Web Based Document and Services Management System for Geological Survey and Mines Bureau

M.G.M.Maduranga

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Web Based Document and Services Management System for Geological Survey and Mines Bureau

A dissertation submitted for the Degree of Master of Information Technology

M.G.M.Maduranga

University of Colombo School of Computing

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Declaration

The thesis is my original work and has not been submitted previously for a degree at this or any other university/institute.

To the best of my knowledge it does not contain any material published or written by another person, except as acknowledged in the text.

Student Name: M.G.M.Maduranga

Registration Number: 2018/MIT/051

Index Number: 18550514

Signature: Date: 2021-11-28

This is to certify that this thesis is based on the wok of Geological Survey and Mines Bureau Mr. M.G.M.Maduranga under my supervision. The thesis has been prepared according to the format stipulated and is of acceptable standard.

Certified by:

Supervisor Name: Prof. G.D.S.P.Wimalaratne

Signature: Date: 29th Nov 2021

Abstract

The main purposes of developing this web-based application are avoidance of lap of paper works, speed up the file movement in the departments to know the up-to-date status of the files. In addition to that centralized file movement and services management system has been designed for minimizing unnecessary employee movements.

Adoption of such a system will enable the staff to carry out data processing faster and with greater efficiency to the benefit of the client. While fulfilling the requirements of my master's degree individual project, this endeavor in developing a new web-based system will fulfill a greater requirement of the Geological Survey and Mines Bureau (GSMB) by greatly enhancing the level of user-focused data processing.

The first chapter of this document, which includes all the details of the software being developed, describes GSMB and the factors that led to developing this software and its importance.

The second chapter describes the order in which information is collected for software development and the information, so collected is analytically prepared and directed to the user's recommendation. It also describes the functional and non-functional requirements of the software as well as other similar software.

The next step in the thesis is the design of the software. Here the functionality of some of the main functions of the software is shown using the UML diagram.

The implementation chapter focuses on the RDMS and programming languages used to improve the front-end and back-end of the system. It is to be mention of fact that how to use the MVC methodology with PHP, JavaScript, and Java.

The most important part is described here. This includes testing the software and releasing it to users, as well as demonstrating the techniques used. During the testing process, a test plan is prepared and the relevant test cases are discussed. Also, the use of the test automation tool Selenium has been demonstrated.

The last chapter of the thesis outlines the prospects of the author and the additional knowledge that I have gained through software development. Apart from the above, the benefits of the software are also explained. Some additional parts have been added as an appendix document.

Acknowledgement

This effort of my self is not just passing the postgraduate degree, but also to alleviate the grief of the employees of the Bureau for a long time due to the lack of proper software. If their requirement is met through this software, I assume that my attempt became successful.

At the final preparation stages of this project, I would like to thank my loving parents who brought me to this world and my belong wife and three daughters. At the same time, I would like to thank Prof. G.D.S.P.Wimalaratne, a senior lecturer at the University Of Colombo School Of Computing, who helped and guided me to prepare this project comprehensively.

I would also like to thank the Director of the UCSC and all the MIT lecturers of UCSC and Visiting lecturers who give their maximum contribution to make us more knowledgeable in the field of IT. Without their support, I assume that I will not be able to carry out this exercise. Their corporation became strong enough to avoid any problematic issues.

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List of Abbreviations

DG/CEO	Director General/ Chief Executive Officer
Dir	Director
MA	Management Assistant

AD	Assistant Director
SG	Senior Geologist
SDM	Senior Director Mining
SDG	Senior Director Geology
SR	Senior Registrar
KKS	Office Assistant
JM	Junior Manager
DMS	Document Management System
GSMB	Geological Survey and Mines Bureau
HoD	Head of Department
IT	Information Technology
JRE	Java Runtime Environment
ME	Mining Engineer
PHP	Hypertext Preprocessor
RAD	Rapid Application Development
RAM	Random Access Memory
RDBMS	relational database management system
RMT	Registrar Mineral Titling
SMS	Short Messages Service
SQL	Structured Query Language
UI	User Interface
UML	Unified Modeling Language
URL	Uniform Resource Locator
WAMP	Windows, Apache, MySQL, and PHP
WWW	World Wide Web

Chapter 1: Introduction

1.1 Introduction

The Geological Survey and Mines Bureau is the proud successor to a series of geo-scientific departments which span more than a century, starting as the Mineral Survey of Ceylon (MSC) in 1903 headed by Dr.Ananda Coomaraswamy. On 18th March 1993, the Bureau was established through the Mines and Minerals Act#33 of 1992 to combine the functions of the Geological Survey with the new responsibilities of a modern Mines Department (gsmb@gov.lk/*History)*.

GSMS does not maintain a complete computer system for processing documents, and the service does not update records to access required movements. Therefore, the management of the organization looks for a suitable document management system to manage the whole process of the daily workload. The office IT team investigated the DMS systems available on the market. Management was advised on the systems available in the market, these system costs are very high and they contained many usable and unnecessary functions. Then the desktop would have to pay for unnecessary features, including apps that are on the market. Next, management decided to develop an application that would only include office staff requesting functions.

Currently, there is a large movement in the Geological Survey and Mines Bureau (GSMB) to streamline processes and improve current methods of handling processes. As with any business, this effort is difficult without an "information at your fingertips" type of application. A well-designed database for GSMB is a large improvement over the current methods of managing documents, services, and allows quick responses to upper management requests for information used to make business decisions. Several problems with the current mining file management system have been identified. The current system does not benefit from a centralized document record repository or communications platform on which documents are kept and from which statistics and reports can’t be generated.

The new software should increase staff communication by providing a common interface for retrieving and storing information while reducing data redundancy. Furthermore, it will increase employee efficiency by allowing them to focus on their primary job functions rather than data entry.

The Bureau, with its vast computer network and vast knowledge, hopes to disrupt the minimum technological capabilities used by the Bureau and pave the way for a new era of information technology.

The maximum use of new technology should reduce the workload of employees, increase the efficiency of other services they provide, and provide quality service to the public. It can also be a great comfort to top management.

In particular, the software targets some of the more common areas of office documentation and aims to add additional areas depending on its success.

1.2 Aim and Objectives

This proposed system attempts to address several issues that have been faced every day in the working environment in the bureau. The system will include essential modules for avoided all paper works and human movements. Following functionalities and features including in the proposed application.

GSMB has to manage many files and documents for the licensing process. Each request includes multiple file transfers to obtain multiple permits required to issue a mining permit. A particular file may come many times for a particular officer or several other officers. The system will address all movements on the online process.

Currently, all these movements are performed under a manual process. The system proposes all in reference with the proposed system handling will be under computer base system. In this new process, SMS send to the reserving person after completed the reservation process at the vehicle reservation process. It is been sent 2 SMS to the receiver and driver.

If an employee takes a leave, that he or she will have to fill the application and it should be carried to several officers for approval. At that time the relevant officer hasn't been on the seat the applicant should come again and again. This system will address these all steps doing by easy.

This system has been included a high interactive dashboard. The dashboard has facilities that show the current position of file movement. It shows he/she requested service details. Further shows login employee's leave details (taken leaves and balance leaves) and top management that show the summary of all activities.
The System will be given more facilities to generate the various type of reports for the decision-making process and day-to-day work supervising the process. Like

- Daily/monthly handling files details report (Mineral wise/Category wise/District wise/Regional office wise etc.)
- Issued Item reports/ return items reports/ non-return item reports.

- Taken leave report/ balance leave reports/ no pay reports.
- Data analyzing reports. (license issued details/ pending details)

1.3 Scope

The software is expected to be delivered in several stages. It is expected to offer a vehicle reservation module as its first offering. It then hopes to launch the meeting room reservation module, the machine reservation module, and the file transfer module. The leave management module will be launched as the final module here.

There are six major tasks that need to be done to make this project a success. One of the main tasks is to first complete the analysis and then design the software. The UI is then designed and coded and the system is tested at various times. All of this happens and the system report is prepared. Finally, the software with minimal errors is designed to be used by the Bureau.

Basically do not prepare a budget to set up the system, because this system is set up to meet my exam requirement. Other factors include the fact that the Bureau already has enough computers for every employee to use and the Bureau also has purchased fast internet facilities, so there is no significant initial expense.

1.4 Structure of the Thesis

Chapter 2 of the dissertation contains the background of the study. This chapter mainly discusses the current system and its functionalities. Also discusses the similar systems feature compared with the proposed system. Finally, included in the chapter what's the technologies used in the analyzing, designing, and development processes.

Chapter 3 of the dissertation will be included how the system designing, then this chapter has included database design method and diagram, and discusses system functionalities design method and diagrams(sequential diagram, activity diagram, and class diagram) also included use case narratives.

Chapter 4 is the implementation; this implementation chapter deeply describes the tool and technique used for the software development process (frameworks, DBMS). This chapter will include the code practices method, which also consists of hardware and network installation techniques methodologies.

Chapter 5 is the Evaluation; this chapter mainly discusses testing and maintenance techniques and methods. Especially describe all test method handling in the software development process (unit test, acceptance test, integration test, etc.) With test results. The chapter also describes how the system smoothly maintains without bugs and errors.

In the final chapter of the dissertation conclusion, this chapter discusses how future improvement will be given here and what lessons were learned during the period. Also include closing details of the project.

Chapter 2: Background

2.1 Introduction

This chapter discusses basic software development research and analysis, and how these analyze address existing office problems. The functional and non-functional requirements of the system and other similar software are discussed.

2.2 Requirement Analysis

The management of requirements is an important aspect of the project. After the project requirements have been met, they must be examined for any ambiguities that need to be resolved. Next, determine the project's flow. This is followed by a process of system documentation maintenance, analysis, assignment, prioritizing, and agreement on changes.

2.2.1 Information Gathering

We know that it is very important to have all the requirements for the success of this software. For that reason, had to go from different angles and gather information. Efforts were made to collect data relevant to the design of this system, using the knowledge gained at the university.

Following techniques are used in the information gathering phase.

Interviews

Quick answers and prompt clarification of doubts are possible with interviews. In addition, throughout the interview, indirect observations may be made. As a result, the most relevant data was gathered, the requirements were defined, roles and duties were defined, and an understanding of the process and what the proposed system should deliver was gained.

For the collecting information have been interviewed various type of employers of the Geological Survey and Mines Bureau and license holders.

Observations

Also observe the real environment working situation and collection using document to process license issues. Visited several regional offices and sites for watching real world activities of the process.

Collection existing documents

The document handling process included various activities and changing their requirements very short time. Then sometime had been made prototypes for gathering clear requirements.

Research and visit regional offices

Without sticking inside the office, visit the regional office and working sites crew to see the actual environment that they had to work in and to analyze the operational feasibility in the real world. From there, I collected the information that they required to complete their job perfectly. This field visit helps me to identify the behaviors of the customers and what they expect to do work easy.

Prototype

The prototyping was used to identify uncertainties in the proposed system requirements and to ensure that the requirements were correctly defined. The prototype was exhibited to relevant officials, who assisted in verifying that their criteria were correct.

2.2.2 Document Management Process

In the data analysis, diagrams were used to illustrate the flow process of information relevant to selected units. These diagrams will let users know at the outset whether they are meeting their desired needs.

This process is a high required process of GSMB staff. Therefore each license issuing process should handle plenty of documents and movements for completing the whole process. The following Figure 2.1 had me show top level use case diagram of the document management process.

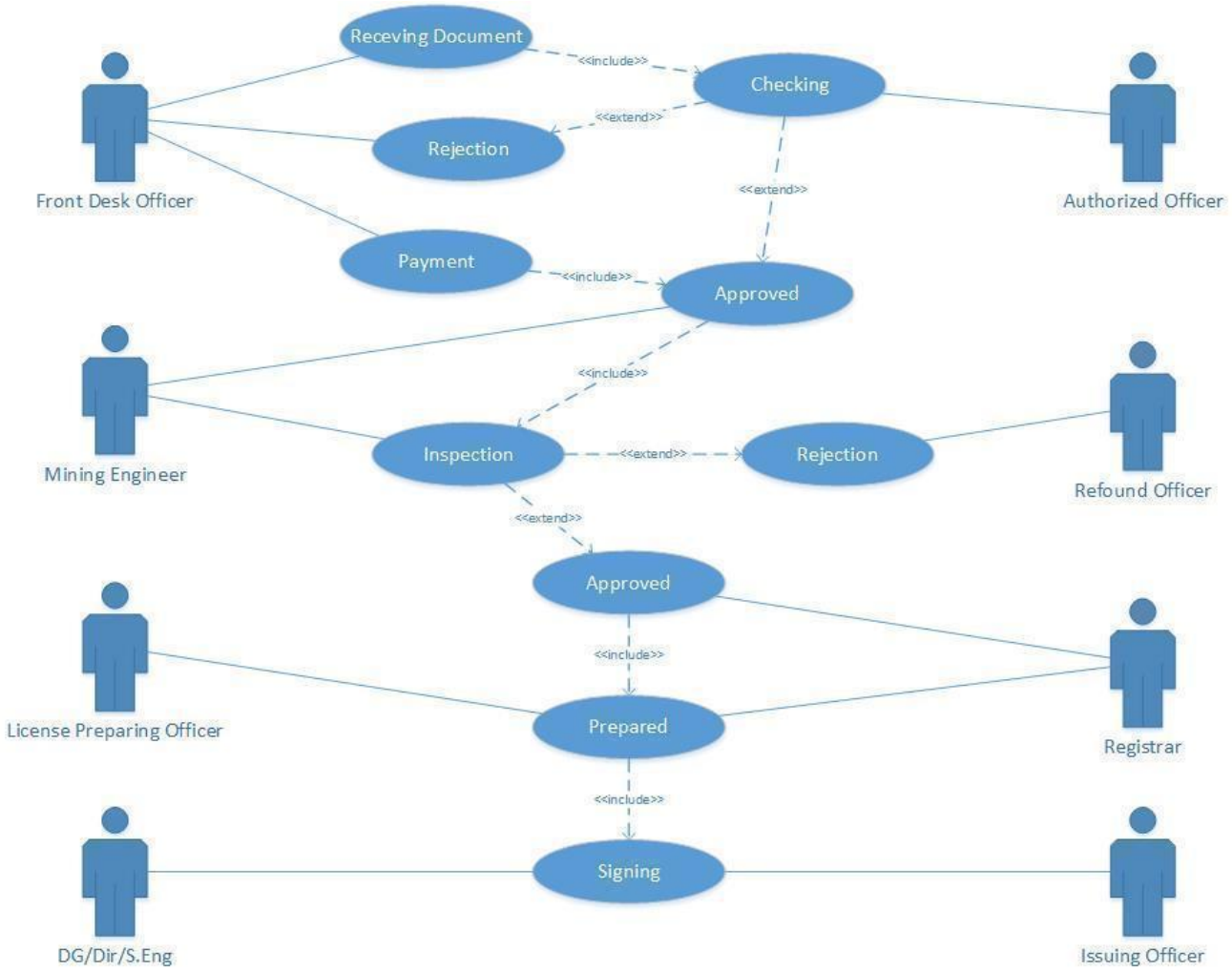


Figure 2.1 Top level use case diagram of document management process

Receiving Document

After receiving a set of documents to the front counter, it should be sent to the registrar for checking correctness and missing attachments. When there are no mistakes or have small mistakes, the registrar gives advice for processing documents to the next step.

Inspection

A registrar decides the application is accepted level, he/she informs the front officer to issue payment voucher and application forward to engineers for inspection. After receiving application engineers visit relevant locations and find technical factors based on client requests. He/she decides the next step of application based on parameters was founded in the inspection.

License preparing

The application was approved by the engineer, and the application sent to the license preparing stage. This stage rechecking application by registrars, application has completed with all relevant attachment and requested information. After he/she satisfies the application condition and recommends preparing a license.

2.2.3 Service and Item Requesting Process

This is a high demand process module in GSMB. Therefore a lot of issues have the current manual document handling process.

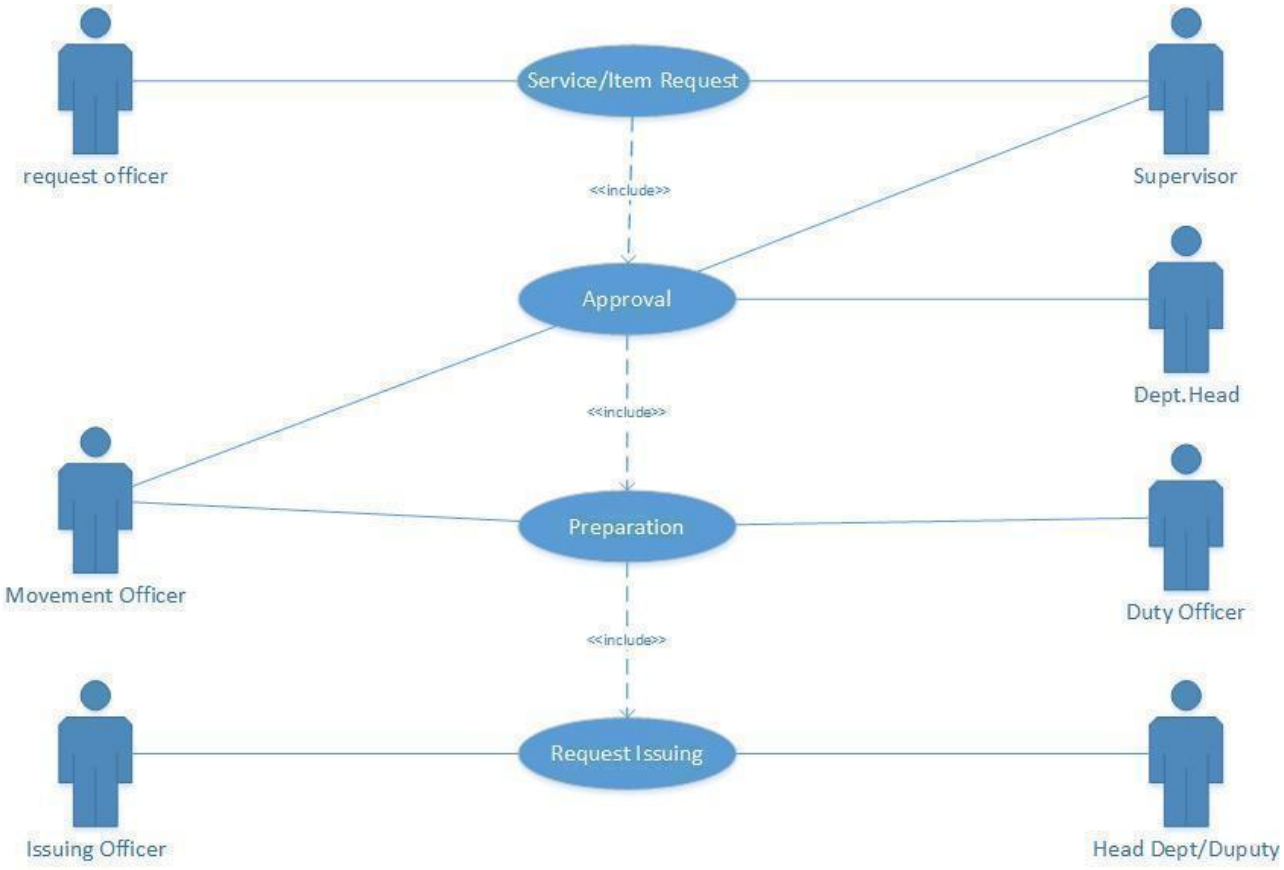


Figure 2.2 Top level Use-Case of service/Items request process

Service/Item request

This is an initial stage of the module, when the employ want to requesting some service(reserve vehicle for any official journey, reserve meeting room, etc....) or requesting any equipment

(Blast mate matching, Projector, etc...) fill the application and it send to his/her immediate supervisor and after he/she signed send to head of department for final recommendation.

