

SECURED WEB-BASED DONATION RECORD MANAGEMENT APPLICATION

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Abstract

Donation is a type of helping that are given by the society for events such as religious activities and charity activities often require different types of donations and gifts. If the donations are not well-managed, it may bring a lot of suffering to the responsible non profitable organisation (NGO) to organised and track down where the donation going. There are also risk that the information or data of donation will be leaked or hacked since most of the time these information and data should be confidential. Hence, a secure web-based donation record management application will be very helpful in this situation. This application will enable such type NGOs to organise and analyse the donation record and data in a secure environment. Other than that, the process of recording data will also become easier and more efficient compared to traditional way. Some of the functions that was included in the system are donation record, donotion type information, user information and donation data analysis report. This application was written in Python and HTML programming language. Cryptographic algorithms which is RSA (Rivest-Shamir-Adleman) or more specific, RSA-256 was used in this project to enhance the security level of the application by preventing unauthorized access to the application through internet connection. In this project, the waterfall SDLC development model approach has been used as it is suitable compared to other model method. With this system, it has designed and developed the project for such type of the NGOs by enhancing the secure user

experience on donation record management system so that the operational and records can be maintained with better efficiency.

Introduction

In Malaysia, there are many non-profitable organisation (NGO) holding different types of events to achieve different goals such as charity activities, religious activities and many more. However, the manpower shortage is one critical consideration in these NGOs. The problem occurs for the NGOs which are still following the traditional way to manage their donation recording which by using handwriting and ledger book. Every time someone went to an event and decided to donate, a worker will write down all the related information into a donation ledger book after receiving the donation. This had caused a lot of troubles during and after the events as the records are hard to track and analyse due to the poor and old management method of the records data. Since that, the person in charge decided to convert all the donation records data into digital form. However, a lot of manpower and time was spent just to convert all the data from the ledger book into analysable data form by hand-typing all the data into an excel sheet. There are even more problems occurs after the data was inserted into the excel sheet as the person in charge is not good at using Excel to analyse data.

Objective

The aim of this project is to build a secured web-based donation record management application which is functional to ease the process of storing donation records and reduce burden of these NGOs.

Scope

The web-based donation record management application is planned to be developed using Django software which using Python language. Since most of the NGOs in Malaysia is using English as their system language, the application will be built in English user interface. One of the main functions that will be performed by the application is providing a platform for NGOs to store their data and

information. By using this platform, NGOs will not be worried about how to store and protect their donation records as the application has already covered the solution for these problems.

Justification And Importance

Firstly, the application was easier while been used as the user interface will be more user-friendly for newbie compared to Microsoft Excel which is quite complicated for someone who has no knowledge on it. Since that, the learning cost and time needed for using this application will be much lower thus solve the problem of budget and manpower shortage faced by the NGOs. Secondly, all the data stored in the application was stored in an online database server which was encrypted by using cryptographic hash function algorithm which is SHA-256, one of the most secured encryption algorithms nowadays. Through this, only the authorised personal will be granted access to view and edit the decrypted data though online database server. If someone try to hack or data mining the database server, they will only find a lot of encrypted strings and numbers which are useless without the decryption key. Other than that, through the secured web-based donation record management application, the problem of physical distances can be solved because as long as the authorised user has access to internet connection, he or she can edit or view the data easily no matter where he or she is. All of the manipulation records can also be recorded in order to monitor all activities happened in the database server.

Methodology

The methodology that will be using to develop the web-based donation record management application is the “Waterfall Method”. It is because the waterfall method is simpler and easier to use compared to other methodology as it contains clearly defined stages while each phase has specific deliverables and a review process. There are 6 states in the waterfall methodology:

1. **Requirement Gathering and Analysis** – The first state of waterfall method. All possible requirements of the system that will be developed should be gathered in this state then documented into a requirement specification document.
2. **System Design** – In this state, the requirement specifications from first state will be studied further. The system design then is prepared to help in specifying hardware and system requirements and defining the overall system architecture.
3. **Implementation** – With the help of the system design, the system will be first developed in small programs called units which will be integrated in the next phase. The developer will test each unit for its functionality during unit testing phase.
4. **Testing** – After all the units developed in the implementation state are tested, they will be integrated into a complete system. Then, the entire system will be tested again for any faults and failures.
5. **Deployment of system** – In this state, after finishing functional and non-functional testing, the final product will be deployed and released to the user or customer environment.
6. **Maintenance** – As always, issues or problems will come up from the system in the client environment. In order to fix them, developer will need to release the patches, not only to fix the issues, but also enhance the product to better versions.

