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MACMA Membership Management System with QR Code

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ABSTRACT

Malaysia Chinese Muslim Associate (MACMA), is an organization that manage the Chinese Muslim community in Malaysia. As one part of MACMA Malaysia, MACMA Negeri Sembilan has the responsibility to manage event and monitor each of their members in the state. However, there are challenges and problems due to the current situation as only two persons involve in the management and administration of the organization. Thus, MACMA membership Management System is developed to manage the organization with more convenient and systematic way. The proposed web based system is equipped with QR Code technology. The QR Code generator was used to record the member attendance in every event organized by MACMA. This system also has plug and play capabilities to ease its implementation. The test result shows that all requirements were fulfilled and the system functioning as expected. Thus, it is hoped that the system can be beneficial and might be implemented to help in the management of other MACMA organization in the other states in Malaysia.

1. Introduction

Malaysian Chinese Muslim Association, also known as MACMA, is an organization that can be a platform for the Chinese Muslim to spread their da'wah among their races more effectively. Their targets of da'wah are among the Chinese and other races and religion in Malaysia [1]. MACMA is not just an organization that only promoting or delivering Islam among the Chinese, but they also provide help and service in various ways to their members such as fardhu ain class and counseling in many aspects by using the Chinese language, in order to keep their welfare and harmony among their members. MACMA also play an important role by becoming a speaker among the Chinese Muslim in Malaysia. Furthermore, MACMA also can be also representing a bridge to a non-Muslim Chinese in order to give them understanding and knowledge about the unique of Islam. In this project, the selected branch of MACMA among 17 branches in this project is MACMA Negeri Sembilan [1]. Base on the observation, the current system that they are using in their workstation is the file-based system where all managements in the office are using the paper-filing method in order to manage their works. Most of the time when the staff tries to search for their member's personal details, they have to go through each file that they have in the office in order to allocate that person personal details. Another management problem is that although in their organization consist of a number of organization members, but the one that do everything at all-time only 2 persons which are the MACMA Negeri Sembilan chairman himself and his assistant. Most of their members are busy with their current job. Since MACMA is a volunteering organization, the members are not paid instead they are given allowance whenever they attend or helping an event that organized by the organization. In addition, most of the activities were written on the whiteboard where sometimes it may cause them overlook from their programs that they should be attended. Thus, this system is proposed to solve the problems.

The objectives of the project are:-

1. To design MACMA Membership Management System by using QR code.
2. To develop MACMA Membership Management System by using QR code.
3. To test MACMA Membership Management System by using QR code.

The target user for this project is the MACMA Negeri Sembilan branch's staffs and the MACMA members. The scope of the project is to develop a computer-based system with QR code in order to handle the membership among the community member. The system will generate a QR code for each member in order to be used in the management. The target platform will be PHP. There are several modules implemented in the system, listed as shown in Table 1

Table 1. System Scope

Module	Description
Login	The system will require MACMA staff and member to input their username and password in order to use the system.
Registration	MACMA staff will register an account for the new member of MACMA community
Contribution	This module will be separate into two sub-modules:- *i. Contribution – Donation Receiver* *ii. Contribution – Donator* This module will require MACMA staff to enter specific details that listed in the system and will be store in the database.
Visit Information	This module will require MACMA staff to enter the description of their visits of selected community member.
Attendance	System will detect a QR code from QR code scanner in order to add the detected QR code's detail in the program attendance list.
Program Information	This module will require the MACMA staff to input the program that will be held.
Generate Report	This module where the system will generate a report for the MACMA staff.

This paper will continue with several section. Section II will discuss about literature review. Section III will discuss on the methodology used in this study. Section IV discuss about system analysis and design. Then, section V discuss about the system implementation and testing and section VI provide concluding remark of this study.

2. Literature Review

This section will address some background study on management information system, QR Code technology and comparative study on similar system.

2.1 Definition of Term

2.1.1 Management Information System (MIS)

Management Information System (MIS) is refer to the system that based on computing system where the computer provide the management with the tools to arrange and to well manage their management in an organization [3], [4]. MIS is developed by the combination of five components, which are: people, hardware, software, communication network and data [5].