Preparation

After receiving a relevant request to the appropriate department/unit they check availability of requirement and inform requested officer current situation of reservation.

Issuing request

If can be issued relevant request, preparing document and issuing request and sent massage relevant party (when vehicle reservation process send message driver of the vehicle)

2.2.4 Leave Management Process

Another requirement identified in the leave management process is to analyze the data collected about that process and draw the following outline.

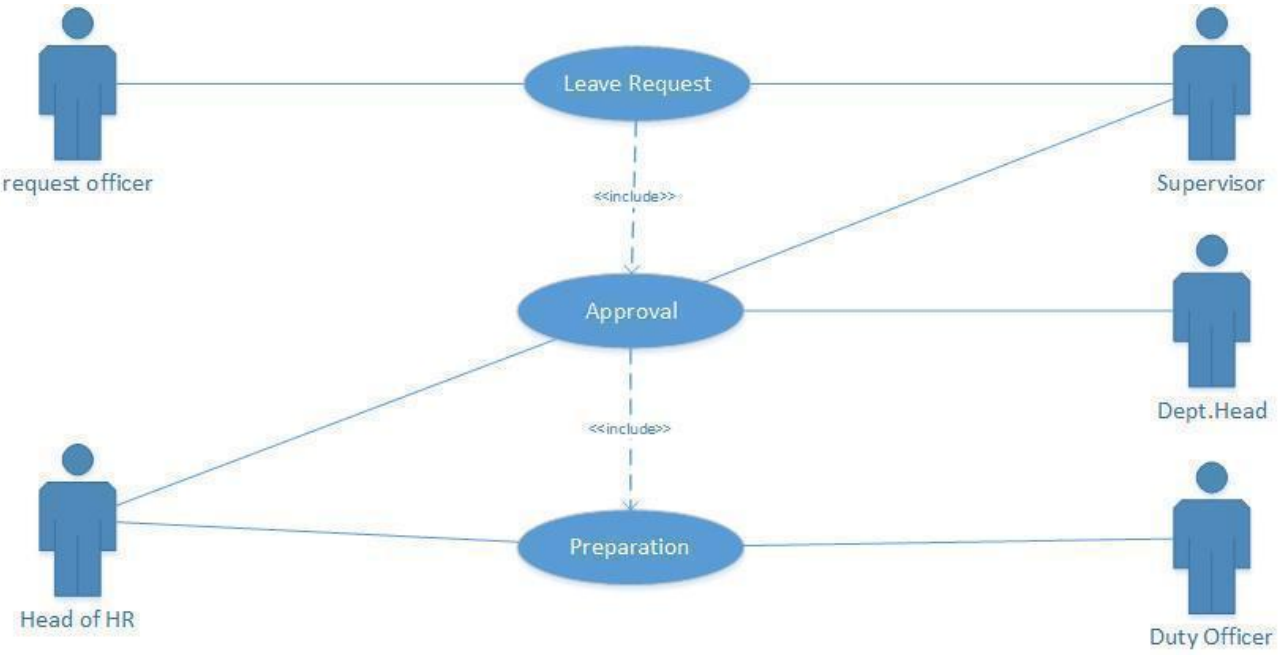


Figure 2.3: Top level Use-Case diagram of the Leave management process

Leave request

This is an initial stage of the module, when the employee wants to take leave to fill the application and it is sent to his/her immediate supervisor and after he/she signed send to the head of department for final recommendation.

Preparation

The leave application received by the HR division is forwarded to the clerk in charge of the subject with the approval of the Director. The subject clerk mentions the application in the relevant book and puts it in the applicant's file.

2.3 Functional Requirements

The analysis prepared at the request of the management and the users concluded that the proposed system development process should build on the following functions, based on the conclusions reached with them.

2.3.1 Document Management Process

- Pending application displays relevant officer login.
- Pending application display head of department.
- Display taking long time for process or delay application
- Can be generate report period wise and region wise

2.3.2 Service/Items Requesting Process

- Display availability of items.
- Pending approvals display appropriate officer
- Auto SMS Send facilities.
- Massage Pop up takes a long time for the process or delay application.
- Must generate reports received applications and issued Items/Services.

2.3.3 Leave Management Process

- Must be display taken leaves
- Monthly and annual reporting

2.4 Non Functional Requirements

2.4.1 Software Nonfunctional Requirements

In the non-functional requirement analysis, ISO9126 - Software Quality Characteristics suggest that…

Characteristics	Sub characteristics	Definitions
	Suitability	The Bureau has employees at different levels and has computers at different generations. This is why suitability is so essential.
	Accurateness	It is the only agency responsible for the earth resources of Sri Lanka and has the most important national and international database. Therefore, the accuracy of the software is extremely important.
Functionality	Interoperability	The proposed software does not typically function in isolation. This software is capable of interacting with existing software in other departments of the Bureau.
	Compliance	The software will be installed in a government institution and will be developed to government standards and regulations.
	Security	The security process will be highly optimized as the system will contain the most valuable data.
	Maturity	This sub-characteristic pertains to the software's failure rate.
Reliability	Fault tolerance	Software's resistance to (and recovery from) component or environmental failure.
	Recoverability	Capability of restoring a broken system to full functionality, including with data and network connections.
	Understandability	Determines the ease with which a system's functions may be comprehended; this metric is used in Human Computer Interaction approaches to link to user mental models.
Usability	Learnability	Effort required for different types of users, e.g. rookie, expert, casual, etc.
	Operability	The software's ability to be simply controlled by a particular user in a certain context.
Efficiency	Time behavior	Determines the reaction time for a particular throughput, i.e. transaction rate.
	Resource behavior	Indicates the resources that have been consumed, such as RAM, CPU, disk, and network.
	Analyzability	This property identifies the capability of the program to determine the underlying cause of a problem.
Maintainability	Changeability	Indicates the amount of work required to alter a system.

	Stability	Indicates a system's sensitivity to change, or the negative impact that system modifications may have.
	Testability	Indicates the amount of work required to validate (test) a system modification.
	Adaptability	Characterizes the system's capacity to adapt to legislative and regulatory changes, as well as managerial choices.
Portability	Install ability	Indicates the amount of work necessary to install the software.
	Conformance	When a minister or a government changes, the organization's choices must adjust to the new circumstances.
	Replace ability	Characterizes the plug and play capability of software components, i.e. how easily a specific software component may be exchanged inside a specified context.

Table 2.1: Non Functional Requirement's

2.4.2 Client Side Hardware Requirement

Highly recommended personal computer or laptop should be consisted following feature or high. Also essential powerful internet connection.

- Processor – i3
- Hard Disk – 500 GB
- Memory – 4 GB (RAM)

Software should be installed mention below.

- Windows 7 or higher
- Code Editor
- My SQL
- PHP
- Java / JRE
- Apache Tomcat server.

2.5 Review of Similar Systems

There are many document management systems on the market. Applications available on the Internet need to be purchased. There are several trial versions available on the Internet, but these versions have only limited functionality. Otherwise, a single function application is not suitable for GSMB, so GSMB requires a combination of multiple applications. The best way is to develop a new application by examining similar software currently available.

2.5.1 OpenKM

OpenKM is one of the most advanced document management systems on the market. This software can do a lot of document-related work as well as Collaborate and project management work. In addition, it is a complete software with a large number of activities including document tracking work.

Although the software has many features, it does not include some important functions in the community edition. The Bureau also has requirements that are not even present in the professional version of this software. Among them are vehicle reservation management software and the process of handling capital items. At the same time the Bureau did not like the software as it would cost a lot of money to buy and maintain the software.

2.5.2 Feng office

Feng Office is a one of open source one most advanced document management systems like the OpenKM. This software also can do a lot of document-related work as well as Collaborate work. This software also has a community version and the functionality of that version is limited. It does not meet most of the requirements of the Bureau. The Bureau did not pay any attention to this as the prices of the registered versions are very high.

2.5.3 LogicalDoc

The Most User-Friendly Cloud based Document Management System in the World. An affordable and secure DMS for small and medium enterprises, it is equipped with special features to secure information. Ease of use is a feature here.

Logical Doc consist in four type of software solution, those are Community, Business, Enterprise and Cloud. The community version has allowed access a few basic features. As with the previous two software, the management of the Bureau did not like this software.

2.5.4 Comparison Table

The table below shows the differences between the 3 software mentioned above and the software ready to be created. This table lists only the essential core functions.

Feature	Openkm	Feng office	LogicalDoc	Propose System
Development Cost	Should be paid	Should be paid	Should be paid	Totally free
Desktop Web Interface	Yes	Yes	Yes	Yes
Mobile Web Interface	Yes	Yes	Yes	Yes
Documents Sharing	Yes	Yes	Yes	Yes
Events Subscriptions	Yes	Yes	Yes	Yes
Digital signature	Yes	Yes	Yes	Yes
Security	Mid	Mid	Mid	High
Workflow	Yes	Yes	Yes	Yes
Dashboard	Yes	Yes	Yes	Yes
Reporting	Yes	Yes	Yes	Yes

Table 2.2: Software Comparison Table

2.6 Related Design Strategies

Without a strategic plan, the goal of the project cannot be achieved. Thus, it is possible to summarize some of the strategies that have been applied for the success of this project. Strategic planning is carried out at the organizational level, guiding corporate strategy and allocating resources for its implementation. Thus, the implementation plan traces its facets and shows how best to implement the strategic plan from the outset and effectively manage it during its implementation.

2.6 Summary

This chapter covers the steps and system requirements for gathering software configuration information. At the same time non-functional requirements are presented in comparison. It also includes information about other software on the market similar to this one.

Chapter 3: Design

3.1 Introduction

Analyze the architectural process required to develop software that best suits the needs of the bureau. Thus, the result documents design considerations that attempt to link the final system to activation. Initially, the plan represents a high-level abstract view of the system. Later, this can be expanded into detailed active and non-functional requirements.

3.3 Selection of Process Model

A simplified depiction of a software process is referred to as a software process model. Each model depicts a process from a unique vantage point. These generic models are the abstractions of the process that can be used to explain different approaches to the software development. The Modeling Language consists of several modeling techniques, which are further supported by a set of diagrams.

3.4 Selection of the Appropriate Process Model

Several factors had to be considered in designing the appropriate process model for the development of this proposed software. Produces functional software rapidly and early in the software life cycle.

Since cost and time constraints play an important role in software development, it is also essential to consider time and cost when selecting a process model. Therefore, the Incremental process model and RAD were at the forefront of software development with this component in mind.

The most essential feature of any process model is to understand the requirements of the project. The same is true in the manufacturing process, so it was considered to select a suitable model. It was found that the prototype and incremental process model were more appropriate.

The other major requirement was user involvement. In this regard, there are three types of prototype, formal and incremental process models. Considering this component, there are three types of prototype, formal and incremental process models.

After considering all these, the **Incremental process model** was finally selected as the most suitable model.

3.6 System Users

A particularly important task in setting up this system was to identify user levels and create system permissions accordingly. The figure below shows the identified major user levels, and there are a few minor subdivisions that will be considered when implementing the system functionality.

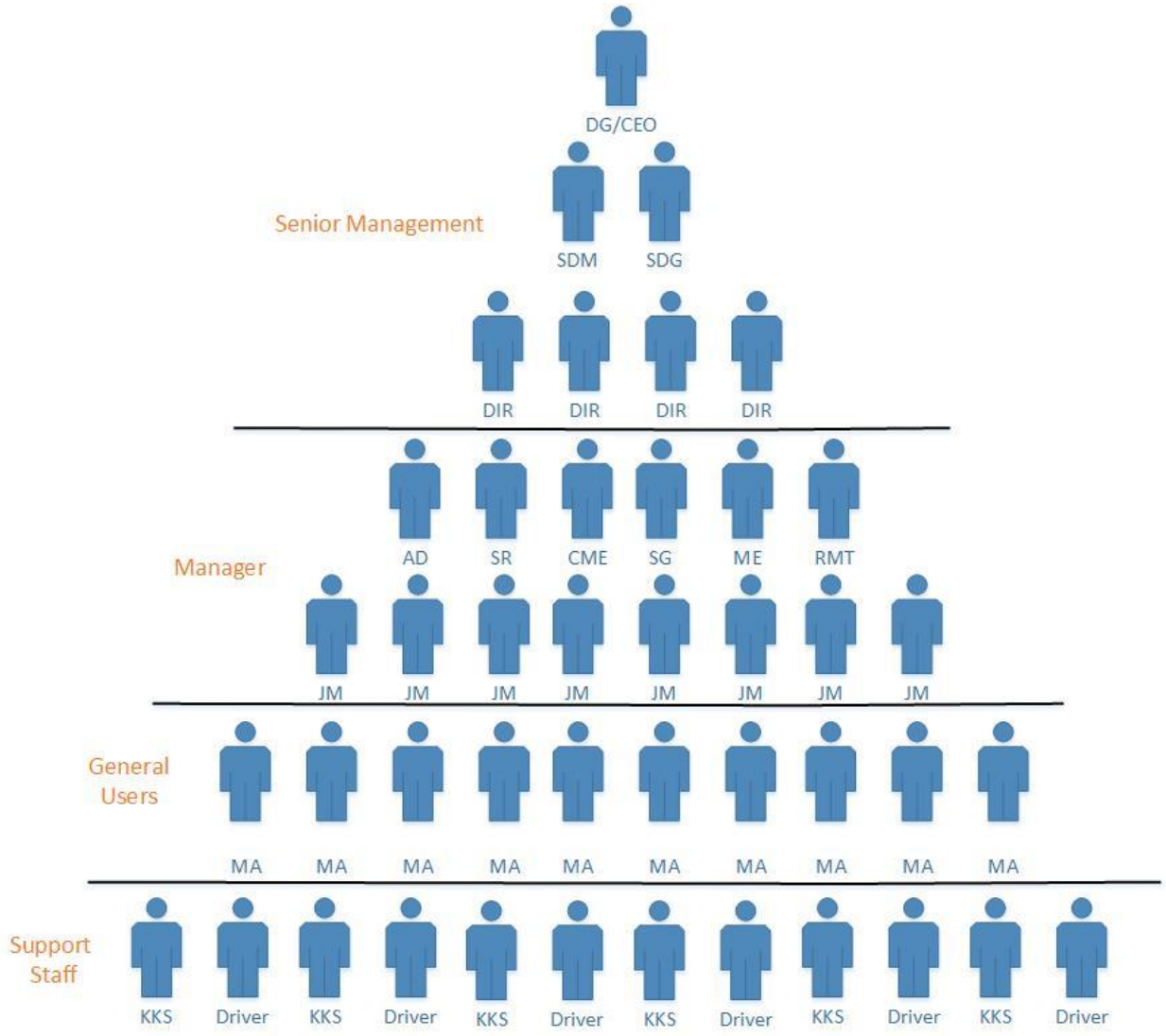


Figure 3.4: Staff hierarchy, privileges level division

Granting of permission to the Bureau takes place at two levels and the first approval is given by a Managing Officer and that approval has to be approved by a higher management level officer.

3.6 Use Case Diagrams

3.6.1 Application Receiving Use Case

The following is an expanded use case diagram of the application receiving use case in the diagram shown in figure 5.

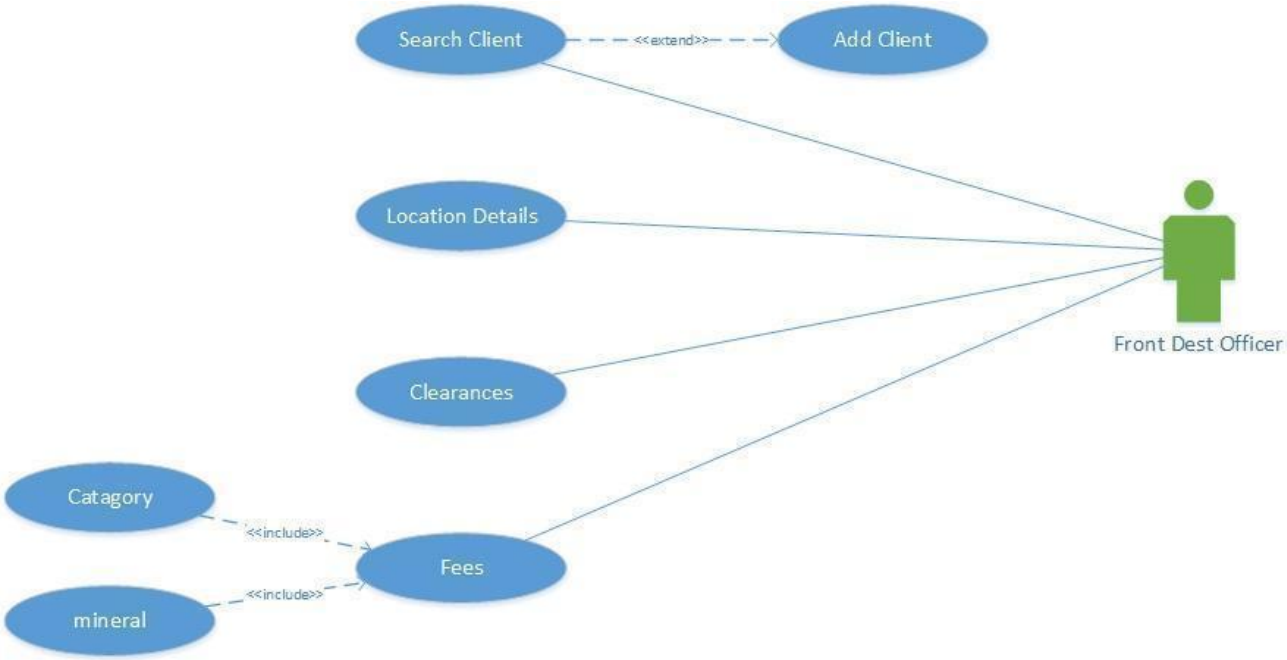


Figure 3.5: use case diagram of application receiving process

The following use case narratives are describes process of each use cases of above diagram.