Literature Review

A Records Management System (RMS) is one of the essential parts in various part of society such as business company, organization or even government. Records Management System can be defined as the professional practice of classifying, organizing, and managing documents and records from the time they are created to the point of their ultimate disposal(Record Nations, 2016). The main objective of having a Records Management System is to assist in a larger need for information governance, risk management and regulatory compliance. In this project, the main focus will be on the perspective of

non-governmental organization (NGO). Recently, there are two types of records management systems that were commonly used by NGOs which named paper record management systems and electronic record management systems. As the name imply, traditional paper record management systems usually involve all the physical form of records and hard-copy documents in the management and storing part while the electronic record management systems is storing and managing all the data, files, information in digital file formats. Most of the time, traditional paper record management systems is used by NGOs which involve legal services or healthcare field which often require hard-copy documentation as proof of records and the electronic record management system is used by company or NGOs which has bigger size in terms of organization as they often deal with a huge amount of data or records, and they needed to be easily accessed from different time and places. In order to develop a functional donation record management application, current system research was done to find out the weak points thus make it as a waypoint to be emphasized during the development of the application. 2 current system which are LogicalDoc and FileHold was chosen to be reviewed and compared with the Secured Web-based Donation Record Management Application. The development model of the LogicalDOC is founded on the principles of modern software engineering which considered strength of community, commitment to quality standards, business-friendly practice, and high performance(LogicalDOC, 2006) while FileHold is a enterprise grade electronic document and records management software for medium sized companies, departments, and large organizations(FileHold, 2022).The result can been seen at the Figure 1 below.

Aspect	LogicalDOC	FileHold	Proposed System
Type of Services	Web-based using web browser	Software	Web-based using web browser
Main Language	English	English	English
User Log-in Function	Yes	Yes	Yes
Enhance Security Function	Depend on prices	Depends on prices	Yes, using One Time Password(OTP)

Data Encryption	Depend on prices	Depend on prices	Yes, using RSA-256 algorithm
Cost	High	High	Low

Figure 1 Comparison between web-based records management system

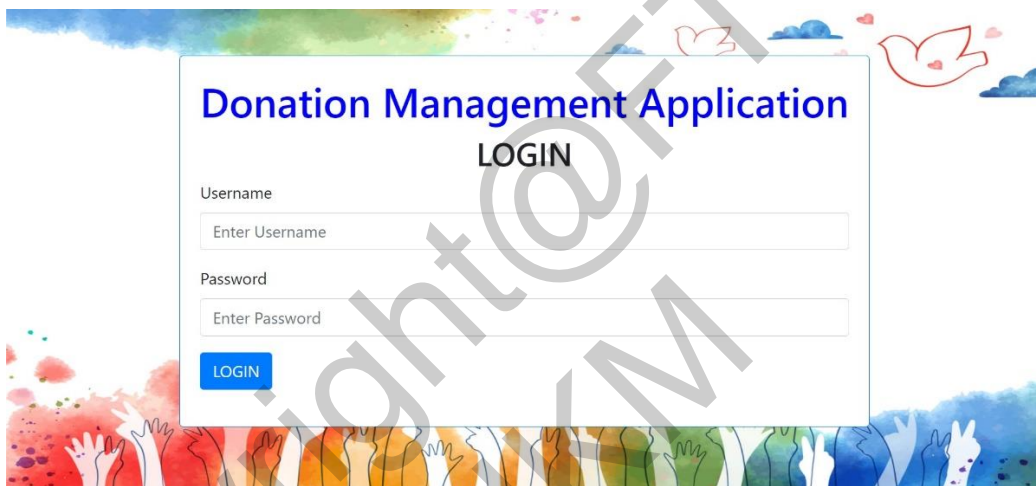
Research Methodology

The Development Process Model that was used for developing Secured Web-based Donation Record Management Application is the Waterfall Model. As mentioned above, the waterfall model consists of 6 different phases which are requirement gathering and analysis, system design, implementation, testing, deployment of system and maintenance. For Secured Web-based Donation Record Management Application, in the first phase which is requirement gathering and analysis, the problem statement, scope of project along with the functional and non-functional requirements was identified. After that, in the system design state, the conceptual diagram such as the context diagram, use case diagram, sequence diagram and entity relationship diagram of the application and database was designed and the UI appearance of the application was drafted. After that, during the implementation state, the code of the application including UI interface design using HTML and database system using Python was designed and written in Visual Studio Code. Next in the testing state, the web-based application which combine all UI interfaces and database function was run and tested for different functionality. The testing was run with 2 different technique which are use case testing and usability testing. In the deployment of system state, the application will be connected with an online server to make it usable for user. Lastly for the maintenance state, any further issues or bugs that was found in the application should be fixed.

