Web based Information System for NSB Circuit Bungalows

A dissertation submitted for the Degree of Master of Information Technology

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University of Colombo School of Computing
2018

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.

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This is to certify that this thesis is based on the work of

Ms. B.M.M.C.K.Basnayake

under my supervision. The thesis has been prepared according to the format stipulated and is of acceptable standard.

Certified by :

Supervisor Name : Mr. G.K.A. Dias

_____

Signature: Date: 10/09/2018

Abstract

One of the welfare activities provided by National Savings Bank to its employees and pensioners was to provide Circuit Bungalows at a concessionary price. The existing manual system had so many draw backs. To introduce a Web Based proper system was the main idea behind this project.

The main functional activities of the new system included reservation confirmation, reservation cancellation, informing the reservationist about the status of reservation by SMS, room management and inventory handling in bungalows.

The new Web Based application was developed using C# .Net, HTML and CSS and SQL Server 2008 for Bank-end. Requirements of reservation each was analyzed, modularized and modeled with UML standard diagrams. System will be hosted in NSB Head Office, Welfare Division.

After introducing of the system all eligible applicants had following benefits. Visiting head office in person for reservation need not to be done. Selection and reservation of Circuit Bungalows could be done in a fair and easy manner. Circuit Bungalows inventory handling could be done speedy with high accuracy.

Acknowledgements

I would like to take this opportunity to express my deep sense of gratitude and profound feeling of admiration to my supervisor Mr. Kapila Dias of University of Colombo, School of Computing (UCSC), who guided me throughout the project.

The knowledge that I obtained in the lectures conducted at UCSC throughout 2 years became great foundation for me to develop this project. I would like to thank my friends who helped me in implementing the system.

Special thanks to management of National Savings Bank, who trusted me and motivated me towards building a complete solution for them.

Finally, I would like to offer my gratitude to my husband and two sons for encouragement and assistance given to me.

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Abbreviations

LUCID - User-Cantered Interaction Design

NSB – National Savings Bank

OOP - Object Oriented Programming

OOPL - Object Oriented Programming Languages

OOSE - Object-Oriented Software Engineering

PDL - Program Design Language

RAD - Rapid Application Development

SCR - Software Change Request

SDLC - Systems Development Life Cycle

Chapter 1: Introduction

1.1 Client's Background

National Savings Bank (NSB), is a state-owned Savings Bank in Sri Lanka. It was incorporated in Sri Lanka (Then Ceylon) by the National Savings Bank Act No. 30 of 1971 and was granted the status of the Licensed Specialized Bank Status in terms of the Banking Act No. 30 of 1988. Presently NSB has 256 branches and over 2500 employees are working in those. Current and ex. NSB employees are entitled for reservation of Circuit Bungalows at concessionary rates.

1.2 Motivation for The Project

Under the prevailing system, the persons eligible for reservation, do not get enough information about the location and the places of interest to be seen near a given bungalow. But the proposed system will provide all information to any eligible person for bungalow reservation well in advance. Further the proposed system will ensure an eligible reservationist with a method of fair selection. Furthermore, it will resolve all stock control activities regarding a given bungalow.

1.3 The Problem Domain

The following problems have been identified in the existing manual system in the bank.

- NSB employees residing far away from Head Office have to undergo unwanted difficulties due to the distance from where they reside and the location where NSB Head Office is situated.
- To reserve high demand circuit bungalows some employees come to the head office in the previous day, two weeks prior to the effective date of the reservation.
- If more than one person is there at the same time problems will be arise.

- Some employees get the chance to reserve circuit bungalows in areas which are in high demand repeatedly.
- Difficult to handle stocks by the head office because they are recorded in manually.

1.4 Objectives of the Project

The objectives of this project are to propose an ICT based solution overcome the following problems.

- Designing of a fool proof mechanism to select circuit bungalows to NSB employees.
- After the implementation of a Web Based system, NSB employees who are working out of Colombo also can apply without coming to the head office.
- Facility to generate MIS reports, ad-hoc reports.
- Facility to generate customized queries.
- Payment procedure will be automated.
- Proper handling of stocks and employee details in the circuit bungalows.

1.5 Scope of Project

Following are the main functionalities proposed by the new system.

- Online circuit reservation system
    - ✓ After registering the members can make reservations and cancellations through the web.
- Selection criteria of the rooms
    - ✓ As limited number of rooms are available proper selection mechanism will be designed to allocate rooms for the applicants in a fair manner.
- Status of the rooms and room allocation details are display through the system
- Rates will be handled by the system.
- Items handled by the new system. Items issued to each circuit bungalow will be analyzed through the system easily.
- Images will be included.

- ✓ Images of the rooms and other parts of the bungalows will be displayed

- Videos and short written descriptions of places of interest will be made available in close proximity to a given circuit bungalow in the website
- Control of stock pertaining to each bungalow.

- Reports and inquiries
  - MIS Reports
    - ✓ Daily reports
    - ✓ Weakly reports
    - ✓ Monthly reports
    - ✓ Annual reports
  - Ad-hoc reports
    - ✓ Customized reports
  - Display queries
    - ✓ Employee / Pensioner can display queries to check their reservation details.
    - ✓ Can display individual bungalow details related to each employee
    - ✓ Can display individual bungalow details for a given period of time
    - ✓ Can display individual employee / pensioner booking details related to each bungalow.
    - ✓ Can display individual employee / pensioner booking details for a particular period of time.
    - ✓ Display stocks of items.
- Informed the booking details by using SMS and e-mail to the reservationist.

1.6 Dissertation Structure

Introduces the background, problem statement, significance of the study, objectives, scope and limitation of the study and presents the framework to give readers a basic idea of this project.

Literature review of similar systems available and technological review relevant to improve the system and their pros and cons will also be included.

Requirement gathering, analyzing and management techniques are discussed. Functional and non-functional requirements of the proposed system will also be included.

Initial design diagrams and the methodological approach used in the system designing, alternative approaches and their justification for not using in the system are discussed.

Appropriate coding and implementation tools and techniques which will be used developing the system are included.

Developed system will be tested against the user requirements which are gathered at the beginning. Actual data from the client's environment will be used.

This chapter discussed about the system enhancements which can be done in the future and also provide a summary note of the system achievements at last.

Chapter 2: Background

2.1 Introduction

National Savings Bank provides many welfare activities to its employees. One such activity is providing circuit bungalows to current and retired employees at a concessionary rate. There are 14 circuit bungalows in total all over the country. Managing of circuit bungalows are handled by welfare division of the bank. Each circuit bungalow has limited no of rooms. Reservations of Circuit Bungalows can only be done by eligible persons stated above. It must be done two weeks or more than a week prior to start the effective date of the reservation. Each such member can reserve maximum number of 3 rooms for 9 persons. Reservation is usually done in first come first serve basis. If the reservationist could not make the payment within 2 days from the date of booking, then it will be considered as cancelled and then the next reservationist in line will get a chance to reserve same. Payments must be done to a branch and has to present the copy of a bank payment slip to the welfare division.

As per the current system, reservations can be done in two ways:

- By sending a fax requesting reservation and followed by confirmation from the welfare division of NSB Head Office.
- Person who wants reservation needs personally to visit the welfare division at head office and then has the reservation done.

Currently there is no proper system in place to record all data pertaining to reservations.

Now NSB needs to implement a web-based software solution to improve the efficiency and effectiveness of same to reduce conflicts among reservationists.

2.2 Existing Similar Systems

2.2.1 Wildlife Circuit Bungalows Reservation eService

Make Reservation Online

department of Wildlife has several Wildlife bungalows on the wildlife sanctuaries and parks under their management. These facilities are available for the public to be reserved and used. The facilities can be reserved for current and next month.

There is maximum occupancy number of each facility and it cannot be exceeded when occupying the reserved facility. Only three consecutive days can be booked for a person and foreign parties will have higher rates than that of the domestic occupants. Payments can be made using the electronic card facility.

Steps to follow complete reservation:

1. Check availability
2. Make reservation
3. Payments
4. Complete reservation

Figure 2.1, illustrates the home page of the Reservation of Wildlife Circuit Bungalows.

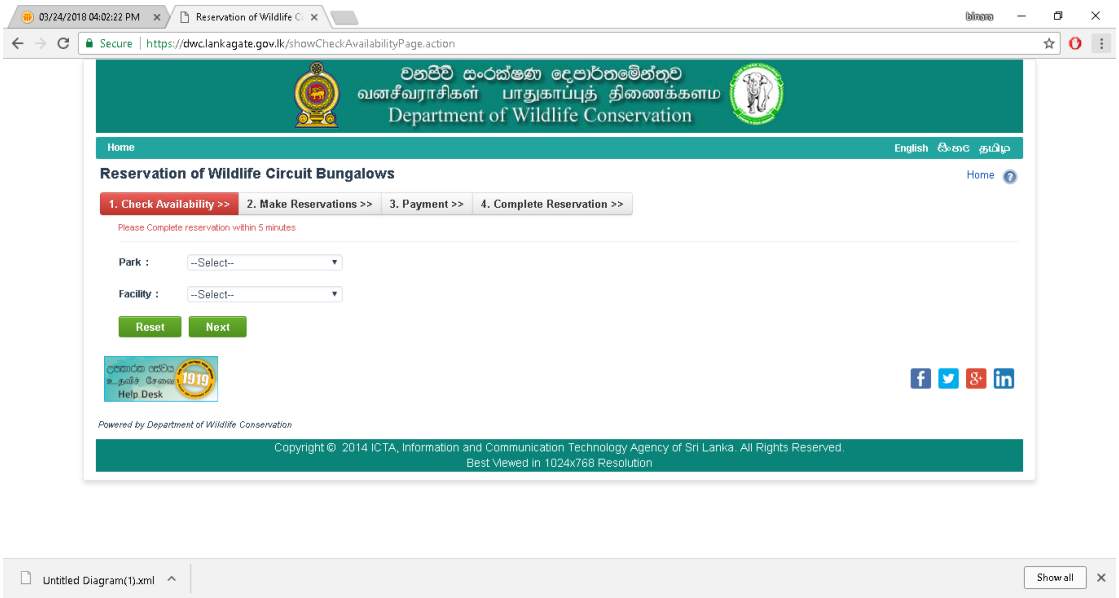


Figure 2.1: Home page - Reservation of Wildlife Circuit Bungalows

Check Reservation Status

After making the reservation the reservationist can Check reservation status.
This is the facility where a person who has made a reservation can check on reservation he/she have made in the eService. This gives the user the facility to download the relevant documents that need to be submitted at the facility and confirm the reservation details. The user can get the confirmation SMS by sending the following text to 1919 *DWC RES (NIC Number) (Reservation reference number)* [1]

2.2.2 Handy Business Resources for small accommodation providers

Hotel reservation system works by processing secure online reservations made through a hotel's website. The data is then passed onto a backend system which can be accessed by hotels to manage bookings. Other features may come with it – for example, the automation of reservation confirmation emails.

Small hotel managers and owners recognize that technology is key to growing their business and increasing their bookings overtime.

A hotel reservation system is a software application that is implemented by hotels to allow guests to create secure online reservations. The hotel reservation system can be synced, not only with current website, but also with Facebook. This allows guests to reserve rooms in a way that is convenient for them via social media.

In addition to allowing guests to book online directly, these reservation systems can also provide hotel operators with additional resources.

For example, a channel manager may be a part of the reservation system, giving hotel operators the chance to distribute their products and live availability simultaneously to their entire network of online agents. The Handy Business Resources hotel reservation system login page is illustrated in Figure 2.2

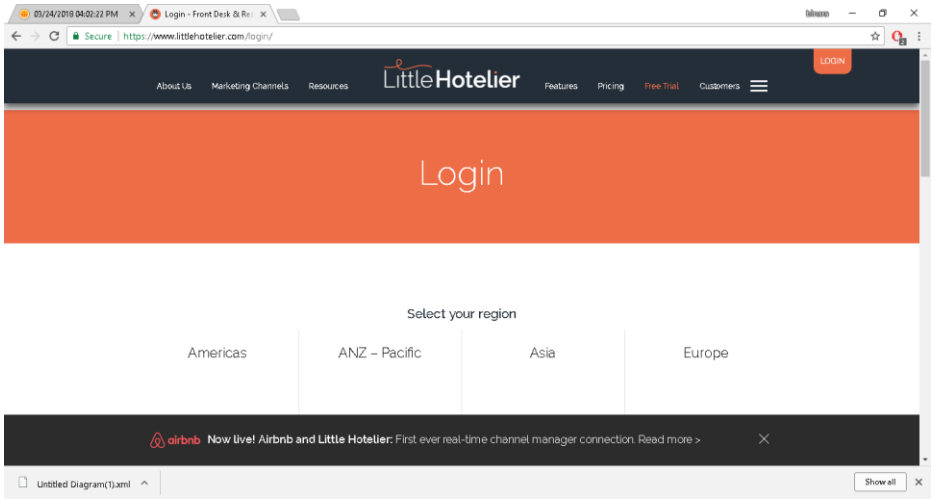


Figure 2.2: Login page - Handy Business Resources Hotel Reservation System

Advantages of **Handy Business Resources** hotel reservation system

- Gives an advantage over the competitors. There are still many small hotels today that do not have online booking capabilities. Less people are staying at those locations.
- Improves efficiency of the business.
  -save time on administrative tasks and minimizing the risk of overbooking the rooms. [2]

2.3 Review of Existing Systems

Under the existing reservation system at Wild Life Department, it is not only available to the eligible persons at the department but also are available for the public. The said software system is available for the access to anybody who wishes to reserve rooms. They have a well-developed e-Service reservation system for circuit bungalows. The web-based system / procedure that NSB requires is slightly different to the existing solution at Wild Life Department.

Under the Handy Business Resources for small accommodation provides an online system for the hotels. The system can be access by anybody with current web site as well as Facebook. This gives competitive advantage to the other competitors in the hotel industry. It minimizes the over booking of the rooms and helps the administrative work.

Chapter 3: Analysis and Design

3.1 Introduction

Systems analysis is most important in designing a software system. Before start to implement a software, system must get a proper idea of the problem domain in the existing system. The business or the organization has many functions relating to the system each are interrelated. Each of these information systems has a purpose or focus, and each has a life of its own. This "life of its own" concept is called the **systems development life cycle** or SDLC. SDLC includes the entire process of planning, designing, developing, testing, deploying and maintaining an information system.

Agile SDLC model is a combination of iterative and incremental model. Small and highly motivated software teams are involved. There should be continues communication between user and the development team. The most important part is delivered first. According to their importance the product is delivered to the user. Delivery is done frequently. Agile methods break the processes into small tasks and present them to the user. The user will do the user acceptance test. If the user requirements are satisfied, then continue. Otherwise the tasks must be repeated. While user involves to the system throughout the SDLC the constant changes could be avoid. Changes are inevitable during the software development.

Business people and developers must work together during the entire life of the project. Meetings must be handled frequently with the development team. Then conveying information with in the development team and they can exchange their views. This process will motivate the development team.

System design is the process of defining the components, modules, interfaces and data for a system to satisfy specified requirements. System development is a process of creating or altering systems along with the processes, practices, models and methodologies.

Figure 3.1 illustrates the Use Case Diagram for the current system.

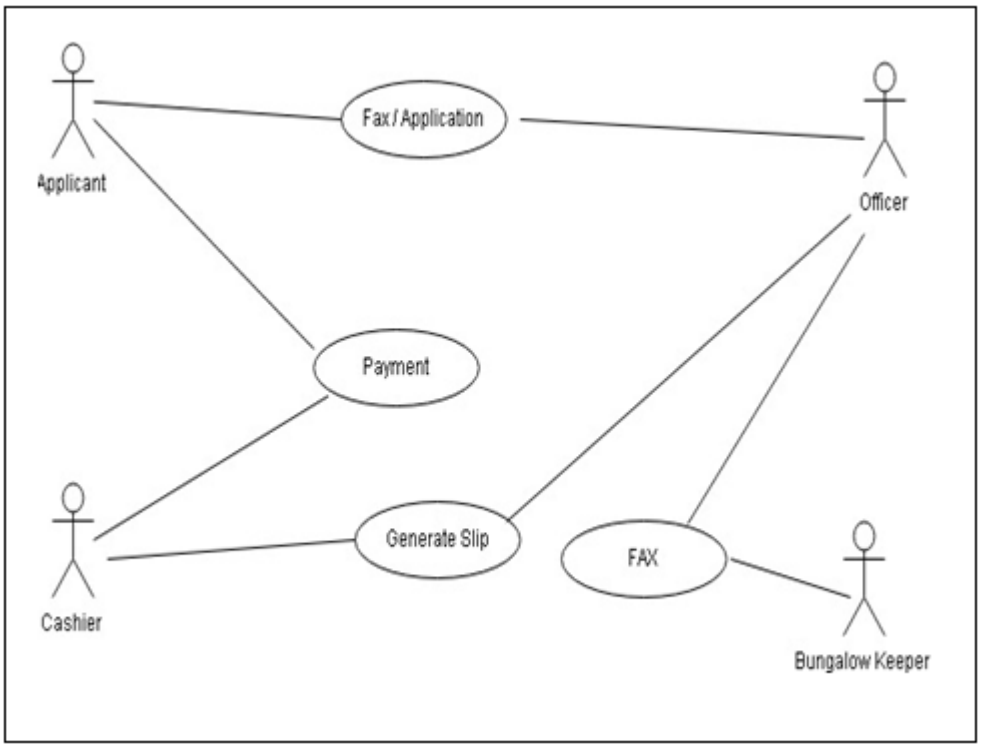


Figure 3.1: Use Case Diagram of Current System.

3.2 Analysis of the existing system

Need to study the existing system in detail in order figure out the benefits achieved by the new system. The new system should benefit to the employees in the bank. The problems in the existing system should be properly identified.

Analysis would involve

- Collecting data about the current system / proposed system
- Find out problems with the current system
- Establish the problem that the customer needs solving.
- Identify inputs, processing and outputs of the current system / proposed system
- Identify requirements of the new system.
- Producing a cost benefit analysis.

Requirement gathering stage can be done using various fact-finding techniques. Following techniques have been used for the gathering requirements.

3.2.1 Questionnaires

A questionnaire allows getting a quick response from users of the system and results can be tabulated quickly, also easy to analyze.
Prepared questions are given to the users and they are left with the user to complete. Simple questions are given and asked them to click right.

3.2.2 Interviews

Interviews take place face to face and asked more detailed questions and got more detailed answers. Consult various levels of employees. Among them welfare division officers, manager and employees of the bank. The questions were not restricted for specific structure. Different questions were asked from different users. This method was quick.

3.2.3 Looking at the current manual systems documentation

This involves looking at paperwork for the current system. Refer the books that maintain for the Circuit Bungalow reservation. The reports that they have prepared manually to the management.

The whole system is designed with five separate subsystems. They are system user registration, Circuit Bungalow Management system, Circuit Bungalow Reservation and Confirmation System, Circuit Bungalow Inventory Control, Report generation system. Illustration of the system's intended functions, its surroundings and the relationship between them are provided using use case diagrams. Main use cases represent the functionality provided by the system. Administrator, Manager, Officer, Cashier are the main actors of the company.

3.3 Functional Requirements

Administrative module

This module enables the system administrator to add/update/delete records in the database.

- ✓ Internal User Management - Administrator assign user authorities to the internal users
- ✓ Manage Circuit Bungalows - Administrator has the privilege to add/modify Circuit Bungalow details in the system.
- ✓ Manage items – Administrator has the privilege to Add/ Modify new item to the system.
- ✓ Manage rates of the circuit bungalows – Add /Update bungalow room rates.

Internal Management Module

Manager is assigned with to this module.

- ✓ Confirm reservation

  Select reservationists from the applicants by appropriate selection criteria method (by rating system).
- ✓ Cancel reservation

  Reservationist can cancel the reservation at any time. The cancelation process is done by reservationist or by the branch user.
- ✓ After confirming and cancelling the reservation status inform to the reservationist through SMS.
- ✓ Manage rooms

  Add/Update rooms in the circuit bungalow
- ✓ Manage items in the circuit bungalow

  Manager has authority to add/update items in different areas in the circuit bungalow.

Internal Operational Module

Through this module the officer can perform the following functionalities.

- ✓ Reservation data entry

  Enter reservation entry details to the system.

- ✓ After settle the payment to the branch generated slip will be produced and update the payment flag.
- ✓ Report and query module
  - Generate MIS reports
- ✓ Generate MIS reports to the management to make decisions.
  - Generate ad-hoc reports
- ✓ Generate ad-hoc reports when the management needs.
  - Display queries

3.4 Nonfunctional Requirements

Nonfunctional requirements identified for the Circuit Bungalow Reservation system is listed below.

User friendly interfaces

User friendly interfaces are provided in the system. The instructions given in the screens are in simple English language.

Accessibility and availability

If an employee wants to apply to reserve a circuit bungalow then he/she can produce the application to the branch. The branch user can access the application from the branch and can enter reservation details t the system.

Usability

The user can follow the instruction manual and he/she will be able to learn how to operate the system.

Maintainability

Maintainability is the ease with which faults in a software system can be found and fixed. Maintainability requirements address the user concern for how easy it is to upkeep and repair the system.

Modifiability

If there is a change in the software system it can be developed and deployed efficiently, and quickly. Changes as well as enhancements also can be done Modifiability easily.

Security

Allow only authorized users to enter to the system. User id will be added to the system by administrator. There are some security levels for the users in the system. Some users have administrative privileges, some has limited access.

Reliability

The system should be reliable when it comes the making reservations, which is very important module to the users

Accuracy

Input and update data done through the reservation system is accurate. Generated reports are also accurate against the data in the database. There is no possibility to reserve one circuit bungalow by two employees.

3.5 Use Case diagram

Following use case scenario description helps to identify the actors and reservation system processes for the proposed system.

The Use Case Diagram for the proposed system is shown in the Figure 3.3 as shown in the next page.

