Department of Science and Technology IV-A Quality Management Information System

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***Abstract* —The DOST IV-A Quality Management Information System is a web application that aims to enable data transparency in the regional office. Authorized users can add, view and update on the entries to Customer Satisfaction Measurement, Management Review and Quality Management System Documentation Modules. Users can view the graphical data about the satisfaction rating of a functional unit. Users can generate a report on the satisfaction rating of all the functional units. Authorized users can download relevant documents from the modules. The developer conducted a user survey for the measurement of systems functionalities and usability.**

I. Introduction

A. Background of the Study

Cost-efficient technologies such as microcomputers, telecommunication technologies, and information systems are vital elements in a developing country. Information systems for governance and public administration is one of the top priorities of every developing country, as it is one of the best application of modern technology. Governance and public administration is more productive, effective and efficient through the help of modern technology [1].

Information technology is being used by different organizations in planning the activities of the whole organization, more accurate decision making, and safekeeping of important records and automation of complex repetitive task which can streamline processes inside the office and reduce the time needed to complete the task significantly boosting efficiency and productivity of the whole organization [2] [3].

In the case of the DOST IV-A regional office they see the need to create an information system that can help the top management to plan the objectives and goals of the organization, a system that can aid in the decision making process of the organization, and lastly, a system that automates complex task such as analysis and presentation of customer satisfaction to reduce some workload of their employees.

B. Statement of the Problem

The management of DOST IV-A regional office wanted to improve their efficiency in measuring customer satisfaction, documenting the meetings held within the organization, and management of information resources for effective decision making. They requested a system that can measure and analyze customer satisfaction and can track all the meetings held within the regional office and documentation of their Quality Manual.

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C. Significance of the Study

The Quality Management Information System will provide a faster way of measuring and analyzing customer satisfaction. It will provide a database of all the meetings held within the office, its agenda and action plan, for easier retrieval of information. Lastly, it will store the quality manual of the regional office to facilitate faster retrieval of the rules and policies concerning the quality of the services they offer.

D. Objectives of the Study

The general objective of the study is to develop a web application that can be used by the DOST IV-A regional office in making decisions . The following are the specific objectives that this study aims to achieve:

1) To develop a module that can measure and generate a report on the customer satisfaction for each functional unit of the regional office.
2) To develop a module that will track all the meetings held within the regional office. Each entry in the module contains the agenda, action plan, minutes of the meeting, presentation slides and other relevant documents.
3) To develop a module that will search the quality manual and return relevant information based on the input given by the user.
4) To develop a system that is deemed usable by the System Usability Scale

E. Scope and Limitations

The system is specifically created to be used by the DOST IV-A regional office only. The functionality and specication were provided by the office, and confidential data are provided. User testing and surveys will be conducted in order to measure the systems functionality and usability.

II. Review of Related Literature

Several studies have been conducted on the effects of utilizing new technologies in the processes of institutions and organizations, specifically in the field of information technology. World leaders recognize the value of technology to support the growth of their own country and to satisfy the demands of their citizens.

Electronic government commonly known as e-government is a widely used term that means the use of information technology in government agencies to provide a very good quality service to the clients [4]. Electronic government promotes greater transparency and accountability in government agencies [5]. In 2005, World Bank reported that information technology changed the way how the government works through office automation and through the development of web-based applications that can improve efficiency and transparency of government offices [6].

In 1997, the South Korean Government replaced their primitive procurement system in their government processes to an automated one because it was widely recognized to be corrupt, complicated and lacking accountability. In 2004, the World Bank Organization showed that the South Korean government greatly benefited in replacing their primitive procurement system, the system that cost 26 million dollars generates savings estimated at 2.5 billion dollars a year [7].

In the Philippines there have been people developing systems for the betterment of our government agencies. One of the best examples is the OpenLGU System, an open source enterprise information system for a typical local government unit in the Philippines. It aims to provide automated systems for different transactions or processes in local government units.

In 2014, San Buenaventura created an inventory system module for supplies and materials in local government units in the OpenLGU System [8]. This application was successful in delivering its primary functions such as requesting for supplies and efficient inventory management. Through this application, errors in managing the inventory of materials were minimized.

According to Marasigan (2015), human errors were successfully minimized through the utilization of modern technology such as automated systems [9]. Automated systems make life and work easier not only for organization but also in the different fields of sciences. Nowadays, companies and government institutions such as the Department of Science and Technology have decided to develop these automated systems for the benefit of their employees and customers.

These studies show the importance of replacing old and manual processes inside organizations and institutions, public or private, into automated ones to minimize human error, boost their efficiency, and reduce the cost of operations.

III. Methodology

A. Functional Requirements

1) Authentication Module: provides authentication for users.
2) Customer Satisfaction Measurement (CSM) module: allows each authorized employee to add, modify, view an entry in the CSM module. It allows authorized user to generate a report on the customer satisfaction of each functional unit. It allows authorized user to generate comparative analysis on the customer satisfaction of each functional unit between different periods of time.
3) Management Review (MR) module: allows each authorized user to add, modify and view an entry in the MR module. Each entry in the module contains information such as: date of the meeting, venue where the meeting held, meeting agenda and its action plan, minutes of the meeting and an attendance sheet.
4) Quality Management System Documentation (QMSD) module: allows authorized user to add, modify, search and view an entry in the QMSD module. Each entry in the module contains information such as: document code, revision number and subject of the document.
5) User Privileges

- Administrator
  - View own profile
  - Update own profile
  - Change own password
  - Create accounts for new employees, managers and administrators
  - View user accounts
  - Update user accounts
  - Activate accounts
  - Deactivate accounts
  - Change password of a user
  - Add functional unit
  - View functional unit
  - Update functional unit
  - Add signatory
  - View signatory
  - Update signatory
  - View logs
  - Add CSM
  - View CSM
  - Update CSM
  - Generate CSM report
  - Add MR
  - View MR
  - Upate MR
  - Add QMSD
  - View QMSD
  - Update QMSD

- Manager
  - Add CSM
  - View CSM
  - Update CSM
  - Generate CSM report
  - Add MR
  - View MR
  - Upate MR
  - Add QMSD
  - View QMSD
  - Update QMSD

- Employee
  - View CSM
  - Generate CSM report
  - View MR
  - View QMSD

6) Logs - record all the activities that are happening on the system. Only the administrators can view the logs.

B. Non-Functional Requirements

1) Performance Requirements: The information system should be only accessible through local server of DOST IV-A regional office. The deployed system should run all its features without errors.
2) Security Requirements: The only security feature of the system is user authentication which is a combination of username and password. The administrator can create, view, update user accounts. The administrator can change a password of a user account in case the user forgets his/her own password. The administrator can activate or deactivate user accounts. The administrator can view logs.
3) Software Quality: The system has a well documented and readable code.

C. System Requirements

The system requires the following:

- A computer running Windows 8 or Ubuntu 14.04 or better.
- Latest version of Mozilla Firefox and Google Chrome browser.

The following were used for development:

- A computer running Ubuntu 16.04.
- Latest version of Mozilla Firefox and Google Chrome browser.

Tools and libraries to be used in developing the information system:

- MySQL 5.7.24
- Laravel version 5.4.22 (PHP Framework)
- Visual Studio Code

D. System Design and Implementation

1) Database: An entity relationship diagram was created for effective and efficient database.
2) Implementation: A database schema was created and designed for the construction of the information system's database. The system has three main modules the Customer Satisfaction measurement(CSM) module, Management Review(MR) module and lastly Quality Management System Documentation(QMSD) module. Model-View-Controller (MVC) will be the architectural pattern to be used in developing the application for better maintainability of the code.
3) User Interface: A simple and user-friendly user interface will be used for easier learning and faster navigation to the different modules of the Quality Management Information System.