Result and Product

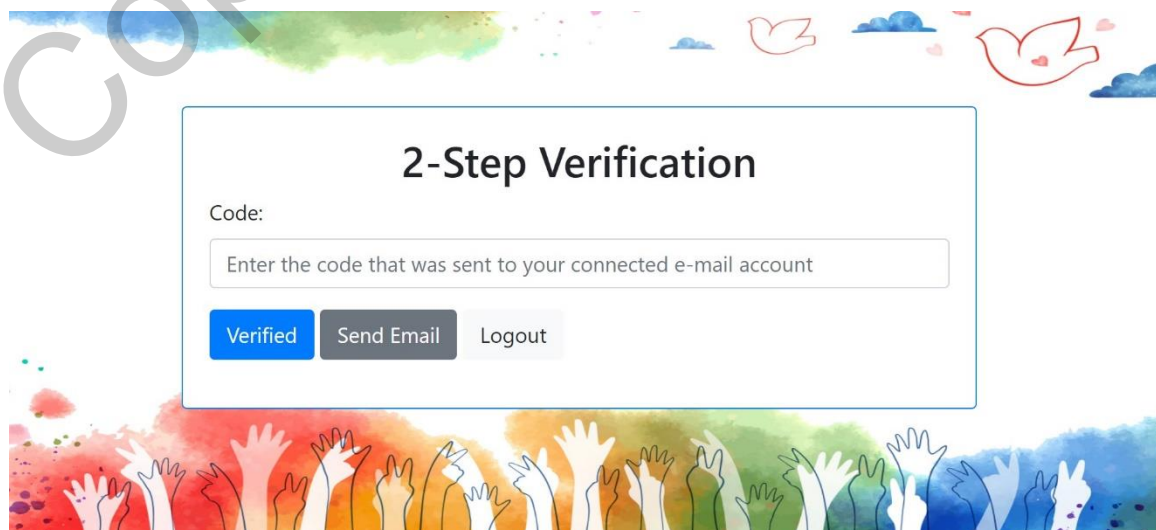
The Secured Web-based Donation Record Management was developed using HTML for display, Python for application logic and all the database was saved in form of MySQL in Visual Studio Code and run on the server localhost. The function of the Secured Web-based Donation Record Management will be shown below.

In the login page (Figure 2), an existing user who want to use the application will need to log in using the correct username and password. After the user input correct information, user will be redirect to an authentication page (Figure 3).



The screenshot shows a login form titled "Donation Management Application" with a sub-heading "LOGIN". The form contains two input fields: "Username" with the placeholder text "Enter Username" and "Password" with the placeholder text "Enter Password". Below the password field is a blue button labeled "LOGIN". The background features a colorful illustration of hands reaching up, with birds and clouds in the sky.

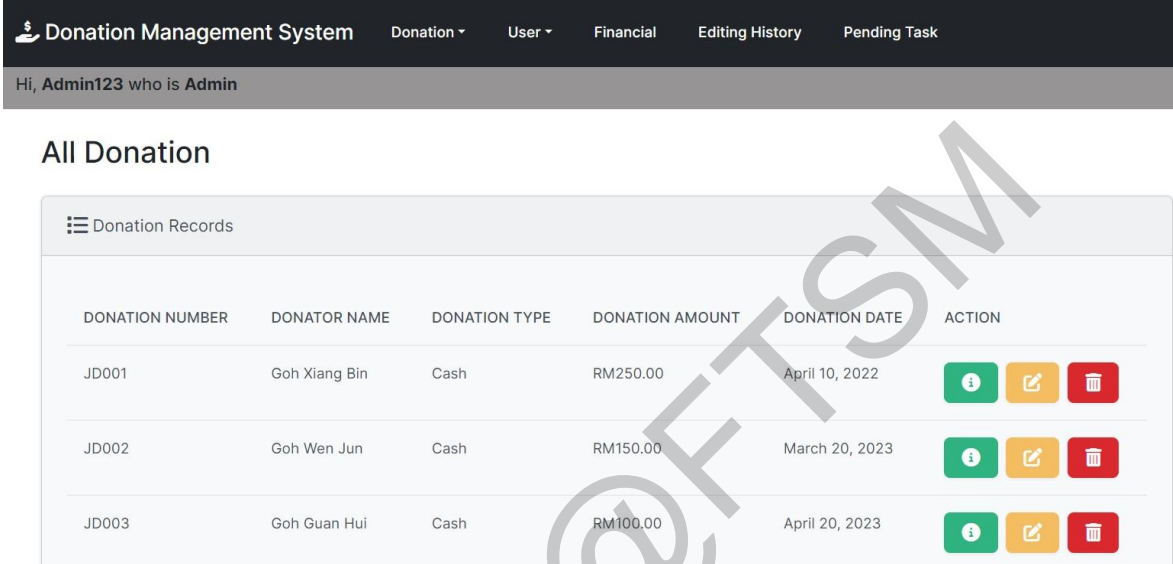
Figure 2 Login Page



The screenshot shows a 2-step verification form titled "2-Step Verification". It includes a "Code:" label and a text input field with the placeholder text "Enter the code that was sent to your connected e-mail account". Below the input field are three buttons: "Verified" (blue), "Send Email" (grey), and "Logout" (grey). The background features a colorful illustration of hands reaching up, with birds and clouds in the sky.