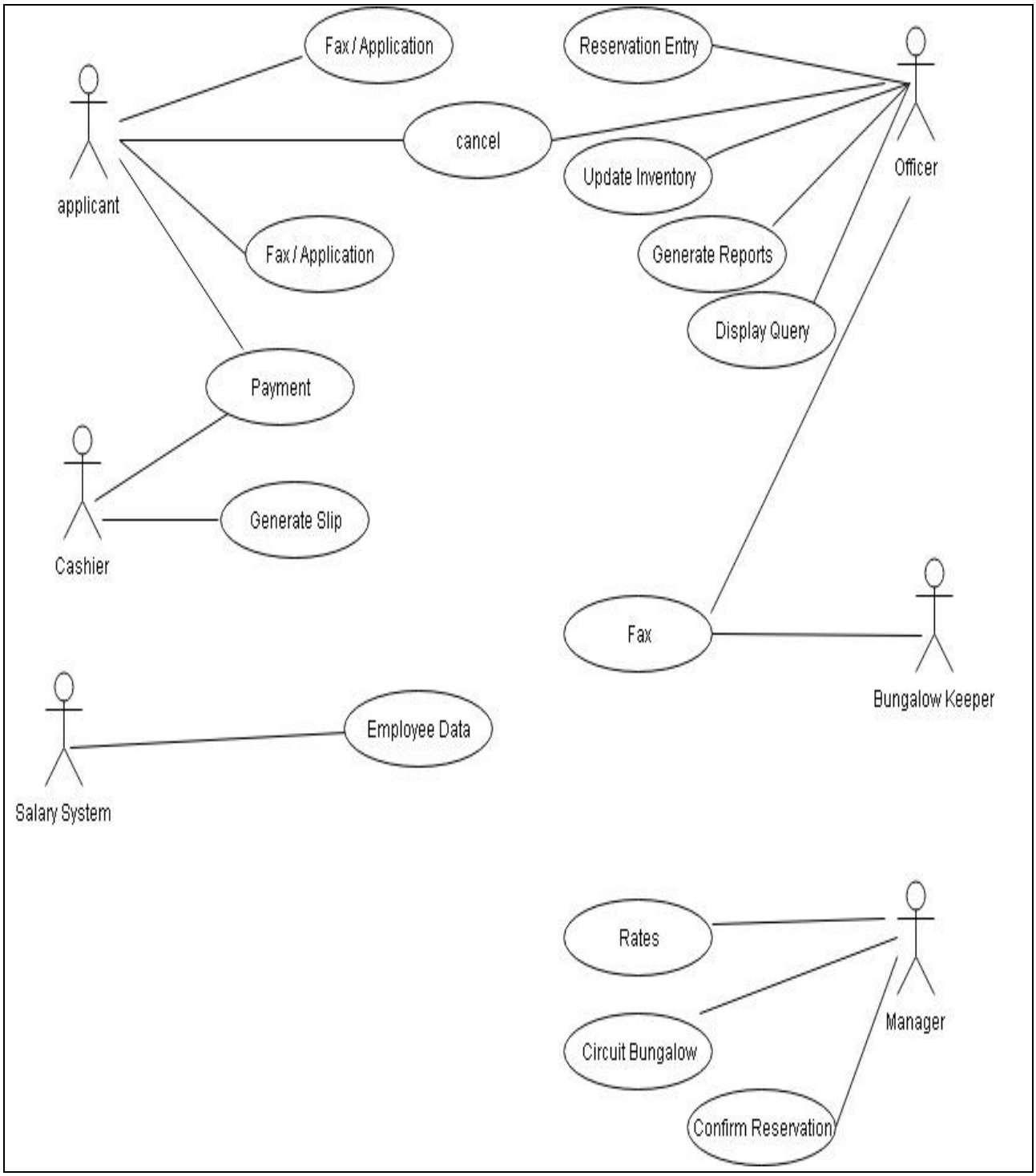


Figure 3.2: Proposed System Use Case Diagram

3.6 Use Case Narratives

Table 3.1 shows the use case narratives for Add/Update a circuit bungalow. All remaining use case narratives are attached Appendix C.

Use Case Name:	Add/Update Circuit Bungalow	Use-Case Type – Business Requirement
Use Case ID:	TM-01	
Priority:	High	
Source:	Document	
Primary Business Actor:	Administrator	
Other Participating Actors:	Branch Users	
Other Interested Stakeholders:		
Description:	Add new Circuit Bungalow and Update Existing Circuit Bungalow.	
Preconditions:		
Trigger:	This use case is initiated after entering the Circuit Bungalow details to the system.	
Typical Course of events	Actor Action	System Response
	Step 1: administrator logs in to the system.	Step 2: system validates user id and password.
	Step 2: enter bungalow code	Step 3: if exist Display bungalow details.
	Step 4: enter data to update	Step 5: update record
	Step 6: enter new bungalow details	Step 7: insert bungalow details
Alternate Courses	Epfno, bungalow_code, arrival_date , departure_date set as the primary key	
Post Conditions	Insert / update bungalow details.	

Table 3.1: Use Case Narrative – Add/Update Circuit Bungalow

3.7 E-R Diagram

Figure 3.3. illustrates the E-R Diagram for the proposed system

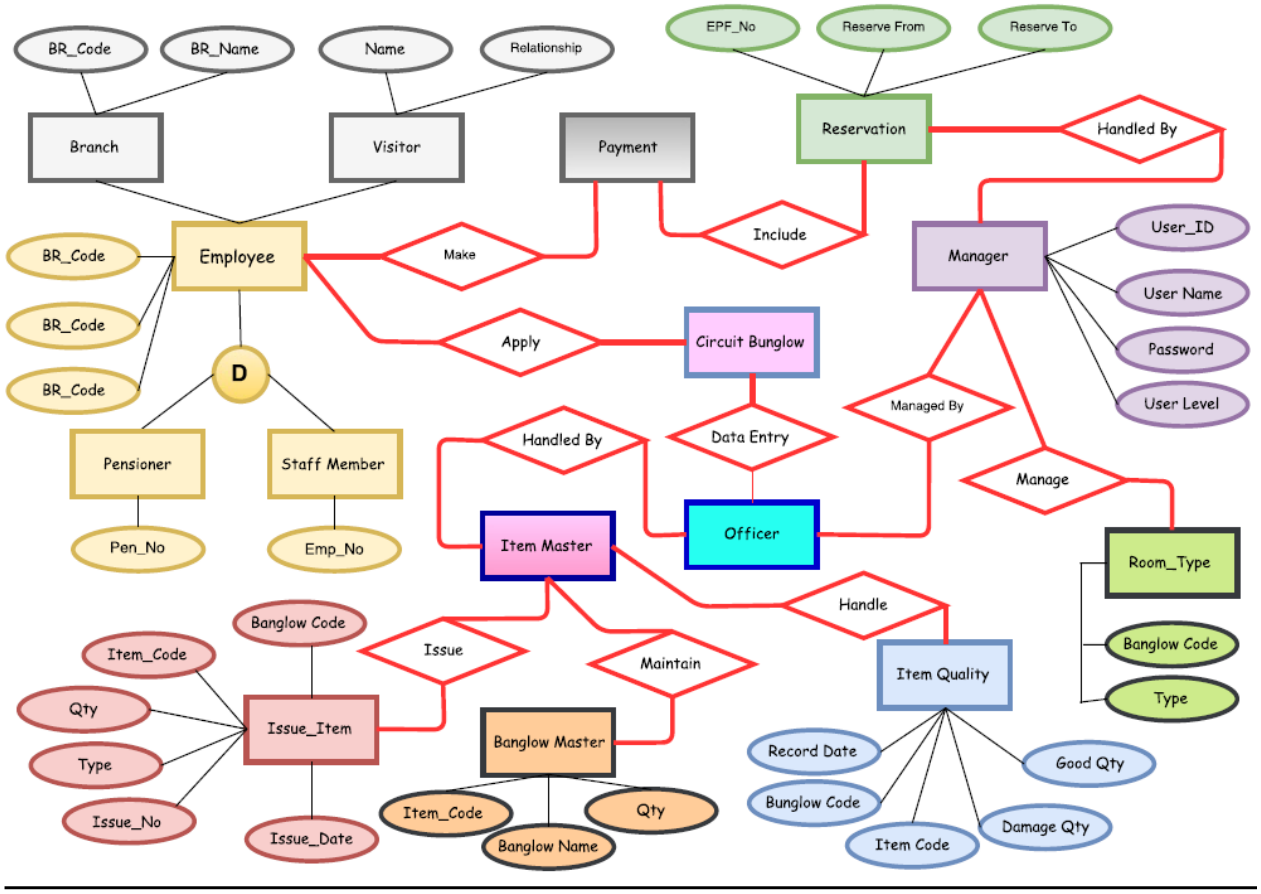


Figure 3.3: E-R Diagram of Proposed System

3.8 Sequence Diagram

Figure 3.4 illustrates the sequence diagram for Add/ Update circuit bungalow. All remaining Sequence Diagrams are discussed in more details in Appendix C.

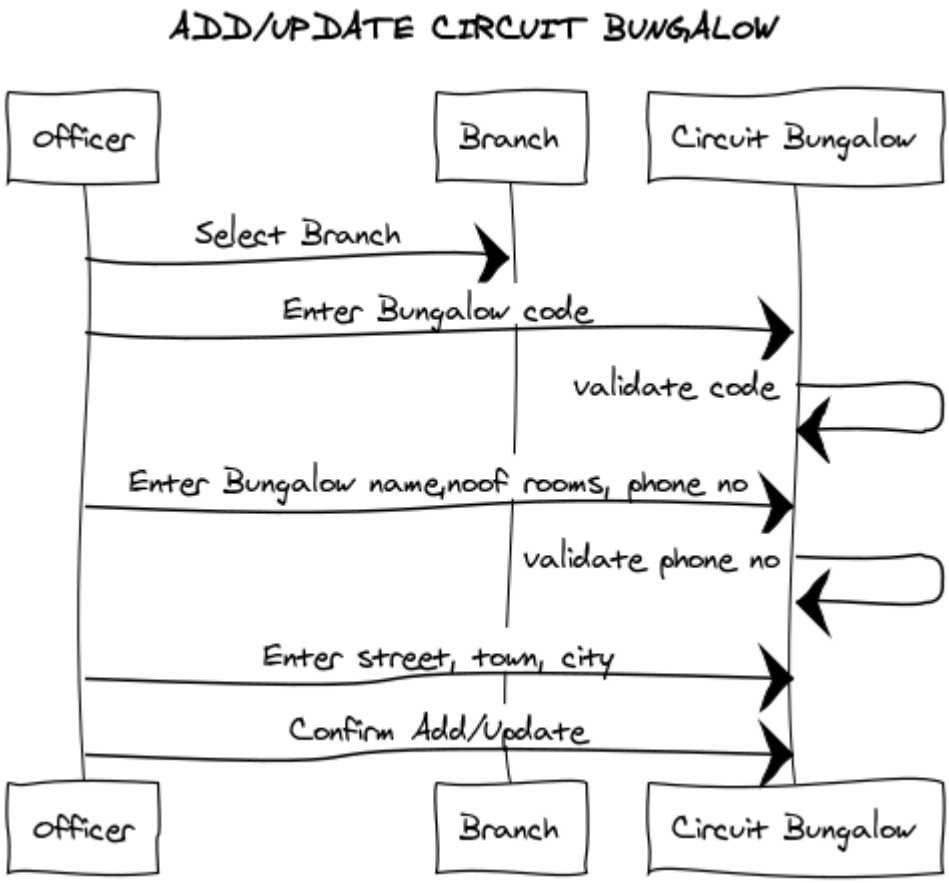


Figure 3.4: Add/ Update Circuit Bungalow

3.9 Class diagram

This represents the static view of the system, as it shows interaction between classes in the system. Also, classes are the blueprint for objects. Ultimately the attributes of the classes are used to create database design and normalized tables are taken in to final implementation of database.

High level class diagram shown in the Figure 3.5 and the Class diagram is discussed in more details in Appendix C.

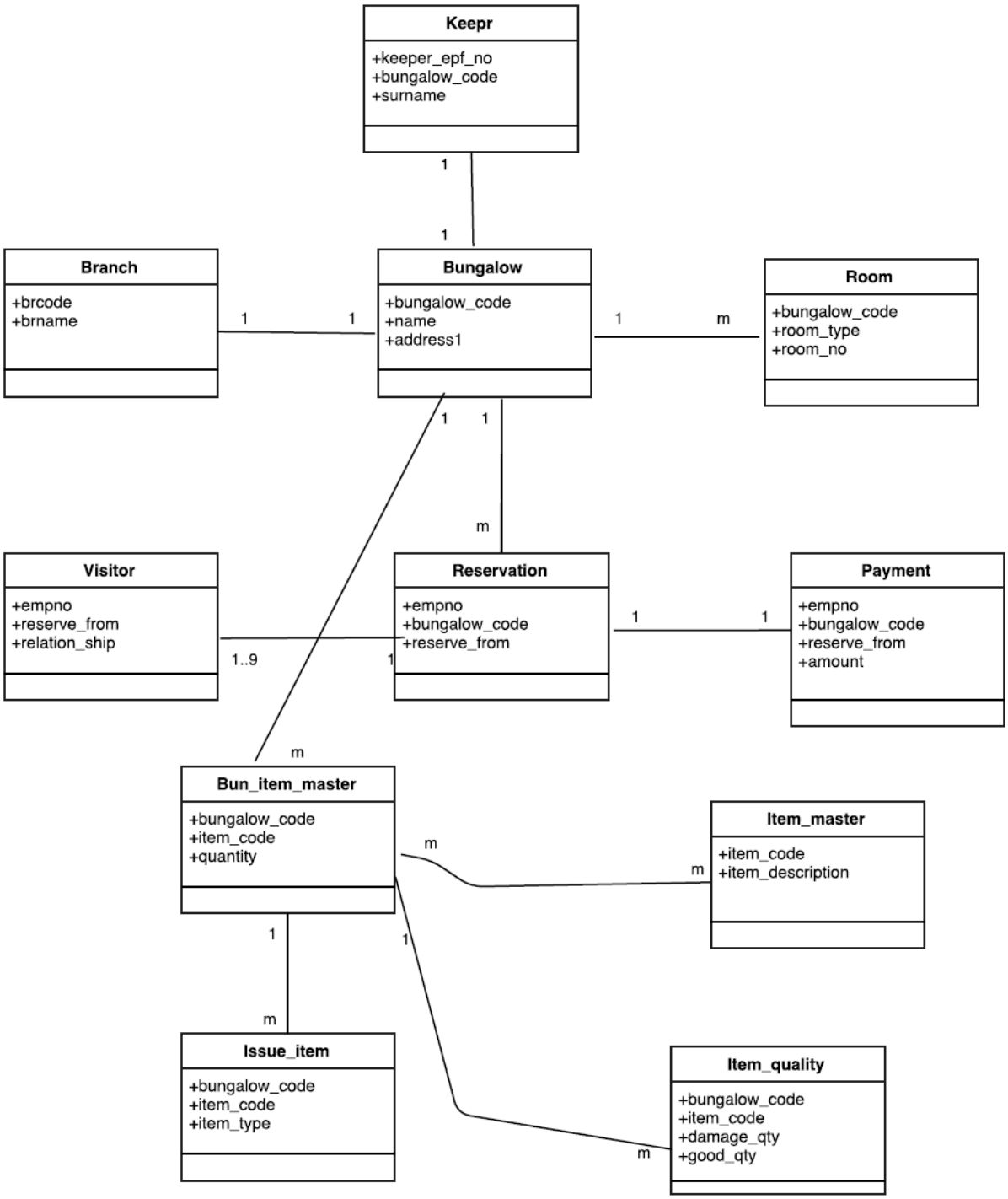


Figure 3.5: The Class Diagram of the System

3.10 Database Design

Database design is an important place in designing a system. During this phase care should be taken to avoid redundancy of information storing into a database, since it leads to wastage of memory space.

The attributes of the classes are used in database design and normalized tables are taken into the implementation of the database. Circuit Bungalow Reservation System Database is designed using SQL Server database design software. Technical details of the tables are further elaborate in Appendix C. Table 3.2: illustrates the table for Bungalow.

Column	**Data Type**	**Nulls**	**Reference**
Bunglow_code	varchar(10)	No	Bungalow code
Branch_code	varchar(4)	No	branch code
No_of_rooms	In	No	Number of rooms
Bunglow_name	char(100)	No	Bungalow name
Bungalow_tel	char(4)	No	Bungalow telephone
Street	Varchr(50)	No	Street
Town	Varchar(50)	No	Town
City	Varchar(50)	No	City
Addusr	char(4)	No	Record inserted user
Adddate	Date	No	Record inserted date
Chgusr	char(4)	Yes	Last change user
Chgdate	Date	Yes	Last change date
Status1	Varchar(1)	No	Status of the bungalow

Table 3.2 : Table structure for Bungalow

3.11 User Interface Design

To design the user interface web pages the concept of Logical User-Cantered Interaction Design (LUCID)Methodology by Kreitzberg is used to provide user the best user friendliness from the system. [6]

The screens were design by HTML and Java Scripts.

Limited numbers of the internal users are interacting with the system when required, it is necessary for going on light color, but components need to be easily viewable to them. There it is decided to use substance themes for this user interface designs. After the implementation of the interface, the training and help through the system is done.

Java script files were used to design the users interface. Cascading style sheets with Bootstrap features were used to improve the graphical view the user interface parameters such as forms, buttons, menus, text boxes, fonts etc.

Figure 3.6: illustrates User Login Registration screen.

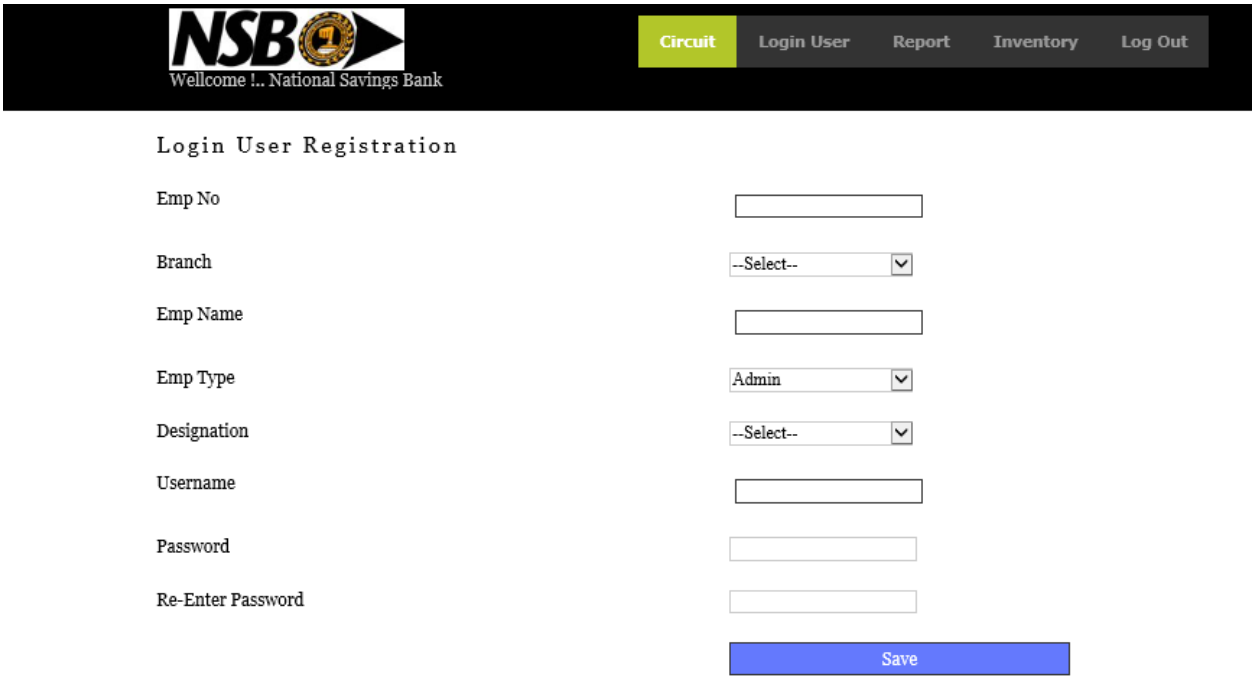


Figure 3.6: User Login Registration

Figure 3.7: illustrates screen for Add new circuit and Modify existing circuit.

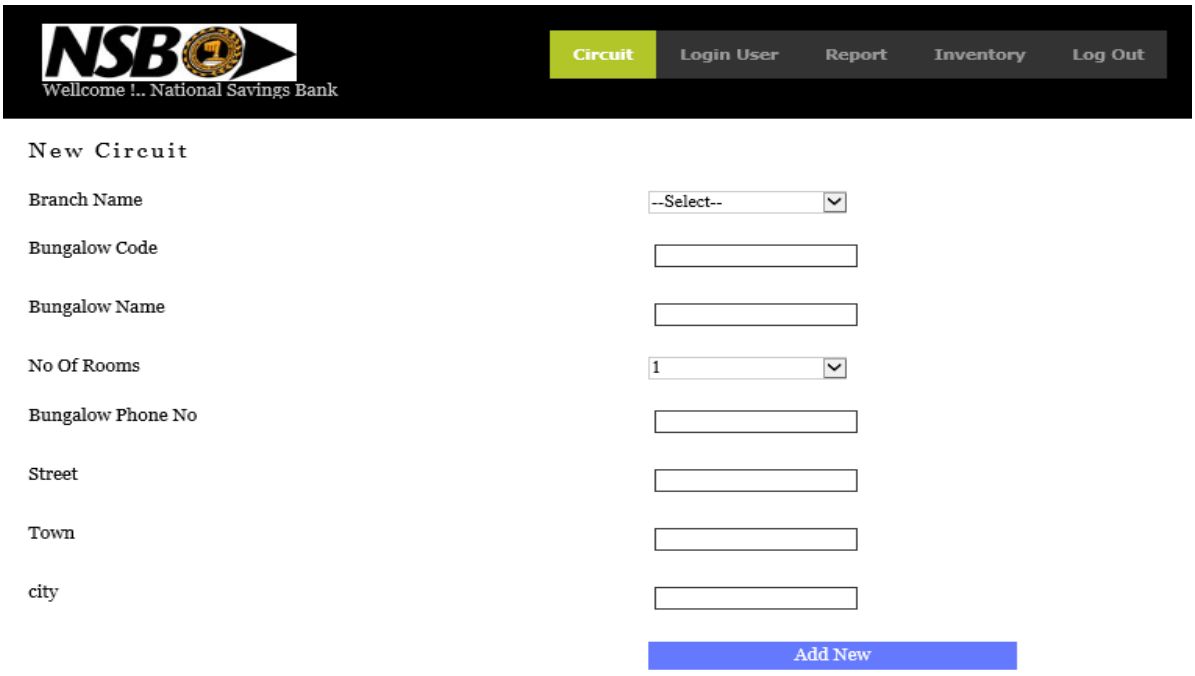


Figure 3.7: Add / Modify new circuit

Figure 3.8: illustrates screen for Add parts in the Bungalow and Modify existing bungalow parts.

