Development Of Progressive Web Application For Tourism Reservation Management System

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Abstract— **In this paper, development of progressive web application for tourism reservation management system is presented. The system development adopted a phased incremental and iterative software development methodology that includes requirement, design, coding and testing is used. The design is presented using dataflow diagrams and use case diagrams. Notably, the tourism reservation system is made up of the following features: registration and login interface, search hotel interface, search restaurant interface, search ride interface, user-access interface, hotel-access interface, restaurant-access interface and rider-access interface. Each of this interfaces is included with a chat interface that enables establishment of communication among all users of the system. The system is coded through the use of the following programming languages and tools: Hypertext Preprocessor (PHP) for the backend, JavaScript, Cascading Stylesheet(CSS), Hypertext Markup Language(HTML) for the frontend and MySQL for the database. Furthermore, WAMP server is used to provide local hosting while Sublime text for the coding environment. The results of the system development are presented by capturing and briefly discussing the screenshots of some of the key web pages in the system.**

Keywords: *Software Development Methodology, Tourism, Data Flow Diagram, Web Application, Use Case Diagram, Hotel Reservation System*

1. Introduction

Today, tourism is one of the fastest growing revenue generating industries in many countries across the globe [1,2,3,4]. In Nigeria, the need to diversify the economy has also drawn the attention of experts to the tourism industry [5,6,7,8]. Moreover, the advancement in the information and communication technologies has made it possible to project the tourism potentials and resource of any locality to the global stage [9,10,11,12]. As such, online branding and promotion of tourist attractions, facilities and relevant resources is on the increase.

Beside branding and promotion, tourists always need to book some facilities ahead of their travelling schedule [13,14,15,16]. Also, there is need to provide real-time information and guidance services to tourist to enable them coupe with any unforeseen circumstance in their trip. Such functionalities can be readily afforded through the use of progressive web application which can perform effectively on the internet, on mobile devices and on desktop computer systems.

Apart from the tourist, the hospitality services providers such as the hoteliers, the taxi drivers, the car wash, tour guide among others need a means to publicize their services and facilities and also to connect to the existing and potential tourists [17,18,19,20]. Again, the use of progressive web application for tourism oriented services can be used to provide such functionalities to the hospitality services providers. Accordingly, in this paper, development of progressive web application for tourism reservation system is presented. The software development methodology that includes requirement, design, coding and testing phases is presented [21,22,23,24,25,26,27,28,29]. The detailed design of the web application is presented using dataflow diagrams and use case diagrams. The implementation of the system is also presented. In all, the system is designed to provide global visibility and access to the tourist and the service providers, as well as manage resource and facility reservations.

2. Methodology
2.1 The Software Development Methodology

The study adopted a phased incremental and iterative software development methodology that includes requirement, design, coding and testing is used [30,31,32,33,34,35,36,37,38,39]. The incremental model make room for modification in each phase while the iterative nature of the model allows the modification process to be repeated following the delivery of each increment, until the system development is complete.

Requirements Phase : At this phase, requirement gathering is conduced; gathering information about the current system, the programming languages used to develop the previous system. Notably, the requirements for the

system are collected by analysing the needs of the user(s), environmental checks, evaluating the priority of the users, considering the possible amenities and service rendered to the users. Analysing previous related articles, journals and books about the system is also conducted in this phase as well as analysing the problems facing the users of the system [40,41,42,43,44,45,46,47,48].

Design Phase: The design phase of the system commenced once the user and system requirements of the system are studied and analysed. The design in this study is presented using dataflow diagrams and use case diagrams.

Coding Phase: In the coding or implementation phase of the system suitable programing languages and tools are used to code the designed functionalities and also the software codes are tested and integrated with previously designed modules. The tourism reservation web application in this study is developed through the use of the following programming languages and tools [9,50,51,52,53,54,55,56,57]:

(i) Hypertext Preprocessor(PHP) – for the backend
(ii) JavaScript
(iii) Cascading Stylesheet(CSS)
(iv) Hypertext Markup Language(HTML) – for the frontend
(v) MySQL – for the database

The actual source code is finally written with Sublime Text 3.

Testing Phase : In the testing phase, the analysis of the written code for the system is carried out with the intention of eliminating errors and verifying that the codes are efficient. The developers ensured that all aspects of the system design are implemented and the system's module is tested by using the top down testing approach starting from unit testing to system testing.

2.2 The web application design using **Data Flow Diagram (DFD) and Use Case Diagram**

In this study, the web application design is presented using data flow diagrams and also use case diagram. Basically, data flow diagram (DFD) use graph to represent the model of a system and the "flow" of data within a system as the system goes through it different process states. With the DFD, the system input and output data are identified, along with the source of the various input data items to the system. It also indicates where the output data will be sent or stored.