Figure 3 Authentication Page

At the authentication page, the user will need to click on the “Send Email” so the system will send an One Time Password(OTP) to user’s email and the user will need to enter the correct OTP into the authentication page in order to log in to the system (Figure 4).



The screenshot shows the 'All Donation' section of the 'Donation Management System'. It features a table titled 'Donation Records' with the following data:










DONATION NUMBER	DONATOR NAME	DONATION TYPE	DONATION AMOUNT	DONATION DATE	ACTION
JD001	Goh Xiang Bin	Cash	RM250.00	April 10, 2022	  
JD002	Goh Wen Jun	Cash	RM150.00	March 20, 2023	  
JD003	Goh Guan Hui	Cash	RM100.00	April 20, 2023	  

Figure 4 Secured Web-based Donation Record Management Homepage

Create, Read, Update and Delete (CRUD) is the important function which will be included in a record management system. All these function can be achieved by clicking the button which located at the right side of the table which can be seen in Figure 4. The green button represents “View Detail” function (Figure 5), yellow button represent “Edit” function (Figure 6) and red button represent “Delete” function (Figure 7).

The screenshot shows a table of donation records. A modal window titled 'Donation by John Cage' is open, displaying the following details:

- Donation Number: JD005
- Name: John Cage
- Amount: RM800.00
- Date: May 16, 2023

The background table has the following data:

DONATION NUMBER	DONATOR NAME	DONATION TYPE	AMOUNT	DATE	ACTION
JD001	Goh Xiang Bin	Cash			[Edit] [Delete]
JD002	Goh Wen Jun	Cash			[Edit] [Delete]
JD003	Goh Guan Hui	Cash	RM100.00	April 20, 2023	[Info] [Edit] [Delete]
JD004	Lim Li Ping	Cash	RM267.00	May 23, 2023	[Info] [Edit] [Delete]
JD005	John Cage	Cash	RM800.00	May 16, 2023	[Info] [Edit] [Delete]
JD006	Johnson Lee	Cash	RM1000.00	June 8, 2023	[Info] [Edit] [Delete]

Figure 5 Detail View of donation record

Update Donation

The 'Update Donation Record' form contains the following fields and controls:

- Donator Name:** Goh Xiang Bin
- Donation type:** Medicine
- Amount/Worth value:** 250.00
- Date:** 10/04/2022
- Buttons:** Update (blue), Cancel (white)

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Figure 6 Edit donation record page

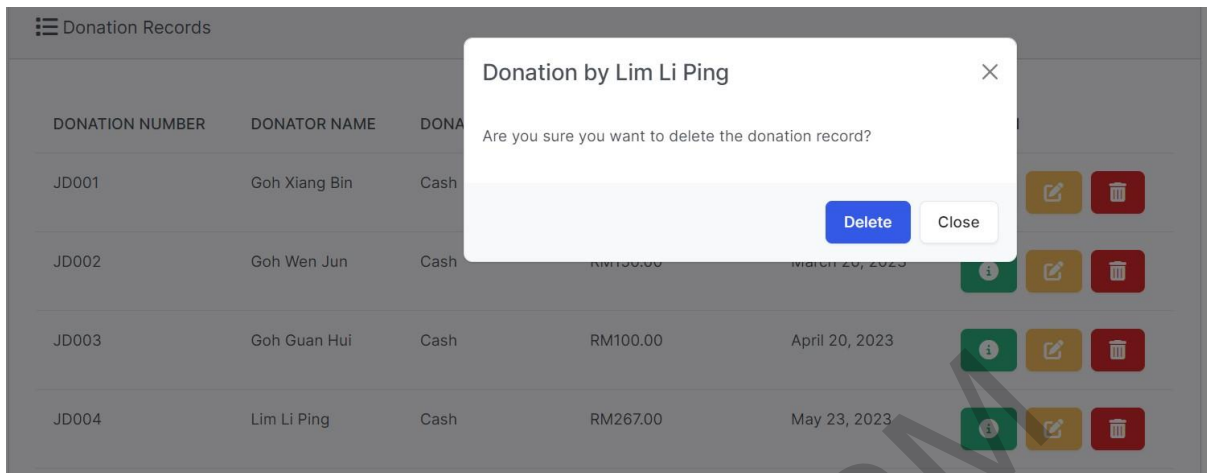


Figure 7 Delete donation record view

The user can also add new record by clicking the Donation tag on top of the page which will make a list pop up and one of the option is “Add donation record”. If user click it, an add donation page (Figure 8) will be shown to enable user to input new donation detail.