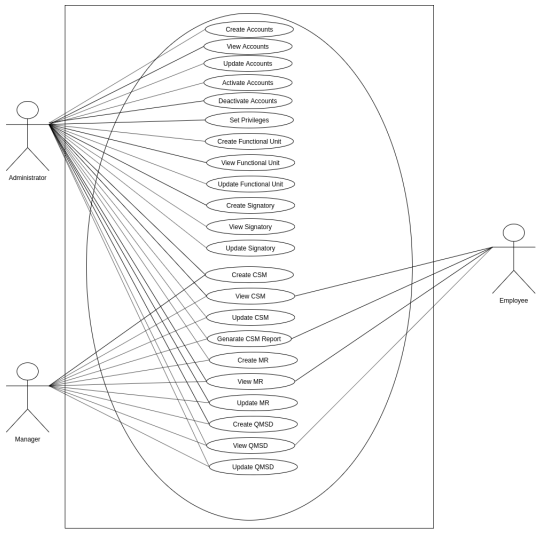

Fig. 1: Use Case Diagram

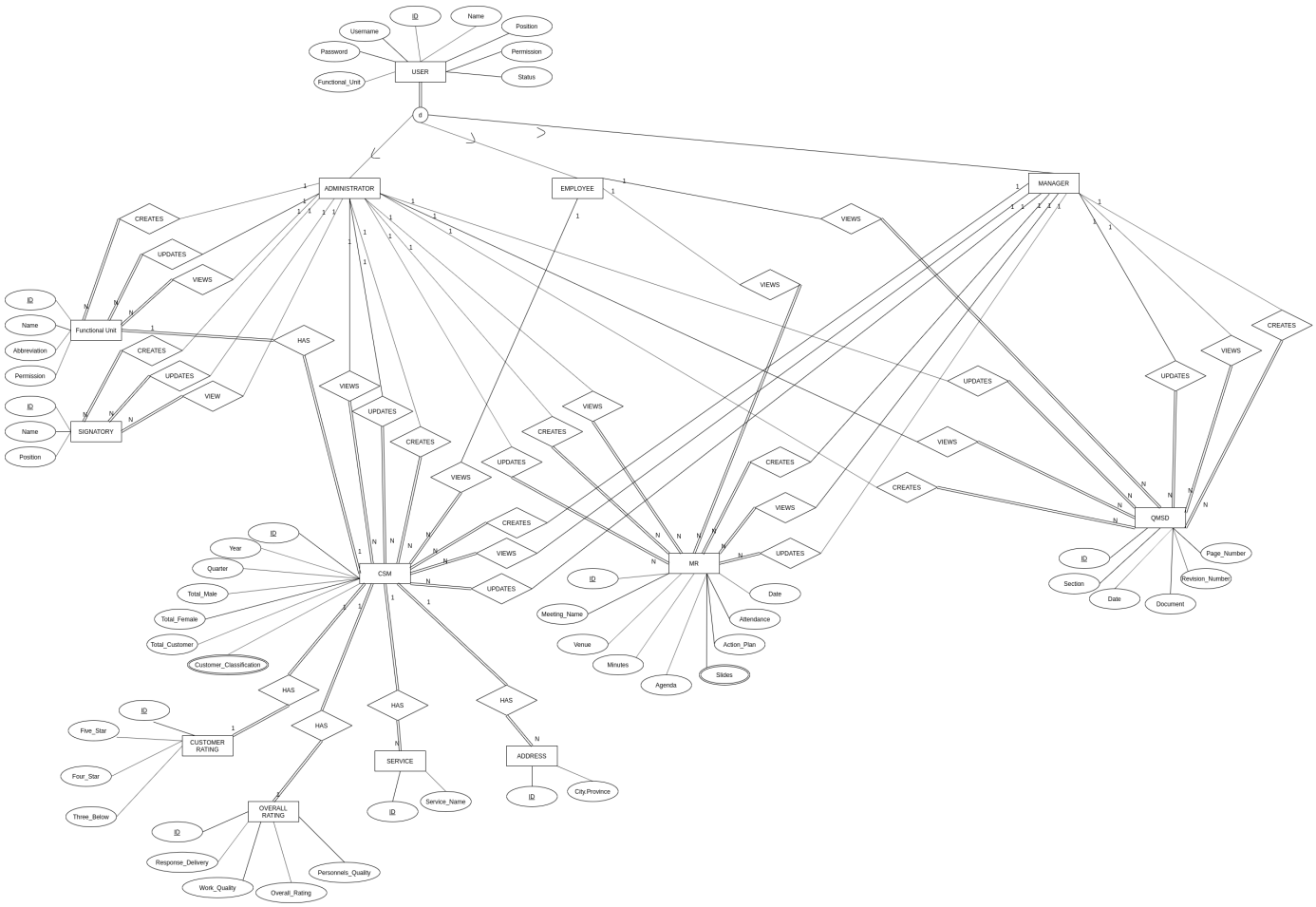

Fig. 2: Entity Relationship Diagram

IV. Results And Discussion

The following are the results of the implementation based on the features specified:

A. Login and Homepage

The user will be redirected to a simple homepage after successful authentication. The homepage contains simple descriptions of the functionalities of the three different modules.

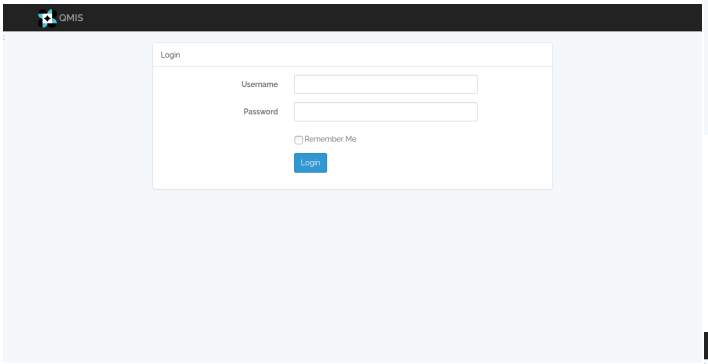

Fig. 3: Authentication Page

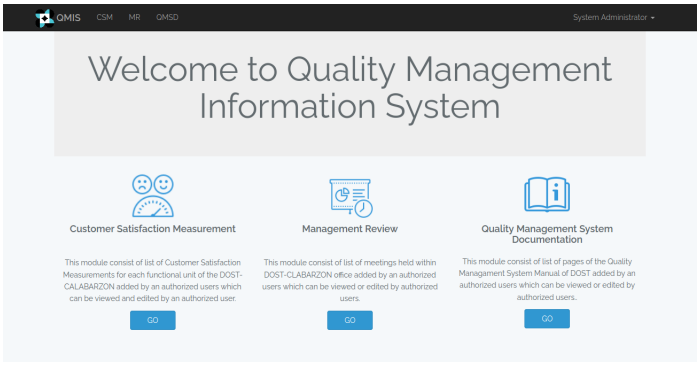

Fig. 4: Home Page

B. User Profile

Every user can view and update their own profile. They can also change their own password.

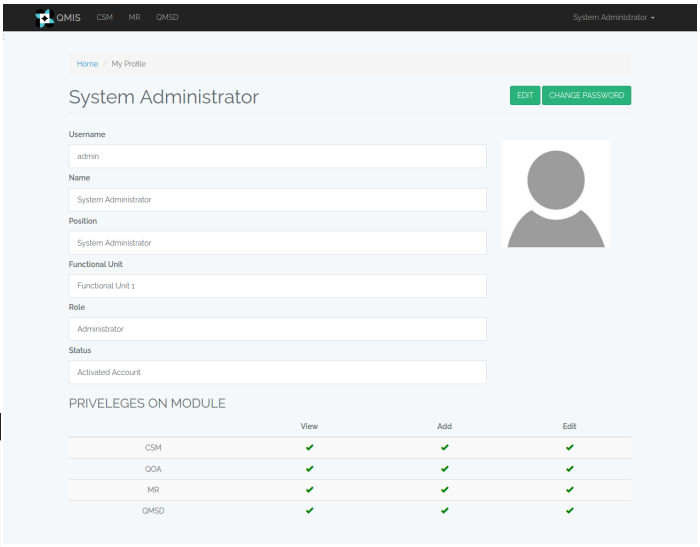

Fig. 5: View Own Profile

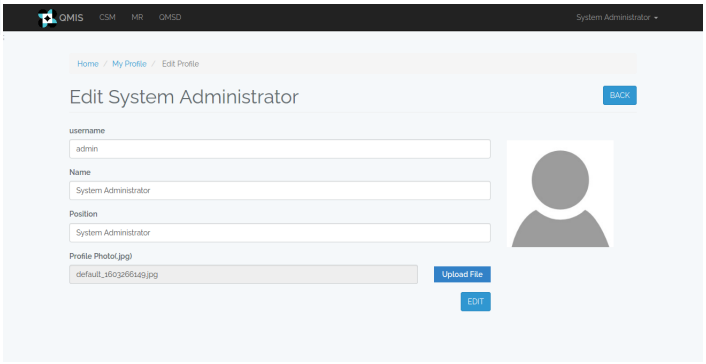

Fig. 6: Update Own Profile

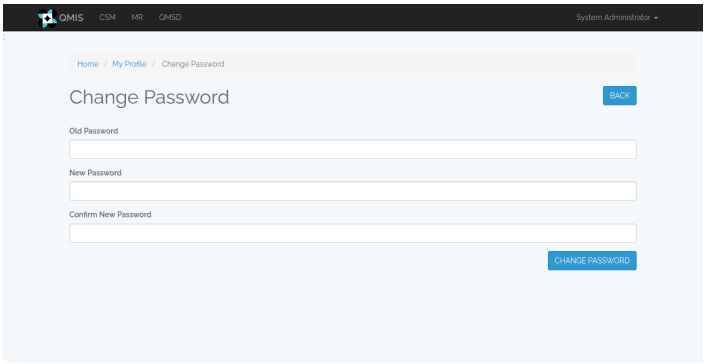

Fig. 7: Change Own Password

C. System Management

Only the administrator account can open the System Management Page. The administrator can add new employee, manager or administrator. The administrator can view and update a user account.