Use case name	Search client
Main flow	Enter client nic /company brc no. and find client is already registered
Actor	Front desk officer
Pre-condition	Select client type correctly
Extensions	
Post-condition	If client already in system check correctness of inserted data.

Use case name	Add client
Main flow	• Insert client nic/brc no • Insert name and other requerd details • Submit form
Actor	Front desk officer
Pre-condition	No client in the system
Extensions	
Post-condition	After submitted pop up submit completed

Use case name	Location details
Main flow	• Insert mining province, district, ds division, gn division, village name and land name of the relevant location. •
Actor	Front desk officer
Pre-condition	Find ds and gn already in the system
Extensions	
Post-condition	Should not leave without submit

Use case name	clearances
Main flow	Select institutes which was needs recommendation
Actor	Front desk officer
Pre-condition	Should be identified what's institutes recommendation will be need to process
Extensions	Defend on mineral type and license category and location condition for this use case.
Post-condition	Should be included facilities to insert data after receiving clearance latters from the relevant institutes

Use case name	Fees
Main flow	• Insert required mineral in the application • Select required category of the application
Actor	Front desk officer
Pre-condition	Select correct mineral and category are required by the client
Extensions	
Post-condition	Calculated voucher printed.

3.6.2 License Preparing Use Case

The following is an expanded use case diagram of the license preparing use case in the diagram shown in figure 6.

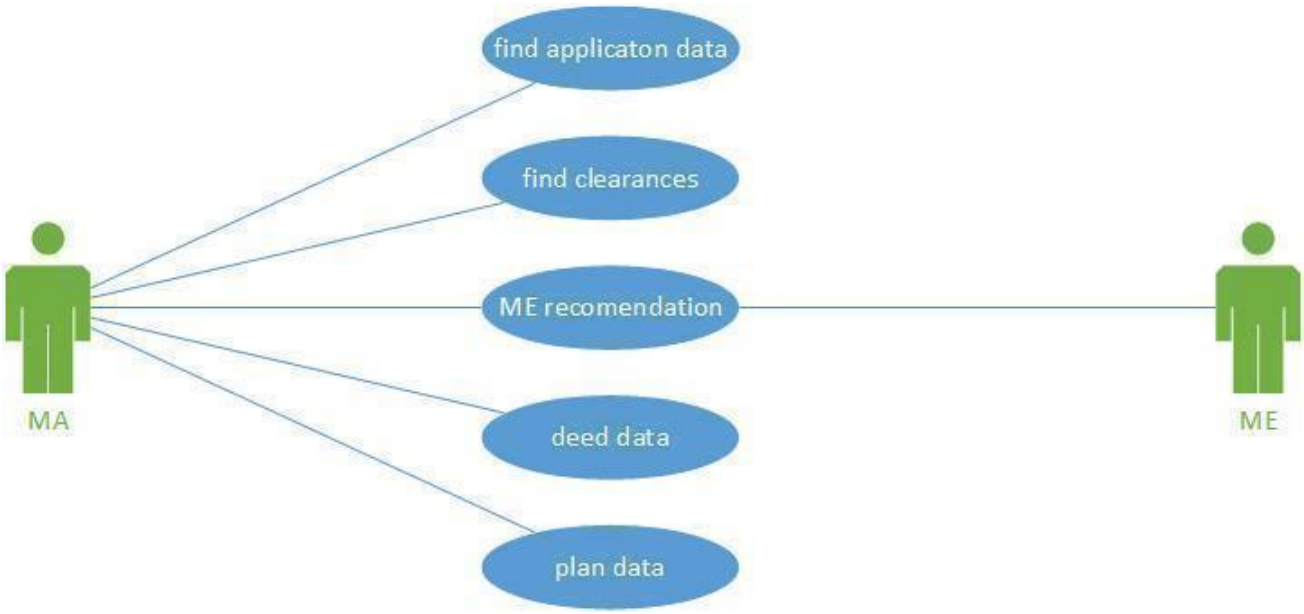


Figure 3.6: Use case diagram of license preparing process

The following use case narratives are describes process of each use cases of above diagram.

Use case name	Find application data
Main flow	Check availability of request application in the system Check correctness of the given data by the applicant
Actor	License preparing officer
Pre-condition	Application should be early inserted
Extensions	
Post-condition	If already existing move next step.

Use case name	Find clearances
Main flow	Find all relevant clearance latters are received Find the received latters validity Find the clearance latters conditions
Actor	License preparing officer
Pre-condition	Should be added later send details.
Extensions	
Post-condition	Start license preparing

Use case name	ME recommendation
Main flow	Find first application approved or rejected from the ME Should be inserted all conditions are given by the ME
Actor	License preparing officer
Pre-condition	Site had been inspected
Extensions	
Post-condition	Do license preparing process

Use case name	Deed data
Main flow	Insert all relevant details are required in license paper.
Actor	License preparing officer
Pre-condition	Find the recommendation certification of the registrar
Extensions	
Post-condition	Do preparation

Use case name	Plan data
Main flow	Insert all relevant details are required in license paper.
Actor	License preparing officer
Pre-condition	Check real lot no is mention in the plan
Extensions	
Post-condition	Continue license preparing process

3.6.3 Service Requesting Use Case

The following is an expanded use case diagram of the service request use case in the diagram shown in figure 7.

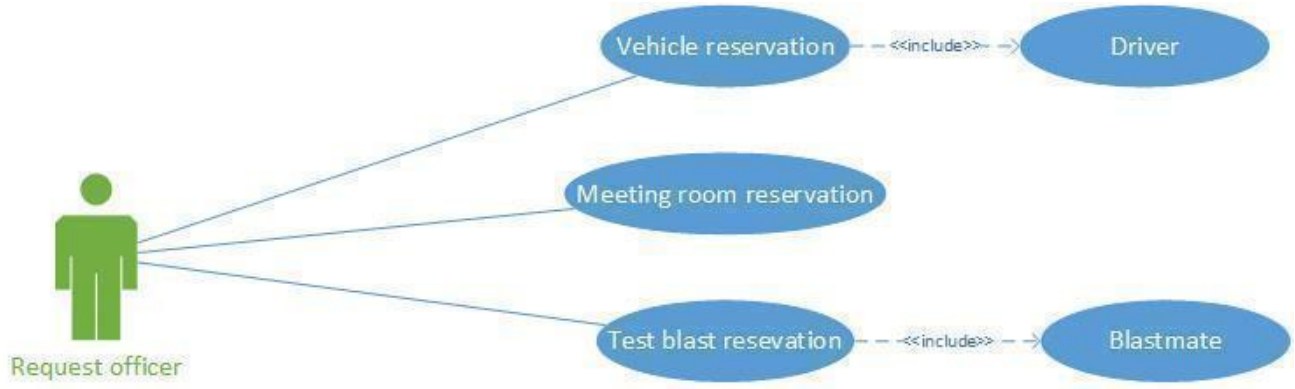


Figure 3.7: Use case diagram of services requesting process

The following use case narratives are describes process of each use cases of above diagram.

Use case name	Vehicle reservations
Main flow	Check the availability of request vehicles type on relevant date and time If available fill relevant field and send request to respond officer
Actor	Request officer
Pre-condition	Should be available vehicles
Extensions	
Post-condition	Feedback of the process are completed

Use case name	Meeting room reservations
Main flow	Check the availability of request meeting room on relevant date and time If available fill relevant field and send request to respond officer
Actor	Request officer
Pre-condition	Should be available reasonable meeting room
Extensions	
Post-condition	Reservation successful feedback

Use case name	Test blast reservation
Main flow	Check the availability of request engineers and blastmate matching on relevant date and time If available fill relevant field and send request to respond officer
Actor	Request officer
Pre-condition	Should be available blastmate and more than two mining engineer.
Extensions	
Post-condition	Send massages relevant mining engineers.

3.7 Class Diagrams

The class diagram related to the software being developed is shown below. This image shows only the classes identified from the information received during the data collection process. These may increase as the software progresses.

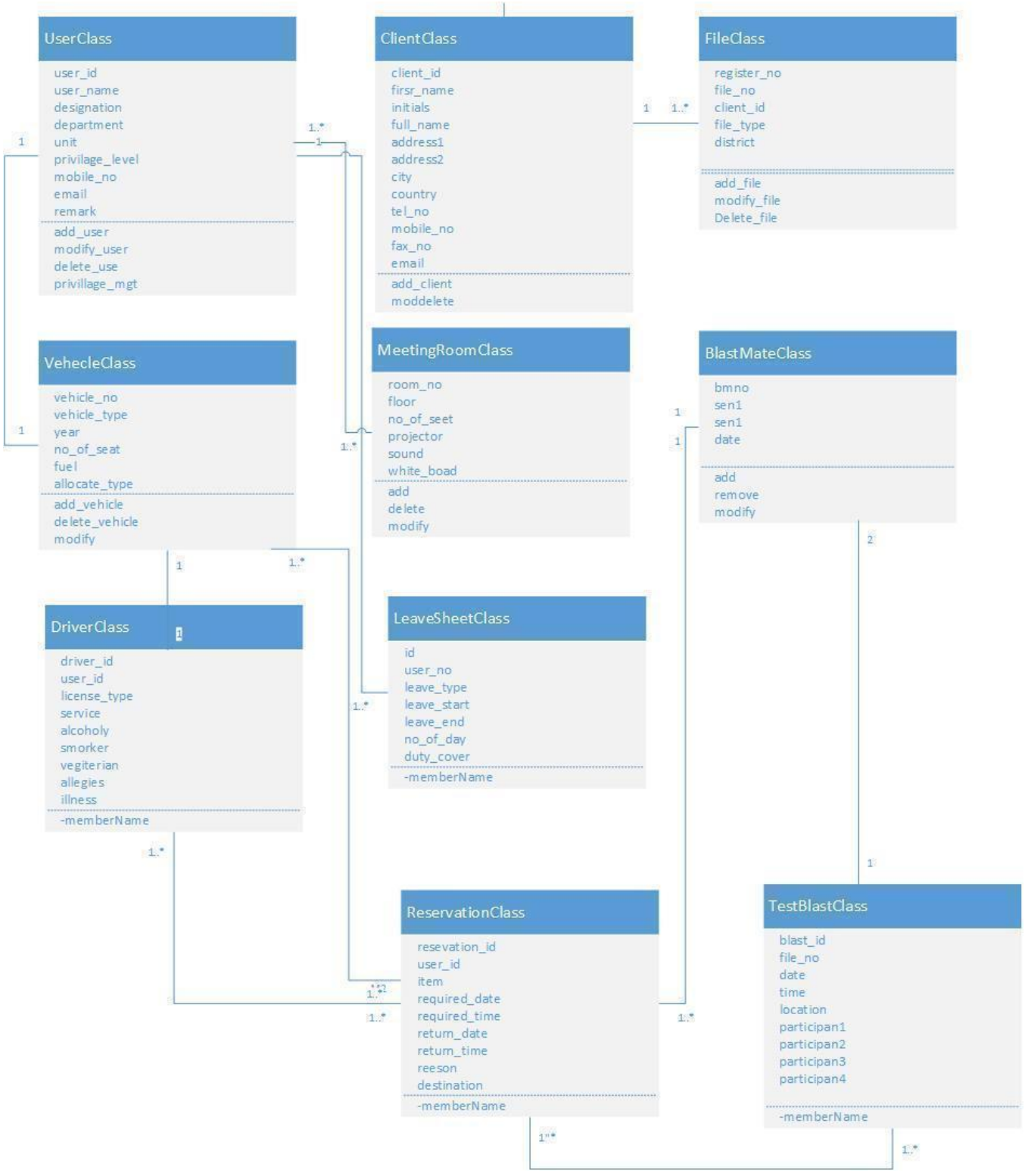


Figure 3.8: Class diagram of the full system

3.8 Extended Entity Relationship Diagram

EERD is a diagram that displays the relationship of entity sets stored in a database. In other words, EER diagrams help to explain the logical structure of databases. These diagrams are created based on three basic concepts: entities, attributes and relationships. The EER diagram related to the software being developed is shown below.

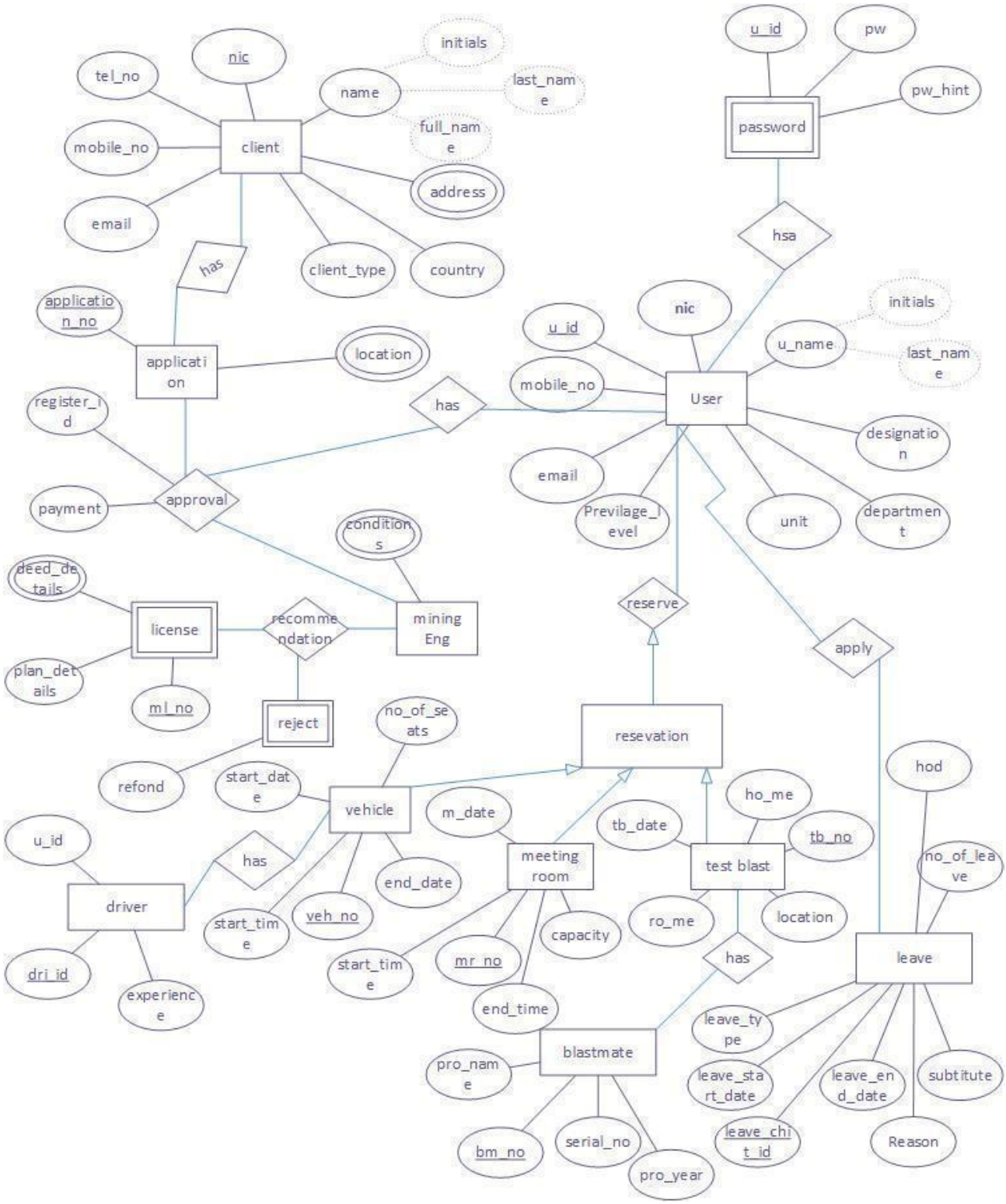


Figure 3.9: Extended Entity Relationship diagram of the full system3.9 Sequence diagrams

3.9 Sequence Diagrams of Document Management Process

UML Sequence Diagrams are interaction diagrams that illustrate the flow of processes. They document the interaction between items throughout a collaborative effort. Sequence Diagrams are time-based and visually depict the sequence of an interaction by utilizing the vertical axis of the diagram to represent time and the messages delivered and received. Below is a sequential diagram of the Document Management function, which is a key component of this software.