Add Donation

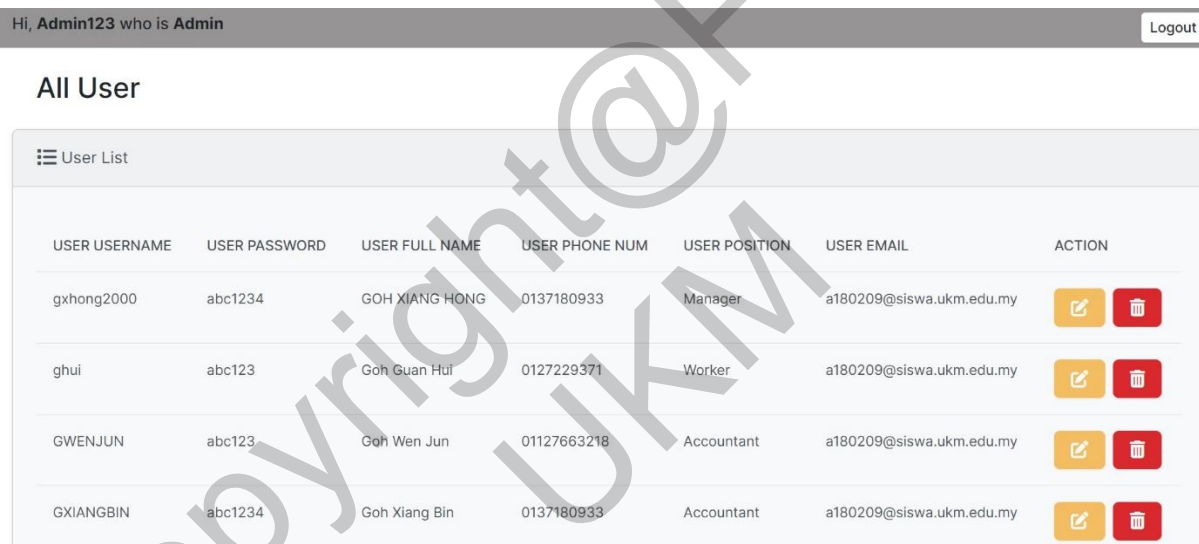
The form titled 'RECORD REGISTRATION' contains the following fields and buttons:

- Donator Name:
- Donation type:
- Amount/Worth value:
- Date:
- Buttons:

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Figure 8 Add donation record page

For user table, the CRUD function will be different from the donation record table. It is because different user level will have different view. For workers and accountants, they can only view and send request to update their own user detail while the manager level user can view all the user account detail except password. However, manager can only request update his own account user information. For admin user, he can add, view, update and delete the user information as desired. Only admin user can add new user as the Secured Web-based Donation Record Management Application is developed in consideration of used by company which will not be accessible by unauthorized identity or normal people. The Figure 9 and Figure 10 show the difference between view of admin and worker user.



Hi, Admin123 who is Admin Logout

All User

☰ User List








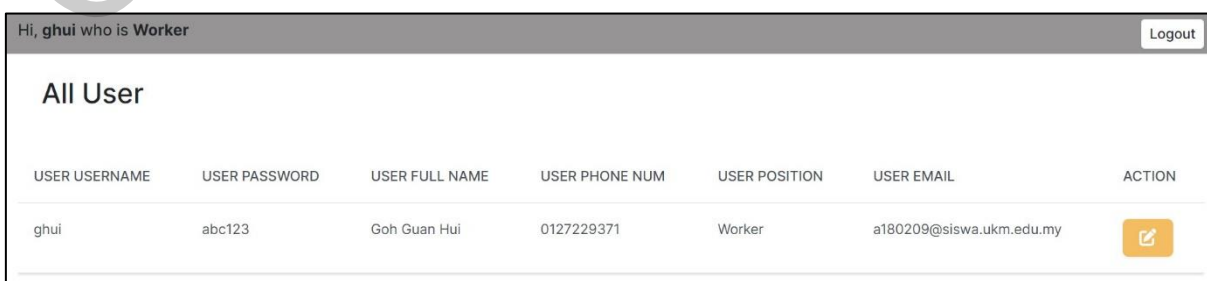
USER USERNAME	USER PASSWORD	USER FULL NAME	USER PHONE NUM	USER POSITION	USER EMAIL	ACTION
gxhong2000	abc1234	GOH XIANG HONG	0137180933	Manager	a180209@siswa.ukm.edu.my	 
ghui	abc123	Goh Guan Hui	0127229371	Worker	a180209@siswa.ukm.edu.my	 
GWENJUN	abc123	Goh Wen Jun	01127663218	Accountant	a180209@siswa.ukm.edu.my	 
GXIANGBIN	abc1234	Goh Xiang Bin	0137180933	Accountant	a180209@siswa.ukm.edu.my	 