2.1.2 MACMA [1]

MACMA which is stands for Malaysian Chinese Muslim Association. Malaysian Chinese Muslim Association or also known as MACMA is referred to an organization that established especially for the Chinese Muslim to spread their da'wah among their races in order to give more knowledge about Islam.

2.2 QR Code Technology

Since QR code system was introduced in 1994 by Denso Wave, Quick Response Code or also known as QR Code has become a trademark for a type of matrix barcode and people nowadays using the QR Code as their advertisements, product, packaging, movie posters, and on many other printed material because it is convenient with the current trend and technology where most of the people are now have their own smart phone [6].

Figure 1. QR Code

QR code is a type of 2D barcode that used to provide easy access to a information. Unlike barcode which information is coded in one dimension only, QR code is coded in 2 dimensional. Base on John V. (7 July 2001) [7], Barcode cannot disfiguration while QR code still can tolerate loss where it is configurable between 0 to 30%. Hence, barcode is static which is unchangeable. As for QR code, it is modifiable in order to make them look better without losing data. In term of size of storage, barcode can only store small information while QR can store bigger information compare with Barcode [8].

2.3 Similar System Comparison

Three related systems have been reviewed to highlight the key attributes that the system shall have. The comparison between the reviewed systems and the developed system is shown in Table 2.

Table 2. Similar system Comparison

No.	Description	Sahabat Baiduri System	Mualaf Center Indonesia System [10]	Yayasan Dakwah Islamiah Malaysia System[9]	MACMA Membership Management System
1	Login	Yes	Yes	No	Yes
2	Online Registration	Yes	Yes	No	Yes
3	Members Attendance	No	No	No	Yes
4	QR Code	No	No	No	Yes
5	Generate Report	No	No	No	Yes

6	Manage Contribution Information	No	No	No	Yes
7	Manage Member Detail	Yes	Yes	No	Yes
8	User	Member, outsider	Member, outsider	Outsider	Staff, member, and outsider

2.3.1 *Sahabat Baiduri System (*URL: http://site.raymtamanbaiduri.com/)

This system is developed for the purpose of managing user and to identify how many users are active in their system. This system does not provide any other functionality such as attendance management for each event but the system more focus on the information handling for the organization

2.3.2 *Mualaf Center Indonesia (URL: http://mualaf.com/)*

This system also is focusing on giving information about the organization. This system also purposely developed for registering and managing the mualaf information. Not much functionality is provided in the system.

2.3.3 *Yayasan Dakwah Islamiah Malaysia*

This system does not have any member registration and login page. This webpage provide more information on the organization, activities and services offered.

3. Methodology

In this project prototype model was merged with system development life cycle methodology. System development life cycle which also best known as SDLC is a conceptual model used in project management that describes the stages that involved in an information system development project. Unlike waterfall model, the steps from SDLC can be turning back to its previous stage. For example when the project is in implementation phase, when there is any problem from previous stage during implementation stage, the developer can turn back to its previous stage in order to modified/ fix the previous stage. The model are shown in Figure 2.

Figure 2. Prototyping software process model [11]

Figure 2.0: Prototyping Modeling phase, the developer and stakeholder will hold a meeting where developer will collect all the requirement from the stakeholder. From this stage, the developer will interview the MACMA Negeri Sembilan staff regarding on the system that they want to be implement in the system. In the interview, the head of the developer team, the project manager, will frequently as k the stakeholder about the system that the organization wants. Project manager will

ask for the requirements for the system where the requirement that gathered will be used in implementing the system. A set of project plan with be created. All information will be written in the project plan in order to use it as reference for the stakeholder and the developer. In proposal, objective, project scope, problem statement and project background will be included in order to give better information about the project that will be run by the developer team. In planning phase, project manager will need to make an educated guess of the staff, resources and equipment that needed to be use during implementing the system. Therefore, project manager has to create a comprehensive suite of project plan which able to explain the project roadmap ahead clearly.