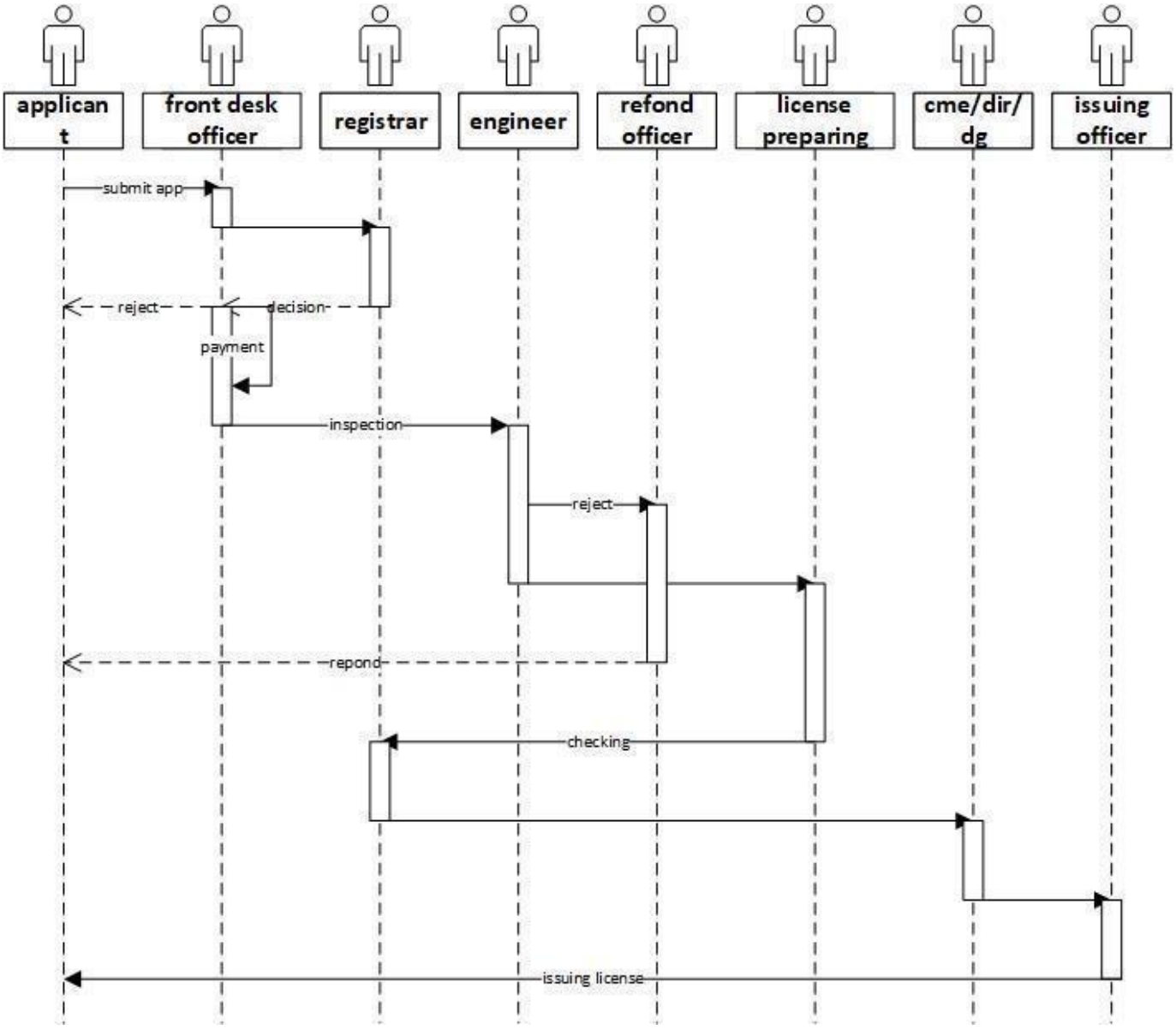


Figure 3.10: Sequential Diagram of the document handling process

3.10 Activity Diagram

Below is the Activity Diagram of the vehicle management module of the system, as a Activity diagram can provide a better understanding of decisions making points and routes.

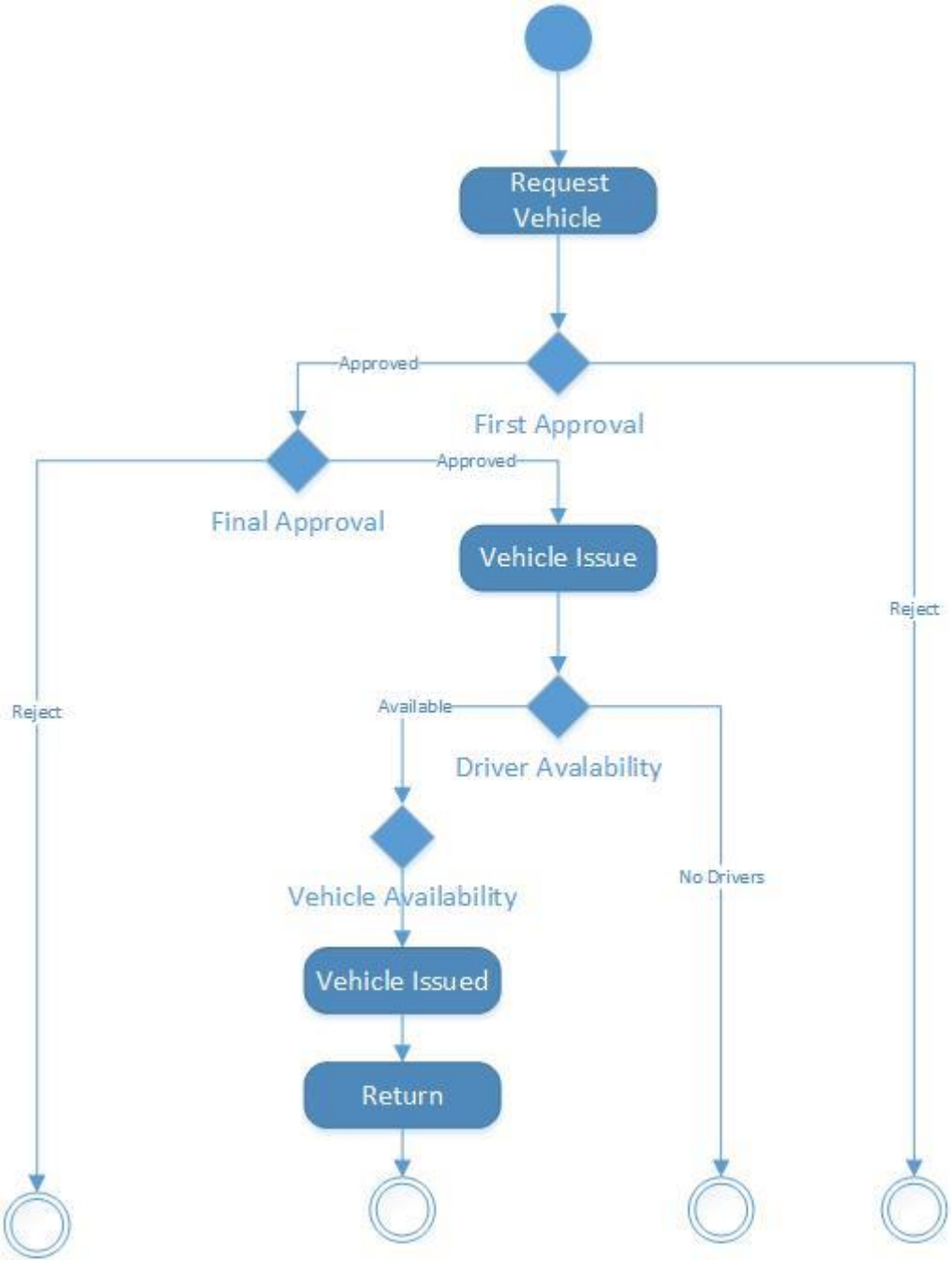


Figure 3.11 Activity diagram of vehicle management system

3.11 Component Diagram

The UML component diagram depicts the arrangement and wiring of a system's physical components. Component diagrams are frequently used to assist in modeling implementation details and to ensure that planned development covers all aspects of the system's necessary functions. The following is one such component diagram created for this system. This diagram is created in MVC format.

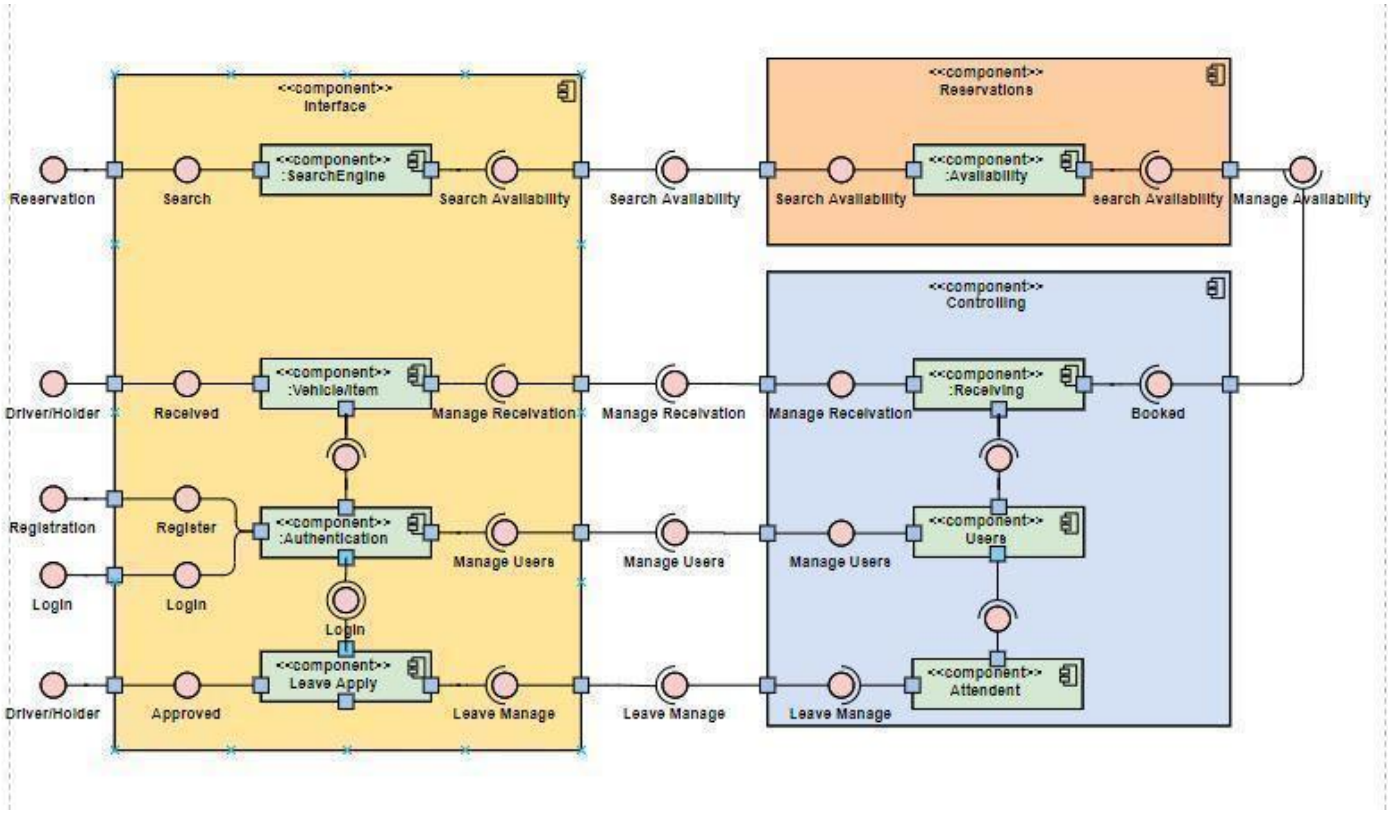


Figure 3.12: Component diagram of the system

3.12 UI Design

Attempts were made to create several user interfaces for each function for the convenience of the users. Some of the content UI of the system are shown in this section and the rest of the UI are in the appendix.

3.12.1 Component 1 – Vehicle Management Process

Several sample interfaces related to this design are included in this paragraph and the rest are included in the appendix A and the main points of this paragraph should be included in this paragraph

. Incremental development process tries to release vehicle management process as a first increment. This process mainly included login function, staff registration function, vehicle registration process and vehicle reservation process.

Login process

Figure 3.13: Login interface of the system

GSMB employees can log on to a system where a user account has already been created. If the member does not have a user account, they can click the Register Now button and create a new account by filling in the appropriate information in the registration window.

New User Registration

Following interface is allowed to create new user account. When you press sing up now in the interface above figure 12, pop up the following interface.

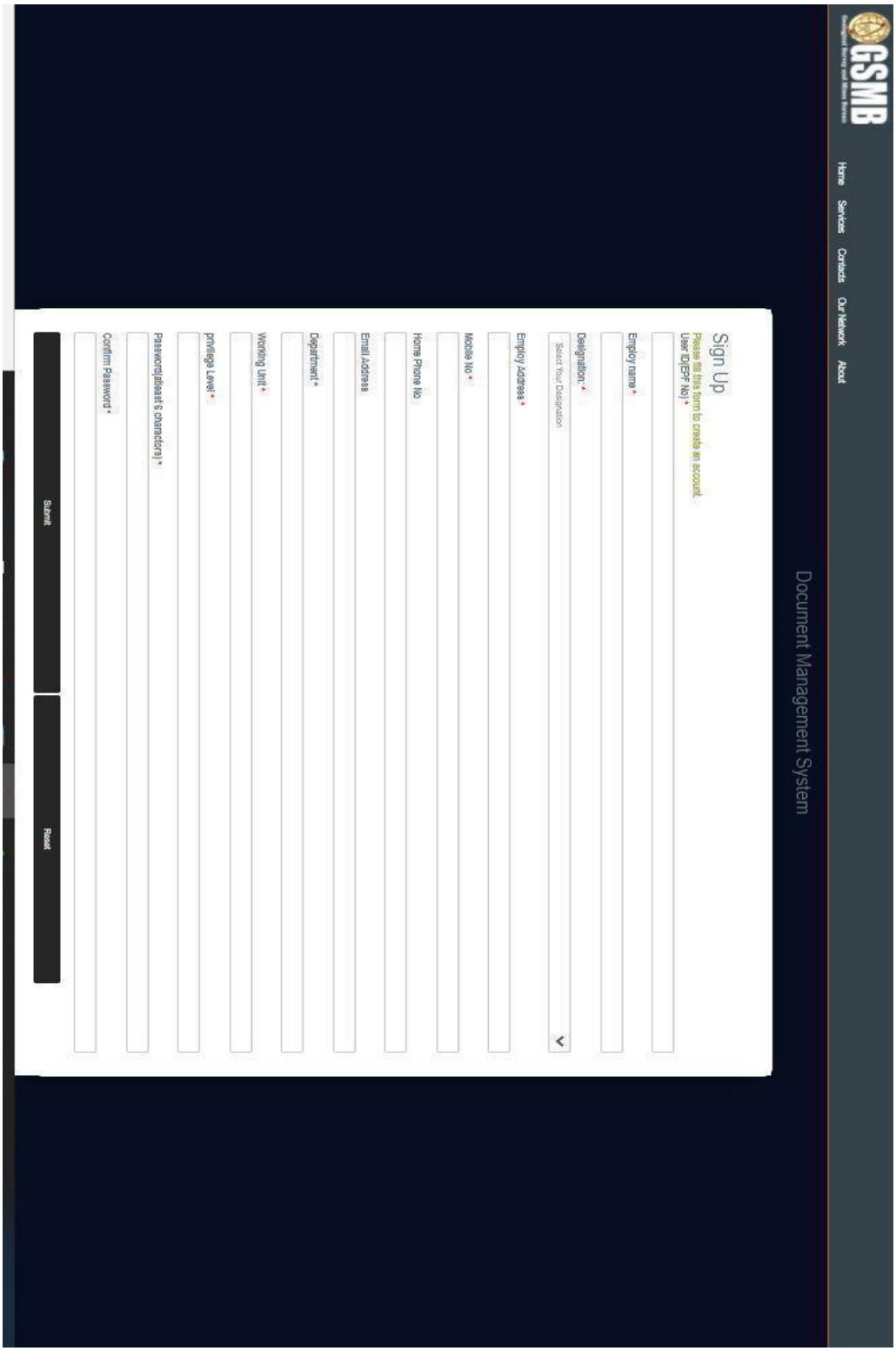


Figure 3.14: Sing up Interface (User registration)

Vehicle registration process

The following is the interface for entering data in the system vehicles, and it is hoped to create a similar interface to enter other capital items data.

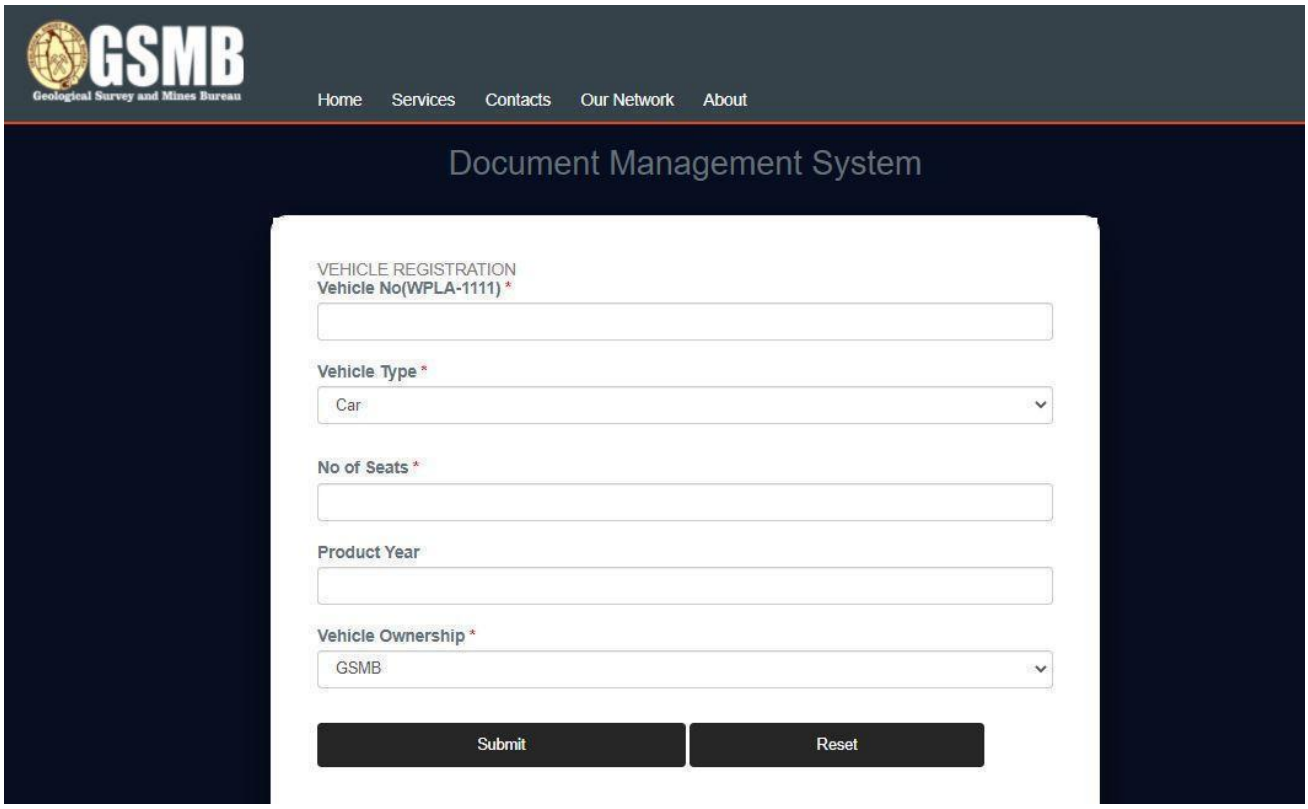


Figure 3.15: Vehicle registering interface

Top management dashboard

An attractive dashboard adds great value to the software and offers a number of functional and nonfunctional benefits. They include accessibility, and usability. The figure below shows the dashboard created for the top management of this system. This page shows briefly illustrated daily as well as annual reports.