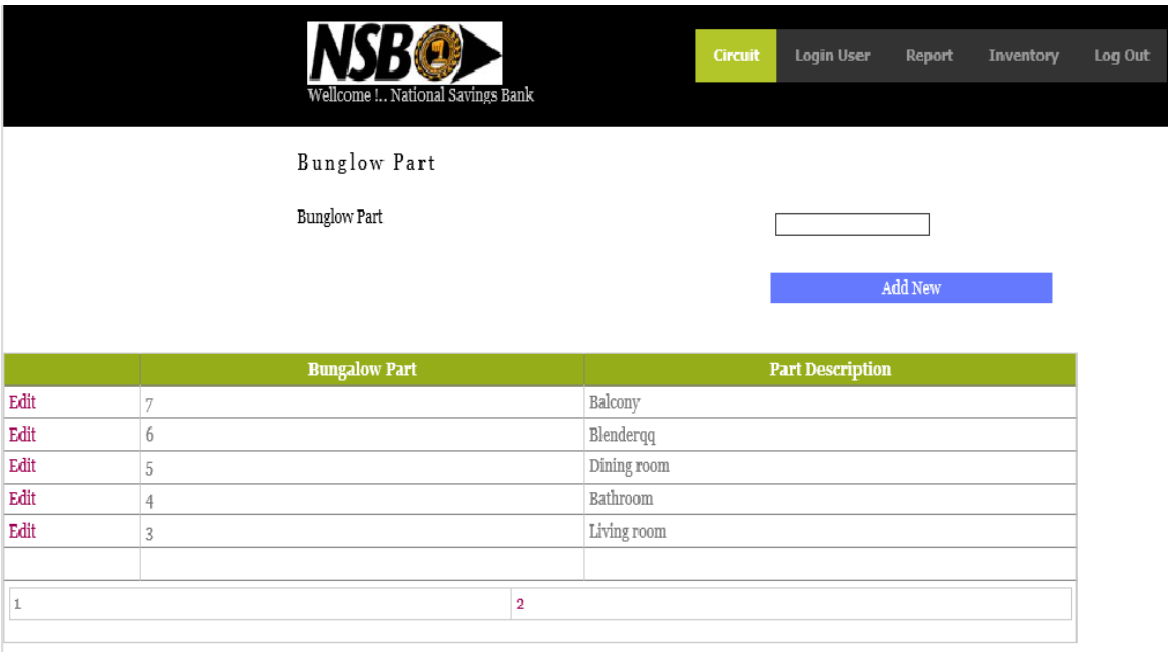


Figure 3.8: Add / Update Bungalow Parts

Chapter 4: Implementation

4.1 Introduction

During the implementation process Visual Studio 2008 platform used to build the code and web interface which were the outcome of the design process. Database which is designed using the class diagram was created using SQL Server 2008 software.

4.2 Technological Overview of the Implementation

4.2.1. Implementation Language

Current developments are mainly done using Object Oriented Programming Languages (OOPL). Because of its re-usability, encapsulation, inheritance and polymorphism.
Re-usability is that a programmer can use an existing class without modifying or add additional features.
Encapsulation is that prevents code and data from being accessed by other outside codes.
Inheritance is that one object acquires the properties of another object. Eg. All .NET classes inherit from the system object class so that a class can include new functionality as well as existing object class functions and properties.
Polymorphism is that allows one interface to be used for a general class of actions.
OOP is the core ingredient of the .NET framework. The idea of the OOP is to combine both data and methods in to a single unit. These units are called objects.

The system design methodology is used for software design in OOP is OOSE (Object-Oriented Software Engineering). OOSE includes requirements, analysis, design, implementation and testing model.

When it comes to C#.net it is a very well defined OOPL, which incorporates logical classes, objects, methods, relationships and other processes with the design of software and application.

As this is a web project can use Visual Studio to develop well structured, secure web applications.

4.2.2 Implementation Database

SQL client server is used to create and implement the database.
DB Connect connection sting class file consists of coding which can be reused to connect to the Backend.

4.2.3 Frontend Implantation

For the front-end implementation of web-based user interfaces used HTML and JavaScript as jQuery Framework with Bootstrap to implement better dynamic responsive web pages design (in Visual Studio 2008).

4.3 Implementation model of OOSE

After deriving the database design from the class diagram, implementation of the database is done using SQL Server 2008. The database is password protected and database administrator has ability to restrict its usages as desire.

This project uses 3 Tier Architecture to structure the system. Logical layer contains all the logic and interactions with Data level and these modules are used collaboratively between many web pages through the Presentation layer to enhance reusability.

Classes defined are branch, circuit, employee, payment, inventory.

4.4 System Architecture

Software architecture refers to the high-level structures of the system, the discipline of creating such structures, and the documentation of these structures. These structures are needed to reason about the software system.

Figure 4.1, illustrates the Network diagram and Figure 4.2, illustrates the Application Architecture.

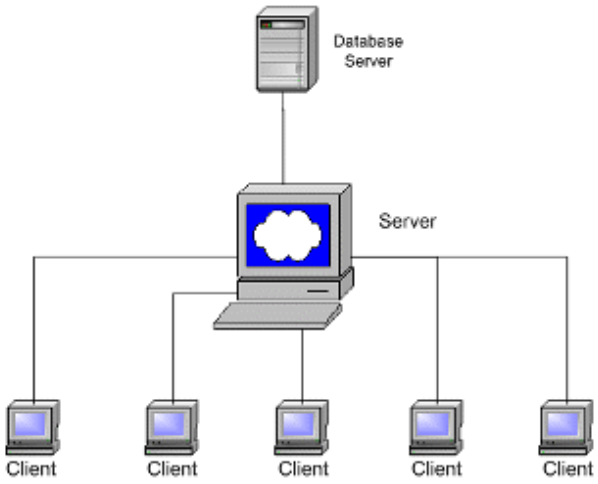


Figure 4.1: The Network Diagram

System design is the process of defining the components, modules, interfaces and data for a system to satisfy specified requirements. System development is a process of creating or altering systems along with the processes, practices, models and methodologies.

Figure 4.2: Illustrates the Presentation Layer, Logical Layer and Data

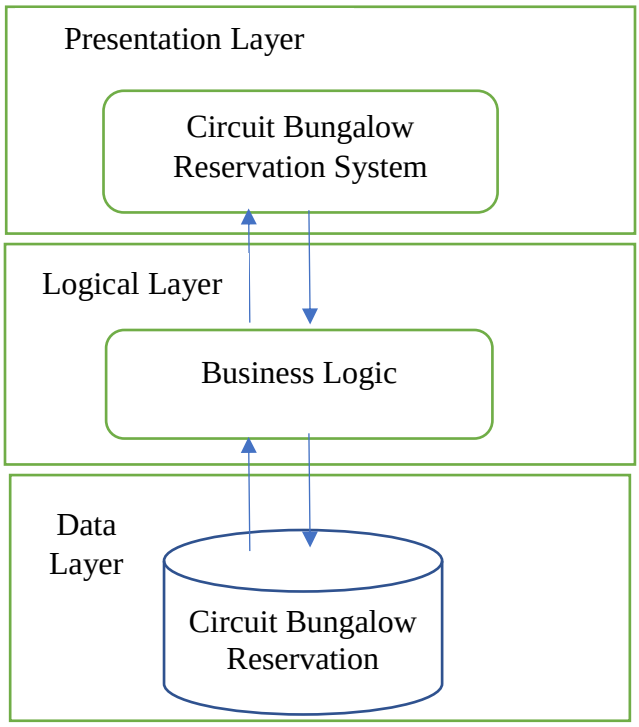


Figure 4.2: The 3-tier Architecture

Multi-tier architecture is used in this project for traceability and ease of maintenance.

1. it gives you the capability to update the technology stack of one tier, without impacting other areas of the application.
2. It permits for different development teams to each work on their own areas of expertise. Today's developers are more likely to have deep competency in one area, like coding the front end of an application, instead of working on the full stack.
3. You can scale the application up and out. A separate back-end tier, for example, allows you to deploy to a variety of databases instead of being locked into one technology. It also allows you to scale up by adding multiple web servers.
4. It adds reliability and more independence of the underlying servers or services.
5. It provides an ease of maintenance of the code base, managing presentation code and business logic separately, so that a change to business logic, for example, does not impact the presentation layer.

This is the topmost level of the application. The presentation tier present information related to such services as permits to data manipulation and data entry. This also is this layer for request handling from and to the data from Business layer. It interconnects with lower tiers (Figure 4.3: Illustrates Strict interaction of layered architecture used) by which it places the results to the browser tier and all added tiers in the network. In simple terms, it is a layer which user can access directly (such as a web page, or an operating system's GUI).

The Presentation layer (a.k.a. UI layer, view layer, presentation tier in multitier architecture) Is used for presenting the view to the user for interaction. In this report it is a web-based interaction using asp.net and front end with IIS. (Figure 4.5: Illustrates Hosting Architecture and Figure 4.6: Illustrates using asp.net and OOP classes for design). Presentation Entity Components encapsulate business logic and data and make it easy for the UI and presentation logic components in the presentation layer to consume;

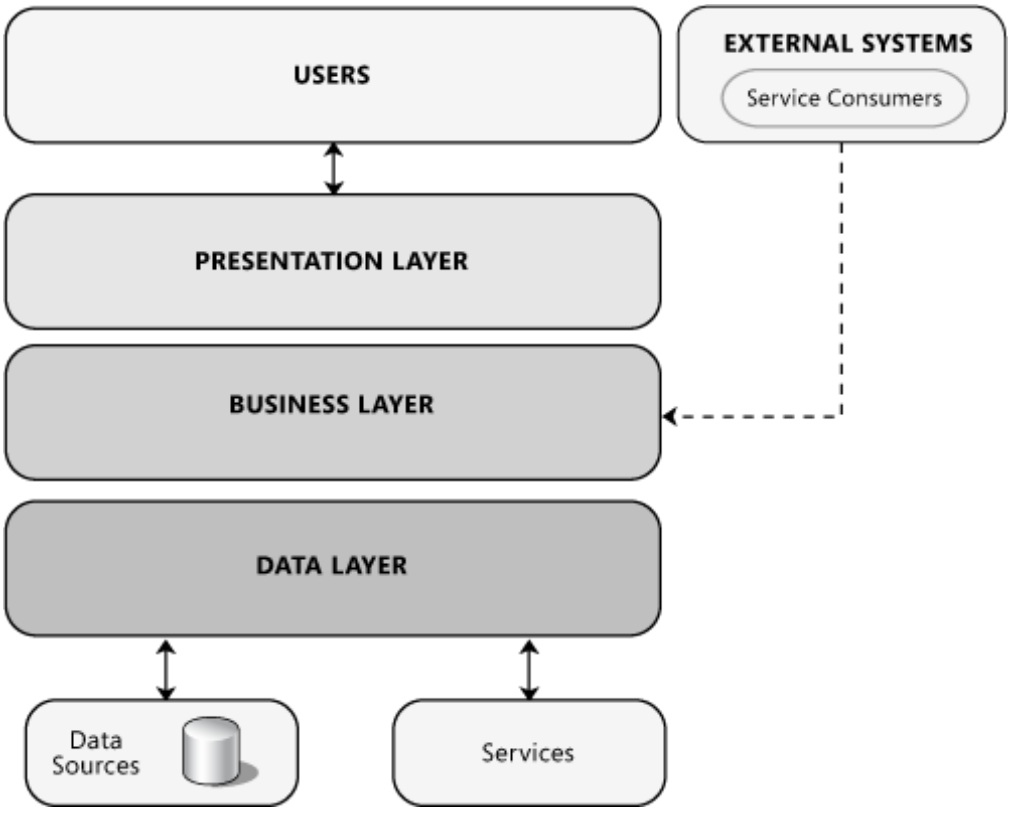


Figure 4.3: The Strict Interaction of Layered Architecture Used

Business Logic Tier

The logical tier is pulled out from the presentation tier and, as its own layer, it controls an application's functionality by performing detailed processing. The business logic acts as the server for client requests from client. It acts according Business rules fetch or insert data through the Data Layer. In this project all the business logic regarding the bungalow maintenance and reservation. Uses OOP for design of the business classes and stored procedure based. Parameterized methods are used for the input and return the datasets. Uses C# classes.

Data Tier

The data tier comprises the data persistence mechanisms (database servers, file shares, etc.) and the data access layer that captures the persistence mechanisms and exposes the data. The data access layer should provide an API to the application tier that exposes methods of managing the stored data without exposing or creating dependencies on the data storage mechanisms. Avoiding dependencies on the storage mechanisms allows for updates or changes without the application tier clients being affected by or even aware of the change. As with the separation of any tier, there are costs for implementation and often costs to performance in exchange for improved scalability and maintainability. In this project we handle the database related queries in this session for the ease of maintain and modifications. Uses DBMS and relational database to access the data on the database. Use SQL Server 2018 as the Data Tier and uses stored procedure to insert, updated, view, delete. For more insight see Figure 4.4: Board view of the web-based bungalow reservation system

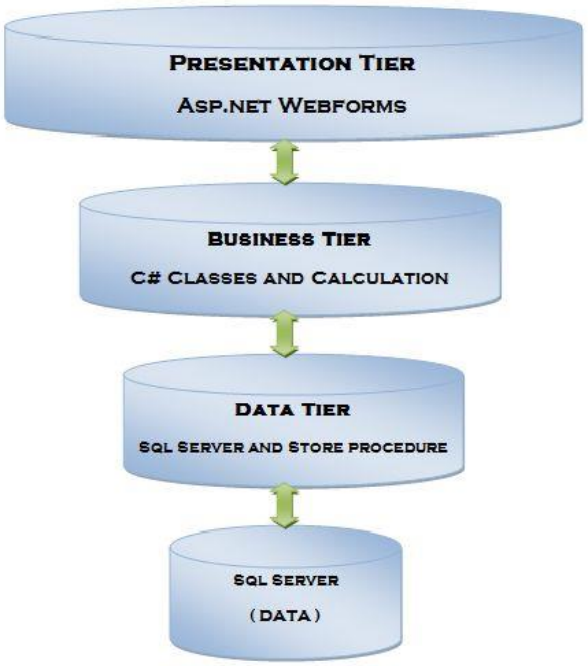


Figure 4.4: Board View of the Web-Based bungalow reservation system

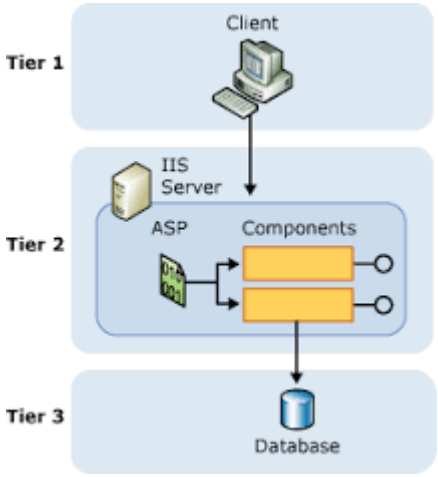


Figure 4.5: Hosting Architecture

Figure 4.6: using asp.net and OOP classes for design

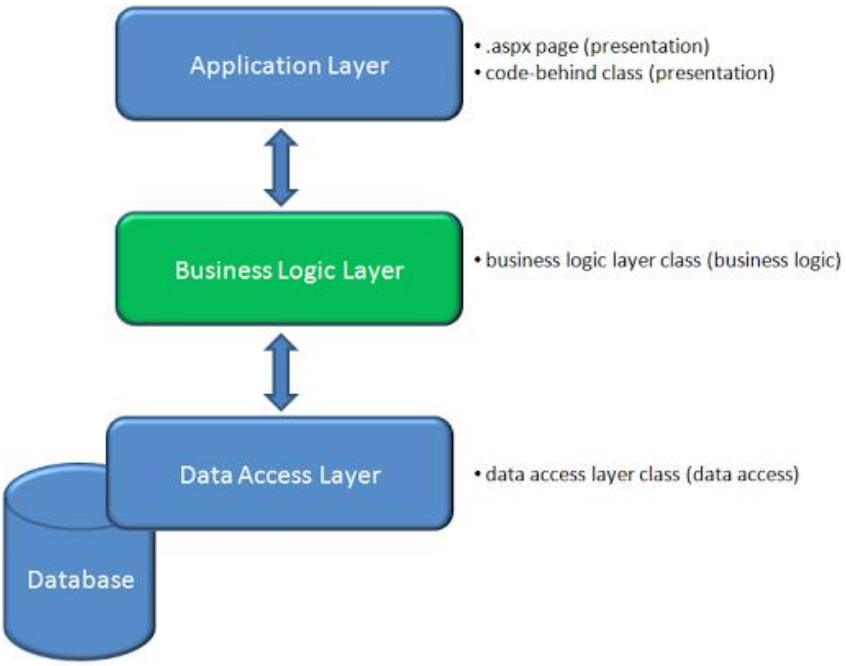


Figure 4.6: The Network Diagram

4.5 Hardware Requirements

Windows server 2008 with IIS 7 or above.

4.6 Software Requirements

Deploying Circuit Reservation ASP.NET Web Application with SQL Server Compact using Visual Studio.

Server

I. IIS (Internet Information Services) 7 and above with port 8080 which supports: -
    i. Anonymous authentication
    ii. Basic access authentication

iii. Digest access authentication
iv. Integrated Windows Authentication
v. UNC authentication
vi. .NET Passport Authentication

II. SQL Server 2008 Database

III. .net Framework 4.0 and above
NET Framework consists of runtime and associated files that are required to run and develop applications to target the .NET Framework 4.

IV. ASP.NET 3.5
Web sites building standards based, next generation were designed using this technology.

Client

Any Web Brower is compatible and could be used. JavaScript should be enabled for better interaction.

Chapter 5: Evaluation and Testing

5.1 Introduction

Major objective of the testing phase is to produce an error free system to the end esurient. Testing is an activity that helps in finding out bugs/defects/errors in a software system under development, in order to provide a bug free and reliable system/solution to the customer. Testing is an activity which is broadly deployed in every phase of the software development.

Each method is tested with white box testing and black box testing. Thereafter, classes are tested in combination. Then group of classes are tested as cluster testing. Finally, the full system is checked for integration. User validation and verification with the document is done eventually.

5.2 Testing Process

Run the tests as defined by the test plan. Record the outcome of each test in the test report. Both success and failure should be reported. For the failed tests should be described in detail. Correct the errors that were reported in the document. Repeat the process until there were no errors.

Figure 5.1 Illustrates the Testing Process

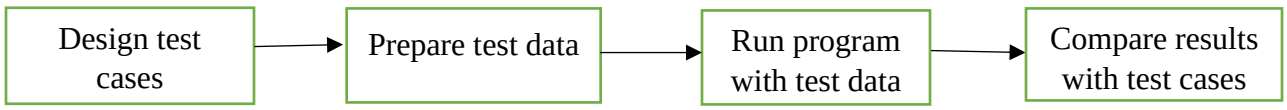


Figure 5.1: Testing Process

5.3 Objectives of Testing

The system should be test by the developer initially. That should be done in development environment. After testing the system by developer, the users must be test. The system must be test in four stages

Figure 5.2: Illustrates the test stages

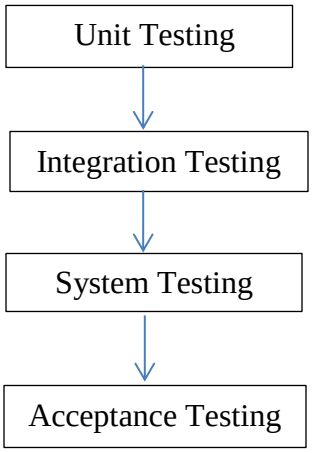


Figure 5.2: Testing Stages

Unit Testing

Unit testing of software applications is done during the development (coding) of an application. The objective of unit testing is to find errors. After correcting the errors and verify the correctness of units of entire interface and classes. This is white box testing. Unit testing will be done by the developer.

Integrated system testing

Integration testing will be done after completing the unit testing. The modules will be combined and tested as a group. The testing should be done as black box, white box, top-down and bottom-up. Integration testing is done by the development team.

System testing

System testing to test software and hardware. System software testing is to test complete integrated system together to evaluate the system's compliance with its specified requirements. This test is falls within the black box testing, stress testing, performance testing. System testing should not require the knowledge of the inner design of the code or logic. This testing will be done by system test team.

Acceptance Testing

acceptance testing will be done to evaluate the system's compliance with the business requirements and assess whether it is acceptable for delivery. Acceptance test will be done by the end user.

Software testing is the crucial element of software assurance and represents the ultimate review of specification, design and code generation.

The objectives are:

- To improve the quality of the product.
- Test the system to check out and verify whether the functional requirements are satisfied.
- Identify the bugs or defects in the implementation so that they can be debugged and rectified.
- Identifying the way, the system responds to different scenarios and the robustness and helpfulness for erroneous situations.

Based on the results of testing solution can be further improved in processing performance, which might have been overlooked in previous stages. Further testing provides the usability of the system, based on which enhancements could be carried out.

- Testing always ensures the following:
- System comes to bug free position.
- Separate procedures/function performance and check whether those are working properly.
- Check whether the system provide exact user requirements.

5.4 Test Model of OOSE

At the beginning for each class it must check whether the relevant methods and operations are captured, further check whether all attributes related to the objects are identified. These attributes specify various stages of class can undergo, also whereas the operations provide the relevant interface to communicate with it. Message passing between object lets then to communicate to perform task successfully. Therefore, it is necessary to perform that.

5.4.1Unit Testing

As the system require higher degree of accuracy each method is tested using white box testing and black box testing. As example model class functions are tested with mock data to in and out to in the controller to identify functions are working at expected level.

Further unit level test cases are written to verify black box testing. Below is an example for it to verify login functions.

Test results

Table 5.1, illustrates the Test results for User login. Other test results are discussed in Appendix B.

No	Field Name	Input	Expected results	Pass / Fail
1	Userid	Enter valid user id	System fires error message “Valid user id”	pass
2	Password	Enter valid user pass word	System fires error message “Valid user id”	Pass
3	Password	User try to enter invalid password	System fires error message “Invalid password”	Pass
4	Userid	User try to enter invalid userid	System fires error message “Invalid user id”	Pass

Table 5.1: Test results of User login

5.4.2. Integration Testing

After ensuring the accuracy of the methods, model classes are tested on the whole. It is identified whether the classes contain all relevant methods and attributes. For example, the model class "Reservation" has several methods and delegates which will be called during triggers from events. Some methods are called during runtime when the form loads. If the methods and delegates give the expected output without an error, when we run the class using controller classes to ensures its accuracy.

5.4.3 System Testing

All classes will be tested. Therefore, it is necessary to check whether all classes work together by-passing messages between models as well as controllers and views.

To make sure the accuracy of the system, a complete set of accurate data is taken from the employees. The relevant employee details, reservation details, and visitors' details are taken to be entered. These data will be process and select the reservationist out of several applicants.

5.4.4 Acceptance Testing

This will be done together with end user. The end user will be provided with created test data to enter to the system to perform the activities. The feedback on the system and the expected out comes will be recorded. Level of user satisfaction will be taken as the key factor. Usability testing will be carried out throughout the project to ensure whether the system will be provided the expected outcomes where user wants.

5.4.5. Regression Testing

Finally, the system scenarios test cases are written and some of those static test cases are automated using selenium to save time in regression testing process as I continuously integrate new changes to the code to make sure nothing new broken from those.

5.4.6 Usability Testing

Usability testing is a necessity to test as that reduces the highest risk impact to the system to user acceptance. In early stages of the project UML diagrams and thereafter prototype web interfaces are used to evaluate and get feedbacks on user experience to enhance the system while developing.