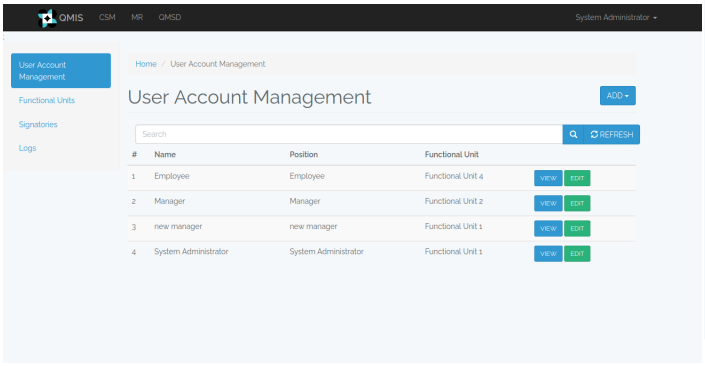

Fig. 8: User Accounts Page Index

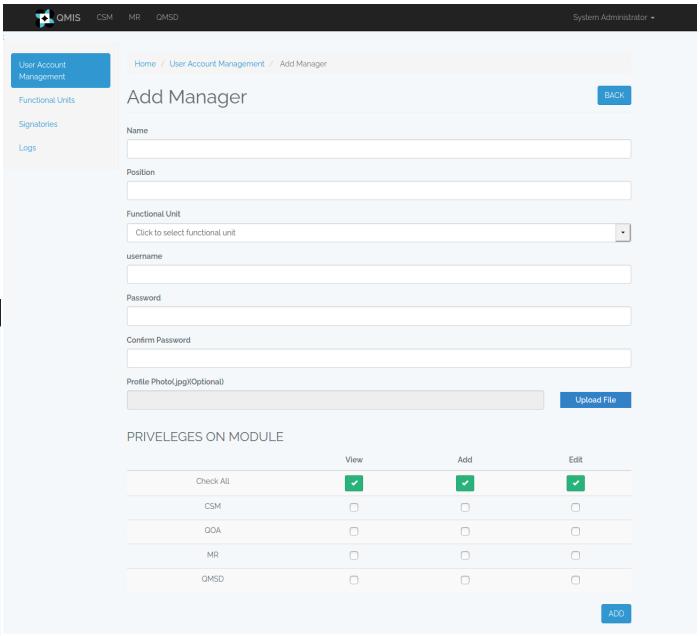

Fig. 10: Add New Manager

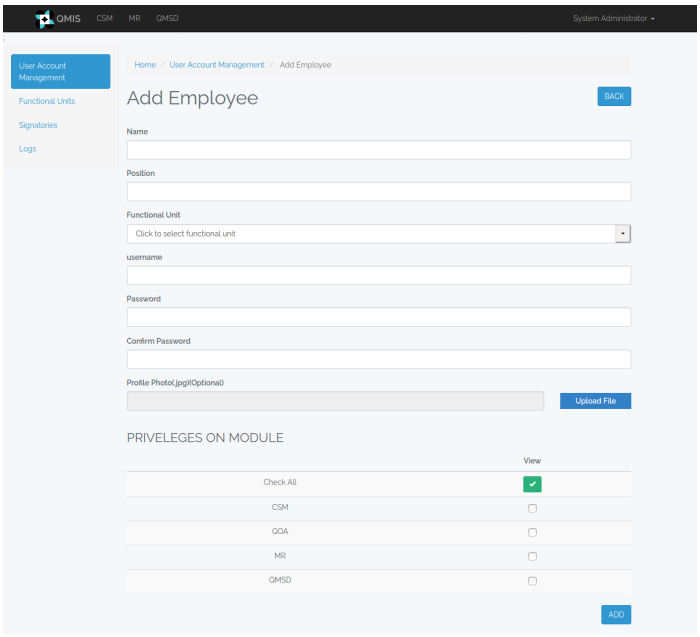

Fig. 9: Add New Employee

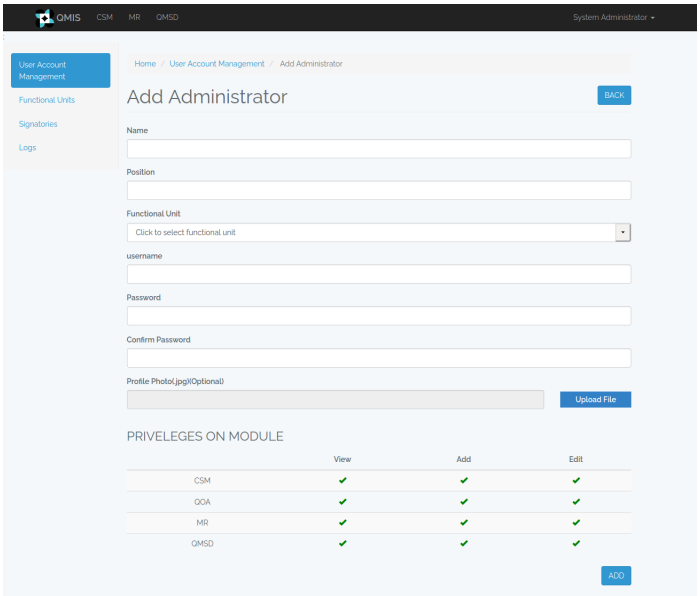

Fig. 11: Add New Administrator

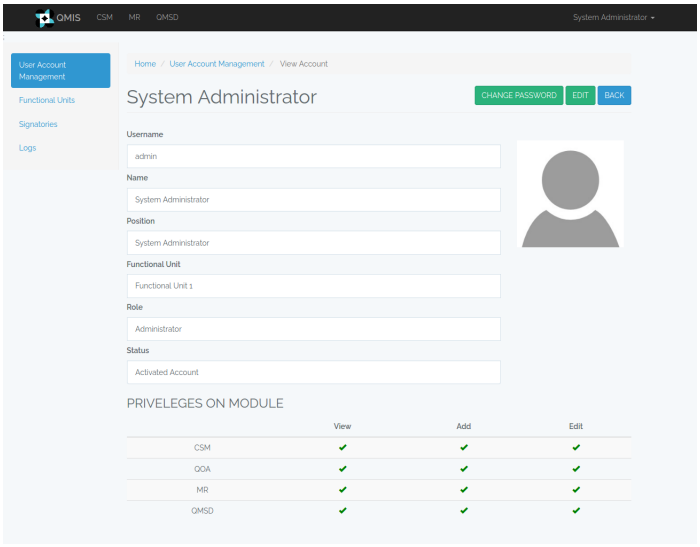

Fig. 12: View User Account

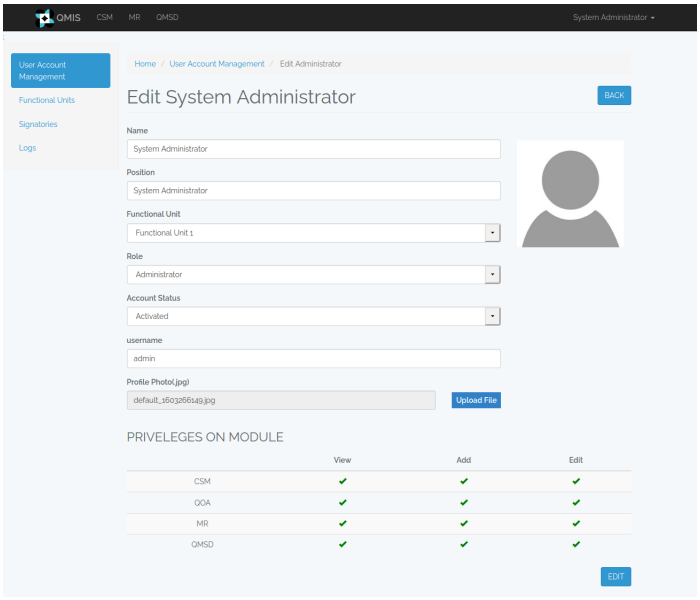

Fig. 13: Update User Account

The administrator can forcefully change the password of an account in case the user forgot his/her own password.