Analysis phase is where project manager will breakdown the deliverables in the high-level charter into more detailed business requirement. In this phase, it is a part of project where the project management team will identify the overall process that will be taken during the developing the system through the creation of the project strategy documents. Gathering requirement is the main attraction of analysis phase where requirements gathered process are usually by asking the users on what they need and all the answers from the users will be wrote down. Depending on the project complexity, the process of gathering has a clearly defined process of its own. Before MACMA

Validation and Verification phase is the phase where the project manager will ask validation from the organization in order to verify the prototype that has been created. This to ensure that the organization have better understanding regarding on the system that they want to be developed. Therefore, until the user verifies the prototype that it is meet their requirement; the prototype will be used as the tools for modification turning them into actual system in implementation phase. If the prototype does not meet the user requirement, the developer can refer back to analysis phase in order to identify the mistakes and add the modification in the prototype.

Before the system can be delivered to the organization, the system must be tested. There are 3 type of testing will be conduct; Unit testing, integration is testing, system testing, and acceptance testing. Unit testing is usually test on individual software component or module. Usually it was done by the programmer but not by the tester. In order to conduct this testing, the programmer is required to have detailed knowledge of the internal program design and code. Intergrade testing is testing the combined functionality after integration. This type of testing is especially relevant to client/ server and distributed system.

System testing is testing of overall system where it will be tested as per requirement. This testing will use black-box testing that is based on overall requirement specification. Final testing will be user acceptance testing. Normally this testing is done in order to verify whether the system meets the user requirements.

Table 3. Activities and Phase in the project

Phase	Activities	Outcome
Planning	Determining the problems of chosen project Identify the problem statement, objectives and scope of the project Selecting approach methods with targeted users Conducting interview and observation Reviewing books, journals and thesis and internet references Plan the work schedule	Microsoft Project-Gant Chart Proposal
Analysis	Analyze the requirements gathered from interview and observation Elicit and prioritize the requirements Interpreting system flow into use case diagram Identify all functional and non-functional requirements	Use Case Diagram Class Diagram Activity Diagram Sequence Diagram Requirement Traceability Matrix
Design and development	Designing system interfaces Designing database Designing testing plan Source code development Web-based system prototype development	Class Diagram System Interface Relational Database Schema Testing Plan Web Page Database

Testing	Unit Testing Integration Testing System Testing User Acceptance Testing	Testing Report

4. Analysis and Design

This section describe system requirements analysis and design.

4.1 Analysis and System Design

4.1.1 Use-Case Diagram

The actors that involve in MACMA Membership Management System are the staff of MACMA Negeri Sembilan and the members of MACMA Negeri Sembilan. There will be eight (8) modules in this system and will be describe as shown in Use Case Diagram in Figure 3.

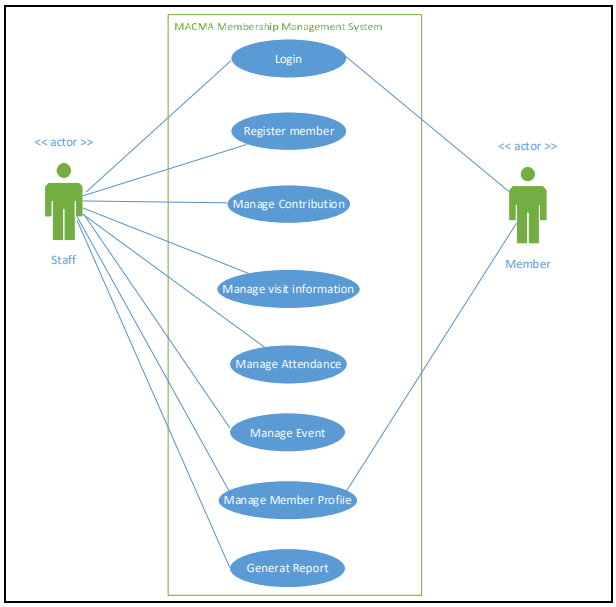

Figure 3. Use Case Diagram

4.1.2 Requirements Traceability Matrix

This section describes the Requirement Traceability Matrix for the system to be developed. The specific requirements are documented which describes the Requirement Traceability Matrix in Appendix A.

Table 4. Requirements Traceability Matrix

Requirements ID	Description
REQ_01	**Use Case Login**
FR01-01	The system shall be able to show login for to registered user.
FR01-02	The system should provide registered user with the ability to enter their details in the login form.
FR01-03	The system shall be able to validate the login credentials entered by registered user.
FR01-04	The system should display the successful login message to the registered user.