The developed web interfaces were shown to the clients and the functionalities described. The interfaces were tested to ensure that only the required information is available. Then all the PHP pages were put through – Performance testing, where most of the pages were tested separately for the performance of the individual pages. The pages that cannot perform individually (depend on other pages) were tested for performance after the individual performance testing of the other PHP pages were done. When the interfaces were shown to the client, at some occasions they came up with some more requirements and suggestions. The possible actions to adopt them in the system were also made.

Further after complete development evaluate on usability by getting feedbacks on parallel run period by letting them experience the system hands on.

5.5 Evaluation of the system

Evaluation can be considered as systematic acquisition and assessment of information used to provide feedback regarding developed system. Therefore, the results of the system evaluation can be considered as key indicators in accessing the degree of success associated with the development process.

The evaluators were selected carefully to evaluate all the related operations of the system. Selected staff of the company and the supervisor was the evaluators of this system. The system was tested by using the dummy data on offline. Further the site is planned to be evaluated or modified according to the feedbacks of users once it is sited.

The evaluation criteria were selected for evaluation and some of the main criteria used for assessment as follows.

- Overall functionality of the system
- Usability and practicality of the system for use in day today activities.
- Performance and speed
- Overall assessment of the system
- Website information contents assessment, usability of the site, attractiveness etc..

The evaluation was carried out mainly based on the feedback obtained from the evaluators during and after the system demonstration.

5.5.1 Test Plan

The system was being tested under following criteria. The checklist is attached to Appendix E.

- Function Testing
- Usability Testing
- Content Testing
- Interface Checking
- Compatibility Testing

5.5.2 Evaluation Result

Most of the evaluators were satisfied with the functions offered by the system and they were agreed this can be used as a final website.

The following section lists out the main areas that gave more satisfaction and the improvement are which were pinpointed by the evaluators.

Evaluator's Satisfactory Points

- User-wise access controls and functionalities
- Use of combo boxes to minimize the typing effort and rejects the input data
- Related information for a selected or given criteria will be automatically displayed

- Restriction of invalid characters during the data input
- Overall functionality of the system
- Meaningful warnings and errors to users of the system

The system will be used by 256 branch users and the divisional users of the head office. The following questioners were given to 42 selected users.

Questioners for Evaluation

1. How easy to read and understand the given instructions?

   Extremely Easy ◉ Very easy ○ Moderately easy ○ Slightly easy ○ Not at all easy

2. How long did you take to understand the process of the system?

   ◉ Extremely quick ○ Very quick ○ Moderately quick ○ Unable to Understand

3. How user-friendly is the interfaces in the system?

   ◉ Extremely user-friendly ○ Very user-friendly ○ Moderately user-friendly

   ○ Slightly user-friendly ○ Not at all user-friendly

4. How often does the system freeze or crash?

   ○ Extremely often ○ Very often ○ Moderately often ○ Slightly often ◉ Not at all often

5. How successful is the system in performing its intended task?

   ◉ Extremely successful ○ Very successful ○ Moderately successful ○ Slightly successful ○ Not at all successful

6. How useful is the included reports and queries in the system?

   ◉ Extremely useful ○ Very useful ○ Moderately useful ○ Slightly useful ○ Not at all useful

7. Are employees/ pensioners happy with the reservationist selection process given in the system?

Extremely happy Very happy Moderately happy little bit happy Not at all

8. Overall, are you satisfied with the performance of the software, neither satisfied nor dissatisfied with it, or dissatisfied with it?

Extremely satisfied Moderately satisfied Slightly satisfied Neither satisfied

According to the answers given by the employees following statistical evaluation was done.

Figure 5.3: Illustrates the How easy to understand the given Instructions to the user.

Most of the employees are very easy to understand the given instruction to follow the flow of process. Nobody can understand the instructions. That means the instructions given by the system is easy.

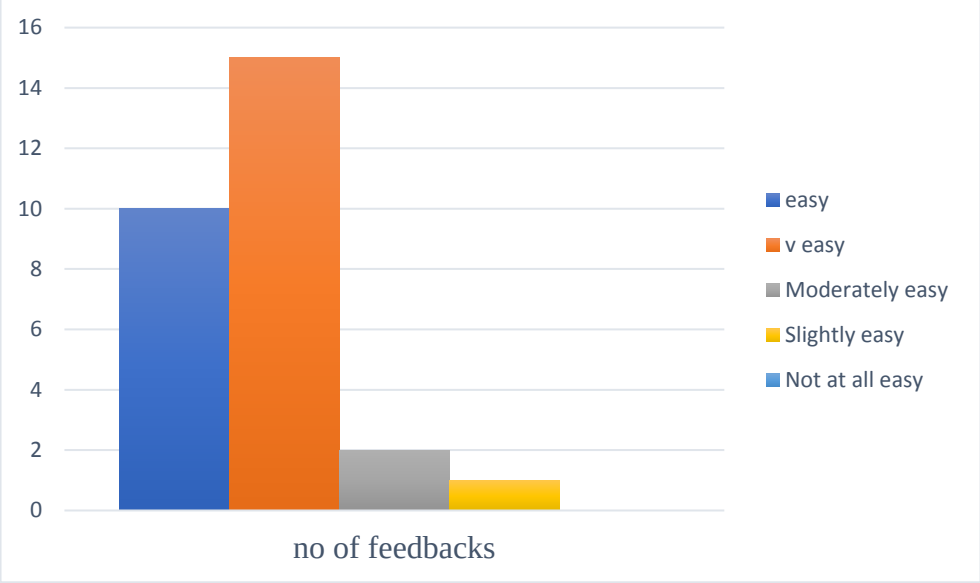


Figure 5.3: How easy to follow the given Instruction

Figure 5.4: Illustrates the Speed of Understand the System. 20 employees out of 40 is extremely easy to understand the system and very quickly understand the system by 15 employees. 5

employees were moderately quick, and 2 employees were unable to understand. This means most of the employees could understand the system.

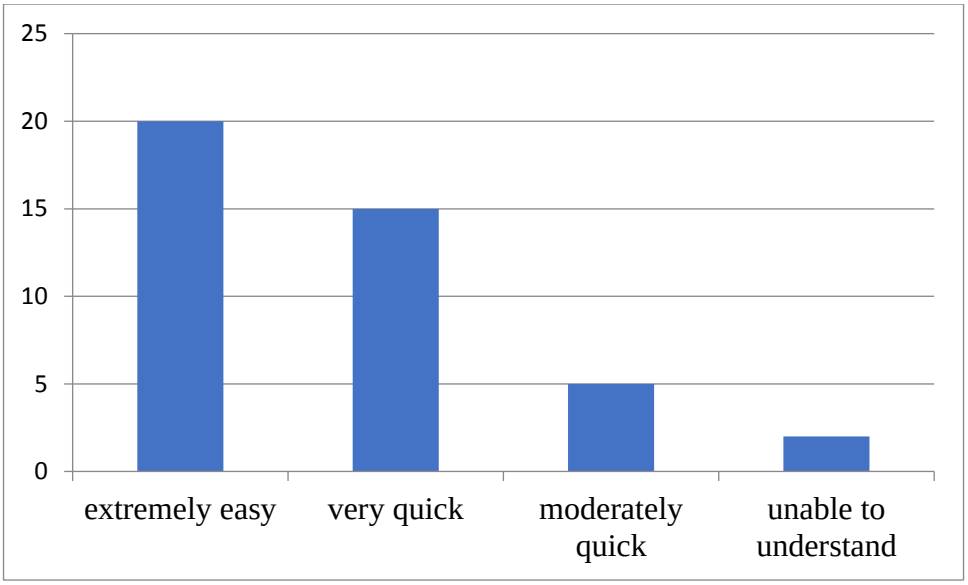


Figure 5.4: Speed of Understand the System

Figure 5.5: Illustrates whether the given Interfaces are user friendly. More than half of the employees says that interfaces are extremely user-friendly. Majority of the other employees say that the interfaces are very user friendly. Very few employees say that interfaces are moderately user friendly or slightly user friendly. Nobody say that the interfaces are not at all user friendly. That says the interfaces in the system are user-friendly.

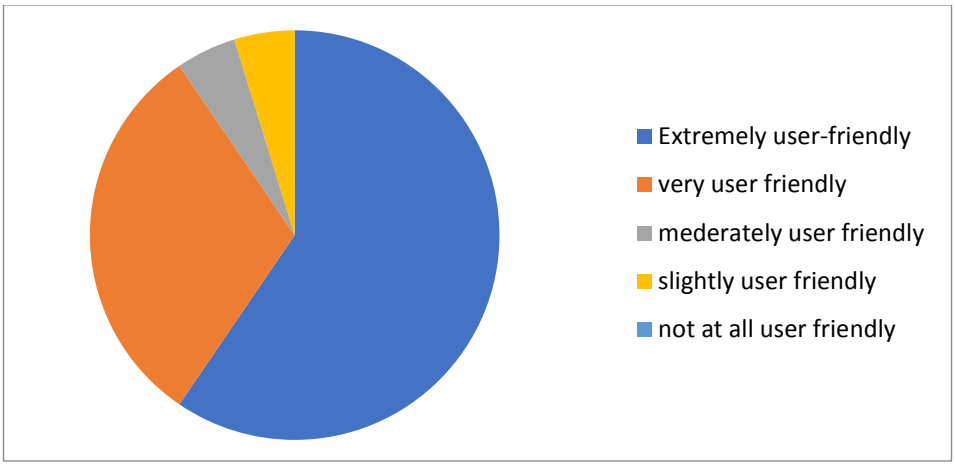


Figure 5.5: User friendly Interfaces

Figure 5.6: Illustrates how often the system freeze or crash. Out of 42 employees 5 says system freeze or crash and 37 says not at all often. That means the system is not freeze or crash very often.

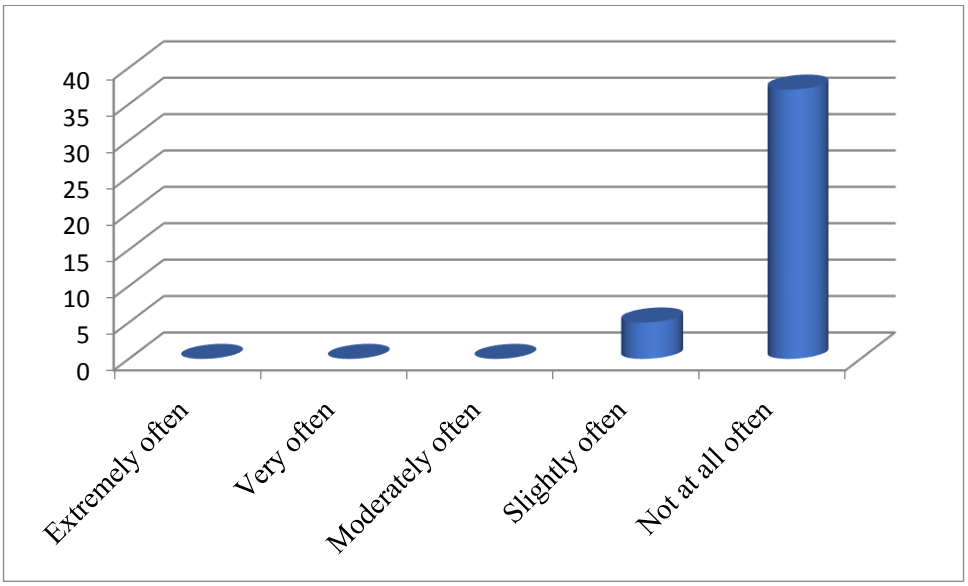


Figure 5.6: Frequency of system freeze or crash

Figure 5.7: Illustrates whether the perform its intended task? 27 employees say that the system in performing its intended task. 10 says very successful, 3 says moderately successful and 2 says slightly successful. Nobody says not at all successful. That means the system in performing its intended task.

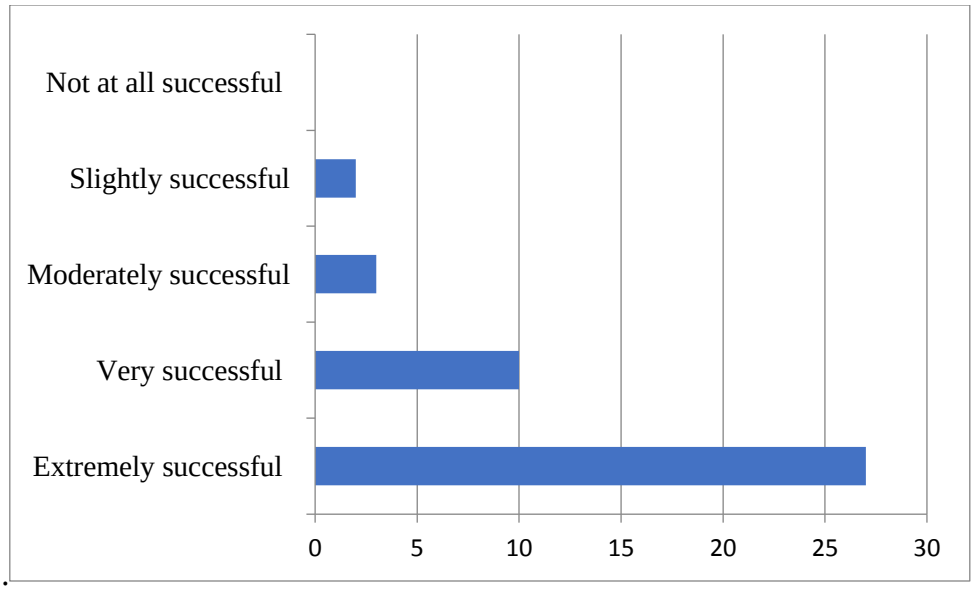


Figure 5.7: How successful is the system in performing its intended task?

Figure 4: Illustrates how useful is the included reports and queries in the system? 23 employees say that the given reports are extremely useful, and 13 employees says the given reports are very useful and 5 says moderately useful and 1 say slightly useful. Nobody says not at all useful. That means it says that the given reports are useful to get information.

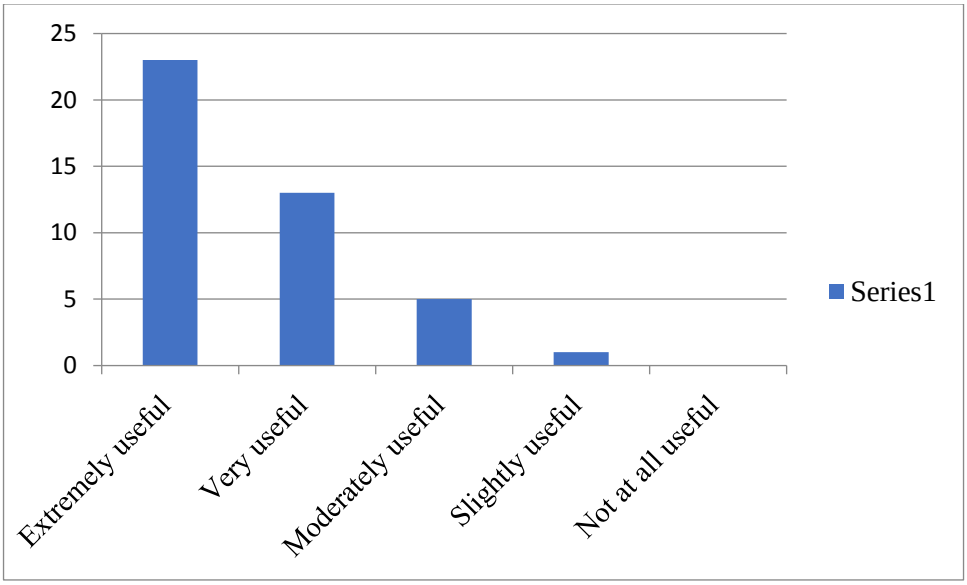


Figure 5.8: How useful is the included reports and queries in the system?

Figure 5.9: Illustrates are the employees happy with the reservationist selection process given in the system? 15 employees are extremely happy with the reservationist selection process and 10 employees are very happy. Another 10 employees are moderately happy, and 2 employees are little bit happy and 5 employees are not at happy with the reservationist selection process. That says there are some employees doesn't agree with the selection process.

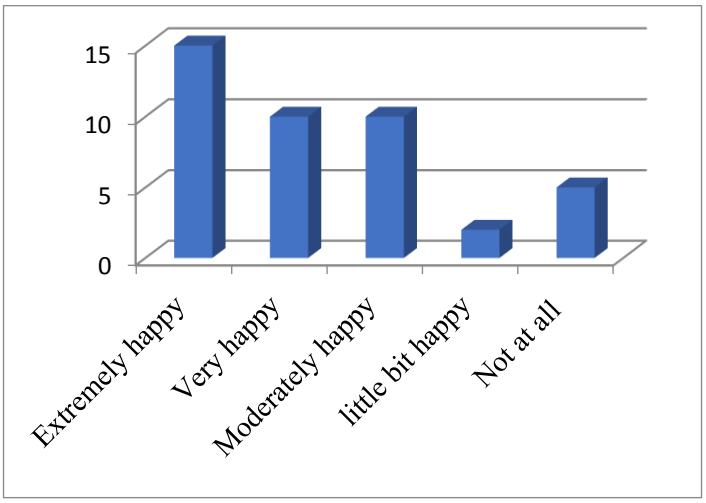


Figure 5.9: Are the employees happy with the reservationist selection process given in the system?

Figure 5.10: Illustrates the overall performance of the software. Most of the employees are extremely satisfy the performance of the software. Very few employees are slightly satisfied, and nobody says neither satisfied. That means the employees are satisfied with the performance of the software.

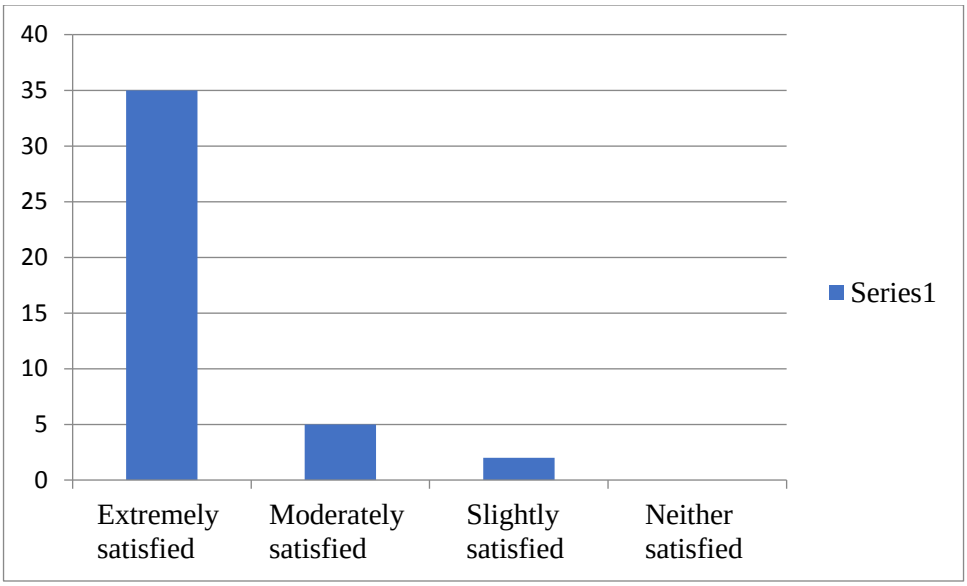


Figure 5.10: Overall, are you satisfied with the performance of the software, neither satisfied nor dissatisfied with it, or dissatisfied with it?

Chapter 6: Conclusion and Future Work

6.1 Introduction

National Savings Bank (NSB), is a state-owned Bank in Sri Lanka. Presently there are 14 circuit bungalows around the country. The employees have the privilege of reserving circuit bungalows of the bank by sending a fax or visit the welfare division of the bank. The current procedure of circuit bungalow reservation is based on first come first serve basis.

Purpose of developing the system was to transform the manual system to a more efficient WEB based centralized network system. The network of branches of the bank scattered all over the country can make use of the system during working hours.

The uses of all branches scattered island wide can access this web-based system simultaneously. The significant importance of this system is its networked and centralized architecture, allowing the bank branches to connect and access the same data of the system to reduce ambiguity and increase availability of the information.

6.2 Evaluation of the Project

At the end of the project, all the required functional, nonfunctional requirements were completed while adhering to constraints of the project. Also, client requirements that were given while system development was also satisfactory implemented.

It was delighted with the response received from the client on implementation of the project on time. They were very happy with the easy to use, attractive and web interfaces which the staff could easily learn.

A centralized database was chosen, because of some data should be able to viewable separately as well as in combination to provide all necessary information to make quick decisions without having need to go through many interfaces. Therefore, centralized database was necessity.

The project has been done as client server system by using C#.Net, HTML and CSS as front-end tools and SQL Server 2008 for Back-end. Moreover, OOSE has been selected as the system design. Reasons for choosing these options were clearly defined with comparisons with other comparatives are clearly described in the introduction chapter at Designing and Implementation chapters of the project report.

Whole project and report was done by the writer. Many books and internet had to refer to enhance the knowledge. Program Design and Programming lectures conducted by UCSC to develop system using PHP and MYSQL database technology were used in the system development.

Interface designing, and database designing were done by using diagrams drawn from the information gathered, and then those database tables were further developed by normalizing before using into coding.

6.3 Future Enhancements

Uses are not satisfy with the payment module. The payment module could be further developed. Payments are done with the main teller function. To enhance the teller, function these two systems can be integrated**.** Also, the program can be further modified to meet the security measures that arise in the further, which will enable the bank to have high data security with many payment methods as requested by users.

Now the system is available during the working hours. Branch users are login to the system. This system can be developed further to access by users other than the branch users and available for 24 hours from anywhere.

Finally, Backup system can also be expanded in order to deal with more problematic situations enabling the company to restore fast in problems that may arise suddenly or unexpectedly.

References

[1] Circuit Bungalow Reservation System. [Online]

https://dwc.lankagate.gov.lk/homeAction.action

[2] Hotel Reservation System. [Online] available:

https://www.littlehotelier.com/r/small-hotel-technology/booking-systems/hotel-reservation-systems-work/

[3] Agile Project Management[Online] available:

https://www.google.lk/search?ei=1m-nWtq1Aof6vASB-6agCg&q=Agile+SDLC+model+is+a+combination+of+&oq=Agile+SDLC+model+is+a+combination+of+&gs_l=psy-ab.3...4374283.4374283.0.4375066.1.1.0.0.0.0.778.778.6-1.1.0....0...1.1.64.psy-ab..0.0.0....0.HbYMizVIZCk

[4] Analyzing an Existing System [Online] available:
http://www.informit.com/articles/article.aspx?p=30340&seqNum=3

[5] design [Online] available:

https://www.mitre.org/publications/systems-engineering-guide/se-lifecycle-building-blocks/system-design-and-development

[6] C. Kreitzberg, "Beyond Automatic Generation - Exploratory Approach to UI Design, in Proceedings of 3rd International Conference on Computer-Aided Design of User Interfaces", 1999

[7] G.V.Perera, “Vehicle Transport and Movement Management System for Jayarathne Transport and Movers LTD-Master Thesis, "Postgraduate Unit,Univercity of Colombo school of Computer, Colombo, 2015.”