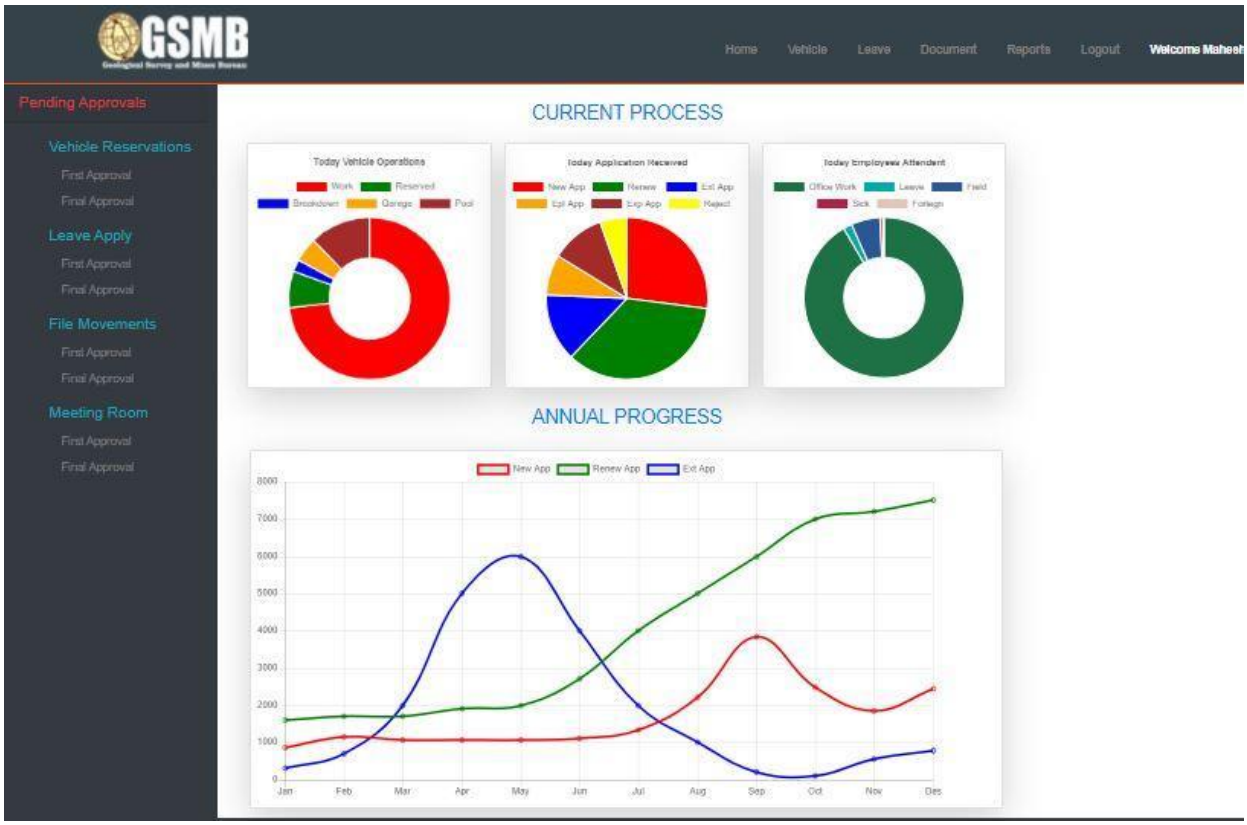


Figure 3.16: Vehicle reservation Interface

Management reports

The software can be generating many reports that are important for management to make decisions. The following is one such report. Figure 4.17 below gives important information about the distance traveled by one vehicle during the year and the cost of getting to the vehicle during the year up to the report.

Geological Survey and Mines Bureau

Annually Travel Details(Vehicle wise)

Download PDF

Vehicle No	Vehicle Type	Product Year	Travel Days	Traveling Km	Ideal Days	DreakDown Days	Fuel Coast
WPLA-1578	Cab	2018	260	13000	103	2	219,000.00
WPLA-1551	Cab	2018	289	13480	71	5	235,060.00
WPLA-1470	Cab	2018	266	12469	96	3	248,500.00
WPLA-1650	Cab	2018	232	12739	123	10	214,970.00
WPGN-5790	Cab	2015	272	10247	87	6	138,245.00
WPGN-6845	Cab	2015	235	8452	112	18	168,300.00
WPKD-4589	Lorry	2017	164	5752	198	3	129,420.00
WPKA-4698	Car	2015	310	14578	48	7	165,480.00
WPKA-4600	Car	2015	268	3850	48	49	52,735.00
250-1008	Lorry	2005	108	5705	242	15	96,450.00

Figure 3.17: Annual vehicles travel detail report

3.13 Chapter Summary

This design chapter covers pages 18 to 34 and contains many diagrams that will help you to create software. Among them is the Use Case diagrams, Extended Entity Relationship Diagram, Class Diagram, and sequence Diagram. At the same time there are some UI designs included.

Chapter 4 –Implementation

4.1 Introduction

This chapter discusses the key method and technique used to design and implement the process of the development life cycle and includes a reflection on the justification and limitations of the methods used and the theoretical status of the identified problems. Also, the chapter has detailed the process of designing, planning, and implementing this project and the methodology utilized to undertake this project.

4.2.1 Choice of Methodology

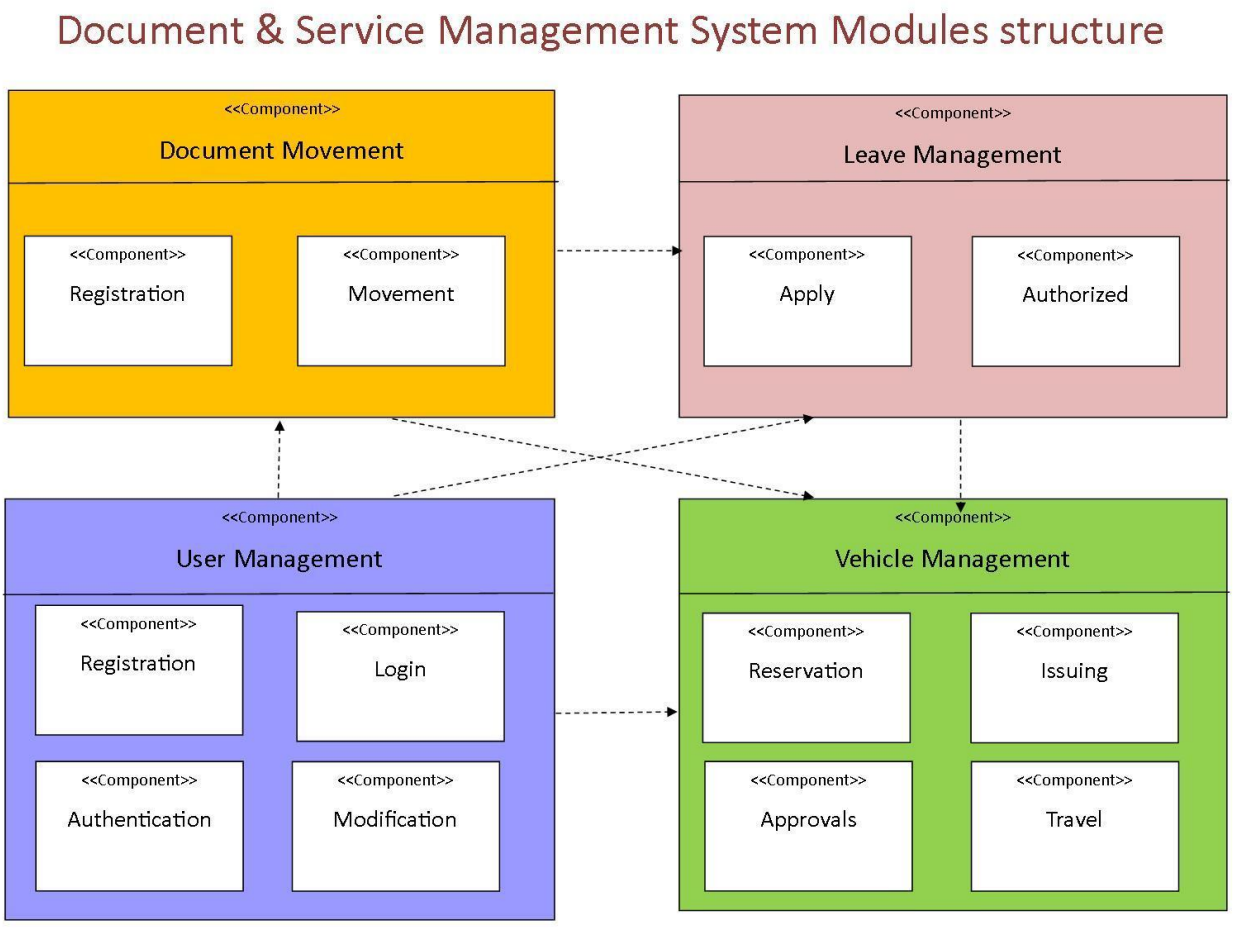


Figure 4.1: Module structure of the System

When assembling the first requirement for developing this software, it is understood that this system has many components that need to be integrated. After all the requirements were lined up, the 4 most essential models were selected. Figure 4.1 above shows the interrelationships

between the 4 modules. The UML diagrams showing the requirements flow and results obtained for these models are included in the Design chapter.

PHP is the main programming language used in developing this software. The main reason for this is the recognition of PHP as the most sensitive and fastest language for web services in web-based software development.

A framework was used to quickly complete the software. Selected for this is the 4th version of Codeigniter, a cross-platform framework containing MVC. The main purpose of using Codeigniter 4 was to have a very large pre-defined library and to be integrated with the PHP language.

4.3 Source Code

There is a large amount of code in the software development, for example a very small amount was included in this chapter additionally some of special code samples are included in the appendix B.

4.3.1 Controller Class

The system used codeigniter4 in the development and the lines of codes on its page are below. Due to the use of MVC architecture code set has three separate's parts then the following is a list of code set in controller class.
The following set of code is used for the user input validation process.

```
$rules = [
        'epf_no' => 'required|min_length[2]|max_length[4]|numeric',
        'pw'=> 'required|min_length[6]|max_length[16]',
      ];
```

The following series of codes shows the process of connecting to a data variable.

```
$epf_no = $this->request->getVar('epf_no');
$password = $this->request->getVar('pw');
$userdata = $this ->loginModel->verifyEPF($epf_no);
```

The following codes show how to transfer data to a database.

```
$logininfo=[
                    'epf_no' => $userdata['epf_no'],
                    'agent'=> $this->getUserAgentInfo(),
                    'ip'=> $this->request->getIPAddress(),
```

4.3.2 Model Class

The next stage in MVC architecture methodology is the model class. The M symbol calls as the Model class. In this section, the connection between the controller class and the database and the database and view is established.

By entering the codes related to the database in a separate class, it is possible to use that data from any other class, which makes coding easier.

```
public function veh_issue_pending(){
   $db = \Config\Database::connect();
   $builder = $this->db->table('users');
   $builder->join('veh_receive_issued','users.epf_no = veh_receive_issued.epf_no');
   $builder->where(['veh_receive_issued.status2'=>'Approved']);
```

4.3.3 View Class

The V symbol for MVC architecture stands for View. Here the view allows the user to interact with the system. This view helps the user to see the information in the system. View provides the user's requirement to the controller class, which builds the required logic and delivers it to the Model class. The Model class will then retrieve the information from the database and transfer it to View. Below are some of the codes in the view class.

```
<?= form_open(); ?>
        <div class="right">
         <?php if(isset($validation)):?>
          <div class="alert alert-danger">
           <?= $validation->listErrors(); ?>
          </div>
         <?php endif; ?>
            <div class="formbox text-info p-4">
               <h3 class="title text-primary">User Login </h3>
               <p>Please fill in your credentials to login<p>
               <div class="form-group ">
               <label>User Id:</label>
               <input type="text" name="epf_no" class="form-control" placeholder="Online">
               <span class="help-block"></span>          </div>
               <div class="form-group ">
               <label>Password:</label>
               <input type="password" name="pw" class="form-control"  placeholder="*******">
               <span class="help-block"></span>
               </div>
               <div class="form-group">
               <input type="submit" class="btn btn-primary" value="Login">
               <p>Don't have an account? <a href="<?= base_url(); ?>/Registration">Sign up
now</a>.</p>
               </div>
            </div>
        </div>
           <?= form_close(); ?>
```

4.3.4 Scripting Method

JavaScript language is often used for scripting in software development. In this case, too JavaScript was used many times and one of them is given below.

```
<script type='text/javascript'>
  $(document).ready(function(){

   $('#sel_user').change(function(){
        var data = {
            'epf_no':$('.epf_no').val();
        };
        $.ajax({

          method: 'POST',
          url:baseURL('/vehicleissue/FindAvailableDriver'),
          data: data,
          success: function(response
    });
  });
 });
 </script>
```

4.4 Database Management

The most valuable part of the software is its backend or database. The developer has paid close attention to this process. MySQL RDBMS was used because of its ease of data management and ease of implementation for Web Services.

The SQL language was used to manipulate data into the database. Below is a SQL code segment used to create a View.

```
select `r`.`id` AS `id`,`r`.`epf_no` AS `epf_no`,`r`.`distination` AS `distination`,`r`.`route` AS `route`,`r`.`reason` AS `reason`,`r`.`rq_date` AS `rq_date`,`r`.`rt_date` AS `rt_date`,`r`.`part` AS `part`,`r`.`remark` AS `remark`,`r`.`status1` AS `status1`,`r`.`status2` AS `status2`,`r`.`driver_id` AS `driver_id`,`r`.`vehicle_id` AS `vehicle_id`,`r`.`i_datetime` AS `i_datetime`,`r`.`i_office` AS `i_office`,`e`.`name` AS `name`,`e`.`desi` AS `desi`,`e`.`dept` AS `dept`,`e`.`unit` AS `unit`,`e`.`s_unit` AS `s_unit` from (`dmsgsmb`.`veh_receive_issued` `r` join `dmsgsmb`.`users` `e`) where (`r`.`epf_no` = `e`.`epf_no`)
```

The diagram below shows the system data table structure.

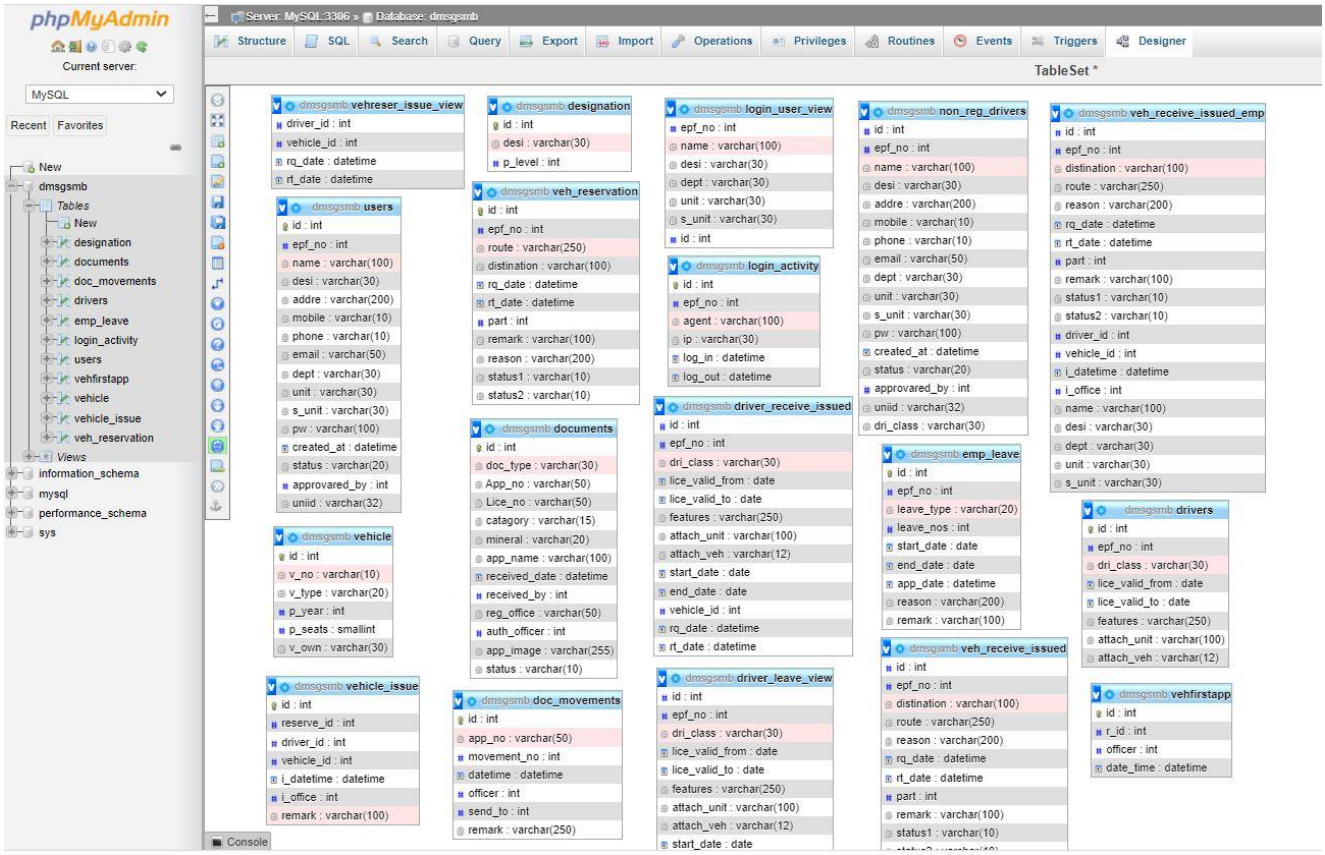


Figure 4.2: Table structure of the System

4.5 Chapter Summary

This implementation paragraphs consist in 6 pages, and discusses the methods of manipulating data systems and code writing methods used in software development.

Chapter 5: Testing and Evaluation

5.1 Introduction

The testing phase in software development is very unique. If this process does not work properly, the entire software will have to be discarded. Many software developers spend more time on this stage because of its uniqueness. Software testing is done at different levels and by testing it correctly in those stages a good software can be produced. As maintenance signs of progress and existing systems improve, a significant amount of testing is required to validate systems after making changes. It is therefore important to explore its potential. The main purpose of software testing is to learn about software errors before the user detects them.