FR01-05	The system shall be able to handle exceptions.
FR01-06	The system shall be able to navigate new user to the main page once the login is successful.
FR01-07	The system should display registered user's full name on the menu bar once the login is successful
CR01-01	The system shall not allow registered user to login if the login form is incomplete or invalid
CR01-02	No user can access any other registered user's account.
REQ_02	**Use Case Register Member**
FR02-01	The system shall be able to show registration form to staff menu only.
FR02-02	The system should provide staff with the ability to enter new member details in the registration form.
FR02-03	The system should display the successful account registration message to the staff.
FR02-04	The system shall save details of the new registered member.
FR02-05	The system shall be able to handle exceptions.
FR02-06	The system shall be able to navigate new user to the login page once the registration is successful.
CR02-01	The system shall not allow staff to submit registration form if the form is incomplete.
CR02-02	The system will not save the new member data if the form is incomplete.
REQ_03	**Use Case Manage Contribution**
FR03-01	The system shall be able to show contribution form to user.
FR03-02	The system should provide user with the ability to enter new contribution details in the contribution form.
FR03-03	The system should display the successful saved contribution records message to the user.
FR03-04	The system shall save details of the new contribution details.
FR03-05	The system shall be able to handle exceptions.
FR03-06	The system shall be able to navigate user to the main page once the contribution recorded is successful.
CR03-01	The system shall not allow staff to submit contribution form if the form is incomplete.
CR03-02	The system will not save the new contribution data if the form is incomplete.
REQ_04	**Use Case Manage Visit Information**
FR04-01	The system shall be able to show Manage Visit Information form to user.
FR04-02	The system should provide user with the ability to enter visiting details in the Manage Visit Information form.
FR04-03	The system should display the successful stored visiting record message to the user.

FR04-04	The system shall save details of the new visiting record.
FR04-05	The system shall be able to handle exceptions.
FR04-06	The system shall be able to navigate user to the main page once the user successfully stored the visiting record.
CR04-01	The system shall not allow user to submit Manage Visit Information form if the form is incomplete.
CR04-02	The system will not save the new visiting record if the form is incomplete.
REQ_05	**Use Case Manage Attendance**
FR05-01	The system shall be able to show attendance form to user.
FR05-02	The system should allow user to retrieve data by scanning the QR Code
FR05-03	The system should display the successful scanned QR Code message to the user.
FR05-04	The system shall save details of the new attendance record.
FR05-05	The system shall be able to handle exceptions.
FR05-06	The system shall be able to navigate user to the main page once the user successfully stored the attendance record.
CR05-01	The system shall not allow user to submit attendance form if the form is incomplete.
CR05-02	The system will not save the new attendance record if the form is incomplete.
REQ_06	**Use Case Manage Event**
FR06-01	The system shall be able to show manage event form to user.
FR06-02	The system should provide user with the ability to enter event details in the manage event form.
FR06-03	The system should display the successful stored event record message to the user.
FR06-04	The system shall save details of the new event record.
FR06-05	The system shall be able to handle exceptions.
FR06-06	The system shall be able to navigate user to the main page once the user successfully stored the event record.
CR06-01	The system shall not allow user to submit manage event form if the form is incomplete.
CR06-02	The system will not save the new event record if the form is incomplete.
REQ_07	**Use Case Manage Member Profile**
FR07-01	The system shall be able to show member profile form to user (staff and member).
FR07-02	The system should provide user with the ability to modify member details in the member management form. (Staff)
FR07-03	The system should display the successful modification of the member record message to the user. (Staff)

FR07-04	The system shall save details of the modification member record.
FR07-05	The system shall be able to handle exceptions.
FR07-06	The system shall be able to navigate user to the main page once the user successfully stored the member record.
CR07-01	The system shall not allow user to submit member management form if the form is incomplete.
CR07-02	The system will not save the modification member record if the form is incomplete.
REQ_08	**Use Case Generate Report**
FR08-01	The system shall be able to show generate report form to user.
FR08-02	The system shall be able to show Membership Report to user.
FR08-03	The system shall be able to show Contribution Report to user.
FR08-04	The system shall be able to show Visiting Report to user.
FR08-05	The system shall be able to show Event Report to user.
FR08-06	The system shall be able to show Attendance Report to user.