[8] What’s in the Online Social Networking Survey Template?

https://www.surveymonkey.com/mp/online-social-networking-survey-template/?ut_source1=mp&ut_source2=sample_survey_questionnaire_templates - Create a survey today

[9] Software Evaluation Form Template[Online] available:

https://www.wufoo.com/gallery/templates/surveys/software-evaluation/

[10] systems analysis [Online] available:

https://it.toolbox.com/blogs/craigborysowich/systems-analysis-describing-existing-systems-012511

[11]Object Oriented Programming Using C# .NET [Online] available

https://www.c-sharpcorner.com/UploadFile/84c85b/object-oriented-programming-using-C-Sharp-net/?

Appendix A-System and Technical Documentation

Hardware requirements

Hardware	Minimum Hardware Requirements 32-Bit	Minimum Hardware Requirements x64	Minimum Hardware Requirements IA64
CPU	Pentium III-compatible processor or faster. 1GHz minimum. Recommended 2GHz or faster.	Any Intel EMT64 or AMD x64 chip. Minimum 1.4GHz. Recommended 2GHz or faster.	Itanium processor. Recommended 1GHz or faster.
Memory (RAM)	512MB minimum, 2GB or more recommended. Report Server will use a maximum of 3GB (with /3GB switch in boot.ini).	512MB minimum, 2GB or more recommended. Maximum is the OS-specified maximum.	512MB minimum, 2GB or more recommended. Maximum is the OS-specified maximum.
Hard disk space	Total will vary depending on selected components. See Table 5.2.	Total will vary depending on selected components. See Table 5.2.	Total will vary depending on selected components. See Table 5.2.
Monitor	VGA or higher resolution. 1024x768 recommended for SQL Server graphical tools.	VGA or higher resolution. 1024x768 recommended for SQL Server graphical tools.	VGA or higher resolution. 1024x768 recommended for SQL Server graphical tools.
Pointing device	Microsoft mouse or compatible pointing device.	Microsoft mouse or compatible pointing device.	Microsoft mouse or compatible pointing device.
CD/DVDROM	CD or DVD drive as needed for given installation media.	CD or DVD drive as needed for given installation media.	CD or DVD Drive as needed for given installation media.

Table A-1 : Hardware Requirement for the System

Software Requirements

Server

Deploying Circuit Reservation ASP.NET Web Application with SQL Server Compact using Visual Studio.

i. IIS (Internet Information Services) 7 and above with port 8080 which supports: -
   a. Anonymous authentication
   b. Basic access authentication
   c. Digest access authentication
   d. Integrated Windows Authentication
   e. UNC authentication
   f. .NET Passport Authentication

ii. SQL Server 2008 Database

iii. .net Framework 4.0 and above

   NET Framework consists of runtime and associated files that are required to run and develop applications to target the .NET Framework 4.

iv. ASP.NET 3.5

Web sites building standards based, next generation were designed using this technology.

Client

Any Web Brower is compatible and could be used. JavaScript should be enabled for better interaction

Appendix B – User Documentation (Manual)

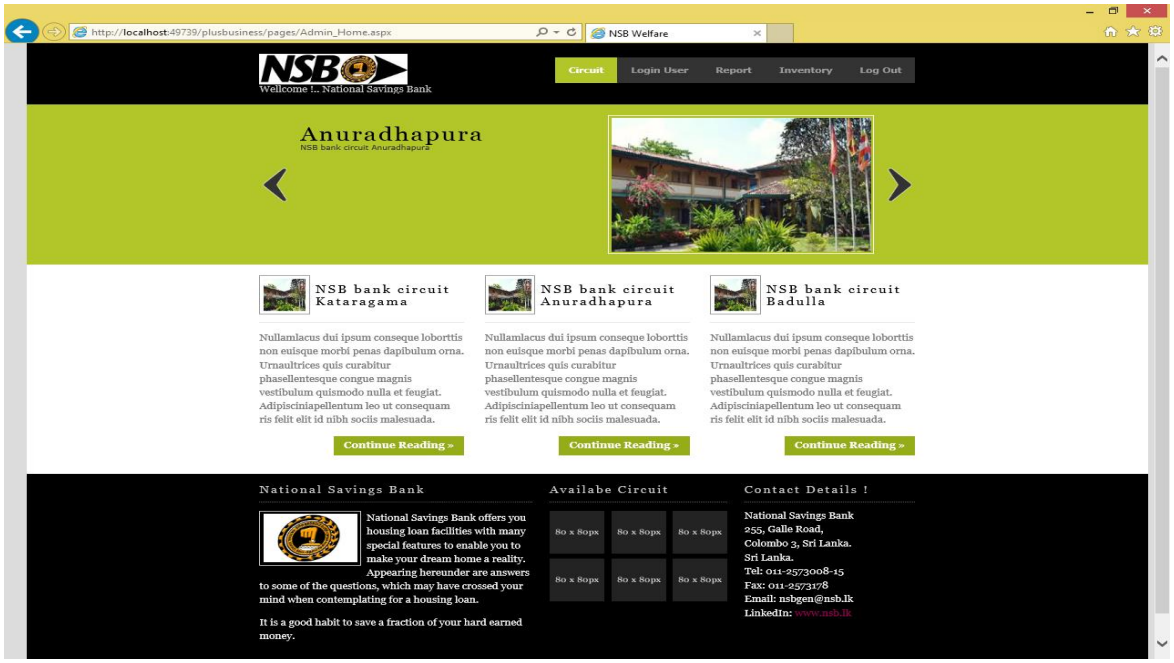
Circuit Bungalow Reservation System

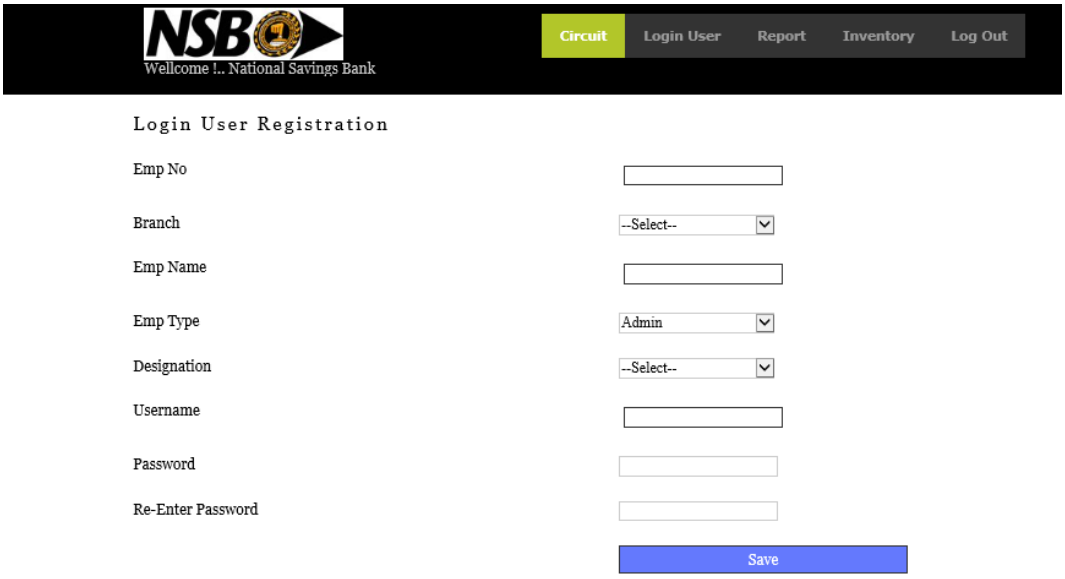
User Guide

Officer Functions

Enter the system http://localhost:8080/plusbusiness/pages/Admin_NewUser.aspx

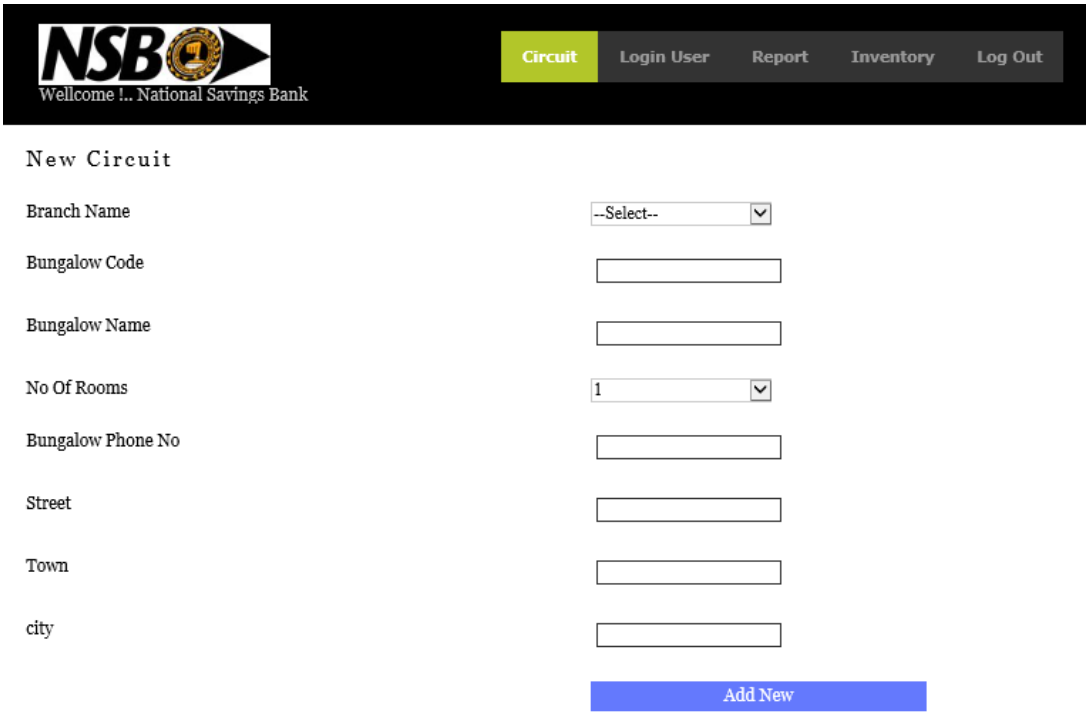
The Login Screen will appear. Enter Username and Password to Login. You will direct to the Staff Home Page.





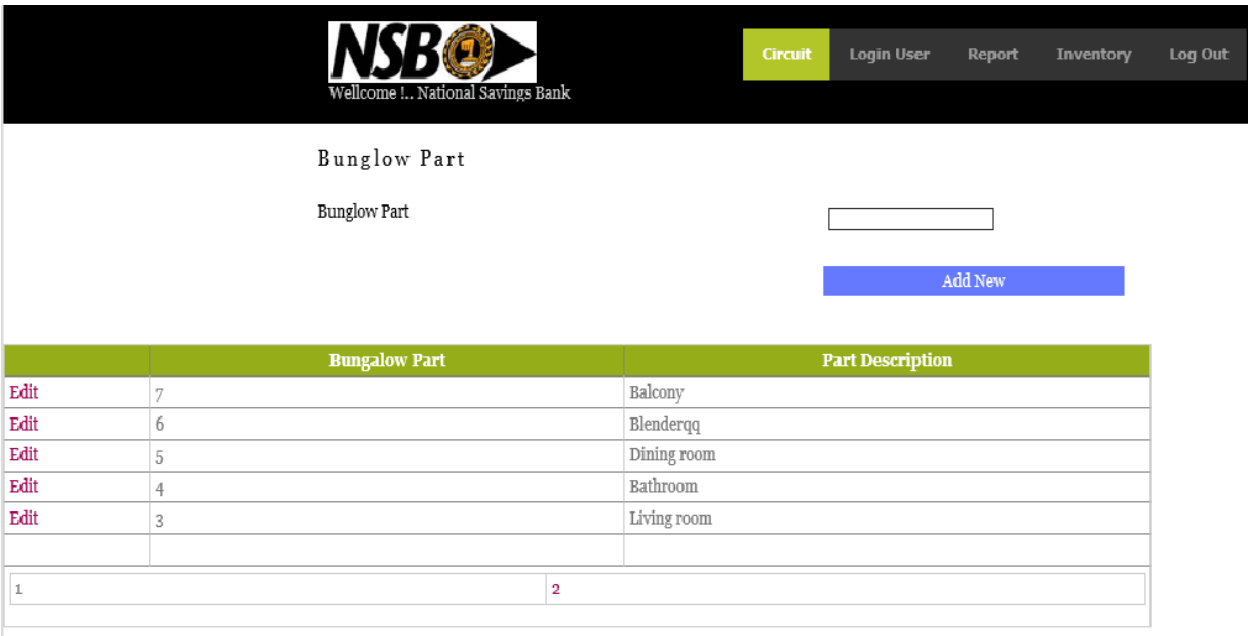
Login -> Login User -> New Users

Add new users to the system. When enter employee number branch, employee name, employee type and designation will be displayed on the screen. Username and pass word must enter by the user.



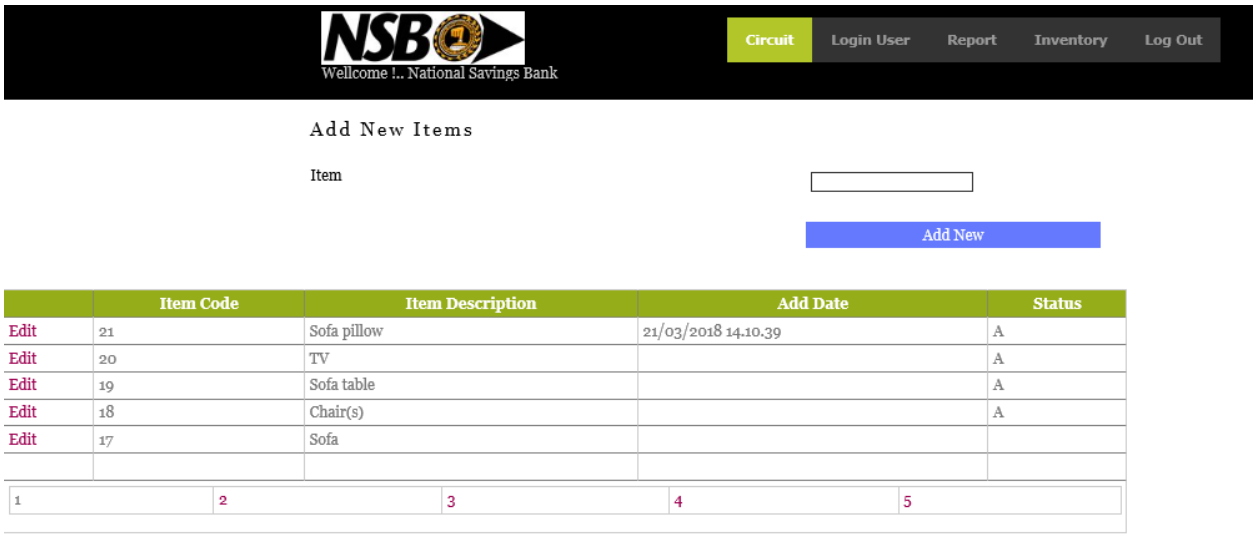
Login -> Circuit-> New Circuit

Add New Circuit Bungalow to the system. User must select and enter branch name. Other fields bungalow code, bungalow name, number of rooms, telephone number, street, town, and city will be entered. To update the existing bungalow must enter the bungalow code. Then display the other details and could update the required field.



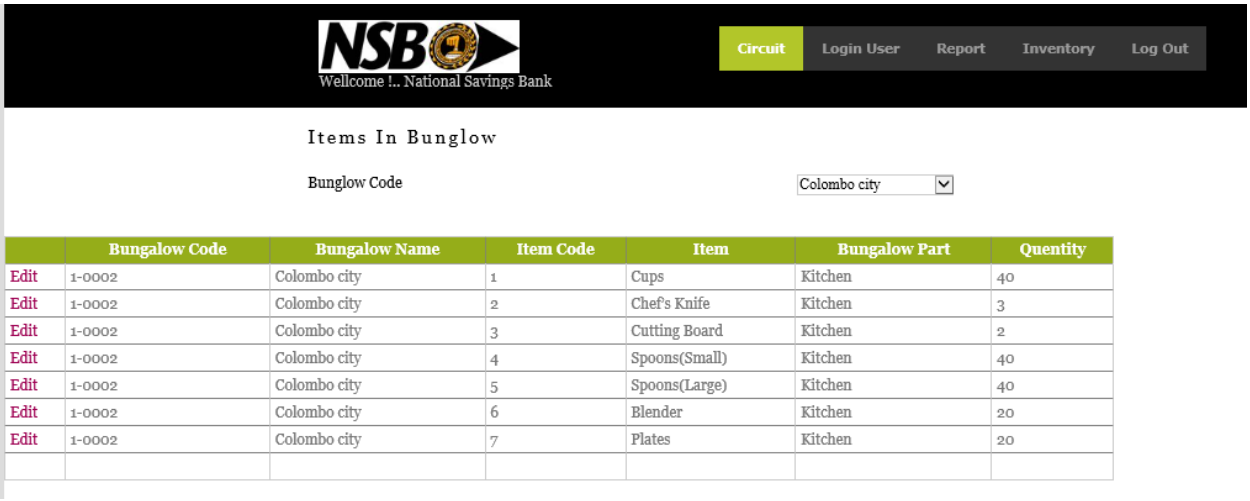
Login->Inventory-> Add Parts of Circuit Bungalow

Add New Bungalow Parts to the to the bungalow. Part descriptions can be update.



Login->Inventory -> Add / Update Items

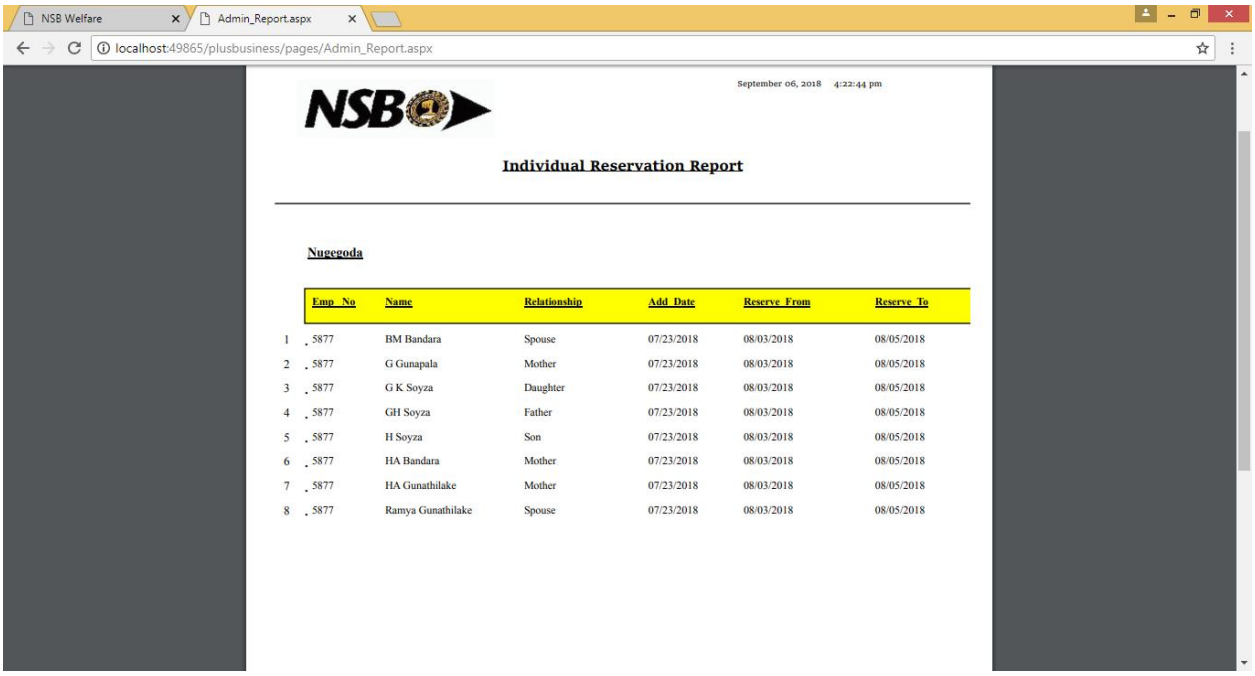
Add New Items to the system or Update Existing items.



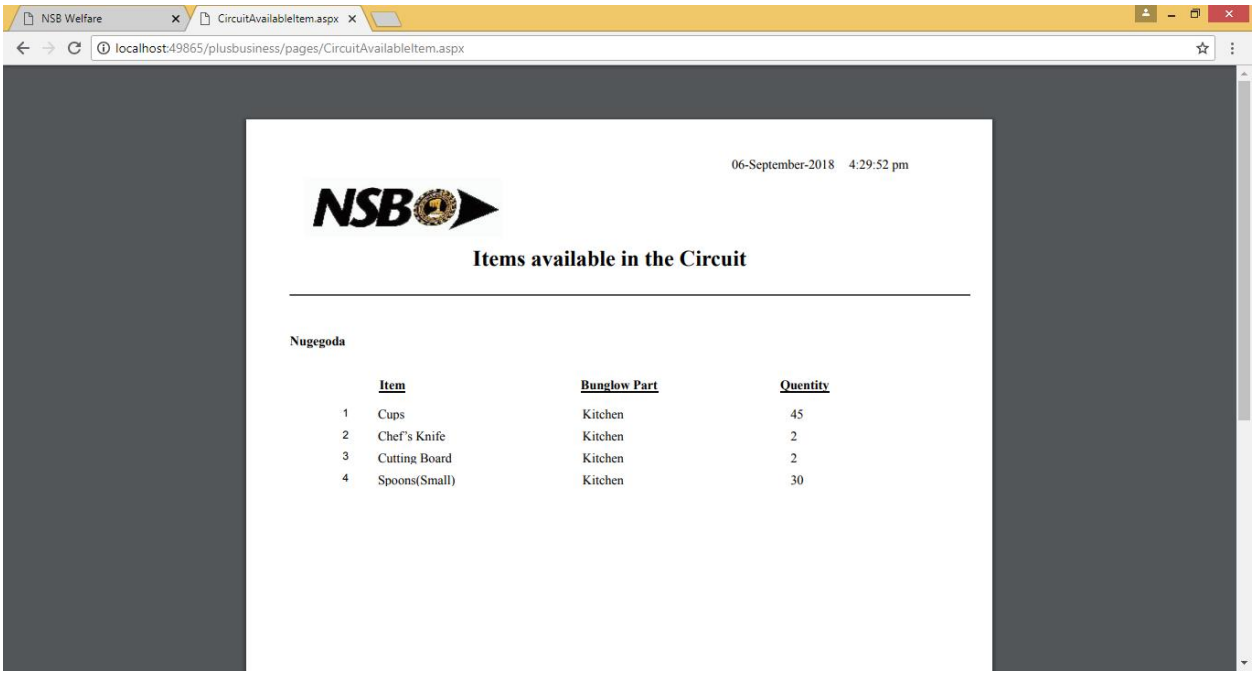
Login -> Inventory -> Items in bungalow

After entering Bungalow code add items to the Bungalow or update existing items in Bungalow.