In practice, DFD are presented in levels, each level presented a processor details of a process and the accompanying data flows in and out of the system. Usually the lower levels in DFD is a detail description of the higher level process. The topmost level (denoted as L0 in this study) is referred to as the context diagram and it most often has a single process which is further detailed in the lower DFD levels.

The tourism reservation web application **DFD Level 0**
The context view (L0) of tourism reservation system is presented in Figure 1. The context view identifies a single process (the Tourism reservation system) along with two main categories of system stakeholders, the User and the Admin along with the key functionality of the system which is to handle tourism reservation query. According the context view in Figure 1, the User must sign up and always sign in to use the system.

The tourism reservation web application **DFD Level 1**
The diagram in Figure 2 shows the Level 1 of the tourism reservation web application **DFD . The Level 1 v**iew of tourism reservation system captures the booking and user view. This Level 1 view, as shown in Figure 2 shows that the users includes the hotel owners, the riders and the restaurant owners, along with any individuals that want to book any of the listed items, namely, ride, room or food. In all, the **Level 1 v**iew show that the system captures the information about each of the user category in order to accommodate their request or services in the system.

The tourism reservation web application **DFD Level 2**
The diagram in Figure 3 shows the Level 2 of the tourism reservation web application which captures the tourism reservation systems services and database layout. The DFD Level 2 diagram shows that the system has a database that stores all the requisite data about the services and stakeholders including the service providers and the individuals who needs the service and may book the services in advance.
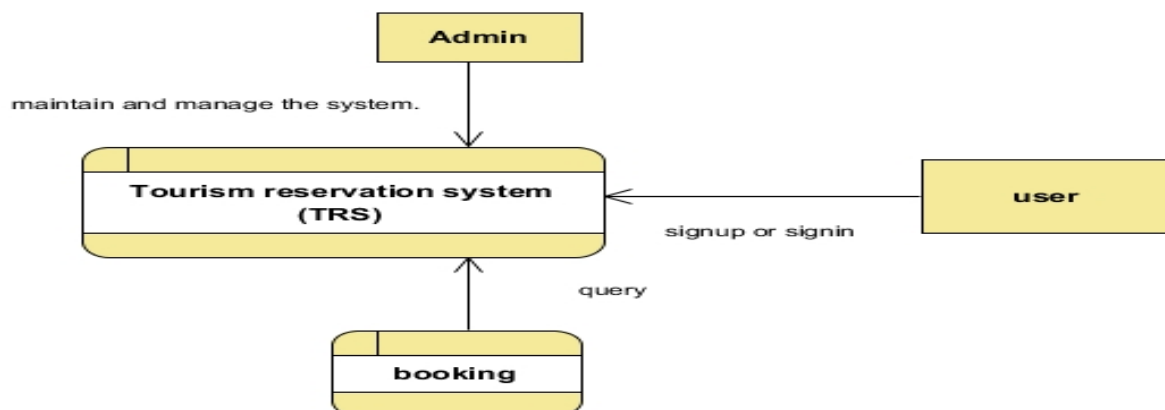

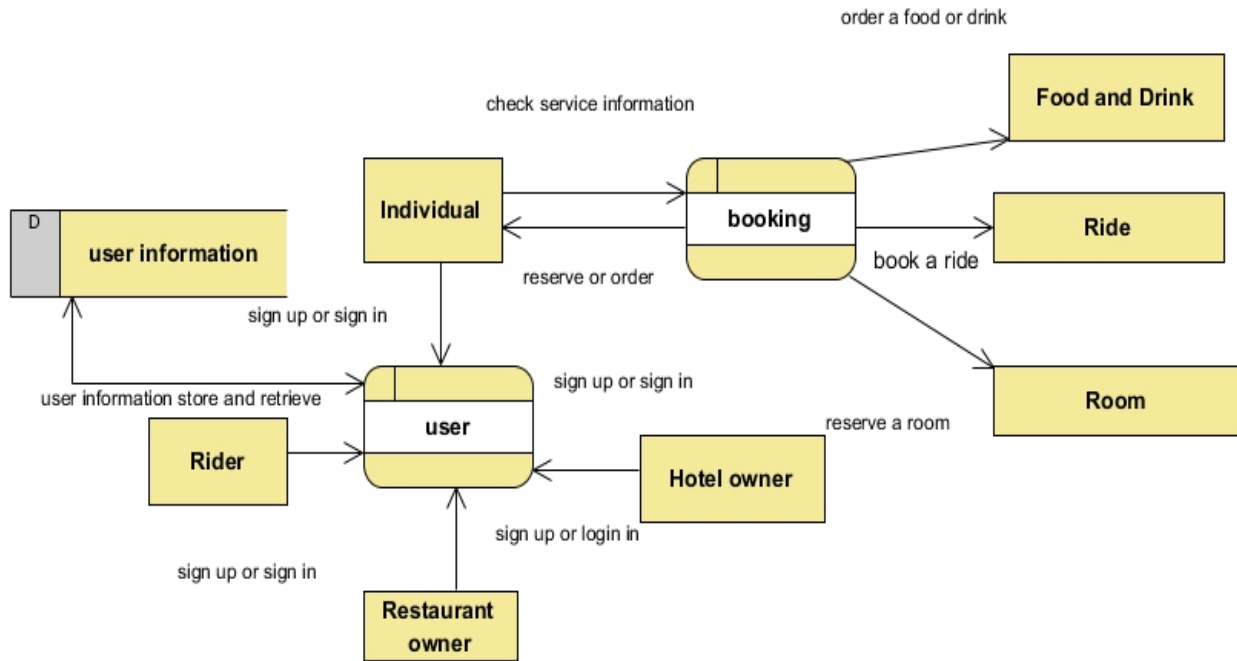Figure 1 Level 0: Context View of Tourism Reservation System