5. Implementation and Testing

This section will discuss the implementation and testing of the MACMA Membership Management System with QR Code. The specification and modules the have been designed will be implemented in implementation phase.

5.1 Implementation

5.1.1 Login Account Module

The system will start with login in the main page. There will be type of login, which are login as administrator and as a membership. Figure 4 shows the Login interface in the MACMA Membership Management System.

Figure 4. Login Interface

This is the function where the MACMA staff to create account for their new member. This registration include with the member personal background, convert info and their beneficiary information. Figure 5 shows the Member Registration interface in the MACMA Membership Management System.

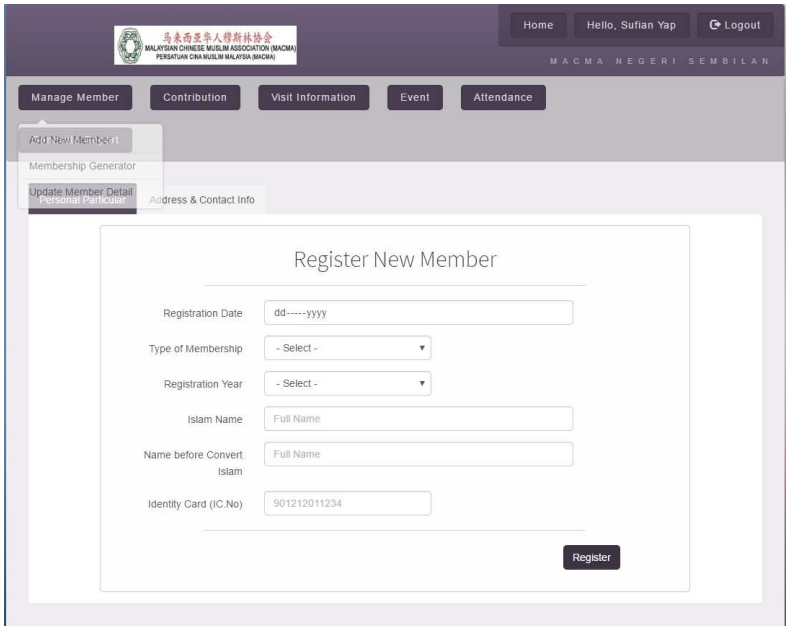

Figure 5. Member registration

5.1.2 Contribution Management Interface

This is the function where user will record whether the contribution that has been received or contribution that will be hand out to next party. Figure 6 shows the Contribution interface in the MACMA Membership Management System.

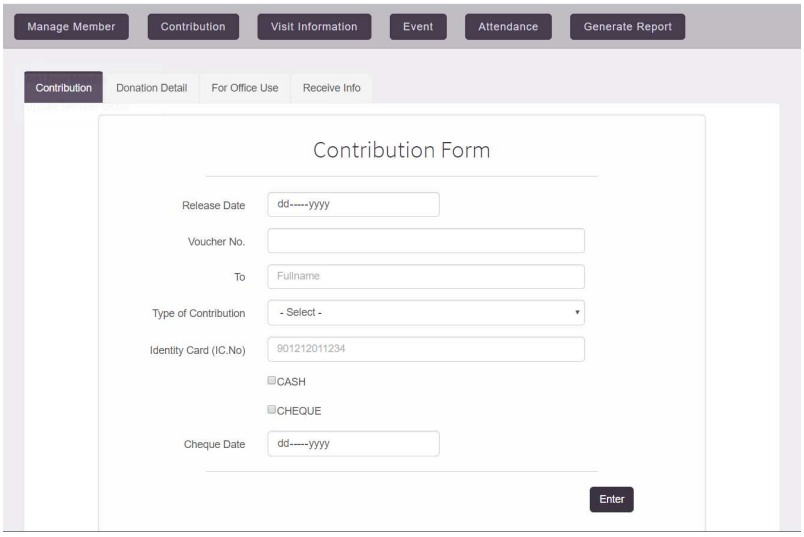

Figure 6. Contribution Interface

5.1.3 Visit Information Interface

This is the function where all visiting information will be record in the system where to be used to reviewed back their visiting that has been conduct. Figure 7 shows Visit Information interface in the MACMA Membership Management System.