5.2 Testing Methodology

Testing is a very important part of getting successful software into the hands of users. This evolving software is being tested by three major processes. And other sub levels.

- **Functional Testing**
- **Non-Functional Testing**
- **Maintenance Testing**

5.3 Functional Testing

Under the functional testing process, the testing phase was conducted according to a test plane. The testing plane is used to get a sound idea of the weight of the testing phase and order each function according to the priority. Then develop test cases for each function and report them for further use.

5.3.1 Test Plan

For this system, a test plan that covers the system was developed and a specific approach to project testing was developed. Followings are the objectives of developed test plane.

- Develop a comprehensive test plan that describes the nature and scope of the tests that are deemed necessary to achieve the project's test objectives, including software and hardware requirements.
- Organize an orderly agenda of activities, identify equipment and organizational provisions, define test methods and strategies to be used, and determine what to deliver.

The following is how the checks were performed on the user registration process.

	Function	Testing Procedure	Expected Output	Propriety
01	Submit blank form	Control blank record entering	Pop up error message all require fields	High
02	Epf_no validation	Inserting various type numbers	Pop up error message until correct type	High
03	Validate email address	Insert wrong email address	Ask to enter real format email address	Medium
04	Phone number validation	Insert incorrect Phone numbers	Warn the user as Incorrect no	High
05	Submit form with correct details	Insert Correct facts	Submit successful	High

Table 5.1: Registration control test plan

The following is how the checks were performed on the user login process.

	Function	Testing Procedure	Expected Output	Propriety
01	Login to the system without Username or Password	Do not insert any credentials	Ask to enter Username and Password	High
02	Login to the system without Username	Insert Password only	Ask to enter Username	Medium
03	Login to the system without Password	Insert Username only	Ask to enter Password	Medium
04	Login to the system with incorrect credentials	Insert incorrect credentials	Warn the user as Incorrect credentials	High
05	Login to the system with correct credentials	Insert Correct credentials	Login to the system	High

Table 5.2: Login control test plan

The following table show how vehicle reservation process test plan is.

	Function	Testing Procedure	Expected Output	Propriety
01	Submit Blank form	Do not submitted blank details	Pop up error message	Medium
02	Submit blank with required fields	Do not null required fields	Pop up error message	High
03	Add unregister user credentials	Do not issue vehicle un employees	Auto load logged user details	Medium
04	Selecting passed require date	Do not insert non valid dates	Warn the user as Passed date	Medium
05	Select already received driver for tour	Can be only select vacant drivers	No permission	High
06	Select already received vehicle to tour	Can be only select vacant vehicle	No permission	High

Table 5.3: Vehicle reservation process test plan

The following table show how is leave manage process test plan.

	Function	Testing Procedure	Expected Output	Propriety
01	Submit Blank form	Do not submitted blank details	Pop up error message	High
02	Submit blank with required fields	Do not null required fields	Pop up error message	High
03	Add unregistered user credentials	Do not enter non registered user	Auto load logged user details	Medium
04	Selecting early applied leave dates	Do not repeated records	Warn the user as Already applied	Medium

Table 5.4: Leave manage process test plan

Following table is mention test plan of the document handling process

	Function	Testing Procedure	Expected Output	Propriety
01	Submit Blank form	Do not submitted blank details	Pop up error message	Medium
02	Submit blank with required fields	Do not null required fields	Pop up error message	High
03	Submit blank without application no fields	Do not null application No field	Pop up error message	Medium
04	Submit without regional office	Do not null regional office	Pop up error message	Medium

Table 5.5: Document handling process test plan

5.3.2 Test Cases

After developing the test level, then it is necessary to start the test process according to the plan. Each function in the test plan can be a unique test case. But here are some examples of test cases generated under a test plan segment.

Following are the Test case for the test plan “user registration process” which showed in Table 5.1.

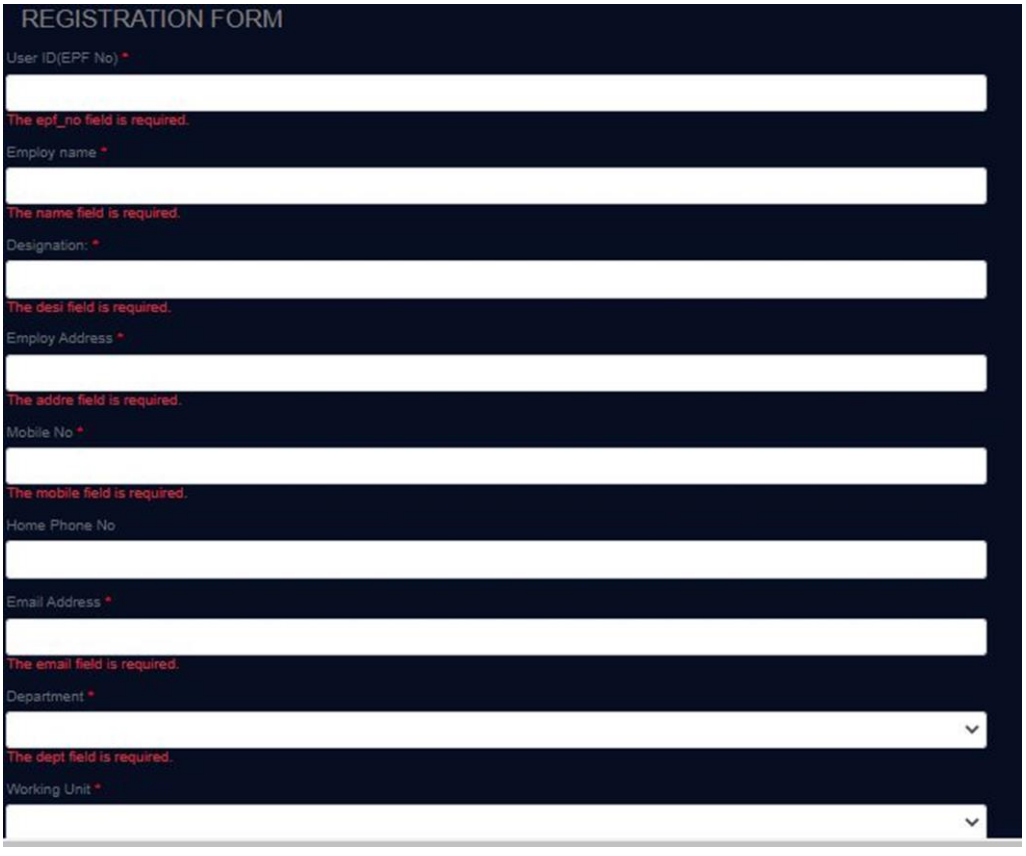
Test case ID	01	
Tested Component	User registration process	
Test Case	Submit without required fields	
Expected Output	Request to enter all require fields	
Actual output		**Status**
		Pass

Table 5.6: Test Case of blank submission in registration process

Test case ID	02
Tested Component	User login process
Test Case	Login without user id/password
Expected Output	Ask to enter epf_no and password

Actual output	**Status**
	Pass

.

Table 5.7: Test Case of blank submission in login process

Test case ID	03
Tested Component	Vehicle Reservation process
Test Case	Submit Reason fields with blank
Expected Output	Ask to enter reason for reservation

Actual output	**Status**
	Pass

Table 5.8: Test Case of missing required field in vehicle reservation process

Test case ID	04
Tested Component	Documents Receiving process
Test Case	Submit without app no
Expected Output	Ask to enter Application No

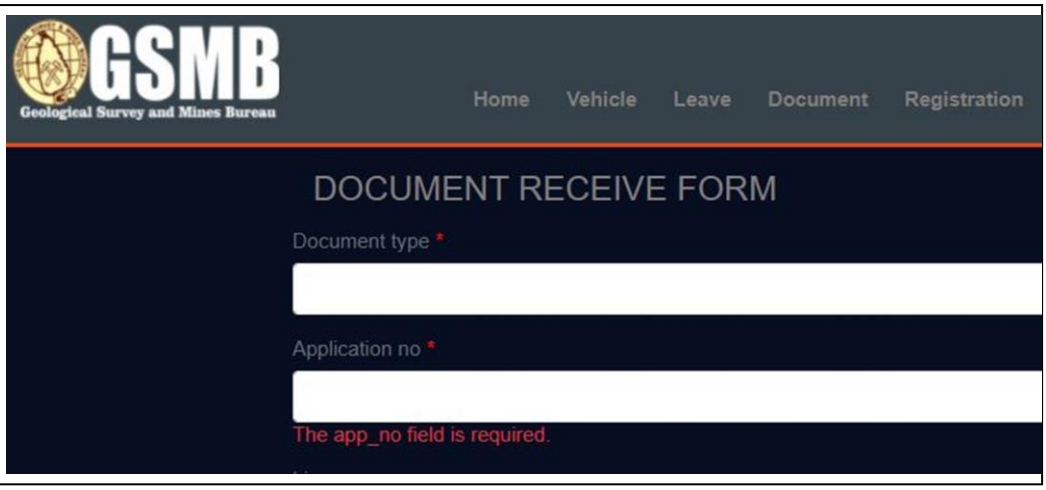
Actual output	**Status**
	Pass

Table 5.9: Test Case of blank submission required field in documents receiving process

Test case ID	05
Tested Component	Leave Apply process
Test Case	Submit without details
Expected Output	Pop up error message

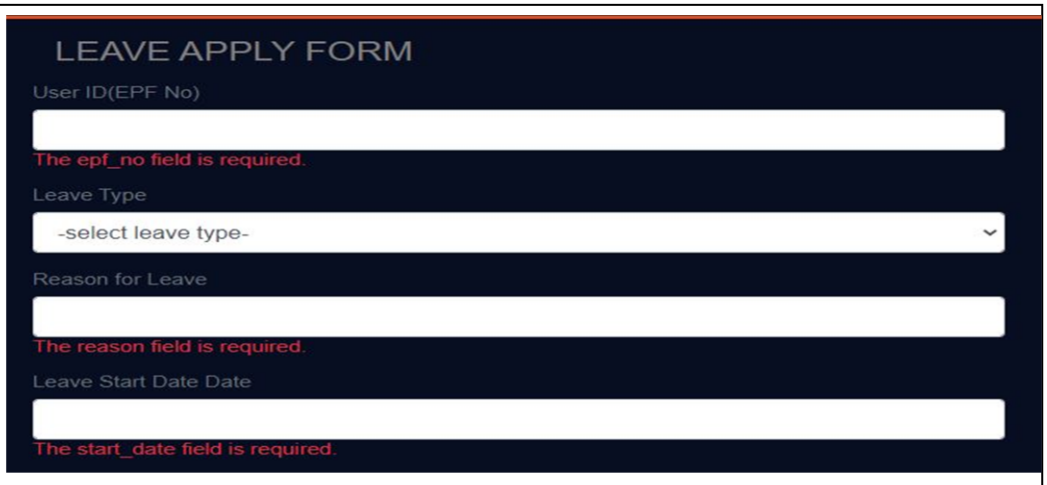
Actual output	**Status**
	Pass

Table 5.10: Test Case of blank submission required field in leave apply process

5.3.2 Regression Testing

During this testing process, the code of the software is modified to test whether its functionality is the same as before. This system belongs to both functional and non-functional testing processes.

Selenium

Selenium is one of the most commonly used test automation tools. This framework is specially designed for web applications. Selenium was widely used in testing this software and one of them is given below.

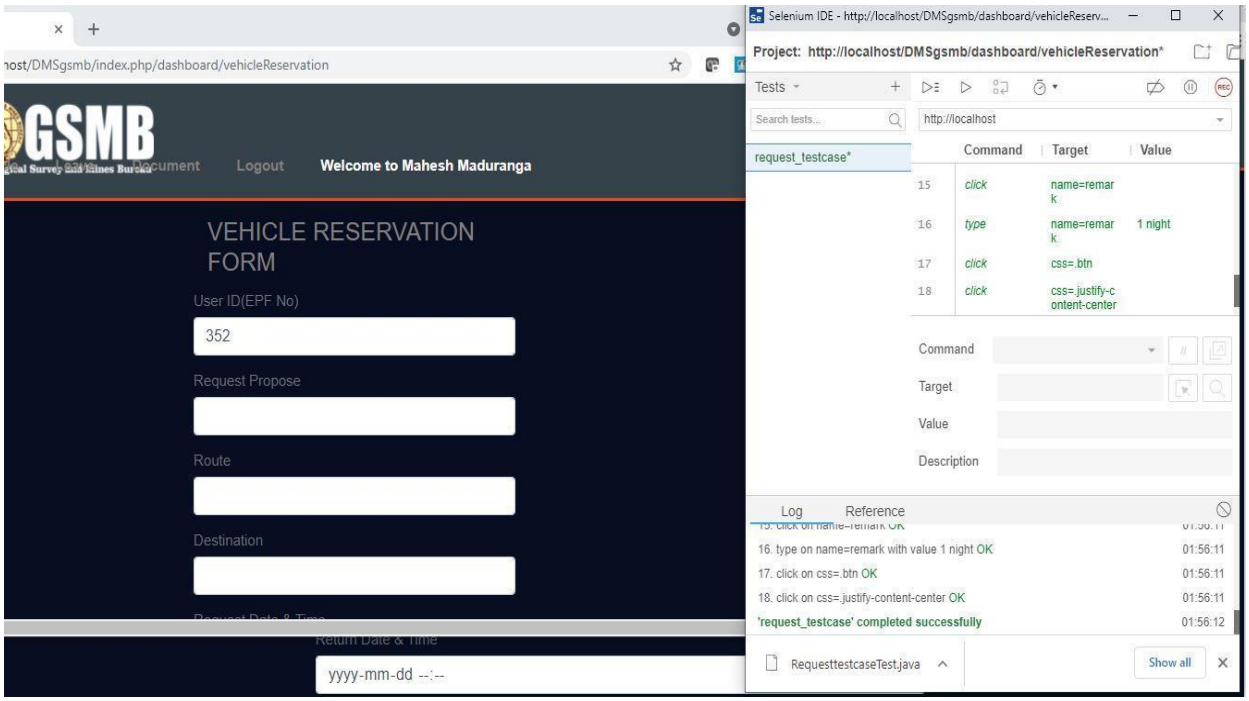


Figure 5.11 Selenium test result for vehicle reservation process

Figure 5.1 above shows an image showing the success of the selenium framework when the data of the vehicle separation function is checked. The evaluation result of that test is given below. All the activities we have done are mentioned in the evaluation file below.

```
// Generated by Selenium IDE
import org.junit.Test;
import org.junit.Before;
import org.junit.After;
import static org.junit.Assert.*;
import static org.hamcrest.CoreMatchers.is;
import static org.hamcrest.core.IsNot.not;
import org.openqa.selenium.By;
import org.openqa.selenium.WebDriver;
import org.openqa.selenium.firefox.FirefoxDriver;
import org.openqa.selenium.chrome.ChromeDriver;
import org.openqa.selenium.remote.RemoteWebDriver;
import org.openqa.selenium.remote.DesiredCapabilities;
import org.openqa.selenium.Dimension;
import org.openqa.selenium.WebElement;
import org.openqa.selenium.interactions.Actions;
import org.openqa.selenium.support.ui.ExpectedConditions;
import org.openqa.selenium.support.ui.WebDriverWait;
import org.openqa.selenium.JavascriptExecutor;
import org.openqa.selenium.Alert;
import org.openqa.selenium.Keys;
import java.util.*;
import java.net.MalformedURLException;
import java.net.URL;
public class RequesttestcaseTest {
  private WebDriver driver;
  private Map<String, Object> vars;
  JavascriptExecutor js;
  @Before
  public void setUp() {
    driver = new ChromeDriver();
    js = (JavascriptExecutor) driver;
    vars = new HashMap<String, Object>();
  }
  @After
  public void tearDown() {
    driver.quit();
  }
  @Test
  public void requesttestcase() {
    driver.get("http://localhost/DMSqsmb/dashboard/vehicleReservation");
    driver.manage().window().setSize(new Dimension(1137, 635));
    driver.findElement(By.name("reason")).click();
    driver.findElement(By.name("reason")).sendKeys("IT Work");
    driver.findElement(By.name("route")).click();
    driver.findElement(By.name("route")).sendKeys("Rathnapura,Balangoda");
    driver.findElement(By.name("distination")).click();
    driver.findElement(By.name("distination")).sendKeys("Badulla Regional Office");
    driver.findElement(By.name("rq_date")).click();
    driver.findElement(By.name("rq_date")).sendKeys("2021-09-13T05:00");
    driver.findElement(By.name("rt_date")).click();
    driver.findElement(By.name("rt_date")).sendKeys("2021-09-14T05:30");
    driver.findElement(By.name("part")).click();
    driver.findElement(By.name("part")).sendKeys("3");
    driver.findElement(By.name("remark")).click();
    driver.findElement(By.name("remark")).sendKeys("1 night");
    driver.findElement(By.cssSelector(".btn")).click();
    driver.findElement(By.cssSelector(".justify-content-center")).click();
  }
}
```

Figure 5.2 Selenium test case evaluation file

5.4 Non-Functional Testing

5.4.1 Performance Testing

Performance testing was conducted for the software under following subject areas.

- User Satisfaction

The system is designed to be as user-friendly as possible and designed to minimize user error. This stage examines how the designs fit them, with the aim of making them more comfortable by fixing further flaws.

- Average Response Time

Software speeds usually vary by internet speed and ISP functionalities, and the software is designed to be responsive using all modern methods. In this case, it will be checked whether it is set up properly.

- Error Rates

The main cause of most software malfunctions is bug reporting. In this case, the software will scan, creating the maximum number of possible errors.

5.4.2 Usability Testing

Usability testing, also known as user experience testing, is a testing method for measuring the simplicity and usability of a software application. A small group of end users use software applications to identify usage problems. Usability testing primarily focuses on the usability of the application, the flexibility of the application with controls, and the application's ability to achieve its intended goals.

The usability of this software was measured using a software developer questionnaire. The appendix contains an analysis of the prepared questionnaire and the responses received. Below is a summary of the responses received from users.

Better	**12**
Good	**4**
Average	**3**
bad	**0**

Table 5.12: Usability result summery

5.4.3 Security Testing

Security testing was conduct for the following instances

- Login to the app with username and password
- View the jobs only relate officers only
- View only the relevant personal information's of the customers
- Account activation should be need for login
- Authorized officers can be manage users details privilege levels

5.5 Maintenance Testing

5.5.1 Regression Testing

Regression testing was performed to ensure that the changes made to the miners after functional and non-functional testing are correct and will fix any issues found. This test also confirms that the changes made do not affect other parts of the system.