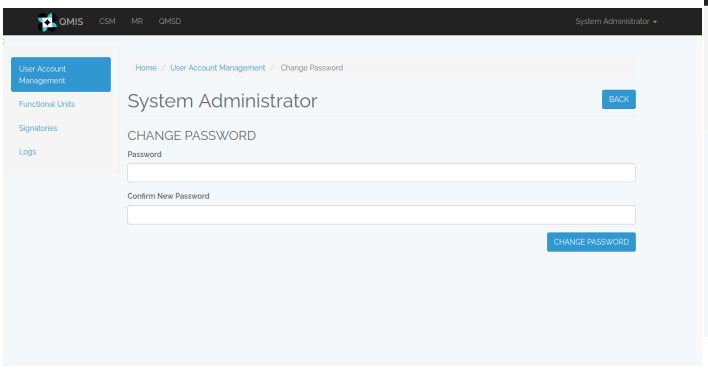

Fig. 14: Change Password For A User Account

The administrator can add, view and update functional units. The administrator sets the privileges of each functional unit.

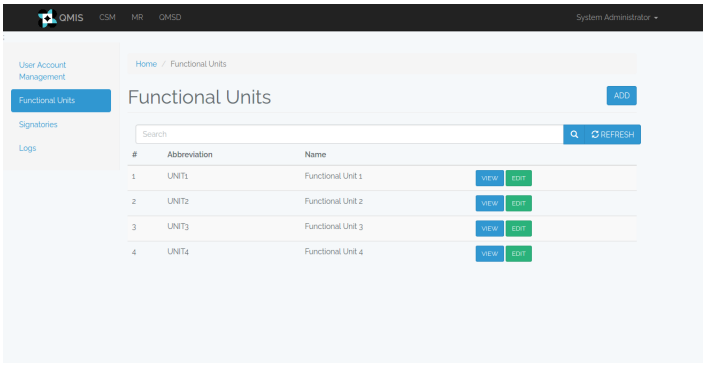

Fig. 15: Functional Units Page Index

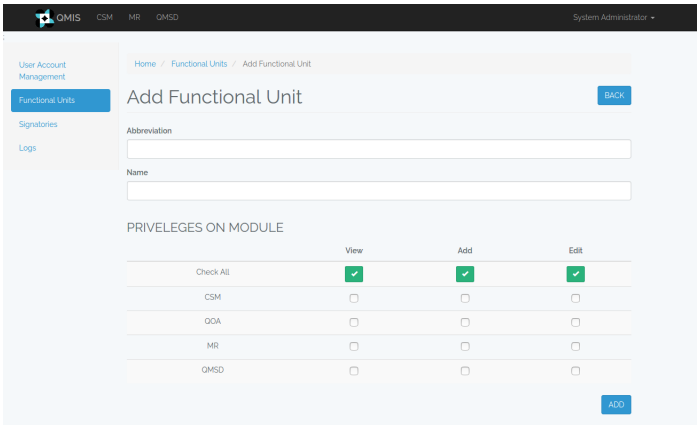

Fig. 16: Add Functional Unit

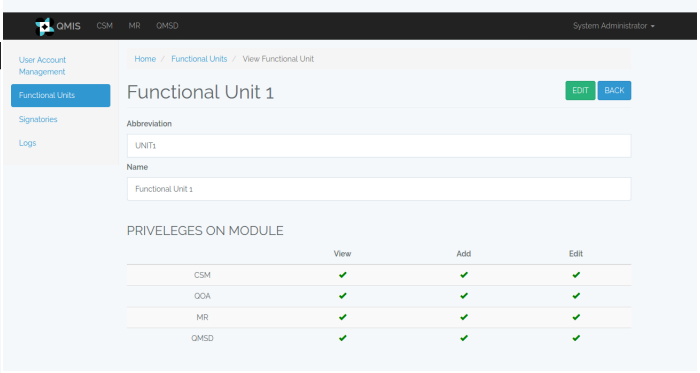

Fig. 17: View Functional Unit

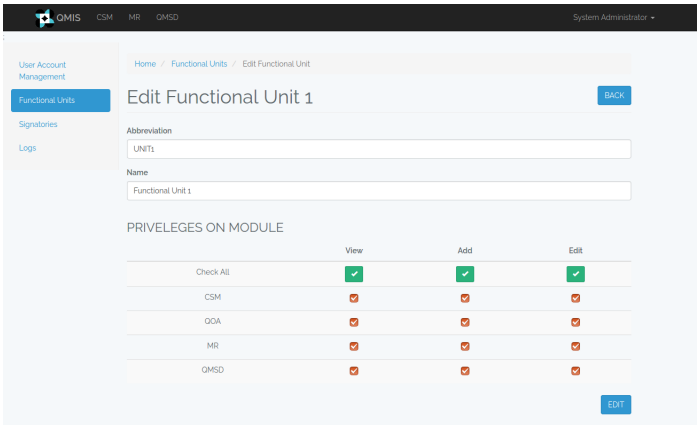

Fig. 18: Update Functional Unit

The administrator can add, view and update signatories.

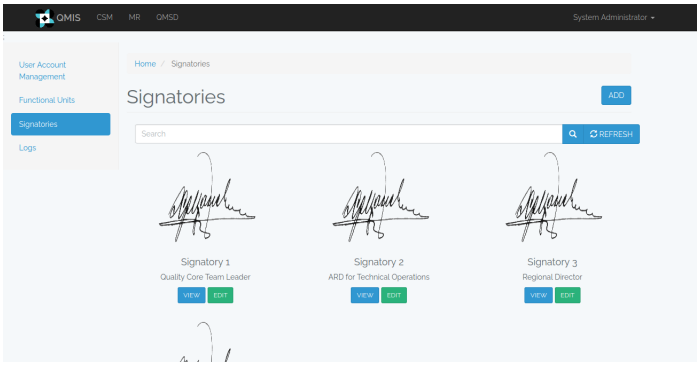

Fig. 19: Signatories Page Index

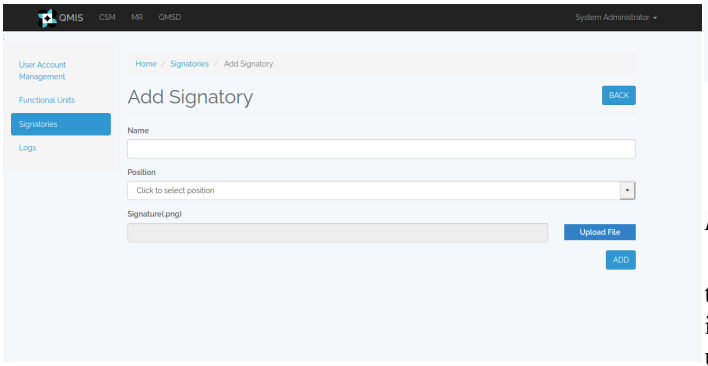

Fig. 20: Add Signatory

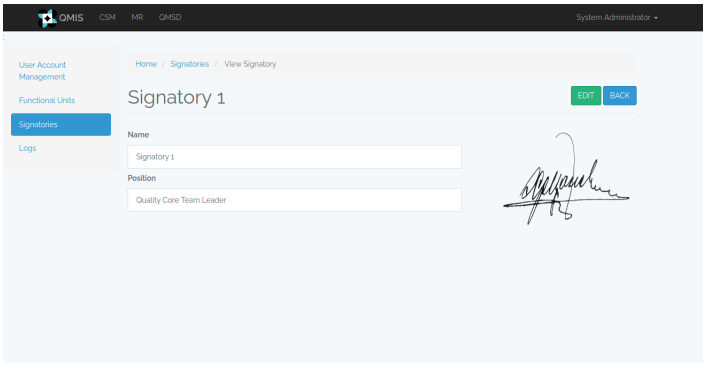

Fig. 21: View Signatory

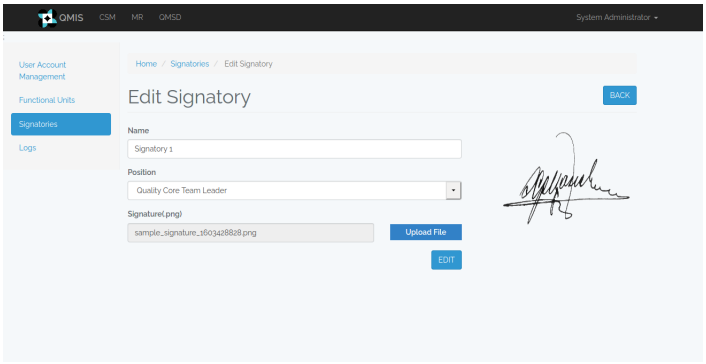

Fig. 22: Update Signatory

The administrator can view and search logs.

