pattern/parameter pass in, get no value for the result and chart doesn't display.

4. SELF EVALUATION OF THE PROGRESS

- Learned new technique in design a website and the skill of plot graph with using the jqplot (plotting and charting plugin for jQuery JavaScript framework)

Supervisor's signature

Student's signature

Trimester: Year3, Trimester 2	**Study Week No. :** 7
Name: Loh Hwei Shien **SID:** 13ACB00492	
Supervisor: Dr. Ooi Boon Yaik	
Project Title: Augmented Tour Solution	

1. WORK DONE

- The design have been modified a little bit become more nicely by using the Bootstrap framework.
- Charts are successfully plot and display on the webpage accordingly to the total clicks value that presented.

2. WORK TO BE DONE

- Insert: Create an insert function to let admin to insert new data/record into the database systematically.
- Update: Create an update function which able to let admin directly update inside the table that display in the website and alter the database to get the accurate figure.
- Delete: Create a delete function that allow admin to delete the unwanted data/record from the table that basically also delete from the database.
- Validation when insert/update/delete function is perform.

3. PROBLEMS ENCOUNTER

- Connection to the database with PHP code. Due to some several error cannot connect to the database to retrieve the data.

4. SELF EVALUATION OF THE PROGRESS

- Understand how the PHP code can be used in Javascript in order to get the value and vice versa.
- Understand the retrieve database and pass to PHP file codes.

Supervisor's signature Student's signature

Trimester: Year3, Trimester 2	**Study Week No. :** 9
Name: Loh Hwei Shien **SID:** 13ACB00492	
Supervisor: Dr. Ooi Boon Yaik	
Project Title: Augmented Tour Solution	

1. WORK DONE

- The whole website is mostly done and the functions are capable to run except the overall design (every pages) need to change to make it consistent.

2. WORK TO BE DONE

- Complete the rest of documentation which continue and make some changes from Project I to make sure that the system functions are up-to-date.

3. PROBLEMS ENCOUNTER

4. SELF EVALUATION OF THE PROGRESS

- Complete the task before the due date.

Supervisor's signature

Student's signature

Trimester: Year3, Trimester 2	**Study Week No. :** 11
Name: Loh Hwei Shien **SID:** 13ACB00492	
Supervisor: Dr. Ooi Boon Yaik	
Project Title: Augmented Tour Solution	

1. WORK DONE

- Three over four of documentation part are done, some changes had been made in the system flow part and new part are added in such as the testing and implementation.

2. WORK TO BE DONE

- Pass up the documentation within this week in order to check whether there is any error or incorrect part that need to redo or modify and for final checking.

3. PROBLEMS ENCOUNTER

4. SELF EVALUATION OF THE PROGRESS

- Complete the task before the due date and make sure there is no error.

Supervisor's signature

Student's signature