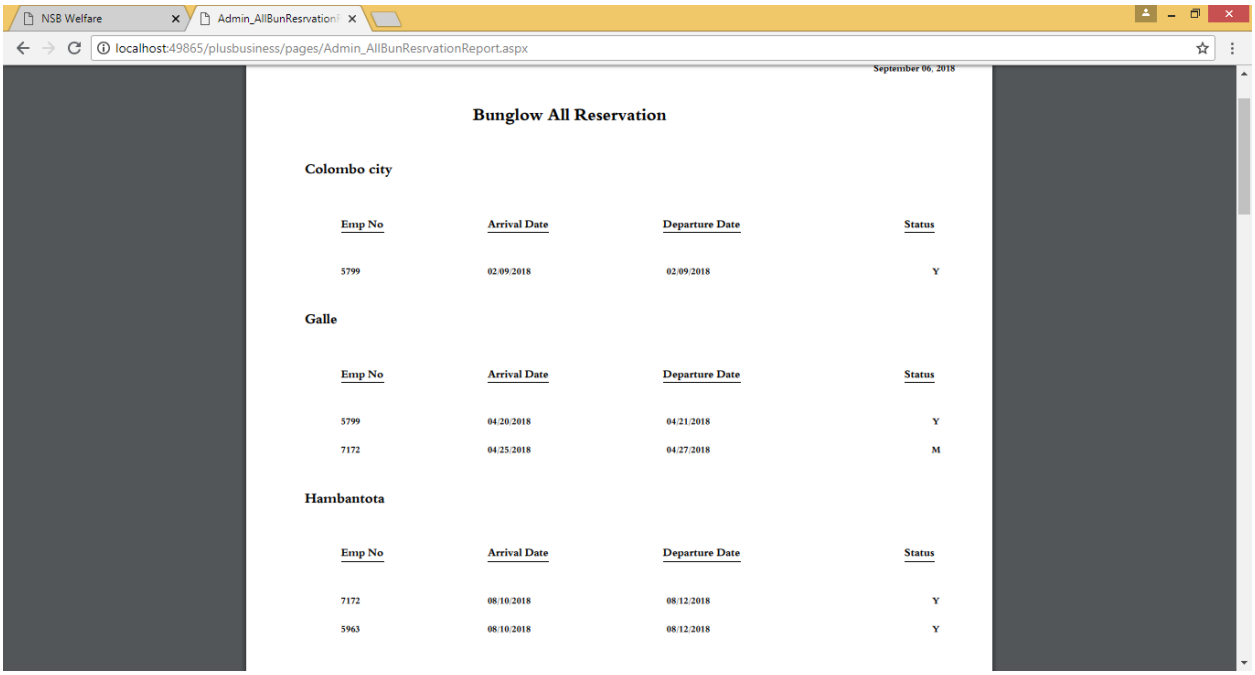
Reports



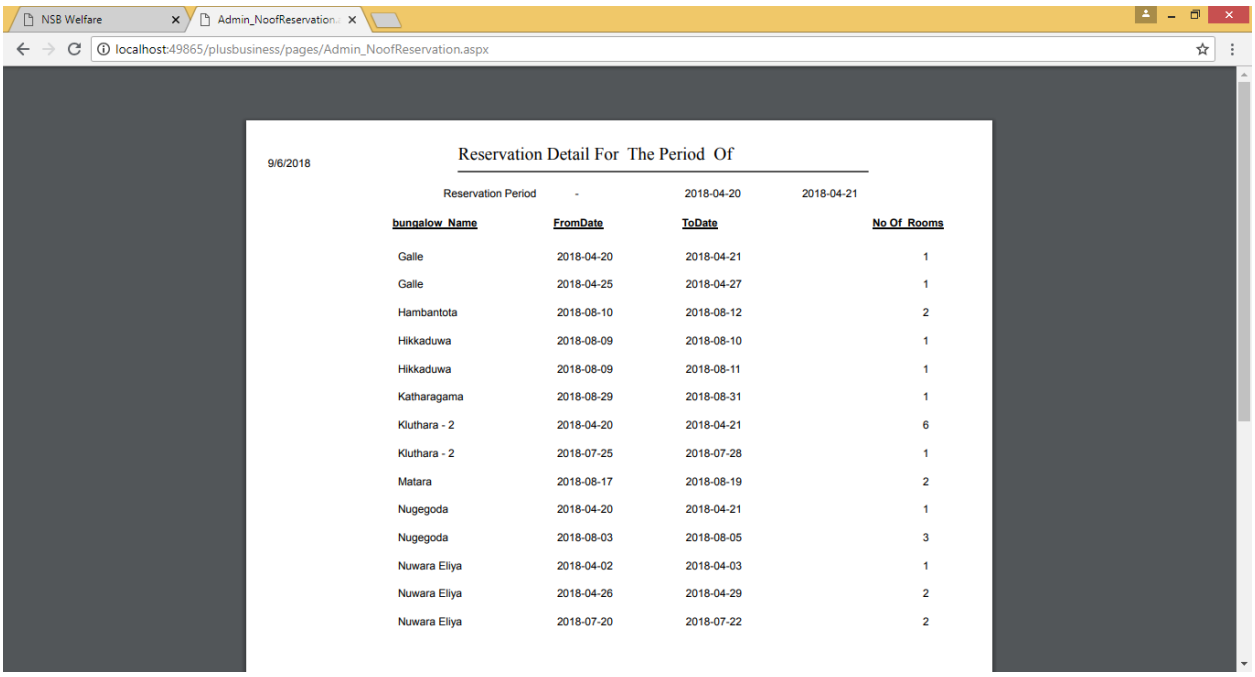
Login ->Reports->Individual Booking



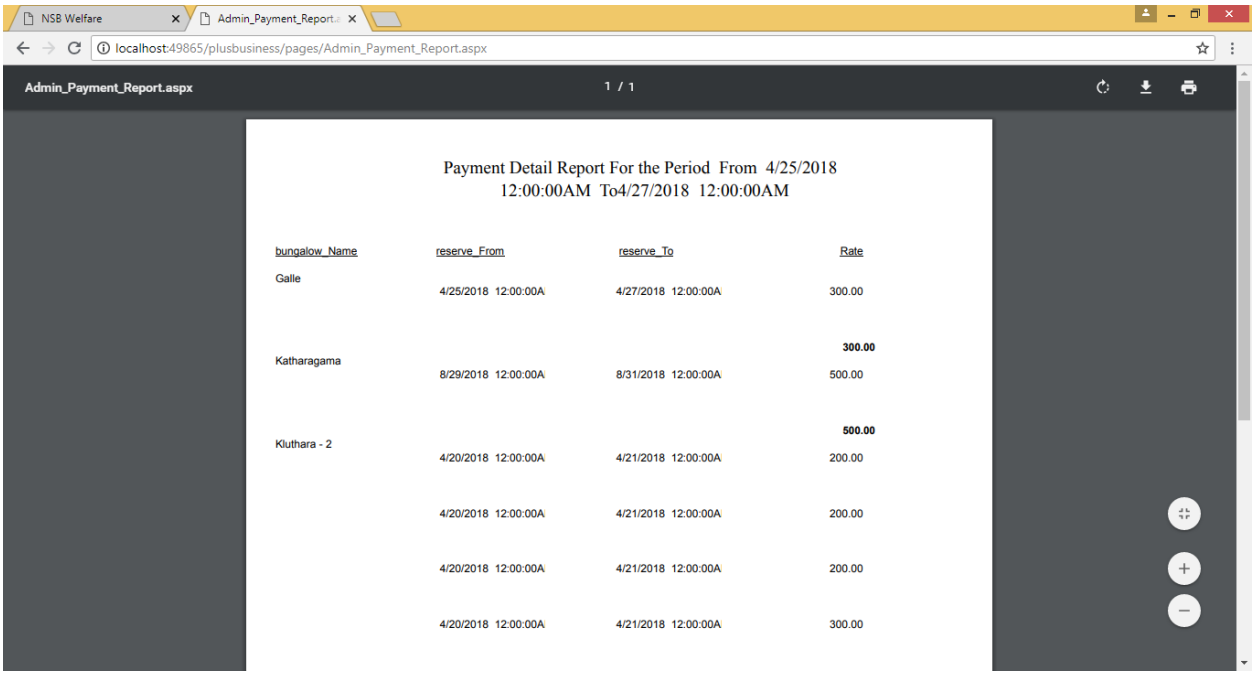
Login -> Reports -> Items available in the Circuit



Login -> Reports -> All Bungalow Reservations



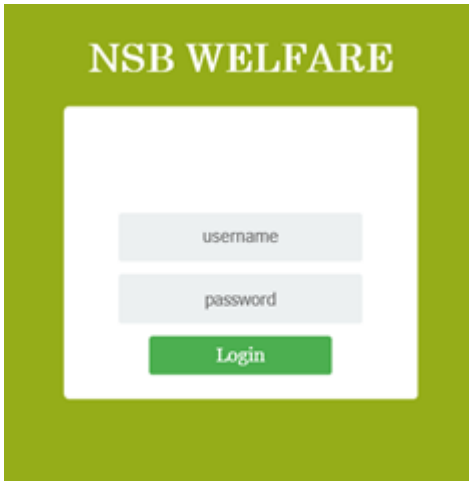
Login -> Reports -> All Bungalow Reservations for a Given Period



Login-> Reports -> Payment Received For a given period

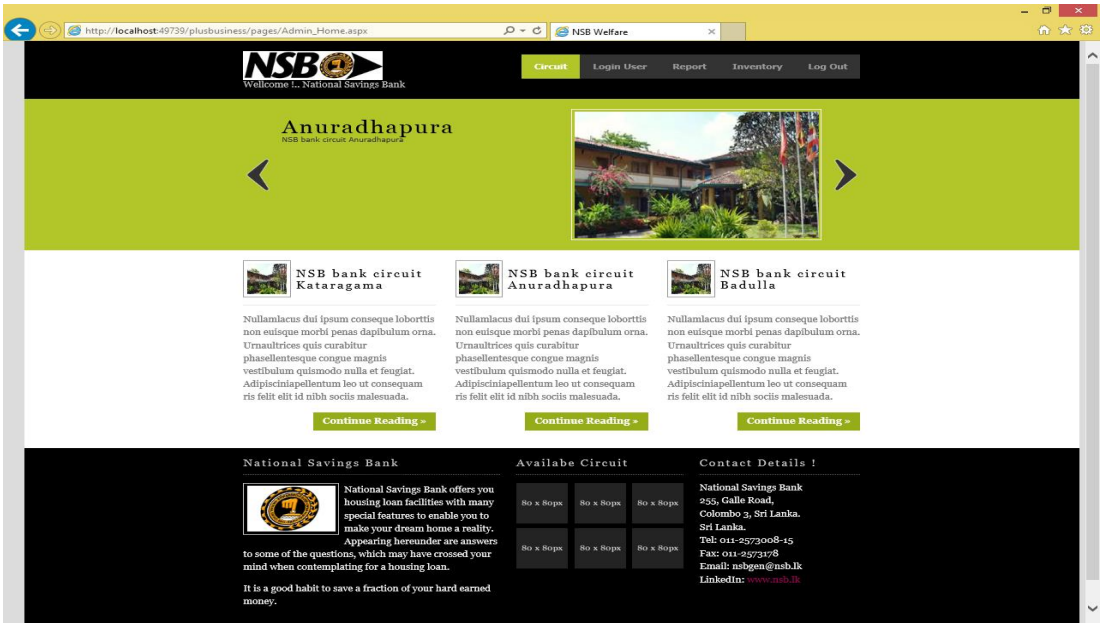
Operator Functions

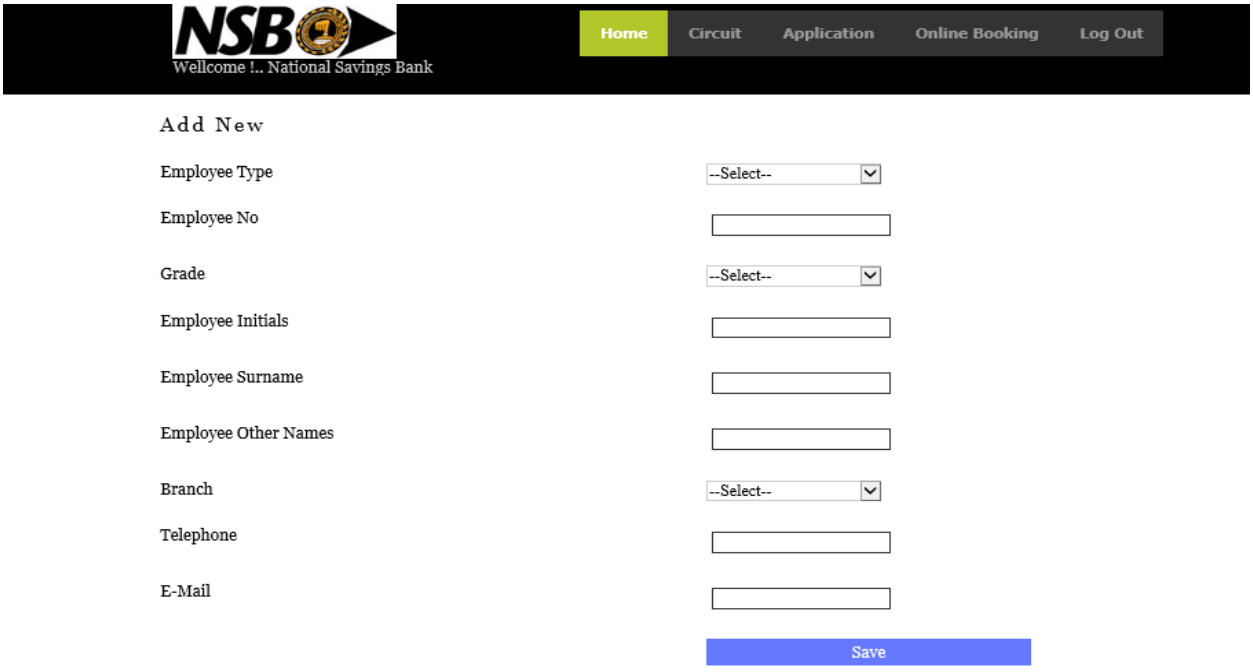
Enter the system http://localhost:8080/plusbusiness/pages/Admin_NewUser.aspx



Enter Username and Password to Login.

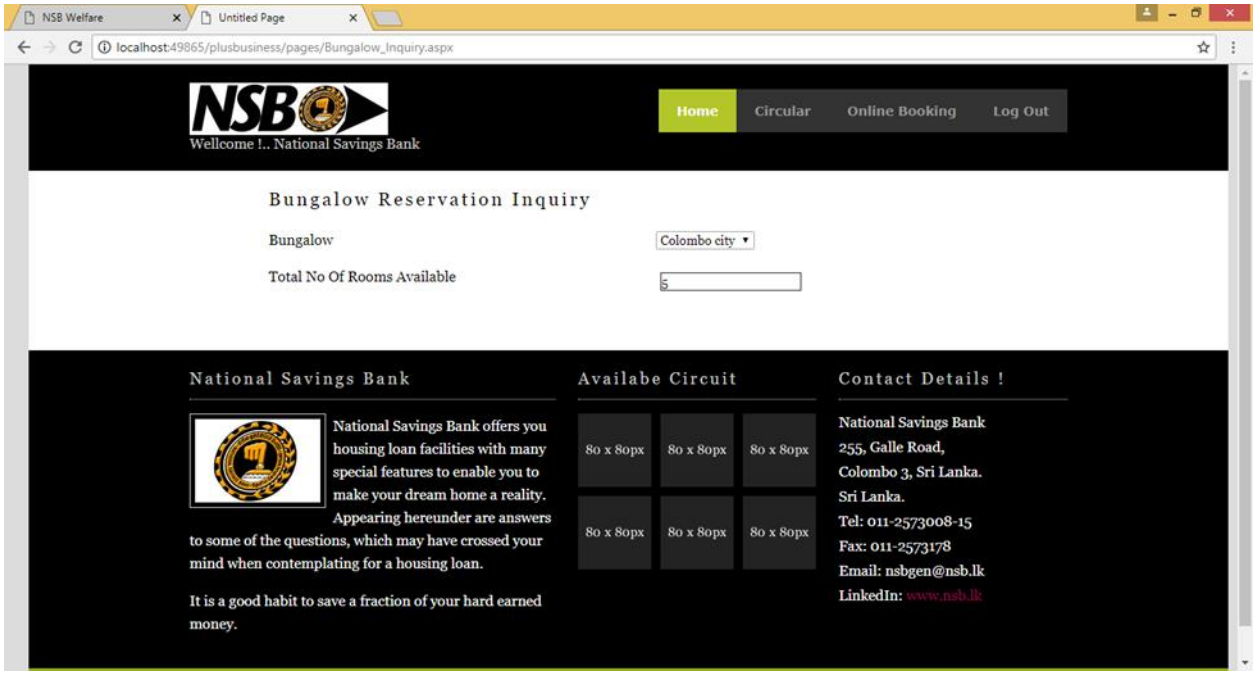
Staff Home Page will be displayed.





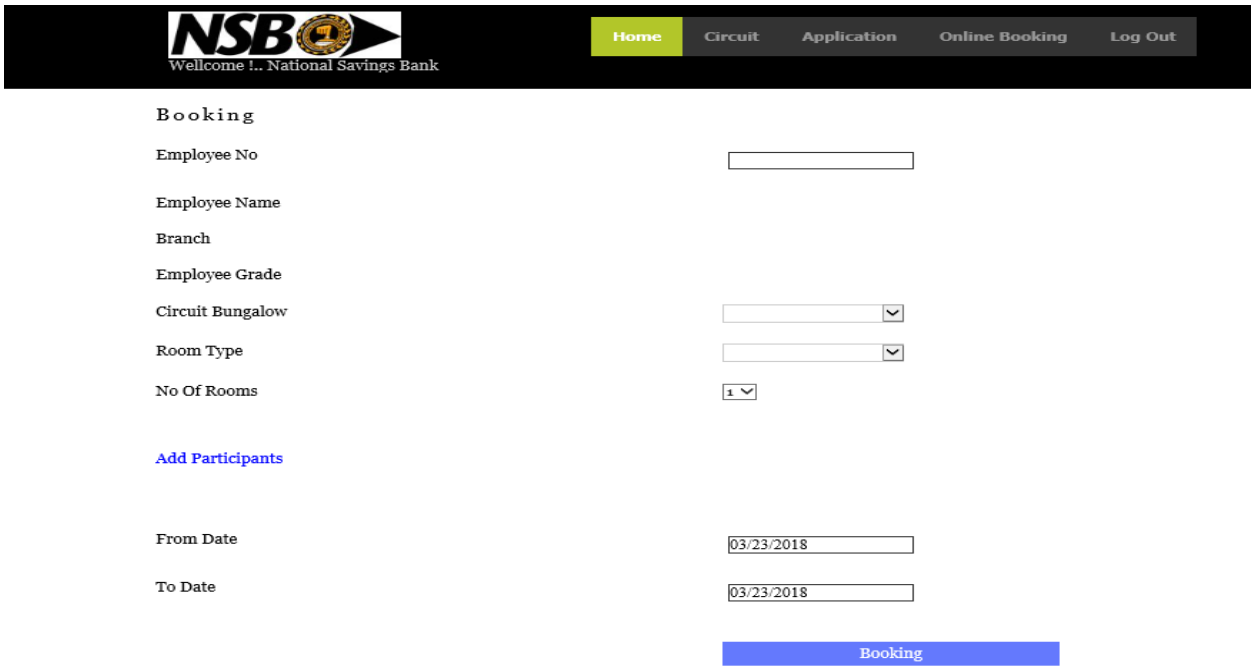
Login User->Circuit -> Employee

While entering employee number all the other details will be displayed.