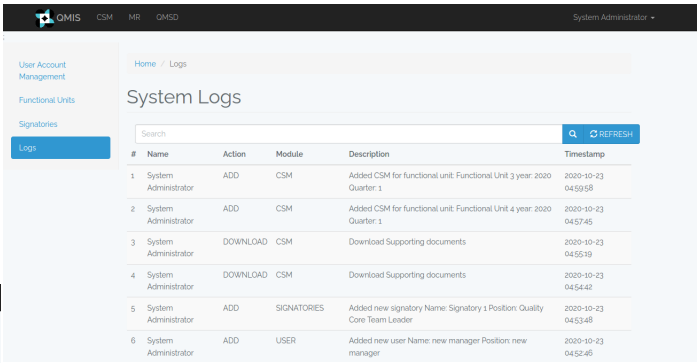

Fig. 23: Logs Page Index

D. Customer Satisfaction Measurement(CSM) Module

Authorized users can add, view and update an entry in the CSM Module. Authorized users that can view an entry in the CSM Module can download the supporting documents uploaded in the entry.

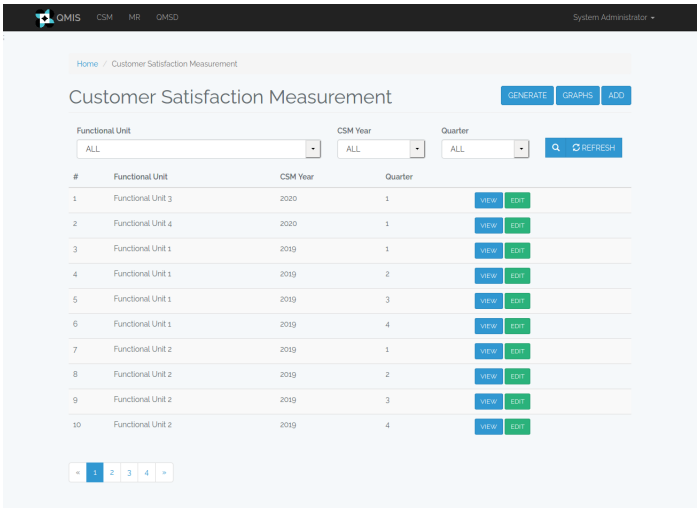

Fig. 24: CSM Module Page Index

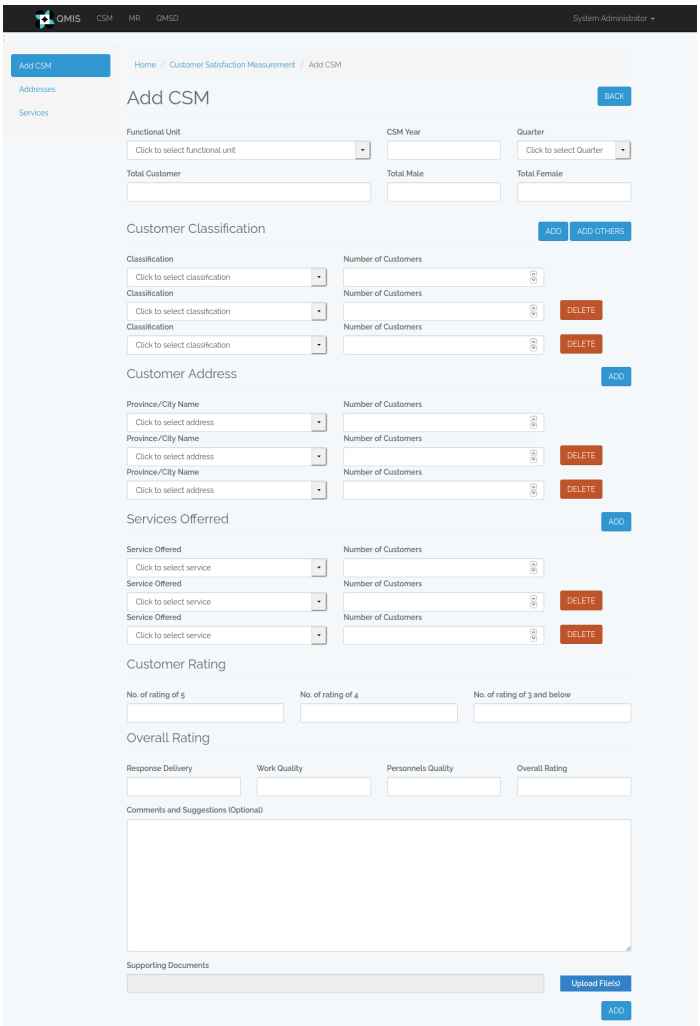

Fig. 25: Add an Entry to the CSM Module

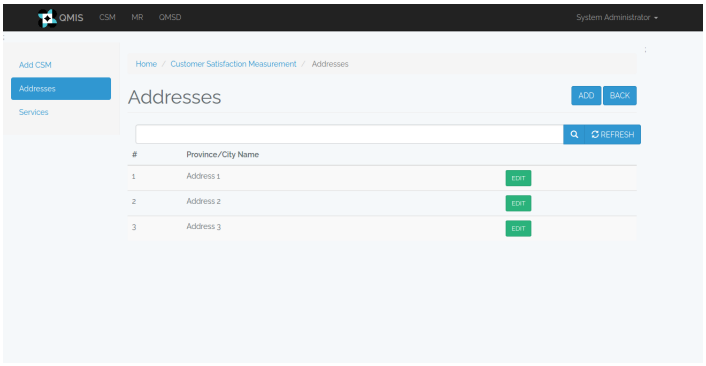

Fig. 26: Addresses Index Page

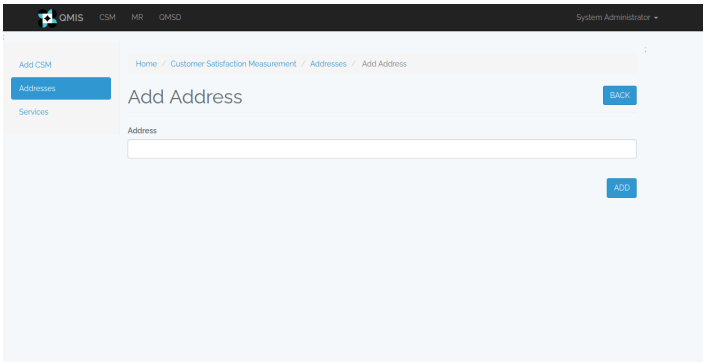

Fig. 27: Add Address

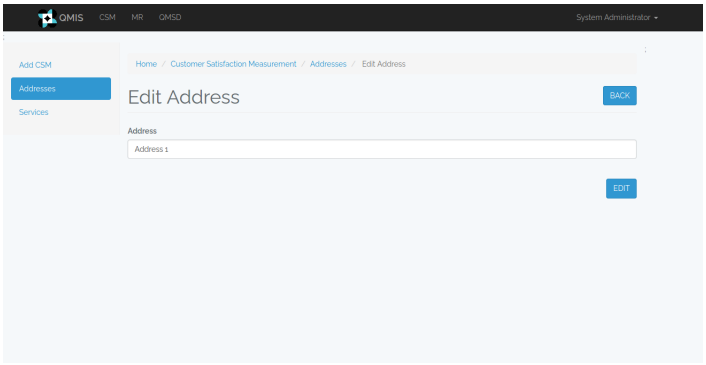

Fig. 28: Update Address

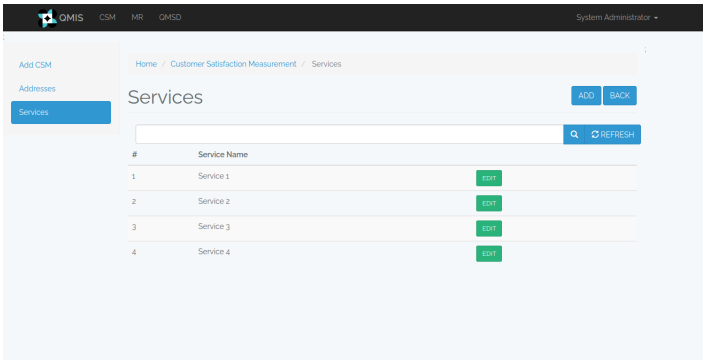

Fig. 29: Services Index Page

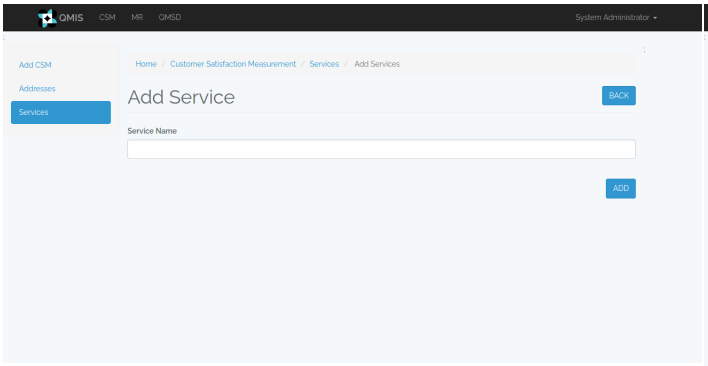

Fig. 30: Add Service

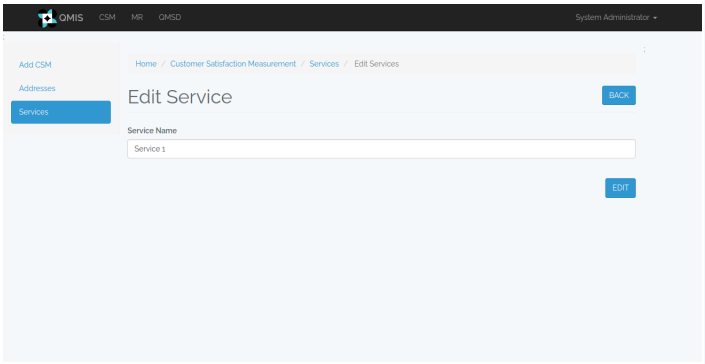

Fig. 31: Update Service

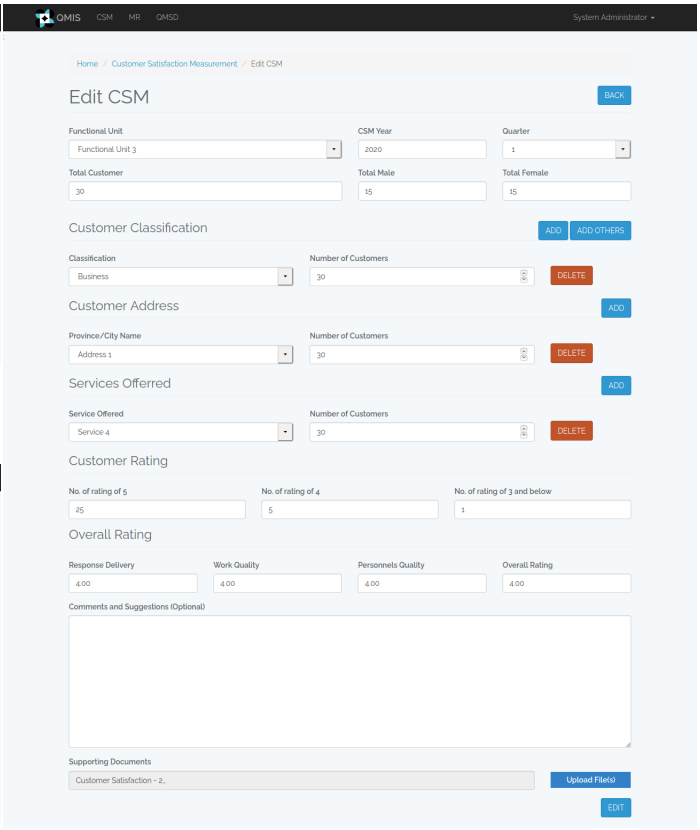

Fig. 33: Update an entry in the CSM

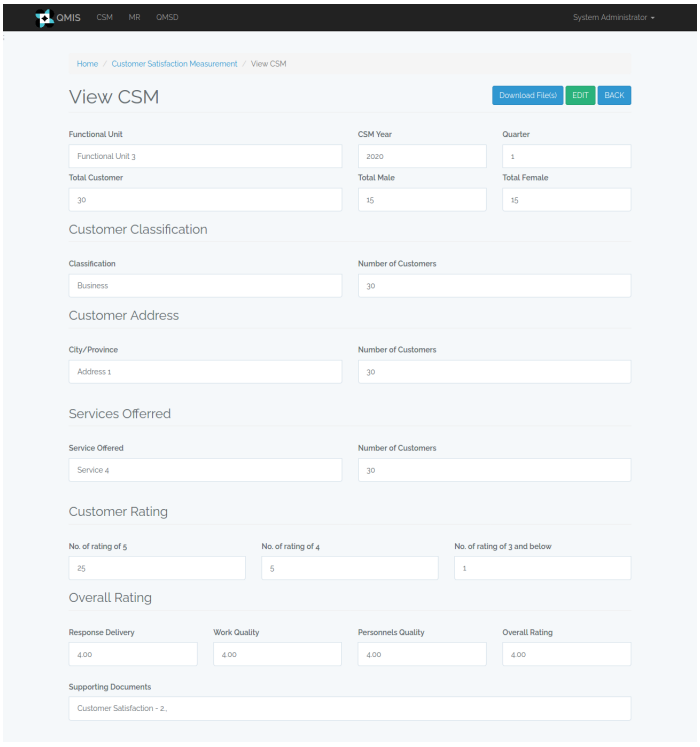