Figure 2 Level 1 View of Tourism Reservation System, booking and user view.
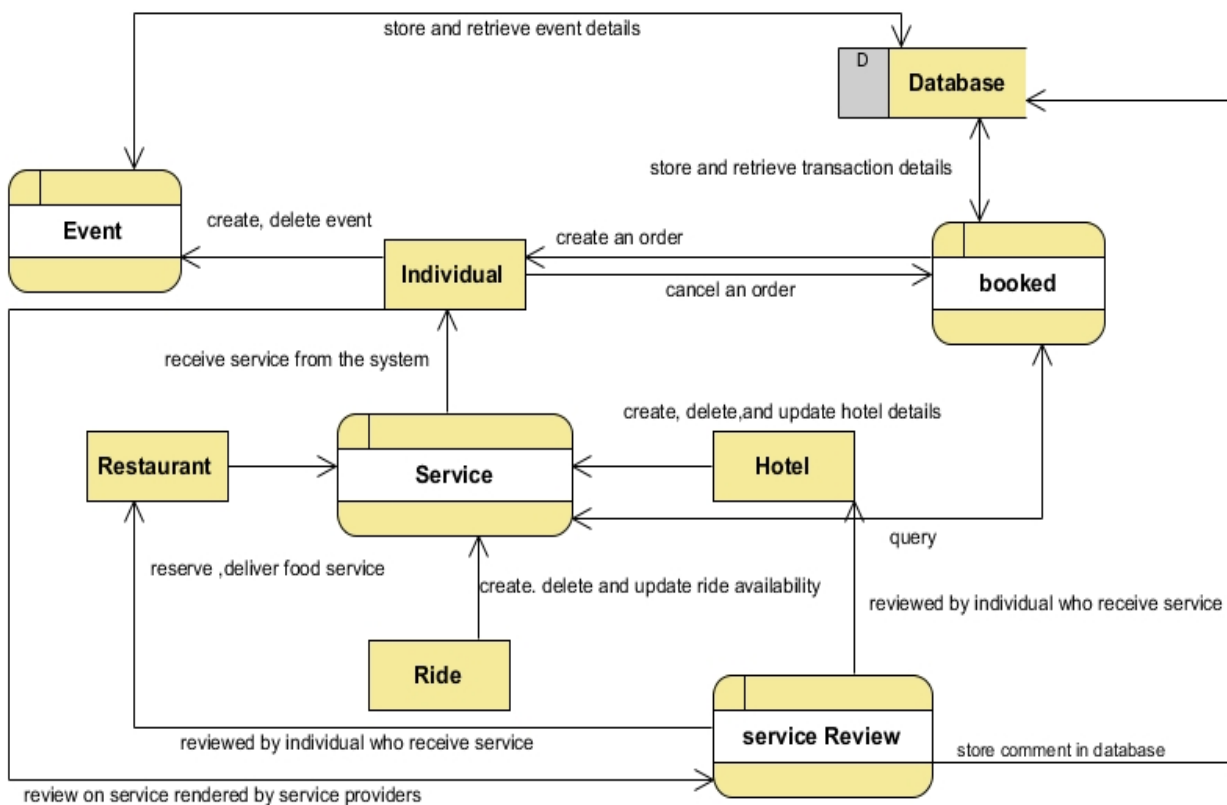
Figure 3 Level 2 Tourism Reservation Systems services and database layout.

Use Case for diagrams for the Tourism Reservation System

Use case describes a system's behaviour such that it shows the way the system responds to a request that originates from outside of that system (the user). The use case of the tourism reservation system is decomposed into six modules identified as Module 0 to Module 5 and the details of each of the six modules are presented in use case

diagrams of Figure 4 to Figure 9. The use case diagrams are used to capture some of the features of the system.