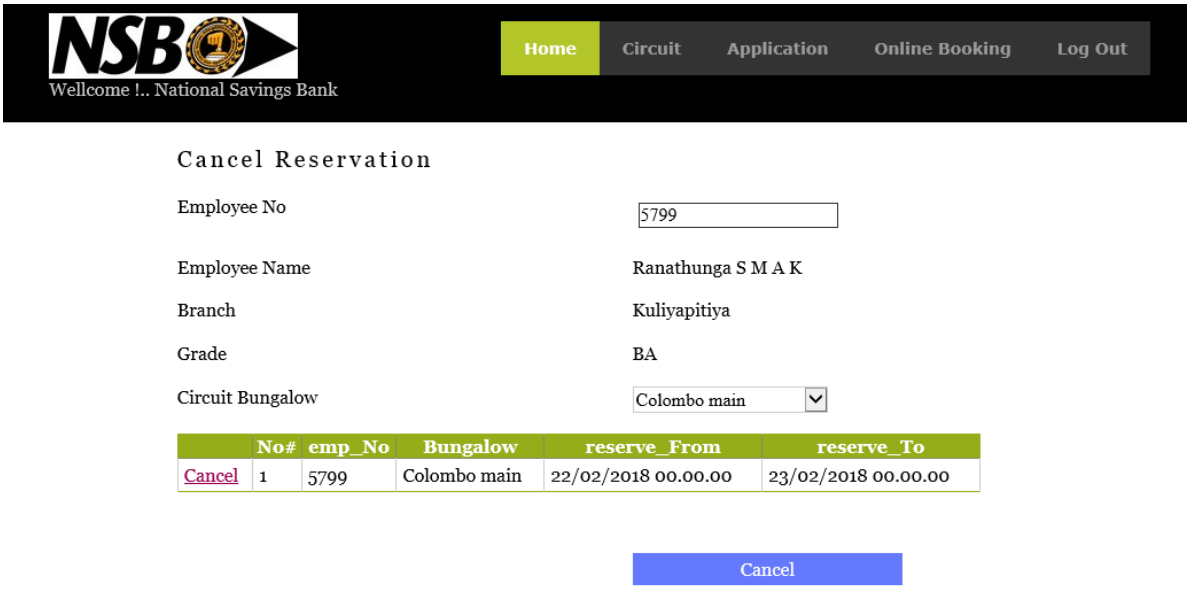
Login ->OnLine Booking->Available Booking

User can check available rooms in the selected Bungalow



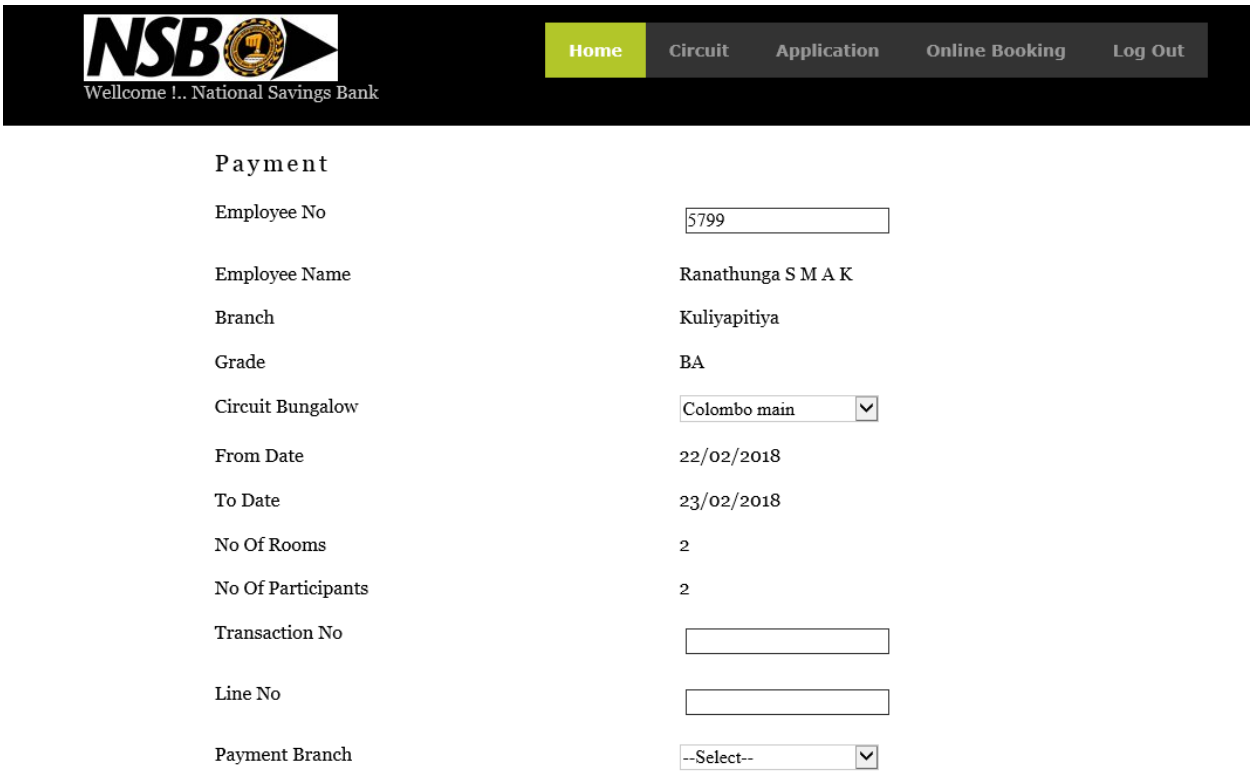
Login User -> Online Booking - > Book Now

while entering employee number employee name, branch, employee grade will be displayed. Relevant room types for the employee grade will be displayed in the drop-down list, must select the required room type by the user. Participants also enter to the system.



Online Booking -> Cancel Reservation.

Reserved booking can be canceled by the user.



After making payments voucher details should be enter to the system.

Appendix C – MIS Reports

Figure C -1 illustrates then report for Bungalow Details for the given date.

Circuit Bungalow Detail Report as at dd/mm/yyyy

National Savings Bank– Welfare Division

Bungalow Name	Branch Name	Number of rooms	Telephone no	Address

Prepared By: ……..

Checked By: …….

Figure C -1 Circuit Bungalow Detail Report

1. Figure C -2 Circuit Bungalow Reservation Detail Report.

Circuit Bungalow Reservation Detail Report

National Savings Bank– Welfare Division

Employee Number	Employee Name	Bungalow name	Arrival Date	Departure Date	Number of Occupants	Number of rooms booked

Prepared By: ……..

Checked By: …….

Figure C -2 Circuit Bungalow Reservation Detail Report

2. Figure C -3 illustrates Confirmed Circuit Bungalow detail Report

Circuit Bungalow Booking Details

National Savings Bank – Welfare Division

From: dd/mm/yyyy - To: dd/mm/yyyy

Bungalow Name	Name of Reservationist	Number of Occupants	No of Rooms booked	Reservation Confirmed Date

Prepared By: ……..

Checked By: …….

Figure C -3 Confirmed Circuit Bungalow Detail Report

3. Figure C -4 illustrates the items in the bungalow for a given date

Items in Circuit Bungalows as at dd/mm/yyyy

National Savings Bank – Welfare Division

Bungalow Name	Item Code	Item Name	Quantity

Prepared By: ……..

Checked By: …….

Figure C -4 the items in the bungalow

4. Figure C -5 illustrates the items, name of the item, quantity in the bungalow parts

Items in Circuit Bungalow Parts as at dd/mm/yyyy

National Savings Bank – Welfare Division

Bungalow Name	Part Name	Item Code	Item Name	Quantity

Prepared By: ……..

Checked By: …….

Figure C -5 the items in the bungalow parts

5. Figure C -6 illustrates the items in the bungalow parts for a given date

Items in (Name of the Bungalow) Circuit Bungalow as at dd/mm/yyyy

National Savings Bank – Welfare Division

Part Name	Item Code	Item Name	Quantity

Prepared By: ……..

Checked By: …….

Figure C -6 the items in the bungalow parts for a given date

6. Figure C -7 illustrates the bungalow keeper details

Circuit Bungalow Keeper Details as at dd/mm/yyyy

National Savings Bank – Welfare Division

Bungalow Name	Keeper Employee No	Keeper Name	Date Join to the bank	Date Transfer

Prepared By: ……..

Checked By: …….

Figure C -7 the bungalow keeper details

Appendix D – Test Results

Unit Testing

Table D-1, illustrates the Test results for reservation details.

No	Field name	Input	Expected results	Pass /Fail
1	Epfno	Enter valid epf no	Record inserted	Pass
2	Bungalow code	Enter valid bungalow code	Record inserted	Pass
3	From_date	Valid Bungalow reserve from date	Record inserted	Pass
4	To_date	Valid Bungalow reserve to date	Record inserted	pass
5	Epfno	Enter Invalid epf no	System fires error message "Invalid EPF no"	Pass
6	Bungalow code	Enter Invalid bungalow code	System fires error message "Invalid Bungalow code"	Pass
7	From_date	InValid Bungalow reserve from date	System fires error message "Invalid Date"	Pass
8	To_date	InValid Bungalow reserve to date	System fires error message "Invalid Date"	Pass

Table D-1: Test Results of Reservation

Table D-2, illustrates the Test results for inventory in the system

No	Field name	Input	Expected results	Pass/Fail
1	Bungalow code	Enter valid bungalow code	Record inserted	Pass
2	Itemcode	Enter valid item code	Record inserted	Pass
3	Bungalow code	Enter Invalid bungalow code	System fires error message “Invalid Bungalow code”	Pass
4	Itemcode	Enter Invalid item code	System fires error message “Invalid Item code”	Pass

Table D-2: Test results of inventory in the system

The Test Plan

The system test is carried out to check whether the system meets the required specification whether it can operate successfully. The Circuit Reservation System application was being tested under following criteria.

- Function Testing
- Usability Testing
- Content Testing
- Interface Checking
- Compatibility Testing

The following checklist was done during the project execution time.

The Test Plan

Table D-3 illustrates, Function Testing - Check all links

ID	Description of Test	Test	Result
1	Whether outgoing links from all the pages from the specific domain are tested?	**Yes**	**Ok**
2	Whether all internal links are tested?	**Yes**	**Ok**
3	Whether links are jumping on the same pages?	**Yes**	**Ok**
4	Whether there are any orphan pages?	**Yes**	**Ok**
5	Whether any broken links are in all above-mentioned links?	**Yes**	**Ok**

Table D-3: Check all links

Tables D-4 illustrates, Test for all pages

ID	Description of Test	Test	Result
1	Whether all validations on each field are checked?	**Yes**	**Ok**
2	Whether default values of the field are checked?	**Yes**	**Ok**
3	Whether invalid inputs to the fields in the forms are checked?	**Yes**	**Ok**

Tables D-4 test for all pages

Table D-5 illustrates, Database Testing

ID	Description of Test	Test	Result
1	Whether data consistency is existed?	**Yes**	**Ok**
2	Whether data integrity and no error are in the data?	**Yes**	**Ok**
3	Whether database queries are executed correctly?	**Yes**	**Ok**
4	Whether data is retrieved correctly?	**Yes**	**Ok**
5	Whether data is updated correctly	**Yes**	**Ok**

Table D-5 Database Testing

Table D – 6 illustrates, Usability Testing - Navigation

ID	Description of Test	Test	Result
1	Whether web sites are easy to use?	**Yes**	**Ok**
2	Whether instructions are provided clearly, correct meaning and satisfy the purpose?	**Yes**	**Ok**
3	Whether main menu is provided in each page and consistent?	**Yes**	**Ok**
4	Content Testing	**Yes**	**Ok**
5	Whether contents are logical, meaningful, understand easily, free from spelling and grammatical mistakes?	**Yes**	**Ok**
6	Whether dark color and unsuitable fonts are used?	**Yes**	**Ok**
7	Whether all the anchor links are worked properly?	**Yes**	**Ok**
8	Whether images are placed properly with proper size?	**Yes**	**Ok**

Table D – 6 Usability Testing

Table D – 7 illustrates, Interface Checking

ID	**Description of Test**	Test	Result
1	Whether all the interactions between servers are executed properly and errors are handled properly?	**Yes**	**Ok**
2	If database or web server returns any error message for any query by application server, whether application server catches and displays this message approximately to users?	**Yes**	**Ok**

Table D – 7 Interface Checking

Table D-8 illustrates Compatibility Testing - Browser compatibility

ID	Description of Test	Test	Result
1	Whether web application is tested on internet explorer, Firefox, Google chrome, Opera, Safari browsers with different versions?	Yes	Ok

Table D-8 Compatibility Testing

User Acceptance Forms

D-9 Illustrates The Issue/Defect Report Sample

ISSUE/DEFECT REPORT			
Tester Name:		Software Version:	
Area of Software Impacted:		Preliminary Severity Assessment:	
Nature of Issue/Defect:			
What occurred:			
How did it occur:			
When did it occur:			
Describe how to reproduce the error:			
SCR INFORMATION			
Assigned SCR Number:	Severity:	Status:	

Table D-9 Issue/Defect Report Sample

D-10 Illustrates Acceptance Test Final Report Sample

ACCEPTANCE TEST FINAL REPORT			
System Name:		Date:	
General description of the acceptance test effort:			
Unresolved Defects			
Issue/Defect	Impact (H, M, L)	Risk Mitigation (If known)	Work Around (If known)

Table D-10 Acceptance Test Final Report Sample

Appendix E – Design Documentation

Use Case Narratives

Table E-1: Illustrates the use case for reservation of the circuit bungalow.

Use Case Name:	Apply for reservation of the circuit bungalow	Use-Case Type – Business Requirement
Use Case ID:	TM-02	
Priority:	High	
Source:	Document	
Primary Business Actor:	Branch User	
Other Participating Actors:	Employee/ pensioner	
Other Interested Stakeholders:	Circuit Bungalow Keeper	
Description:	To apply to reserve the circuit bungalow.	
Preconditions:	Reservation information should be entered to the system.	
Trigger:	This use case is initiated after completing the application details by the branch user or clerk in the welfare division.	
Typical Course of events	Actor Action	System Response
	Step 1: Branch user logs in to the system.	Step 2: system validates user id and password.
	Step 2: enter reservation details.	Step 3: Display confirmation message.
Alternate Courses	Epfno, bungalow_code, arrival_date , departure_date set as the primary key	
Post Conditions	Insert reservation request into the system.	

Table E-1: Use Case for Reservation

Table E-2, Illustrates the Use Case Narrative for Confirm Reservation.

Use Case Name:	Confirm circuit bungalow Reservation	Use-Case Type – Business Requirement
Use Case ID:	TM-03	
Priority:	High	
Source:	System	
Primary Business Actor:	Manager	
Other Participating Actors:	Applicant	
Other Interested Stakeholders:	Circuit bungalow keeper	
Description:	Confirm the circuit bungalow for the reservationist from all the applicants who apply for the same day by a selection process.	
Preconditions:	Applicant details should be displayed.	
Trigger:	This use case is initiated when the manager presses the button to do the selection criteria.	
Typical Course of events	Actor Action	System Response
	Step 1: Manager logs in to the system.	step 2: system validates user id and password
	Step 3: enter arrival date and bungalow code	Step 4: Display applicant names According to the ratings that they have earned.
	Step 5: confirm by checking the no of rooms available and no of rooms requested by the applicant.	Step 6: send SMS and e-mail to the reservationist.
Alternate Courses		
Post Conditions	Update applicant status.	

Table E-2: Use Case Narrative for Confirm Reservation

Table E-3, illustrates the Use Case Narrative for Update Payment.

Use Case Name:	Confirm Payment	Use-Case Type – Business Requirement
Use Case ID:	TM-04	
Priority:	High	
Source:	Document	
Primary Business Actor:	Reservationist	
Other Participating Actors:	Cashier	
Other Interested Stakeholders:	Officer	
Description:	Make payment to the reserved circuit bungalow.	
Preconditions:	Make payment to the branch and cashier will generate the slip.	
Trigger:	This use case is initiated after settling the payment.	
Typical Course of events	Actor Action	System Response
	Step 1: Officer logs into the system.	step 2 : System validates user id and password
	Step 3: Enter employee no	Step 4: validate employee no
	Step 5: Enter bungalow code and arrival date	Step 6: validate reservation
	Step 5: Update payment status	Step 5: Display confirmation msg.
Alternate Courses		
Post Conditions	Confirmed payment.	

Table E-3: Use Case Narrative for Update Payment

Table E-4, illustrates the Use Case Narrative for Cancel reservation.

Use Case Name:	Cancel reservation	Use-Case Type – Business Requirement
Use Case ID:	TM-05	
Priority:	High	
Source:	System	
Primary Business Actor:	Reservationist	
Other Participating Actors:	Officer	
Other Interested Stakeholders:	Circuit bungalow keeper	
Description:	Cancel reservation by the reservationist.	
Preconditions:		
Trigger:	After cancelling the reservation next applicant will get the chance.	
Typical Course of events	Actor Action	System Response
	Step 1: Officer logging to the system.	step 2 : System validates user id and password
	Step 3: Enter reserve from date and bungalow code.	Step 4: Display reservationist reservation details.
		Step 5: Confirm cancellation.
Alternate Courses		
Post Conditions	Confirm cancelation.	

Table E-4: Use Case Narrative for Cancel reservation

Table E-5, illustrates the Use Case Narrative for Report Generation**.**

Use Case Name:	Generate reports	Use-Case Type – Business Requirement
Use Case ID:	TM-06	
Priority:	High	
Source:	System	
Primary Business Actor:	Manager, officer	
Other Participating Actors:	Staff member, pensioner	
Other Interested Stakeholders:		
Description:	Generate reports when required.	
Preconditions:	Enter required report type.	
Trigger:	When the required report is printing this use, case is initiated.	
Typical Course of events	Actor Action	System Response
	Step 1: Manager / Officer select the report type.	step 2: System will display the type of report to be printed.
	Step 3: Manager/Officer will enter the requirements needed to generate the report.	Step 4: Report will be printed.
Alternate Courses	Management decisions can be taken.	
Post Conditions		

Table E-5: Use Case Narrative for Report Generation

Table E-6, illustrates the Use Case Narrative for Query Generation.

Use Case Name:	Display queries	Use-Case Type – Business Requirement
Use Case ID:	TM-07	
Priority:	High	
Source:	System	
Primary Business Actor:	Manager, officer	
Other Participating Actors:	Staff member, pensioner	
Other Interested Stakeholders:		
Description:	Display queries when required by staff member, pensioner, manager or officer.	
Preconditions:		
Trigger:	When the required query is displaying this use, case is initiated.	
Typical Course of events	Actor Action	System Response
	Step 1: Manager / Officer select the query type.	step 2: System will display the type of query to be displayed.
	Step 3: requester will enter the requirements needed to generate the query.	Step 4: Query will be displayed.
Alternate Courses	Staff member / pensioner has a facility to view availability.	
Post Conditions		

Table E-6: Use Case Narrative for Query Generation

Table E-7, illustrates the Use Case Narrative for Add/ Update Inventory.

Use Case Name:	Registration of users	Use-Case Type – Business Requirement
Use Case ID:	TM-08	
Priority:	High	
Source:	Document	
Primary Business Actor:	Administrator	
Other Participating Actors:	Users	
Other Interested Stakeholders:		
Description:	Add / update user record	
Preconditions:	Assign users to access the Circuit Bungalow Reservation System	
Trigger:	This use case is initiated when login users to the system	
Typical Course of events	Actor Action	System Response
	Step 1: enter user id as requested by the user	step 2: if user id is already existing display error message
	Step 3: enter default password	Step 4: update tables.
Alternate Courses		
Post Conditions	User then login to the system and change his / her pass word according to the password policy.	

Table E-7: Use Case Narrative for Add/ Update Inventory

Table E-8, illustrates the Use Case Narrative for Issue items to the Circuit Bungalows

Use Case Name:	Issue new items	Use-Case Type – Business Requirement
Use Case ID:	TM-09	
Priority:	High	
Source:	Document	
Primary Business Actor:	Manager, officer	
Other Participating Actors:		
Other Interested Stakeholders:	Circuit bungalow keeper	
Description:	Issue new items and update existing items to the circuit bungalows.	
Preconditions:		
Trigger:	This use case is initiated when issuing items in the circuit bungalow.	
Typical Course of events	Actor Action	System Response
	Step 1: Select the Bungalow code and the item code.	step 2: System will display the details of related item.
	Step 3:	Step 4: If item not found display error msg.
	Step 5: Enter no of items	Step 6: update tables
Alternate Courses		
Post Conditions		

Table E-8: Use Case Narrative for Issue Items

Table E-9, illustrates the Use Case Narrative for Issue New items to the Item List.

Use Case Name:	Update inventory	Use-Case Type – Business Requirement
Use Case ID:	TM-10	
Priority:	High	
Source:	Document	
Primary Business Actor:	Administrator	
Other Participating Actors:		
Other Interested Stakeholders:		
Description:	Enter New Items to the Circuit Bungalows	
Preconditions:	Get inventory of the circuit bungalow.	
Trigger:	This use case is initiated when updating items in the circuit bungalow.	
Typical Course of events	Actor Action	System Response
	Step 1: Select the Bungalow code and the item code.	step 2: System will display the details of related item.
	Step 3: Enter no of damaged and broken items.	Step 4: update tables.
Alternate Courses		
Post Conditions		

Table E-9: Use Case Narrative for Issue New Items

Sequence Diagrams

Sequence diagram shows how objects communicate by passing messages. Sequence diagram consist of blocks, which are directly used for program design.