Fig. 32: View an Entry in the CSM Module

Users can generate a report that contains the overall summary about the satisfaction rating of the different functional units, the satisfaction rating compared to the previous year and the five year trend of the satisfaction rating of every functional unit.

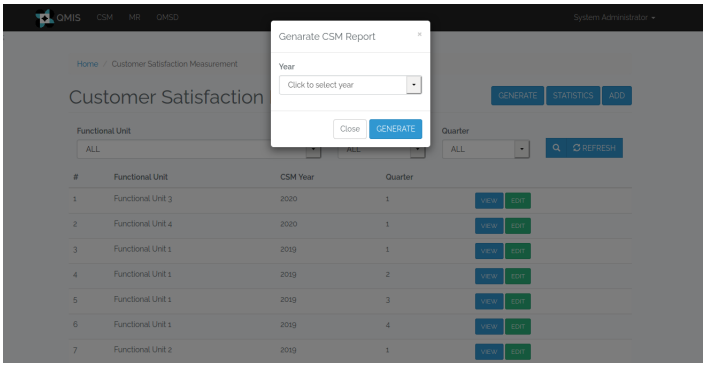

Fig. 34: CSM Generate Report

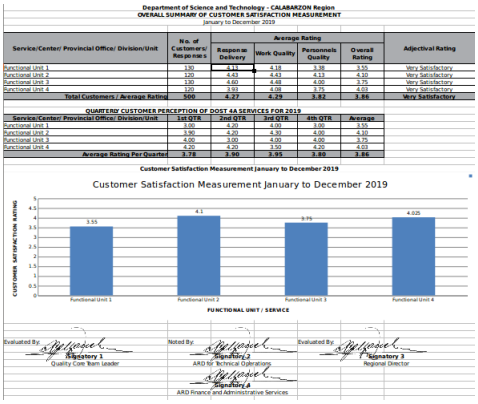

Fig. 35: Sample Overall Yearly Summary Report

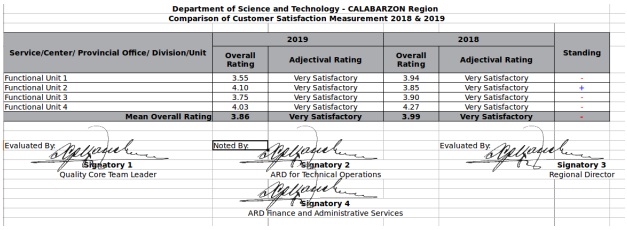

Fig. 36: Sample Satisfaction Rating Comparison Report

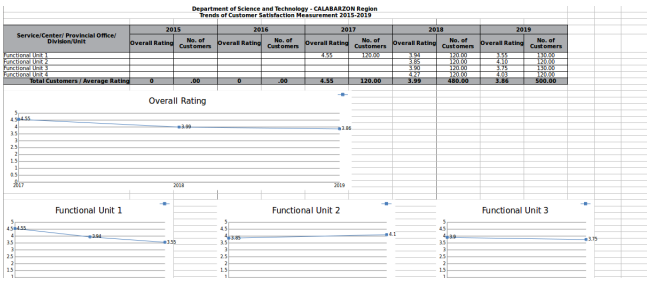

Fig. 37: Sample 5 Year Satisfaction Ratings Trend

Users can view yearly CSM data graphically. It shows the overall satisfaction rating from the 1st to 4th quarter of the year, the ratings given by the customers to the functional unit, the distribution of the different services availed by the customers and lastly the distribution of the addresses to know where the customer came from.