Figure 9 Admin view of user detail



Hi, ghui who is Worker Logout

All User


USER USERNAME	USER PASSWORD	USER FULL NAME	USER PHONE NUM	USER POSITION	USER EMAIL	ACTION
ghui	abc123	Goh Guan Hui	0127229371	Worker	a180209@siswa.ukm.edu.my	

Figure 10 Worker view of user detail

For the financial page, there will be several section which show summary of current financial flow within the secured web-based donation record management application. The page will only be visible by Accountant, Manager and Admin. However, Manager will not be able to make transaction request as it is not his/her responsibility. The Figure 11 and Figure 12 below shows the webpage view of financial page using Admin account.

Financial

Total Amount of Cash Donation
RM3117
Total Amount of Non-Cash Donation
RM250
Total Worth value of Donation
RM3367
Number of donation recorded
9

Figure 11 Admin view of financial page (part 1)

Number of transaction recorded
4
Amount of transaction recorded
RM850
Amount of money left in account
RM2267

[Make Transaction Request](#)

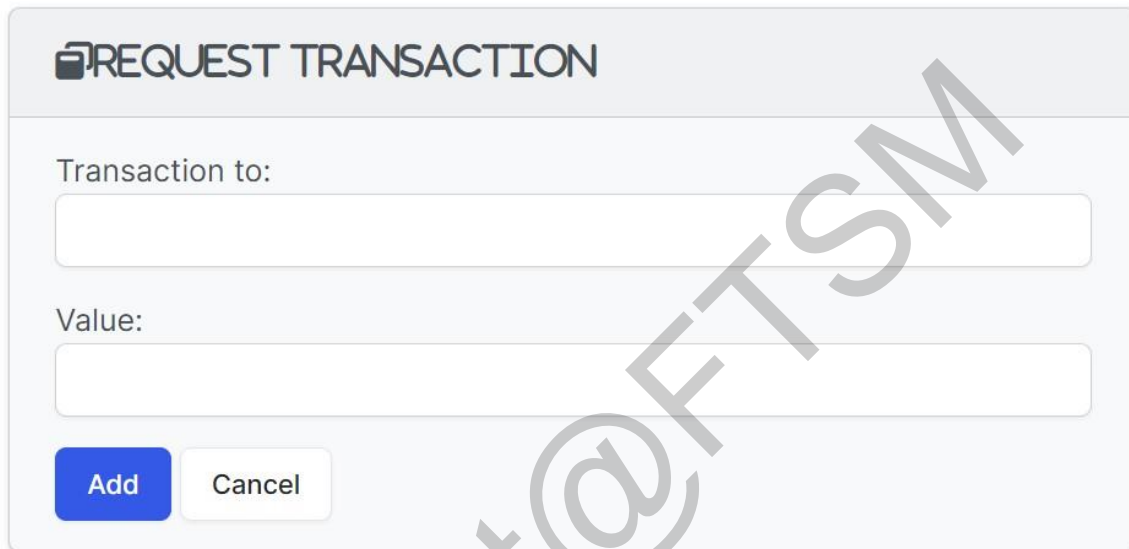
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Figure 12 Admin view of financial page (part 2)

While the “Make Transaction Request” button was clicked, the user will be navigated to request_transaction.html to fill in the information about new transaction. Then the transaction will be

held in the Pending Task table and only be made after getting permission from Manager or Admin. The transaction request webpage view can be seen in the Figure 13 below.

Request Transaction



REQUEST TRANSACTION

Transaction to:

Value:

Add Cancel

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Figure 13 Request transaction page

The pending task page containing requests that need to be reviewed by Manager and Admin. Thus, the page is only accessible for account who has user level Manager and Admin. Since the data saving here such as transaction detail including receiver and amount of transaction can be sensitive, the data will be encrypted using RSA-algorithm before saving in the database. Since that, for task which has type "Trasaction", the data in field "request_section" and "request_new_value" will be encrypted text if viewed directly from the database file. However, the user will still be available to view the data as the text will only be decrypted while the function "pending_task" was call and show the information in webpage. By having encrypted text saved in the database, if anyone obtain the database file only, it will be impossible to read the information in the database thus increase the security level of the

information recorded. The Figure 14 and Figure 15 shows the webpage view of the Pending task table and how to grant permission. The encrypted data example saved in the database table was shown in Figure 16.