When launching a new regression test, a special technique called "regression test selection" was used to run it. The reason for this method is that the errors encountered require only minor changes. The Regression Test Selection method retests only the selected set of test cases, not all test cases.

5.5.2 Maintenance Testing

The maintenance testing process conducted as the request of users. However some regional offices has various technical and human issues. As the example the Baticalloa and Jaffna areas ware language issues.

However, this situation leads to conduct a maintenance testing process in the project.

5.6 User Evaluation

The user rating was carried out as two separate ratings for the web based system. To complete this phase, questionnaires are used to collect user reviews from users. Due to the current situation in Sri Lanka, user reviews are collected via Google Forms and then analyzed.

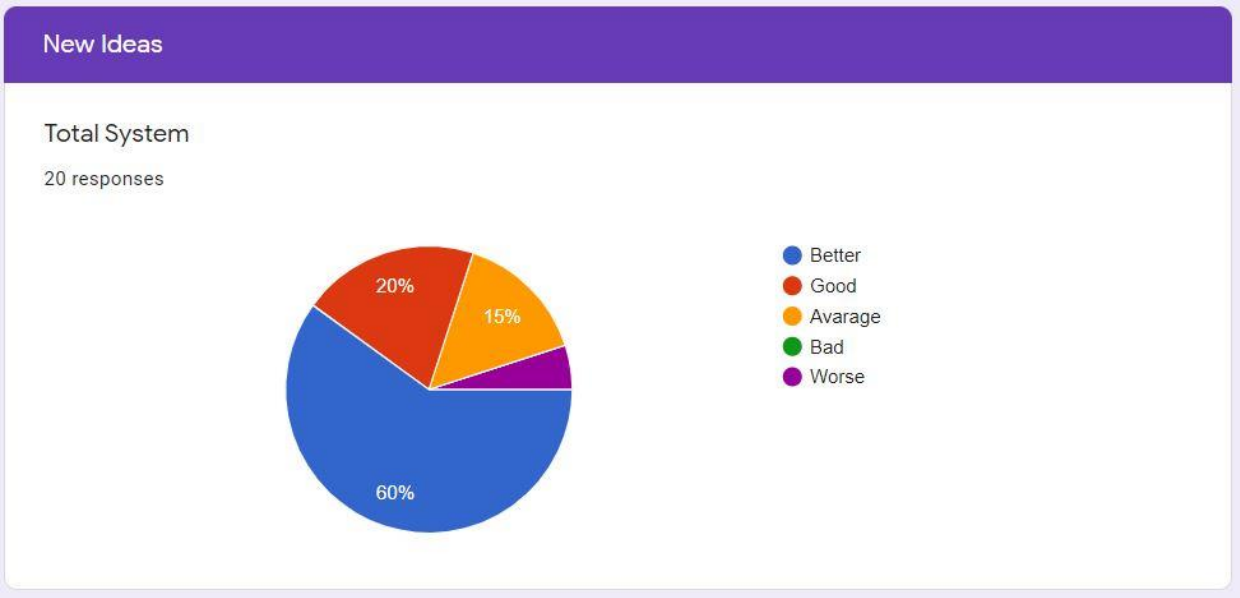


Figure 5.3 User feedback summary analysis graph

The software engineering model used in this project was the incremental development model so that the evaluation of each delivery was made at the time of delivery of each component. These were mainly reviewed meetings and comments received that were used to make the changes.

A set of criteria with a few practical tests enables the software evaluator to check whether the goals of the project have been achieved. Table 5.1 is intended to collect feedback from end-users of the system. It was distributed to the users. The modules returned were then assessed to get real customer feedback and assess whether the project goals were met. The following table is mansion result summary of feedbacks.

5.7 Summary

The most important part is described here. This includes testing the software and releasing it to users, as well as demonstrating the techniques used. During the testing process, a test plan is prepared and the relevant test cases are discussed. Also, the use of the test automation tool Selenium is demonstrated. This paragraph consists of 14 pages.

Chapter 6: Conclusion

6.1 Introduction

This chapter focuses on completing the work with a critical assessment of the system, the knowledge gained, and suggestions for future work. In addition, the extent to which the project goal has been achieved, problems encountered constraints and problems for future development and maintenance. The developer speaks openly and honestly about the successes, shortcomings, and problems of the project.

6.2 Lesson Learned

The developer has a clear understanding of the domain variables and the format of the final output when he starts the project because he is working in the same institute. Although the compiler has experience in developing many software programs, the understanding of basic web systems development, interface requirements, or testing processes, this is the first time that a web-based system has been developed, leading to several analyzes of system development. As a result of research, the PHP language was chosen for software development. Another reason for this choice was that it was very convenient for future production and could easily handle HTML, AJAX, and JavaScript. Also used the Codeigniter 4 it is the latest version of the Codeigniter to framework the production process, which helped to complete the rapid development.

The development of these systems allowed for the acquisition of vast assets. That is, I was able to learn how to set up a web-based system individually from start to end. And learn plenty of methodologies. That is PHP, AJAX, JavaScript, Bootstrap, and CSS. Especially had to be learned codeignoter4 framework how to manage for rapid development. At the same time, it provided an opportunity to learn about the use of MySQL DBMS to manipulate data in the system backend.

6.4 Future Work

The Bureau has identified several activities that need to be addressed in this way. Depending on the success of the design, it is possible to integrate the components into the system at a time.

One of the major functions of the Bureau is the licensing process. These include excavation permits, transport permits, exploration permits, and import licenses. A large number of documents are exchanged for this licensing process and all of them can be scanned and incorporated into the system for huge profit as well as convenience.

The Geology Division is one of the two main departments of the Bureau and all correspondence and operations in that division are done manually. Another primary goal is to integrate all of these activities into this system.

Another essential function that can be attached to this system is the process of conducting an inventory of the goods owned by the Bureau.

The Bureau employs a large number of field officers who do not have a formal system to study their activities and can look into the possibility of facilitating their activities and setting up a new function.

At the same time, several services can be attached to this system. Namely Petty cash request function, stationery request function, and advance payment request function.

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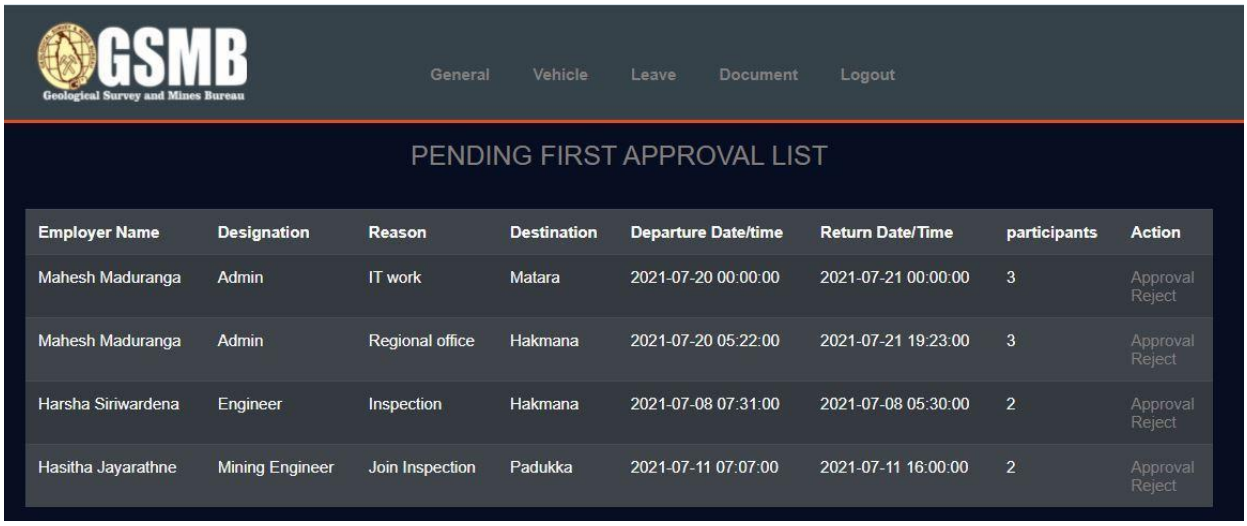
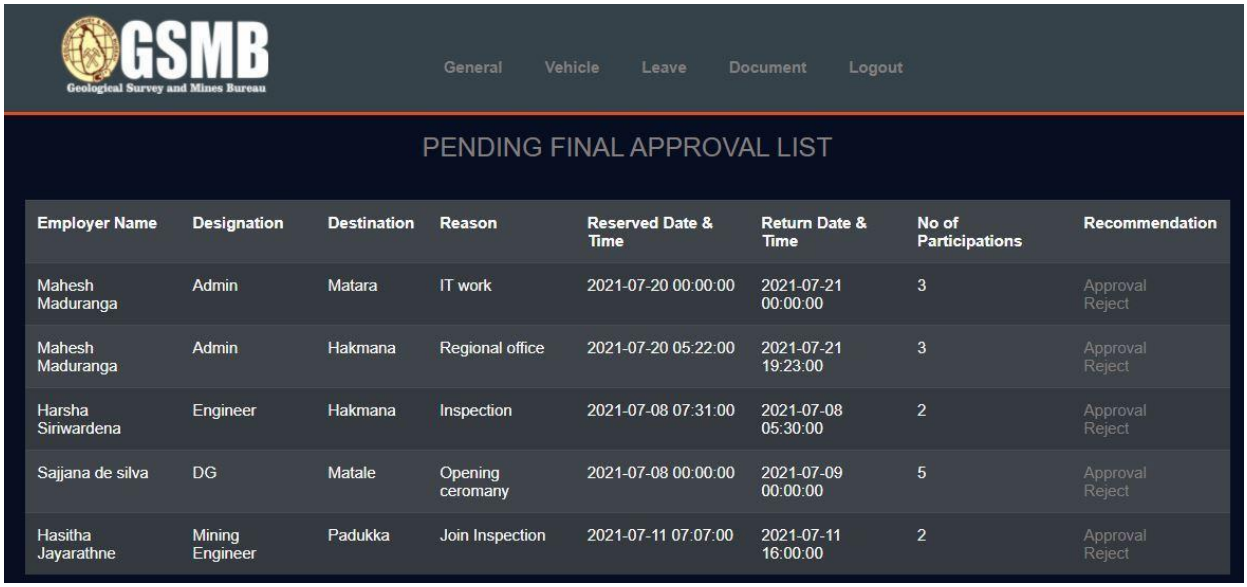
Appendices

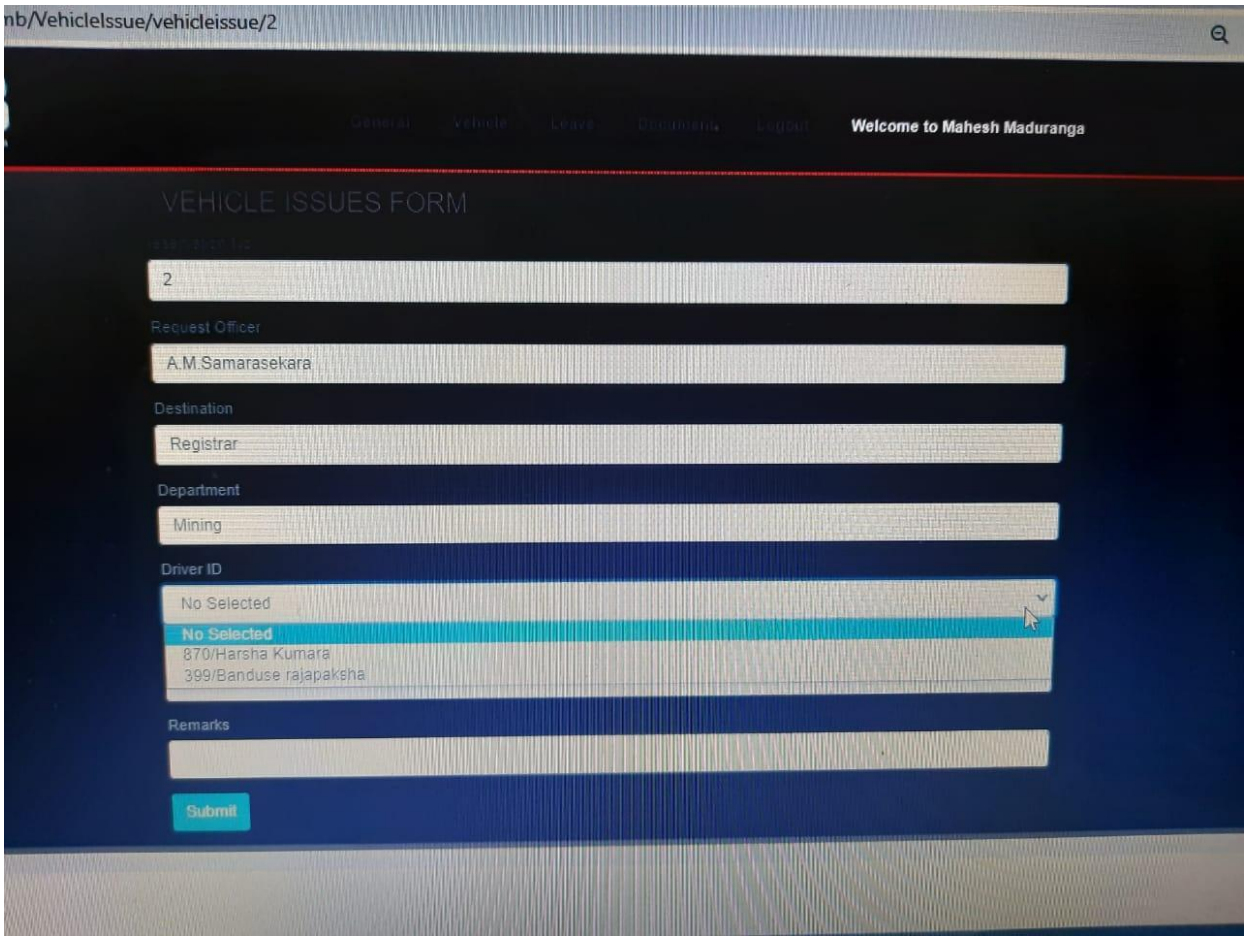
Appendix A – Additional UI's

Images of several sample interfaces are included here to show the completeness of the software. The following interface showed a list of fending applications for the approvals.





Every effort was made to minimize user errors in setting up this system. The image below shows a view of the vehicle issuing interface and then the Bureau's list of free drivers.



Appendix B – Code Segments

Here are some examples of code segments used for this project. The following code segment is the complete code set for the controller class of the login module.

```
<?php
namespace App\Controllers;
use CodeIgniter\Controller;
use App\Models\LoginModel;
class Login extends Controller {
   public $loginModel;
   public $session;
   public $parser;
   public function __construct(){
      helper('form');
      $this->loginModel = new LoginModel();
      $this->session = session();
      $parser = \Config\Services::parser();
   }
   public function index(){
      $data = [];
      $validation[]=null;
      if($this->request->getMethod() == 'post'){
         $rules = [
           'epf_no' => 'required|min_length[2]|max_length[4]|numeric',
            'pw'=> 'required|min_length[6]|max_length[16]',
         ];
        if($this->validate($rules)){
          $epf_no = $this->request->getVar('epf_no');
          $password = $this->request->getVar('pw');
          $userdata = $this ->loginModel->verifyEPF($epf_no);
           if($userdata){
            if (password_verify($password,$userdata['pw'])){
              if($userdata['status']=='active'){
                 if($userdata['p_level']=='1'){
```

```
$logininfo=[
  'epf_no' => $userdata['epf_no'],
  'agent'=> $this->getUserAgentInfo(),
  'ip'=> $this->request->getIPAddress(),
  'log_in'=> date('Y-m-d h:i:s')
  ];
  $la_id=$this->loginModel->saveLoginInfo($logininfo);
  if($la_id){
  $this->session->set('logged_info',$la_id);
  }
  $this->session->set('logged_user',$userdata['epf_no']);
  return redirect()->to(base_url().'/dashboard_top_mgt');
  }
  elseif ($userdata['p_level']=='4'){
  $logininfo=[
  'epf_no' => $userdata['epf_no'],
  'agent'=> $this->getUserAgentInfo(),
  'ip'=> $this->request->getIPAddress(),
  'log_in'=> date('Y-m-d h:i:s')
  ];
  $la_id=$this->loginModel->saveLoginInfo($logininfo);
  if($la_id){
  $this->session->set('logged_info',$la_id);
  }
  $this->session->set('logged_user',$userdata['epf_no']);
  return redirect()->to(base_url().'/dashboard_mgt');
  }
  else{
    $logininfo=[
  'epf_no' => $userdata['epf_no'],
  'agent'=> $this->getUserAgentInfo(),
  'ip'=> $this->request->getIPAddress(),
  'log_in'=> date('Y-m-d h:i:s')
```

```
                    ];
                    $la_id=$this->loginModel->saveLoginInfo($logininfo);
                    if($la_id){
                    $this->session->set('logged_info',$la_id);
                    }
                    $this->session->set('logged_user',$userdata['epf_no']);
                    return redirect()->to(base_url().'/dashboard');
                    }
                    }
                else{
                 $this->session->setTempdata('Error','Please activate your Account',3);
                 return redirect()->to(current_url());
                }
              }
              else{
                 $this->session->setTempdata('Error','Wrong password entered for the User',3);
                 return redirect()->to(current_url());
               }
            }
            else{
               $this ->session->setTempdata('Error','Sorry! Epf_no does not exists',3);
               return redirect()-> to(current_url());
         }
        }
        else{
           $data['validation'] = $this->validator;
        }
      }
      return view("login_view",$data);
}


public function getUserAgentInfo(){
```

```
        $agent = $this->request->getUserAgent();
        if($agent->isBrowser()){
            $currentAgent=$agent->getBrowser();
        }elseif($agent->isRobot()){
            $currentAgent = $this->agent->robot();
        }elseif($agent->isMobile()){
          $currentAgent=$agent->getMobile();
        }else{
            $currentAgent='Unidentified User Agent';
        }
       return $currentAgent;
    }

}
```

Appendix C – Questioner

The questionnaire used to gather information from users and the answers received are analyzed and included in this paragraph.

Questioneer 1

GSMB new web base system feedback form

1. Your Name

2. Reletionship

Mark only one oval.

- GSMB
- Cleint

3. Work unit

4. Designation

Mark only one oval.

- Mining Engineer
- Registrar
- Management Assistant
- Driver
- Office Aid

Vehicle Reservation Model

5. Attractiveness

Mark only one oval.