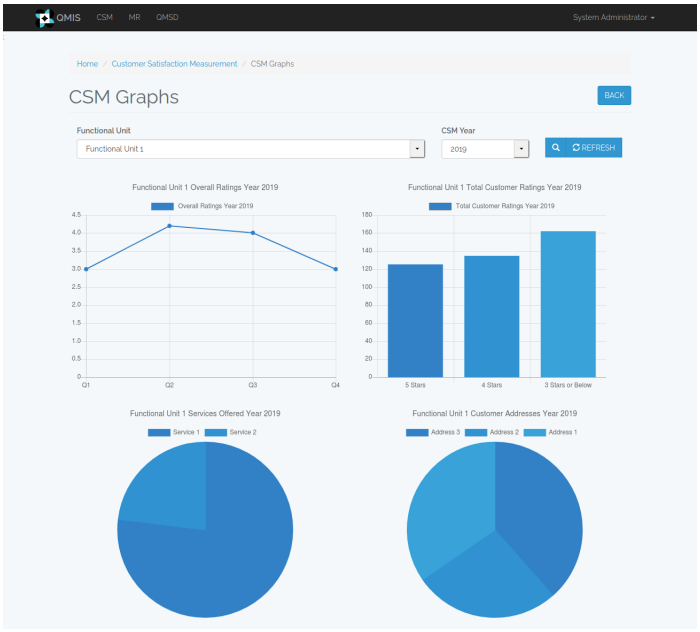

Fig. 38: CSM Yearly Graphical Data

E. Management Review(MR) Module

Authorized users can add, view and update an entry in the MR Module. Authorized users that can view an entry in the MR Module can download the supporting documents uploaded in the entry.

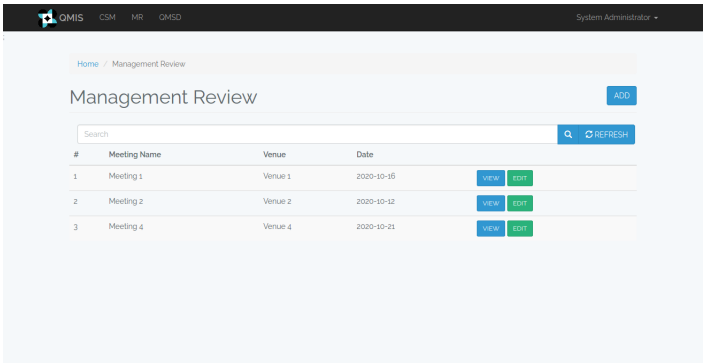

Fig. 39: MR Module Page Index

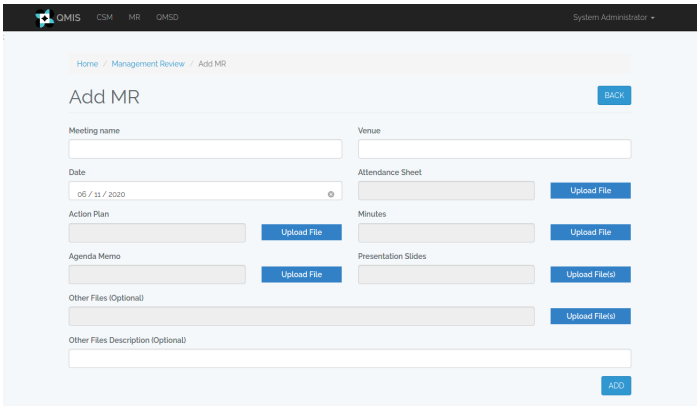

Fig. 40: Add an Entry to the MR Module

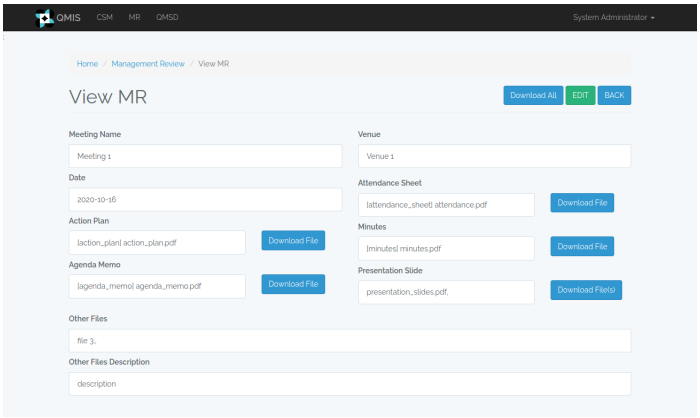

Fig. 41: View an Entry in the MR Module

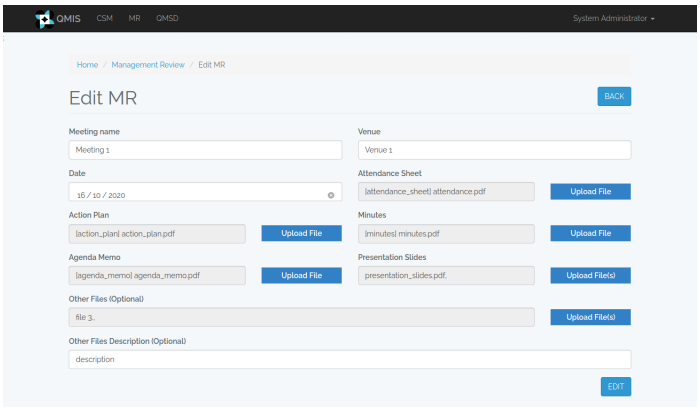

Fig. 42: Update an Entry in the MR Module

F. Quality Management System Documentation (QMSD) Module

Authorized users can add, view and update an entry in the QMSD Module. Authorized users that can view an entry in the QMSD Module can download the supporting documents uploaded in the entry.