Figure E- 1: Illustrates the Sequence Diagram of Circuit Bungalow Confirmation

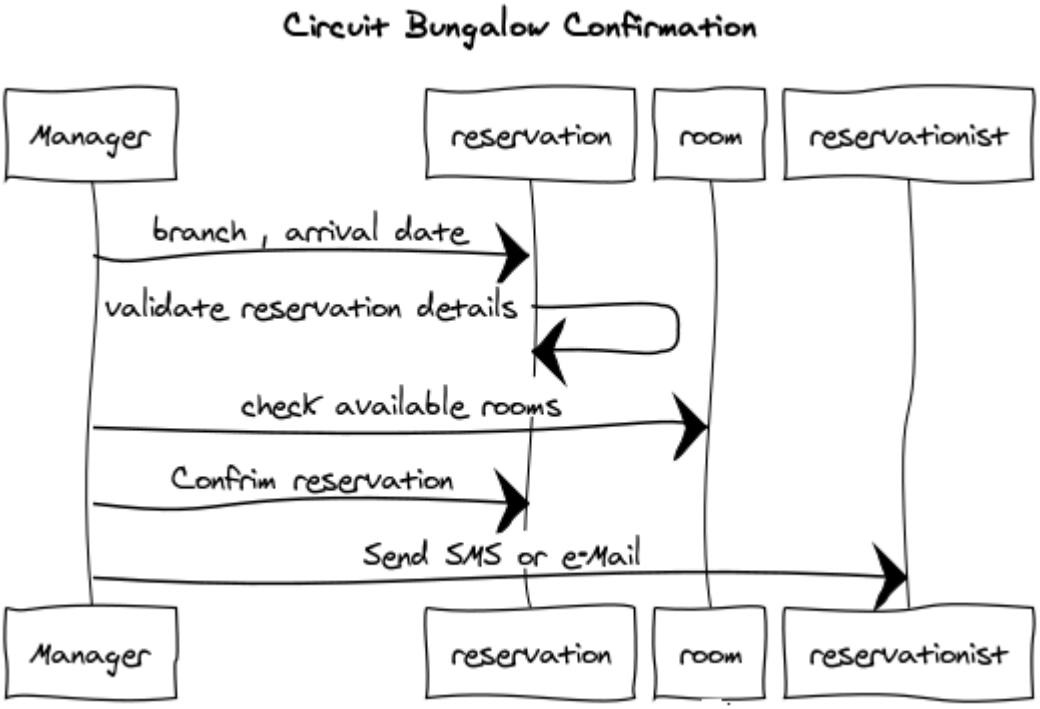


Figure E-1 : Circuit Bungalow Confirmation

Figure E-2: Illustrates the Sequence Diagram of Payment Confirmation

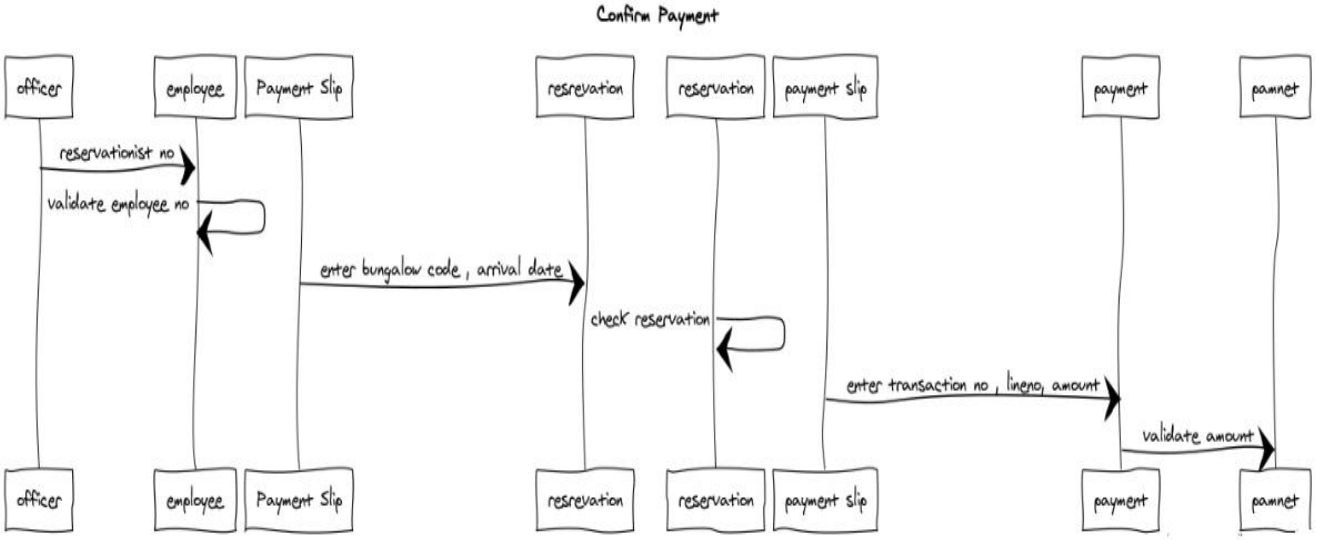


Figure E-2: Payment Confirmation

Figure E-3: Illustrates the Sequence Diagram of Availability of circuit bungalow

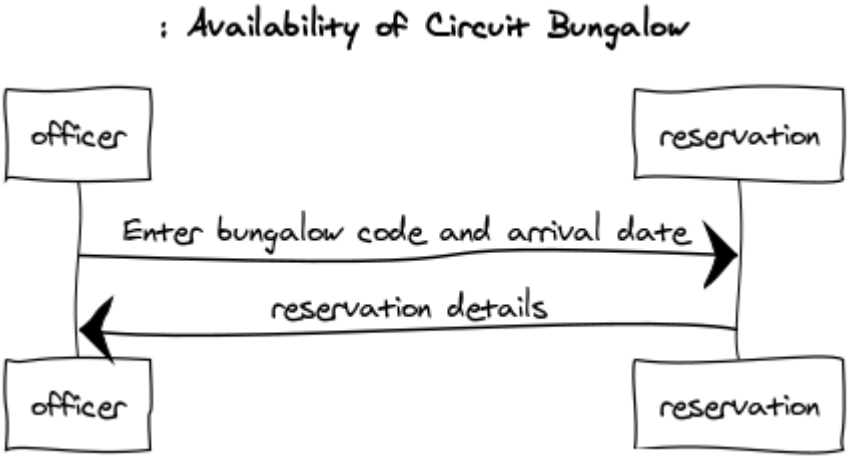


Figure E-3: Availability of circuit bungalow

Figure E-4: The Sequence Diagram of Report Generation

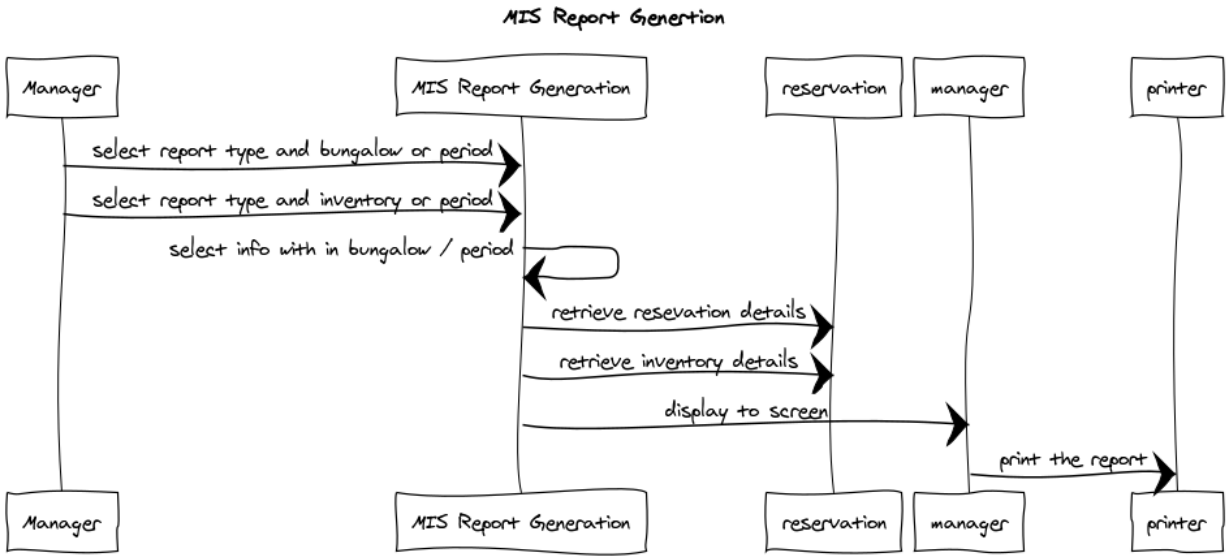


Figure E-4: Report Generation

Figure E-5: The Sequence Diagram of Query Generation

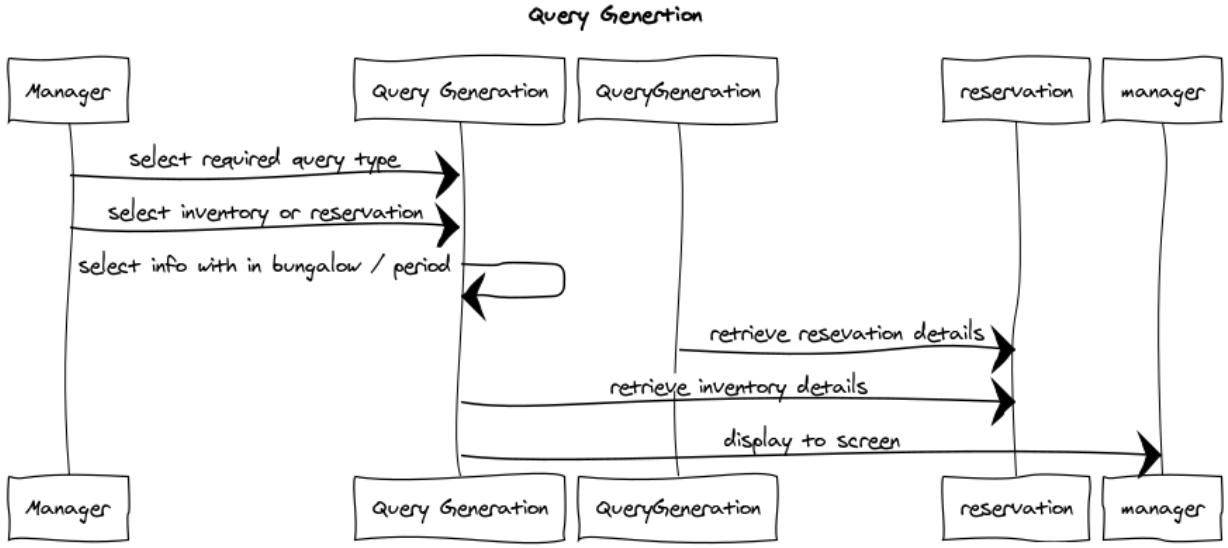


Figure E-5: Query Generation

Figure E-6: The Sequence Diagram for Issue Item to the bungalow

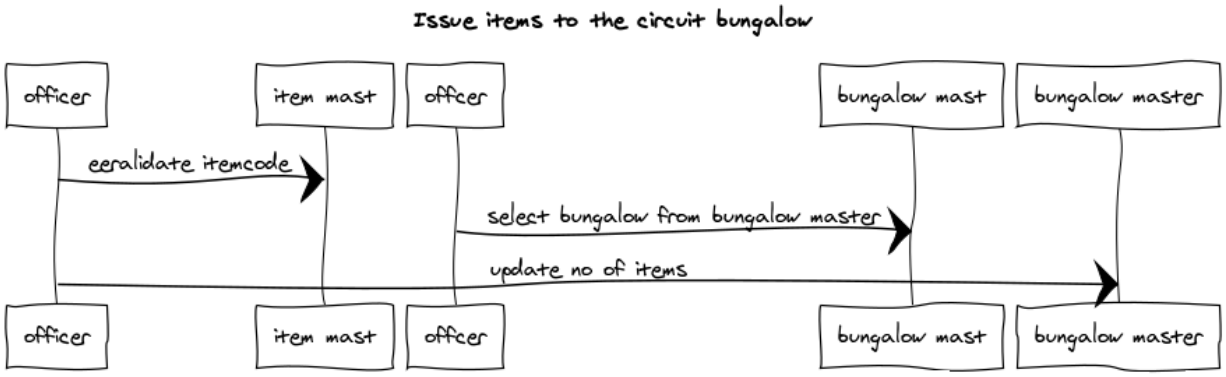


Figure E-6: Issue Item to the bungalow

Figure E-7: The Sequence Diagram for Issue new items

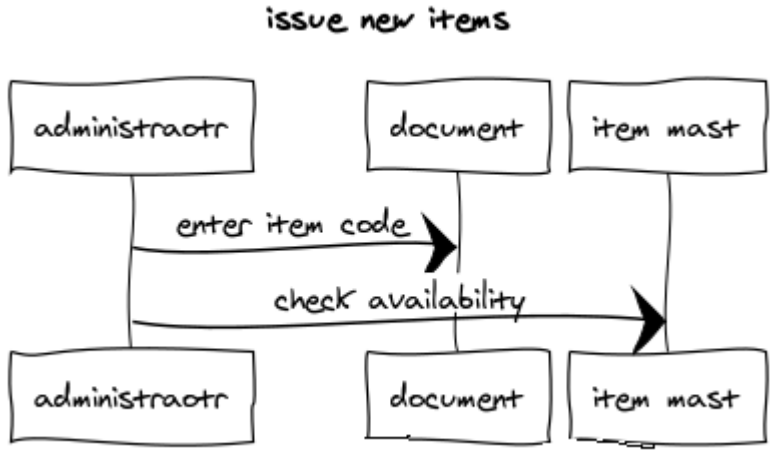


Figure E-7: Issue new items

Figure E-8: The Sequence Diagram for enter user record

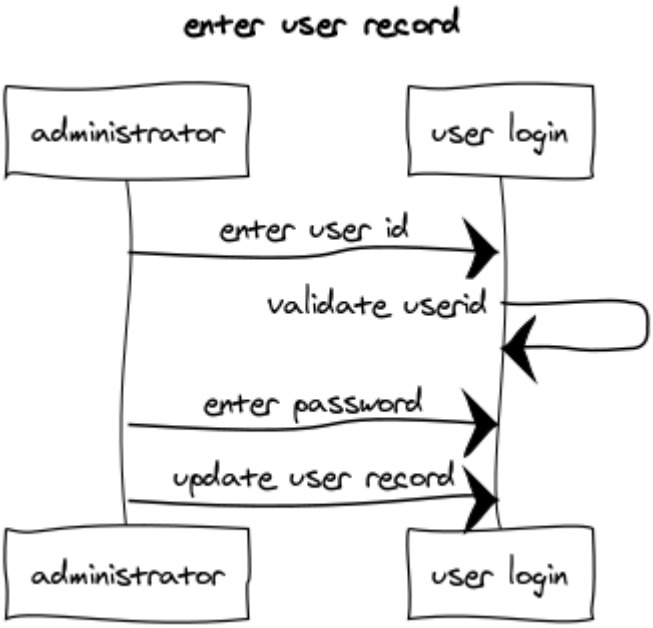


Figure E-8: enter user record

Class Diagrams

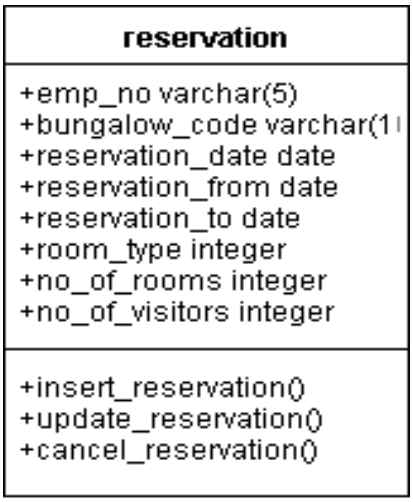


Figure E-9: Reservation Class

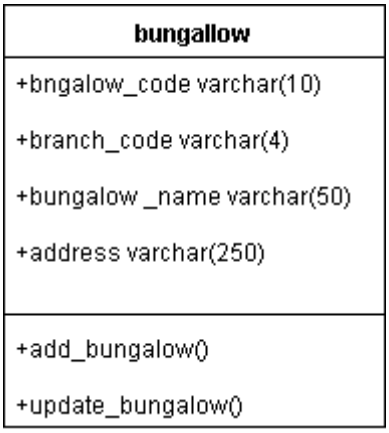


Figure E-10: Bungalow Class

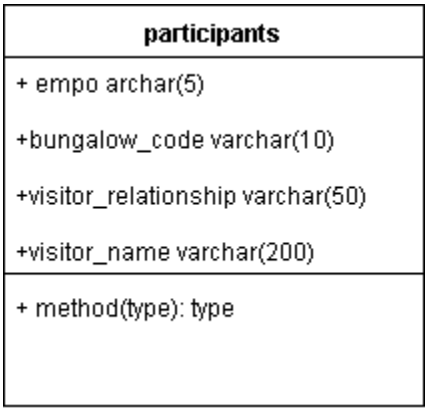


Figure E-11: Participant Class

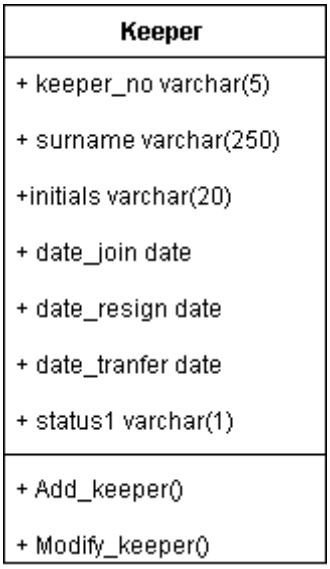


Figure E-12: Keeper Class

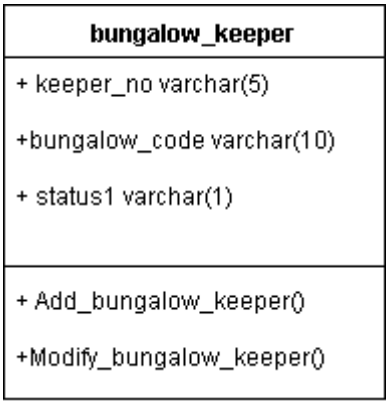


Figure E-13: Bungalow Keeper Class

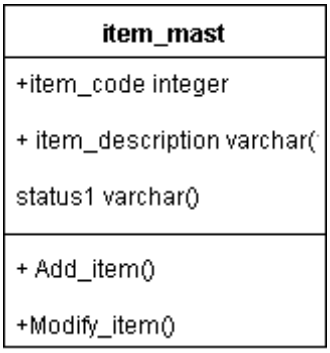


Figure E-14: Item Mast

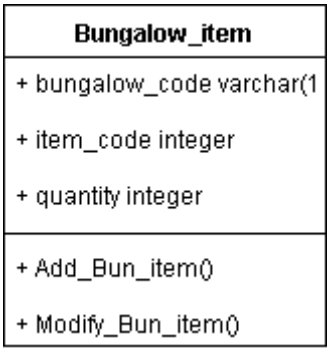


Figure E-15: Bungalow Item

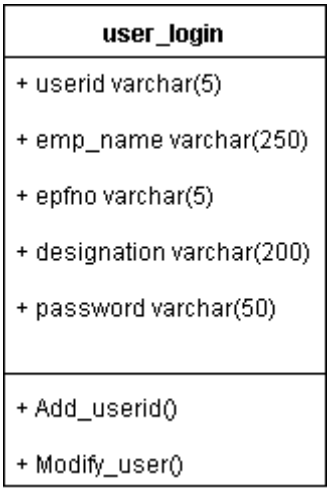


Figure E-16: user login class

Database Tables Structure

The attributes of the classes are used to create database design and normalized tables are taken in to final implementation of database.

Column	Data Type	Nulls	Reference
Brcode	Varchar(4)	No	Branch code
Brname	Varchar(30)	No	Branch name
Branch_tel	Varchar(15)	No	Branch telephone no
Branch_address	Varchar(300)	No	Branch address
Status1	Varchar(1)	NO	Status of the branch

Table E-10: Table structure for Table Branch Table

Column	Data Type	Nulls	Reference
Emp_no	Varchar(5)	No	Employee no
Bungalow_code	Varchar(10)	No	Code of the circuit bungalow
Reservation_date	Date	No	Date of reservation done
Reserve_from	Date	No	Date to be reserved
Reserve_to	Date	No	Check out date
Room_type_id	Integer	No	Type of the room
No_of_rooms	Integer)	No	Rooms allocated
No_of_visitors	Integer	No	No of person visits
Cancellation_date	Date	Yes	If cancelled the reservation
Confirmation_date	Date	No	Date of confirmation
Addusr	Char(4)	No	Record inserted user
Adddate	Date	No	Record inserted date
Chgusr	Char(4)	Yes	Last change user
Chgdate	Date	Yes	Last change date
Status1	Varchar(1)	No	Status of the reservation
Eligibility	Varchar(1)	No	Eligibility

Table E-11: Table structure for Table Circuit Reservation

Column	Data type	Nulls	Reference
emp_no	Varchar(5)	No	Employee id
Grade_id	Integer	Integer	Grade of the employee
Surname	Varchar(250)	No	Surname
Other_name	Varchar(250)	No	Other name
Initials	Varchar(250)	No	Initials
Emp_email	Varchar(250)	Yes	Employee email
Emp_tel	Varchar(10)	No	Employee telephone
Branch_code	Varchar(5)	No	Branch code of the employee
Status1	Varchar(1)	No	Status of the employee
Add_user	Varchar(5)	No	Adduser
Adddate	Date	No	Adddate
Chg_user	Varchar(5)	Yes	Change user
Chg_date	Date	Yes	Change date

Table E-12: The table structure for Table Employee

Column	Data type	Nulls	Reference
Bungalow_code	Varchar(10)	No	Bungalow code
Room_type	Integer	No	Room types are defined
Room_no	Varchar(10)	No	Room nos are allocated
Status_id	Varchar(1)	No	In good condition/ renovation is done
Addusr	Char(4)		Record inserted user
Adddate	Date		Record inserted date
Chguser	Char(4)		Last change user
Chgdate	Date		Last change date

Table E-13: The table structure for Table Bungalow Room

Column	Data type	Nulls	Reference
Room_type_id	Integer	No	Type id of the room
Room_type	Varchar(25)	No	Description of the room type
Status1	Varchar(1)	No	Status of the room type

Table E-14: The table structure for table bungalow_room_type

Column	Data Type	Nulls	Reference
Emp_no	Varchar(5)	Yes	Emp no
Bungalow_code	Varchar(10)	No	Bungalow code
Reserve_from	Date	No	Bungalow reserved from
Reserve_to	Date	No	Bungalow reserved to
No_of_rooms	Integer	No	No of rooms booked
No_of_visitors	Integer	No	No of visitors
Transaction_no	Varchar(10)	No	Transaction no of the txn
Line_no	Varchar(10)	No	Line no of the transaction
Amount_to_pay	Decimal(15,2)	No	Reservation amount
Paid_status	Char(1)	No	Paid/pending
Paid_date	Date	Yes	Date of Payment done
Addusr	Char(4)	Yes	Record inserted user
Adddate	Date	Yes	Record inserted date
Change_user	Varchar(5)	Yes	Change user
Change_date	Date	Yes	Date of the change

Table E-15: The table structure for table: Payments

Column	Data type	Nulls	Reference
Room_type_id	Integer	No	Room type id
Grade_id	Integer	No	Employee grade id
Status1	Varchar(1)	No	Status of the room id

Table E-16: The table structure for table roomsInGrade

Column	Data type	Nulls	Reference
Emp_no	Varchar(5)	Yes	emp no of employee
Bungalow_code	Varchar(10)	No	Bungalow code
Visitor_relationship	Varchar(50)	No	Relationship to the employee
Visitor_name	Varchar(200)	No	Name of the visitors
Addusr	Varchar(5)	No	Record inserted user
Adddate	Date	No	Record inserted date
Chguser	Char(4)	Yes	Last change user
Chgdate	Date	Yes	Last change date

Table E-17: The table structure for table Participants

Column	Data type	nulls	Reference
Keeper _no	varchar(5)	No	employee no of the bungalow keeper
Surname	varchar(250)	No	Surname of the circuit keeper
Initials	varchar(20)	No	Initials of the circuit keeper
Date_join	Date	No	Date join to the bank
Date_resign	Date	No	Date of resign
Date_transfer	Date	Yes	Date transfer
Status1	Varchar(1)	No	Status of the keeper
Addusr	char(4)	No	Record inserted users

Adddate	Date	No	Record inserted date
Chguser	char(4)	Yes	The fields changed by the user
Chgdate	Date	Yes	The record change date

Table E-18: The table structure for table Keeper

Column	Data type	Nulls	Reference
Keeper_no	varchar(5)	No	Keeper identification no
Bungalow_code	Varchar(10)	No	Keeper's bungalow code
Status1	char(1)	No	Whether he's working in that particular bungalow
Addusr	char(4)	No	Record inserted users
Adddate	Date	No	Record inserted date
Chguser	char(4)	Yes	Last Change user
Chgdate	Date	Yes	Last change date
Status1	Varchar(1)	No	Whether he's working in that particular bungalow

Table E-19: The table structure for table Bungalow_keeper

Column	Data type	Nulls	Reference
Item_code	integer	No	Code of the item
Item_description	varchar(150)	No	Item Description
Status1	char(1)	No	Available item
Addusr	Char(5)	No	Record inserted user
Adddate	Date	No	Record inserted date
Chguser	Char(5)	Yes	Last Change user
Chgdate	Date	Yes	Last Change date

Table E-20: The table structure for table Item_mast

Column	Data type	Nulls	Reference
Bungalow_code	varchar(10)	No	Code of the bungalow
Item_code	integer	No	Item code
Quantity	Integer	No	Quantity of the item in the bungalow
Bun_part_no	Integer	No	Bungalow part

Table E-21: The table structure for table bungalow_item

Column	Data type	Nulls	Reference
Bun_part_no	Integer	Not null	part no of the bungalow
Part_description	Varchar(50)	No null	Description of the part
Add_date	Date	Not null	adddate
Add_user	Varchar(4)	Not null	Adduser
Chg_user	Varchar(4)	Null	Change user
Chg_date	Date	Null	Change date

Table E-22: The table structure for table bungalow_part_mast

Column	Data type	Nulls	Reference
Userid	Varchar(5)	No	User id
Emp_name	Varchar(250)	No	Name of the employee
Epfno	Varchar(5)	No	Epf no of the employee
Designation	Varchar(200)	No	Designation of the employee
Password	Varchar(50)	No	Pass word of the user
Branchcode	Varchar(4)	No	Branch code of the user
Add_date	Date	No	Date added
Add_user	Varchar(5)	No	User id of the Record added
Change_date	Date	Yes	User record change date
Change_user	Varchar(5)	Yes	Change user id
Status1	Varchar(1)	No	Status of the user

Table E-23: The table structure for table User_login