- ◯ Better
- ◯ Good
- ◯ Avarage
- ◯ Bad
- ◯ Worse

6. Userbility

Mark only one oval.

- ◯ Better
- ◯ Good
- ◯ Avarage
- ◯ Bad
- ◯ Worse

7. Effectiveness

Mark only one oval.

- ◯ Better
- ◯ Good
- ◯ Avarage
- ◯ Bad
- ◯ Worse

8. Speed

Mark only one oval.

- Better
- Good
- Avarage
- Bad
- Worse

Leave Management Model

9. Attractiveness

Mark only one oval.

- Better
- Good
- Avarage
- Bad
- Worse

10. Userbility

Mark only one oval.

- Better
- Good
- Avarage
- Bad
- Worse

11. Effectiveness

Mark only one oval.

- ◯ Better
- ◯ Good
- ◯ Avarage
- ◯ Bad
- ◯ Worse

12. Speed

Mark only one oval.

- ◯ Better
- ◯ Good
- ◯ Avarage
- ◯ Bad
- ◯ Worse

13. Portability

Mark only one oval.

- ◯ Better
- ◯ Good
- ◯ Avarage
- ◯ Bad
- ◯ Worse

Meeting Room Management Model

14. Attractiveness

Mark only one oval.

- ◯ Better
- ◯ Good
- ◯ Avarage
- ◯ Bad
- ◯ Worse

15. Userbility

Mark only one oval.

- ◯ Better
- ◯ Good
- ◯ Avarage
- ◯ Bad
- ◯ Worse

16. Effectiveness

Mark only one oval.

- ◯ Better
- ◯ Good
- ◯ Avarage
- ◯ Bad
- ◯ Worse

17. Speed

Mark only one oval.

- ◯ Better
- ◯ Good
- ◯ Avarage
- ◯ Bad
- ◯ Worse

18. Portability

Mark only one oval.

- ◯ Better
- ◯ Good
- ◯ Avarage
- ◯ Bad
- ◯ Worse

New Ideas

19. Total System

Mark only one oval.

- ◯ Better
- ◯ Good
- ◯ Avarage
- ◯ Bad
- ◯ Worse

20. Weakness

21. Suggetions

This content is neither created nor endorsed by Google.

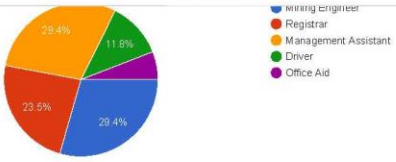
Google Forms

The summary table of the answers to the questionnaire directed to the users is given in Table and Shown here are graphs drawn in graphs of the results obtained when analyzing that data.

Function	Option	No of Feedback		
		Vehicle Reservation Module	**Leave Manage Module**	**Meeting Room Manage M**
Attractive	Better	14	12	10
	Good	3	6	6
	Average	2	1	2
	bad	1	0	1
	Worse	0	1	1
Usability	Better	10	12	12
	Good	7	5	5
	Average	2	2	1
	bad	0	0	1
	Worse	1	1	1
Effectiveness	Better	12	13	9
	Good	3	2	7
	Average	4	4	2
	bad	0	0	1
	Worse	1	1	1
Speed	Better	12	12	12
	Good	4	5	3
	Average	2	1	3
	bad	2	1	1
	Worse	0	1	1
Portability	Better	-	8	11
	Good	-	7	5
	Average	-	4	2
	bad	-	1	1
	Worse	-	0	1
Entire System	**Better**	**12**		
	Good	**4**		
	Average	**3**		
	bad	**0**		
	Worse	**1**		

Untitled form All changes saved in Drive

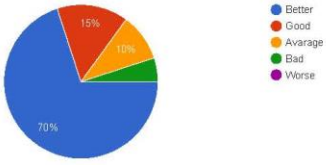
Questions Responses 20



Vehicle Reservation Model

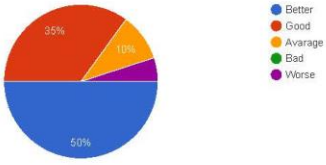
Attractiveness

20 responses



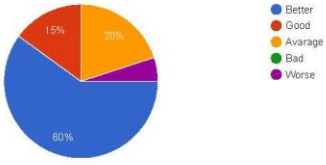
Userbility

20 responses



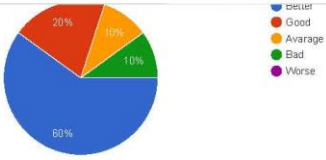
Effectiveness

20 responses



Untitled form All changes saved in Drive

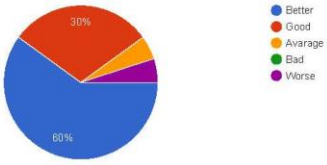
Questions Responses 20



Leave Management Model

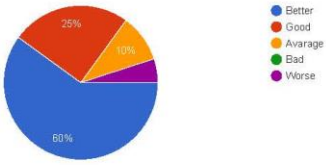
Attractiveness

20 responses



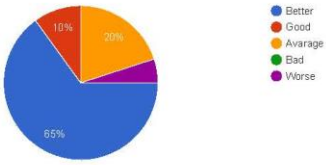
Userbility

20 responses



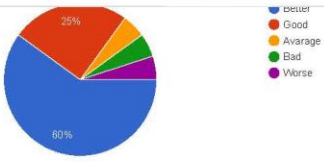
Effectiveness

20 responses



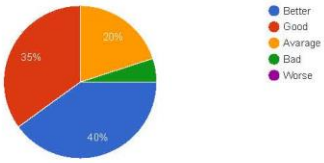
Untitled form All changes saved in Drive

Questions Responses 20



Portability

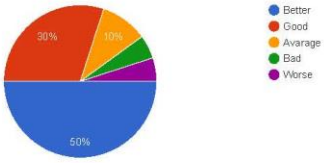
20 responses



Meeting Room Management Model

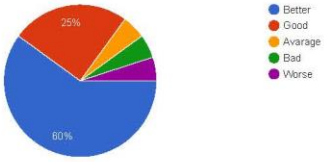
Attractiveness

20 responses



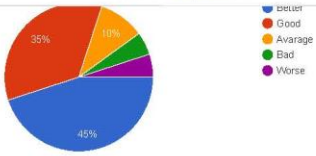
Userbility

20 responses



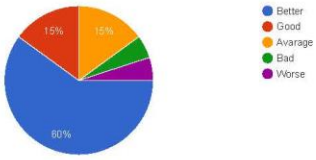
Untitled form All changes saved in Drive

Questions Responses 20



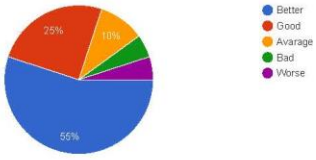
Speed

20 responses



Portability

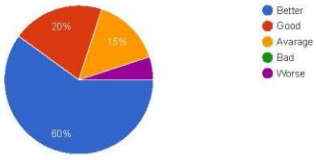
20 responses



New Ideas

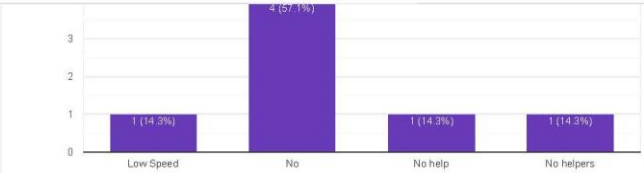
Total System

20 responses



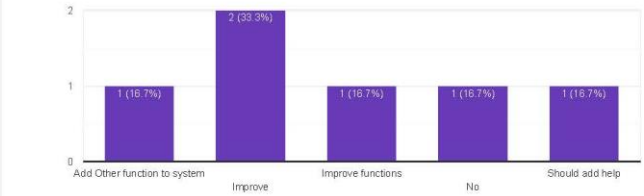
Untitled form All changes saved in Drive

Questions Responses 20



Suggetions

6 responses



Appendix D – Related documents

In developing this system, various methods were used to collect the data, and the documents used by the users provided important support. Below are some illustrations of some of the documents that provided such information.

භූ විද්‍යා සමීක්ෂණ හා පතල් කාර්යාංශය

රාජකාරී ගමන් සඳහා වාහන වෙන්කර ගැනීමේ ඉල්ලුම් පත්‍රය

ඉල්ලුම්පත් අංකය _____

1. අංශය_____**කැණීම්**_____ වාහනය අවශ්‍ය නිලධාරියා සම්බන්ධ කළ හැකි දුරකථන අංකය _____
2. වාහනය අවශ්‍ය නිලධාරියාගේ නම_____නනතුර_____
3. ගමනාන්තය_____
4. ගමන් මාර්ගය _____

   _____
5. අවශ්‍ය කරන දිනය_____වේලාව **පෙ.ව** _____ හා **ප.ව** _____
6. නැවත පැමිණෙන දිනය _____ 7.වාහනය අවශ්‍ය දින ගණන_____
8. රාජකාරි ස්වභාව_____
9. ඉල්ලුම්කරුගේ අත්සන_____10.අංශ ප්‍රධානිගේ නිර්දේශය_____
11. අනුමැතිය- අධ්‍යක්ෂ ජනරාල් / සාමාන්‍යාඥකාරි / නියෝජ්‍ය අධ්‍යක්ෂ (භූ විද්‍යා / කැණීම්)_____
12. ඉල්ලුම් පත ප්‍රවාහන අංශයට ලැබුණු දිනය හා වේලාව_____

    වෙන් කරන ලද වාහනයේ අංකය_____

    රියදුරුගේ නම _____අත්සන_____

    ප්‍රවාහන නිලධාරියාගේ අත්සන_____ ප්‍රවාහන උපදේශකගේ අත්සන_____

    වාහනය ලැබෙන නොලැබෙන බව ඉල්ලුම්කරුට දුරකථනයෙන් දැනුම් දුන් දිනය සහ වේලාව _____
13. වාහනය භාවිතා කළ නිලධාරියා විසින් සම්පූර්ණ කළ යුතුය

    වාහනය මුදා හල ස්ථානය_____වේලාව_____

    අත්සන_____ දිනය_____
14. ආරක්ෂක නිලධාරියා විසින් සම්පූර්ණ කළ යුතුය.

    පිටත් වූ දිනය හා වේලාව_____මීටරයේ අංකය _____

    ආරක්ෂක නිලධාරියාගේ අත්සන_____

    වාහනය ආපසු පැමිණි දිනය හ ාවේලාව_____මීටරයේ අංකය_____

    ආරක්ෂක නිලධාරියාගේ අත්සන_____
15. රියදුරු මහතා සහතික කළ පාවිච්Ñ කරන ලද තෙල් ලීටර් ගණන හා කි.මී. ගණන_____
16. රියදුරු මහතාගේ අත්සන_____

ආරක්ෂක අංශය විසින් සම්පූර්ණ කළ යුතුයි

		පිටවීමේ දී පරීක්ෂා කළා	ඇතුල්වීමේදී පරීක්ෂා කළා
1.	ඉඳිරිපසප්‍රධාන ලාම්පුදෙක		
2.	ඉඳිරිපස සංඥා දෙක		
3.	නොම්මර තහඩුව		
4.	වයිපරය		
5.	කණ්ණාඩිය වම		
	දකුණ		
	ඇතුළත		
6.	වින්ස්ක්‍රීන් ඉඳිරිපස		
	පසුපස		
7.	දොරවල විදුරු ඉඳිරිපස		
	පසුපස		
8.	ජැක් කට්ටලය / වීල් බ්‍රෂ් එක		
9.	අමතර රෝදය		
10.	ආදායම් බලපත්‍රය		
	රක්ෂණ සහතිකය		
	ඉන්ධන කාඩ්පත		
	ධාවන සටහන් පත		
	පිංතාරුවට හා බඳට හානි වී තිබේද		

ඉහත උපකරණ වලට හානියක් වී තිබේ නම් රියදුරාගේ සටහන හා අත්සන _____

_____

_____ _____

පරීක්ෂා කරන ලද ආරක්ෂක නිලධාරී අත්සන

පරීක්ෂා කරන ලද ආරක්ෂක නිලධාරී අත්සන

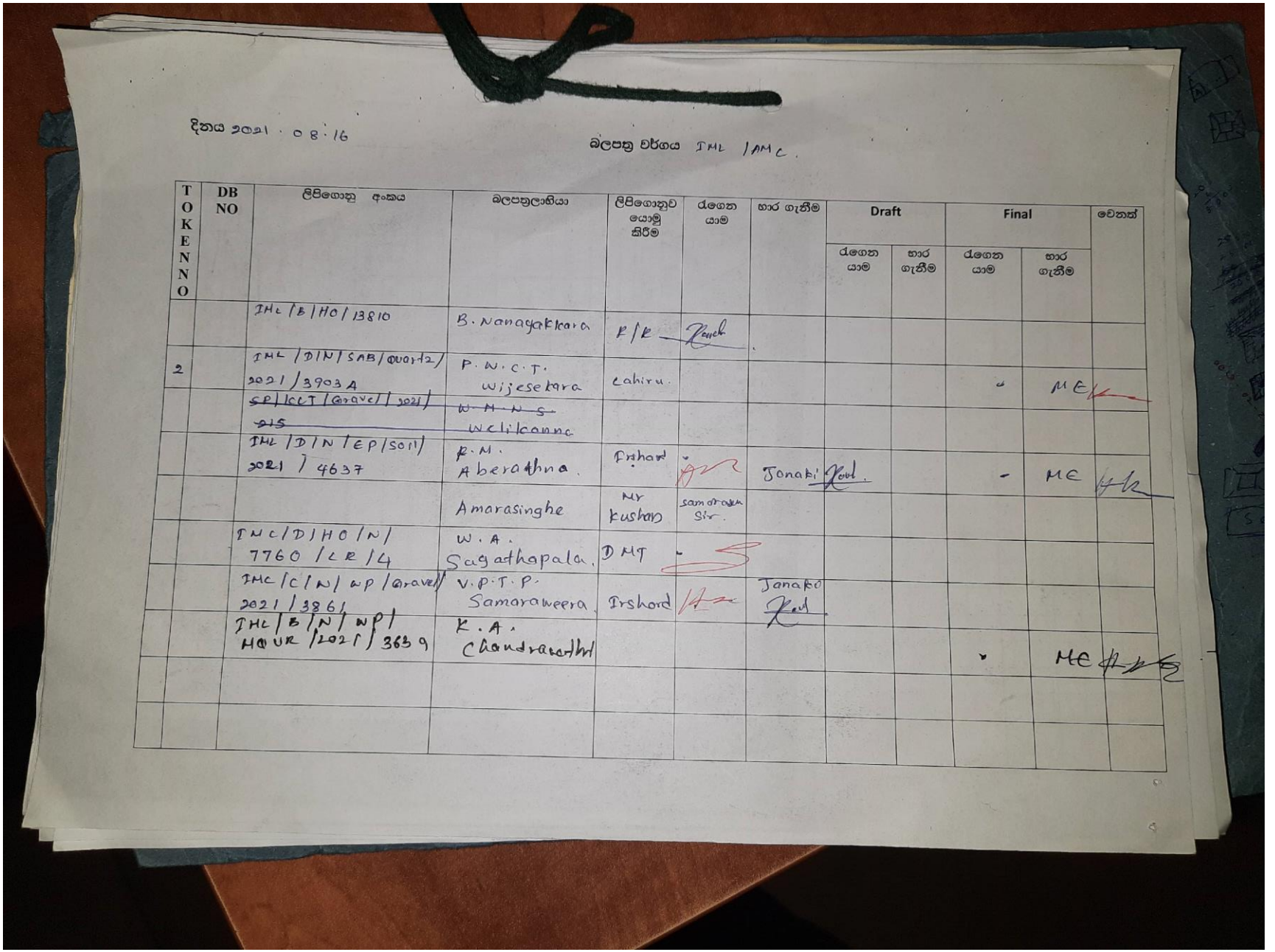
භූ විද්‍යා සමීක්ෂණ හා පතල් කාර්යාංශය
නිවාඩු ඉල්ලුම් පත්‍රය

(මෙම ඉල්ලුම් පත්‍රයේ අංක 01 සිට 10 දක්වා වූ කොටස් අනිවාර්යයෙන්ම ඉල්ලුම්කරු සම්පූර්ණ කල යුතුයි)

01	නම/අංකය		04	පත්වීමේ දිනය	
02	තනතුර		05	නිවාඩු පටන් ගන්නා දිනය	
03	අංශය		06	නැවත සේවයට පැමිණෙන දිනය	

07	නිවාඩු ඉල්ලීමට හේතුව					
08	ඉල්ලා සිටින නිවාඩු දින ගණන	අනියම	විවේක	වෛද්‍ය	රාජකාරි	හිලව
09	නිවාඩු කාලයේදී ලිපිනය					
10	ඉල්ලුම්කරුගේ අත්සන හා දිනය					

11	ඉල්ලුම්කරු වෙනුවට වැඩ කිරීමට එකඟ වෙමි	වැඩ බලන නිලධාරි (අත්සන / දිනය) .....
12	නිර්දේශ කරමි/නොකරමි	අධීක්ෂණ නිලධාරි (අත්සන / දිනය) .....
13	අනුමත කරමි / නොකරමි	අංශ ප්‍රධානියා / සාමාන්‍යාධිකාරි .....



දිනය 2021 . 08 . 16

බලපත්‍ර වර්ගය IML / AMC.

TOKEN NO	DB NO	ලිපිගොනු අංකය	බලපත්‍රලාභියා	ලිපිගොනුව යොමු කිරීම	රැගෙන යාම	භාර ගැනීම	Draft		Final		වෙනත්
							රැගෙන යාම	භාර ගැනීම	රැගෙන යාම	භාර ගැනීම	
		IML / B / HO / 13810	B. Nanayakkara	R/R	[signature]						
2		IML / D / N / SAB / Quartz / 2021 / 3903 A	P. W. C. T. Wijesekara	Lahiru.					-	ME	[signature]
		~~SP / KCT / Gravel / 2021 / 215~~	~~W. M. N. S. Welikanna~~								
		IML / D / N / EP / Soil / 2021 / 4637	R. M. Aberathna.	Irshad	[signature]	Janaki	[signature]		-	ME	[signature]
			Amarasinghe	Mr Kushan	Samarasen Sir.						
		IMC / D / HO / N / 7760 / LR / 4	W. A. Sugathapala.	DMT	[signature]						
		IMC / C / N / WP / Gravel / 2021 / 3861	V. P. T. P. Samaraweera.	Irshad	[signature]	Janaki	[signature]				
		IML / B / N / WP / HQUR / 2021 / 3639	K. A. Chandrawathi						-	ME	[signature]