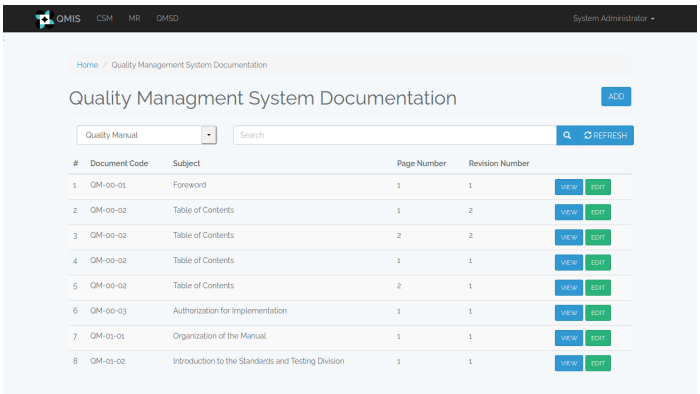

Fig. 43: QMSD Module Page Index

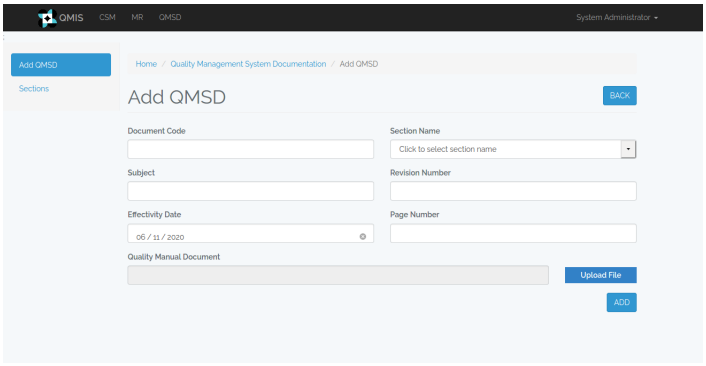

Fig. 44: Add an Entry to the QMSD Module

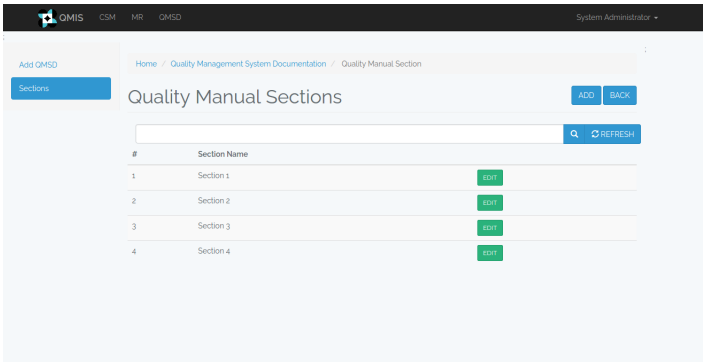

Fig. 45: Sections Index Page

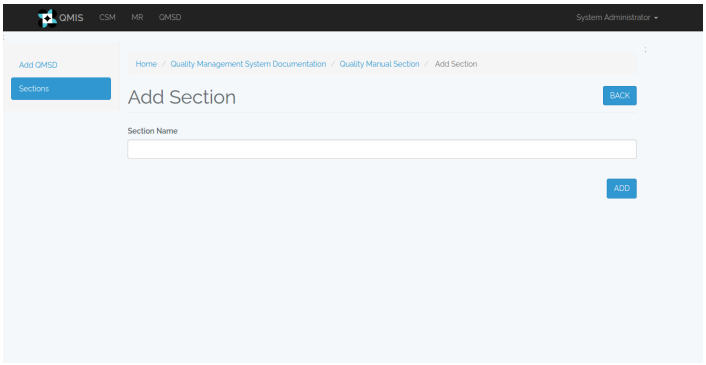

Fig. 46: Add Section

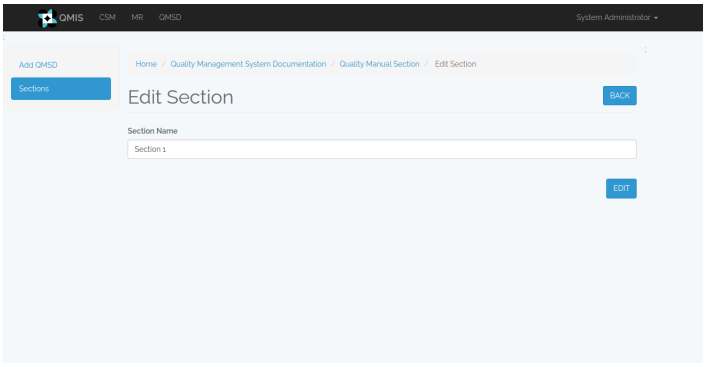

Fig. 47: Update Section

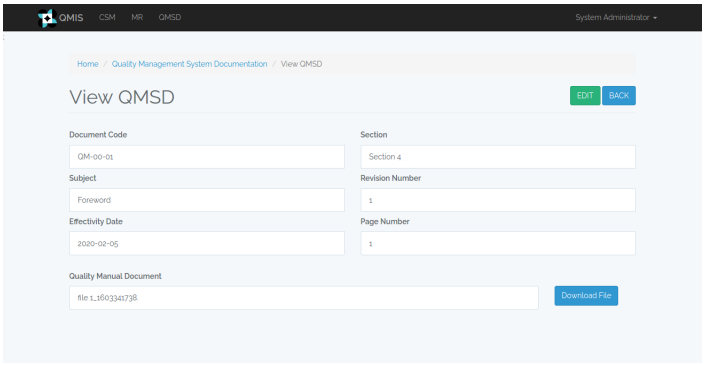

Fig. 48: View an Entry in the QMSD Module

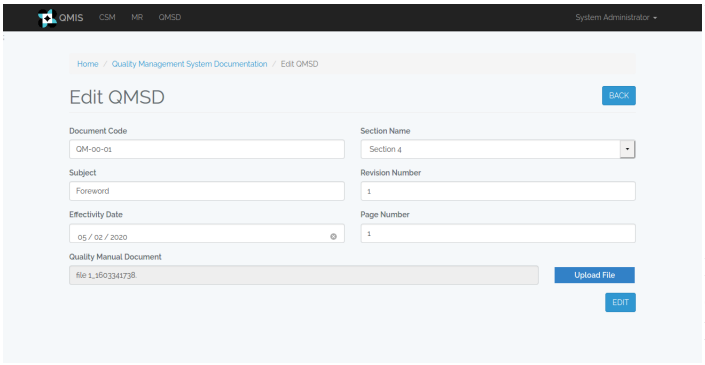

Fig. 49: Update an Entry in the QMSD Module

G. System Usability Scale(SUS) Evaluation

The System Usability Scale is the most frequently used questionnaire to measure the usability of systems and applications. In this study, SUS was used since it is proven to be a method that produces reliable results. After using the system, the respondents answered a 10 item questionnaire with five response options; from strongly agree (5) to strongly disagree (1) The following are the questions included in the survey form:

1) I think that I would like to use this system frequently.
2) I found the system unnecessarily complex.
3) I thought the system was easy to use.
4) I think that I would need the support of a technical person to be able to use this system.
5) I found the various functions in this system were well integrated.
6) I thought there was too much inconsistency in this system.
7) I would imagine that most people would learn to use this system very quickly.
8) I found the system very cumbersome to use.
9) I felt very confident using the system.
10) I needed to learn a lot of things before I could get going with this system.

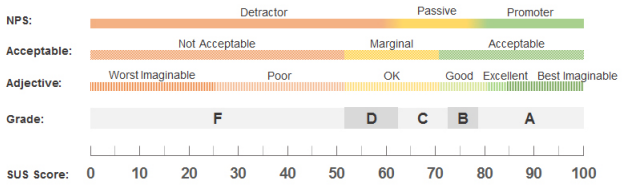

Fig. 50: Grades, adjectives, and acceptability associated with raw SUS scores.

The scores for each question were interpreted by getting the SUS raw score: subtract one from the user responses for odd items and subtract the user responses from 5 to even items in the questionnaire. The only respondent to the survey is Mr. Francis Braquilla III, Director of the DOST IV-A MIS Unit. He gave a score of 62.5. Based on the SUS score measurement (Figure 50), the score gets a grade of D, an adjectival rating of OK and an acceptability rating of marginally acceptable. This also means that the system is considered to be below average since the standard average SUS score is 68.

V. Summary and Conclusions

The developer was able to develop Quality Management Information System for the DOST IV-A regional office. The developer was able to implement the Customer Satisfaction Measurement(CSM) Module that was able to collect quarterly customer satisfaction rating of different functional units. The user was able to view the yearly graphical data of the different functional units of the regional office. The user was able to generate a report which contains the overall summary about the satisfaction rating of the different functional units, the satisfaction rating compared to the previous year and lastly the five year trend of the satisfaction rating of each functional units. The developer was able to develop the Management Review(MR) Module that was able to record all the meetings held that is relevant to the progress of the regional office. This modules disseminate relevant information about the meetings to authorized users. Each entry in the module contains the name of the meeting, its agenda and relevant documents such as minutes of the meeting, the attendance sheet, the action plan of the office and the presentation slides used in the meeting. Lastly the developer was able to implement the Quality Management System Documentation(QMSD) Module that acts as the repository of the the quality manual used by the regional office for easier retrieval of relevant information about the rules and standards of the regional office. The developer conducted a survey that measured the systems functionalities and usability and got a SUS score of 62.5.

VI. Recommendations

The system can be further improved by adding a graphical representation that contains the yearly overall rating of all the functional units and its five year trend for easier data comparison without generating a document. The system can also be improved by adding email or phone number to send notifications whenever there is a new entry to the MR Module

or there are revisions on the quality manual used by the regional office. The system can also be improved by archiving the previous versions of the rules and regulations of the quality manual used by the regional office.

REFERENCES

[1] *Government Information Systems: A GUIDE TO EFFECTIVE USE OF INFORMATION TECHNOLOGY IN THE PUBLIC SECTOR OF DEVELOPING COUNTRIES*, United Nations, 1995.

[2] J. A. OBrien and G. M. Marakas, *Management Information Systems*, 10th ed. 1221 Avenue of the Americas, New York, NY, 10020: McGraw-Hill/Irwin, 2010.

[3] . L. H. C. Olson, M. H., "The impact of office automation on the organization: Some implications for research and practice," *Communications of the ACM*, vol. 25, no. 11, pp. 838–847, 1982.

[4] R. Sudan, "The basic building blocks of e-government," pp. 79–80, 2005.

[5] . O. S. Pasco, R., "Enabling e-government in the philippines: Uncovering gaps and opportunities in policy development," 2017.

[6] W. Bank, "E-development: From excitement to effectiveness." pp. 6–7, 2005.

[7] J. Cho and H. S. Byeon, "Korea's move to e-procurement," *PREM Notes*, no. 90, 2004.

[8] G. N. San Buenaventura, "Openlgu inventory of supplies and materials of local government units," . Undergraduate Special Problem. University of the Philippines Los Baos.

[9] M. Marasigan, "Department of science and technology (dost) iv-a customer relations system," . Undergraduate Special Problem. University of the Philippines Los Baos.