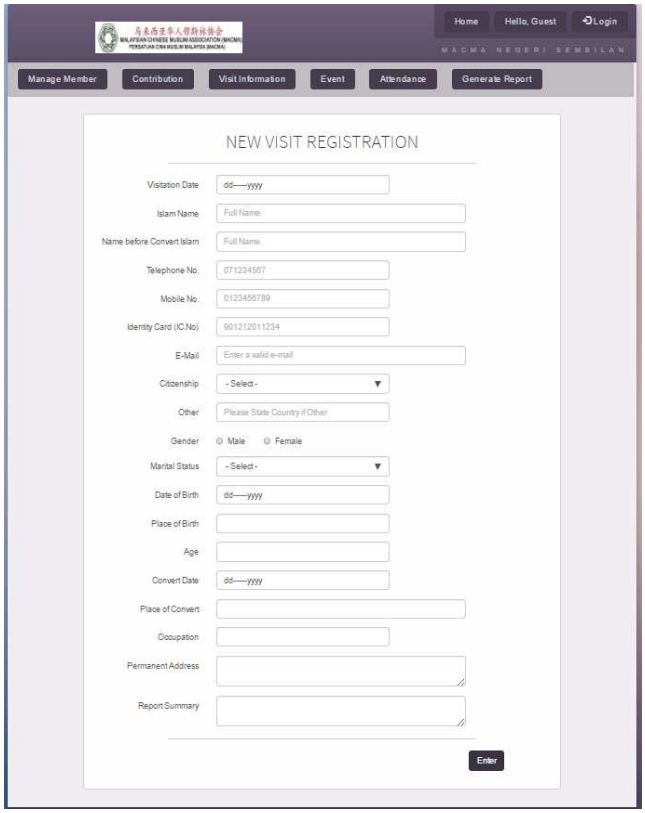

Figure. 7 Visit Information Interface

5.1.4 Event Management Interface

This is the function where user will add new record of new event that the organization will held. Figure 8 shows the Event Management interface in MACMA Membership Management Systems.

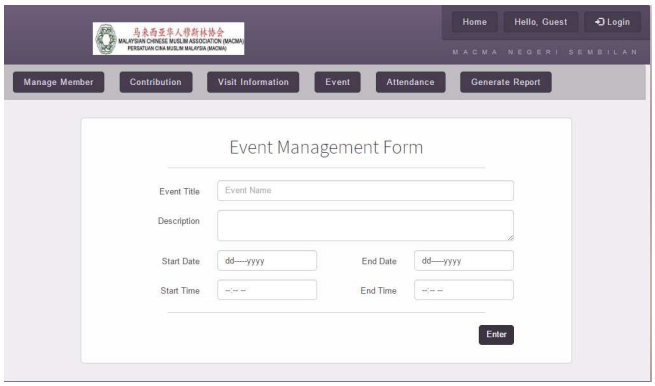

Figure 8. Event Management Interface

5.1.5 Attendance Management

This is the function where admin will scan member QR code and display it at the attendance table. The QR code will automatically save the member detail in the database. Figure 9 shows the Attendance.

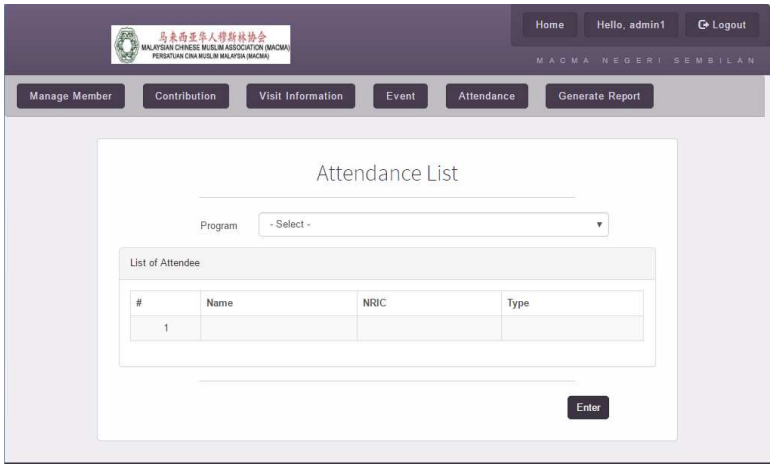

Figure 9. Attendance Interface

5.1.6 Generate report Interface

This is the function that will generate the report that the user prefer. User will select which module they want as their reports; the system will display a list of information depending on what module the user select. Figure 10 shows the generate report interface in MACMA Membership Management System.