Pending Task

Update Transaction

REQUEST USERNAME	REQUEST TYPE	REQUEST DATE	REQUEST STATUS	
GWENJUN	Transaction	July 18, 2023	Pending	
gghui	Update	July 18, 2023	Pending	
gghui	Update	July 18, 2023	Approved	

Figure 14 Pending Task table view

Pending Task

REQUEST USERNAME	REQUEST TYPE	REQUEST DATE	REQUEST STATUS	
GWENJUN	Transaction	July 18, 2023	Pending	
gghui	Update	July 18, 2023	Pending	
gghui	Update	July 18, 2023	Approved	

Request by GWENJUN ✕

Username: **GWENJUN**
 Type: **Transaction**
 Date: **July 18, 2023**
 Transaction to: **Testing**
 Value: **RM90**

Close Grant Permission

Figure 15 Grant Permission view

19	GWENJUN	Transaction	2023-07-10	b'\x00\xeb\xc7\x0cT\xce\x87\x1f(@H-f\x3\xdb\xc5\x9d\x945\xffn\xa5\xfa\xdc\xe1\x
20	GWENJUN	Transaction	2023-07-12	b'\x06\xac\xe9\xbcB)\xb4\xad\xf3\xb6\xc7` \xf5\xe3\xcem\x0c\xcaM\x80 0\xb6\xb0\t\
21	gghui	Update	2023-07-18	Manager
22	gghui	Update	2023-07-18	Manager
23	GWENJUN	Transaction	2023-07-18	b'\x04\x8c\xc7G)\xf0W\xbaJ;\x03qA` \x93}w\x7fJ\xf2\t\xbb\x00H\xa2\x93_r\x80@lr\xa

Figure 16 Example of encrypted data information saved in the Pending Task database file

Result Analysis

For result analysis, 2 types of test techniques were used to verify the overall functionality of the Secured Web-based Donation Record Management Application. The test techniques are Use Case Testing and Usability Testing. Use case testing is a technique which used to verify the usage and flow of use cases throughout the system. It will track the transaction and flow of data from beginning to ending of a function or application. Use Case Testing has been widely used in building software and application that has normal people as target user because it can greatly represent how a normal people operate the system or application. Use case testing is one of the techniques used in Black Box Testing where tester does not require to read or understand the algorithm or code behind the system. The tester will only need to test the functionality of the system or application based on the specification by focus on input and output of the system. The result of Use case testing run on Secured Web-based Donation Record Management Application can be seen in Table 1 below. Since all of the test status is successful, the Secured Web-based Donation Record Management Application can be considered as fulfill requirements and is able to function as expected.

Table 1 Result of Use Case Testing

Test ID	Expected Outcome	True Outcome in Test	Test Status
T01	The new user account successfully sign up	The new user account successfully sign up	Successful
T02	The account is successfully log in and donation detail can be viewed	The account is successfully log in and donation detail can be viewed	Successful
T03	The new donation information was added and old donation information was updated	The new donation information was added and old donation information was updated	Successful
T04	The new donation type information was added and old donation type information was updated	The new donation type information was added and old donation type information was updated	Successful
T05	The user can view the user information of himself and send edit information request	The user can view the user information of himself and send edit information request	Successful

	to Manager and Admin	to Manager and Admin	
T06	The user can view the financial summary	The user can view the financial summary	Successful
T07	The user can make the financial transaction request	The user can make the financial transaction request	Successful
T08	Admin can view editing history	Admin can view editing history	Successful
T09	The request was granted permission and make changes to database	The request was granted permission and make changes to database	Successful
T10	The user information is successfully delete from the database	The user information is successfully delete from the database	Successful

For Usability testing, it will evaluate a product or system by testing it with representative users which have no knowledge on development of the system. Commonly, usability testing will be done by setting several typical tasks which participants will try to complete while the developer or observers will watch, listen and record the process and reviews of the participants. Usability testing is a good way to make sure the application or system developed fulfill the requirement and specification of the user. For running the usability testing on Secured Web-based Donation Record Management Application, several testers were found to use the application then answer a questionnaire based on their experience. The results are shown in Table 2, Table 3, Table 4, Table 5 and Table 6. Based on the result of the usability testing, the Secured Web-based Donation Record Management Application can be considered as acceptable and appropriate for the target user.

Table 2 Interpretation of average rating

Rating	Level of Acceptance
1.00 ~ 2.33	Low
2.34 ~ 3.66	Moderate
3.67 ~ 5.00	High

Table 3 Result of Part 1 questionnaire (Usability)

Question	Total Rating	Average	Level of Acceptance
It is easy to use the application.	$4*1+5*5=29$	$29/6=4.83$	High
It is easy to understand the function of application	$4*2+5*4=28$	$28/6=4.67$	High
I can use the application without guidance	$3*1+4*3+5*2=25$	$25/6=4.17$	High
I can navigate through the application using common sense.	$4*2+5*4=28$	$28/6=4.67$	High

Table 4 Result of Part 2 questionnaire (Effectiveness)

Question	Total Rating	Average	Level of Acceptance
It is easy to moderate donation information.	$5*6=30$	$30/6=5$	High
It is easy to moderate user information.	$4*2+5*4=28$	$28/6=4.67$	High
It is easy to track any suspicious behavior occur in the application.	$4*3+5*3=27$	$27/6=4.5$	High
The application give me a strong impression of integrity.	$4*5+5*1=25$	$25/6=4.17$	High

Table 5 Result of Part 3 questionnaire (UI Design)

Question	Total Rating	Average	Level of Acceptance
The colour used in the application giving feeling of comfortable.	$4*6=24$	$24/6=4$	High
The text can be seen easily.	$5*6=30$	$30/6=5$	High
The button in the application can be used easily.	$4*3+5*3=27$	$27/6=4.5$	High
The User Interface is clear and simple.	$4*1+5*5=29$	$29/6=4.83$	High

Table 6 Result of Part 4 questionnaire (Overall)

Question	Total Rating	Average	Level of Acceptance
The application can work smoothly.	$5*6=30$	$30/6=5$	High
I am happy with the outcome of the application.	$4*3+5*3=30$	$27/6=4.5$	High
I do not need to worry about security issues while using the application.	$5*6=30$	$30/6=5$	High

Constraints and Suggestion

One of the constraints of this project is that the application is not as perfect as expected earlier in the preparation state because of the limited resources, knowledge and time. For now, the Secured Web-based Donation Record Management Application do not include function of back-up information so if there is any mistake of deleting data, it is unavailable to traceback the records. Since that, the deleting process especially deleting user information was developed in the way that the user should input the password to confirm the action to prevent any mistake occur. Other than that, the UI design of Secured Web-based Donation Record Management Application is not considered beautiful. It is simple and clean but also boring compared to other websites which have beautiful layout and amazing animation or sound. The simple UI design also made the application looks not as profesional as it should be and it may cause false impression of the user to think that the application is easy and not reliable. File encryption is also one of the constraints for the applciation. For now, the encryption is only used in transaction detail to protect the sensitive data which is transaction receiver and value of transaction. This was caused by the limited time provided and also technical problems facing as a developer who have limited knowledge on Django.

The first suggestion of improvement to the Secured Web-based Donation Record Management Application is to have a download function so the user can download the data information in file format such as Excel or PDF format. Moreover, the UI design can still be improved by add more

images and backgrounds into the website so the user will not think that the page is too boring or empty. Search data function can also be added so the user can easily filter out the important data from the mass of database information. Data encryption can also be extended to whole database to improve the security level of the application.

Conclusion

In closing, the Secured Web-based Donation Record Management Application has very high potential. The application provide a platform for the NGOs to manage their data in a more easy and secured way with lower cost compared to other commercial data management software. This application can also extend to other aspect such as storage management or medicine management which need a same function. With consideration of the rise of network breaching cases, it is always important to increase the security level of an application as much as possible. Other than that, the Secured Web-based Donation Record Management Application can also be improvised further by adding more functions inside as it is designed in Django which provided highly customization for the developer.

Appreciation

I would like to take this opportunity to express my sincere gratitude and appreciation to all those who have supported and guided me throughout the development of my project “Secured Web-based Donation Record Management Application.” Their invaluable contributions have been instrumental in the successful completion of this application.

Fist and foremost, I would like to extend my appreciation to my beloved supervisor, Dr. Mohammad Kamrul Hasan, who have giving me a lot of support and guidance throughout the journey. Dr. Kamrul exceptional knowledge and experience of web development and security has

been invaluable to me. His continuous encouragement, feedback and dedicated mentorship have truly motivated me in the past year.

I would also like to express my gratitude to the lecturers of the Fakulti Teknologi dan Sains Maklumat (FTSM) for their exceptional instruction and support throughout my academic journey. Their passion for teaching, dedication to excellence and willingness to go above and beyond in imparting knowledge have played a vital role in shaping my understanding and skills in the field of information and communication technology.

Moreover, I would like to extend my heartfelt thanks to my family members and friends, who have been a constant source of encouragement and support. Their unwavering belief in my abilities, their patience during the challenging times, and their unwavering support have provided me with the strength and motivation to persevere and overcome obstacles. Their words of wisdom, encouragement, and understanding have been a constant source of inspiration, and I am truly grateful for their presence in my life.

Lastly, I would like to express my gratitude to all the individuals who willingly participated in user testing and provided valuable feedback on the usability and functionality of the application. Their constructive criticism and suggestions were vital in refining the application and ensuring its effectiveness in real-world scenarios.

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