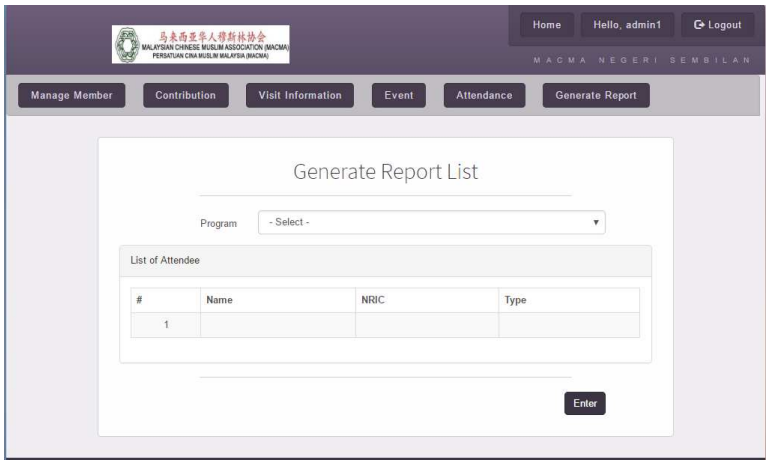

Figure 10. Generate Report Interface

6. Conclusion

The advantages of MACMA Membership management system are: To reduce time management on handling member attendance during event. To help reduce the number of paper usage and space that will involve in storing information. To reduce cost where QR Code can just directly generate from the system and they will no cost to be charge if the member lost their QR Code.

The disadvantages of MACMA Membership Management System are: The system has no printing facilities which allow user to print the report that have been generated by the system. It can only work in a particular PC where for now this system will only act as stand-alone system as their trial in the organization

The future works needed to enhance the MACMA Membership Management System are: Report that has been generated is able to be print by the user. Report format can be converts into bar-chart GUI. Event details can be shown one-by-one by having pagination method instead by displaying a list of events in a table. MACMA Membership Management System is generally fully function and has achieve all the specified objective that are to design, create and test the MACMA Membership Management System. This system is developed especially for MACMA Negeri Sembilan. The service offered by the system such as event attendance management, donation and help management is hoped can facilitate the organization in proper and systematic way.

References

[1] macma.my./ (n.d) Retrieved on September 15, 2016, from https:// macma.my /

[2] http://www.programpermata.my/ (n.d). Retrieved on May 9, 2017, from http://www.programpermata.my/

[3] Naranjo, D. (2009). Management information systems and strategic performances: The role of top team composition. International Journal of Information Management, 29, pp. 104–110.

[4] https://mis.eller.arizona.edu/what-is-mis (2017) Retrieved on September 15, 2016, from https://mis.eller.arizona.edu

[5] Dennis, A., Wixom, B. H. and Roth, R. M. (2012). System Analysis and Design. 5th ed., NJ, United States, John Wiley & Sons. Inc.

[6] Yokota, S. (2009). Qr Code Overview & Progress of QR Applications. Retrieved on November 29, 2016, from http://www.gs1jp.org/pdf/001.pdf

[7] Golub, G. IMA Journal of Numerical Analysis (2009) 29, 467–485

[8] Chang, J. W. (2014). An introduction to using QR codes in scholarly journals. Science Editing, 1(2), pp. 113-117. Retrieved on August 6, 2016, from doi: 10.6087/kcse.2014.1.113

[9] http://yadim.com.my/v2/?page_id=22868 (2011) retrieved on September, 15, 2016, from http://www.yadim.com.my/

[10] http://mualaf.com/ (2012) retrieved on October, 2016, from http://mualaf.com.

[11] Sommerville, I. 2015. *Software engineering*, 10th Ed. Harlow; Pearson Education Limited.