Notably, the tourism reservation system in this study is made up of the following features: registration and login interface, Search hotel interface, search restaurant interface, search ride interface, user-access interface, hotel-access interface, restaurant-access interface and rider-access interface. Each of this interfaces is included with a chat

interface that enables establishment of communication among all users of the system. The PDF interface is used in receipt generation for payment and verification purpose. The admin panel interface is where monitoring of the entire system takes place. Other design interfaces for all users of the system include: setting interface, setup-room interface, setup-ride interface, setup-food interface, booked-room, order-food, and order-ride interface while the interfaces for the admin include: user interface, restaurant interface, rider interface, hotel interface, booked-room interface, order-food interface, order-ride interface, content interface. Login interface called pin. Food, ride and room interface.
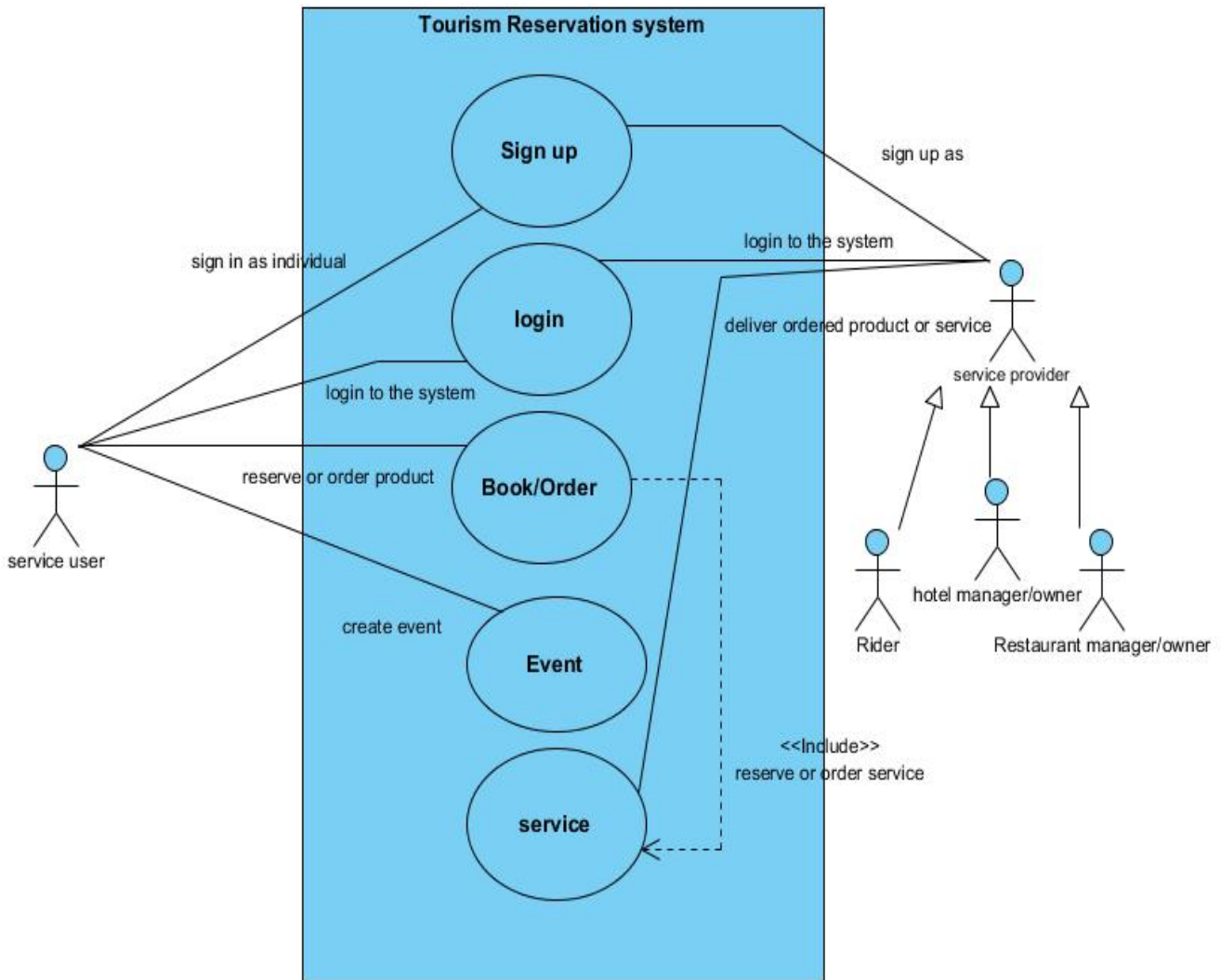
Figure 4 Module 0 use case diagram for TRS.
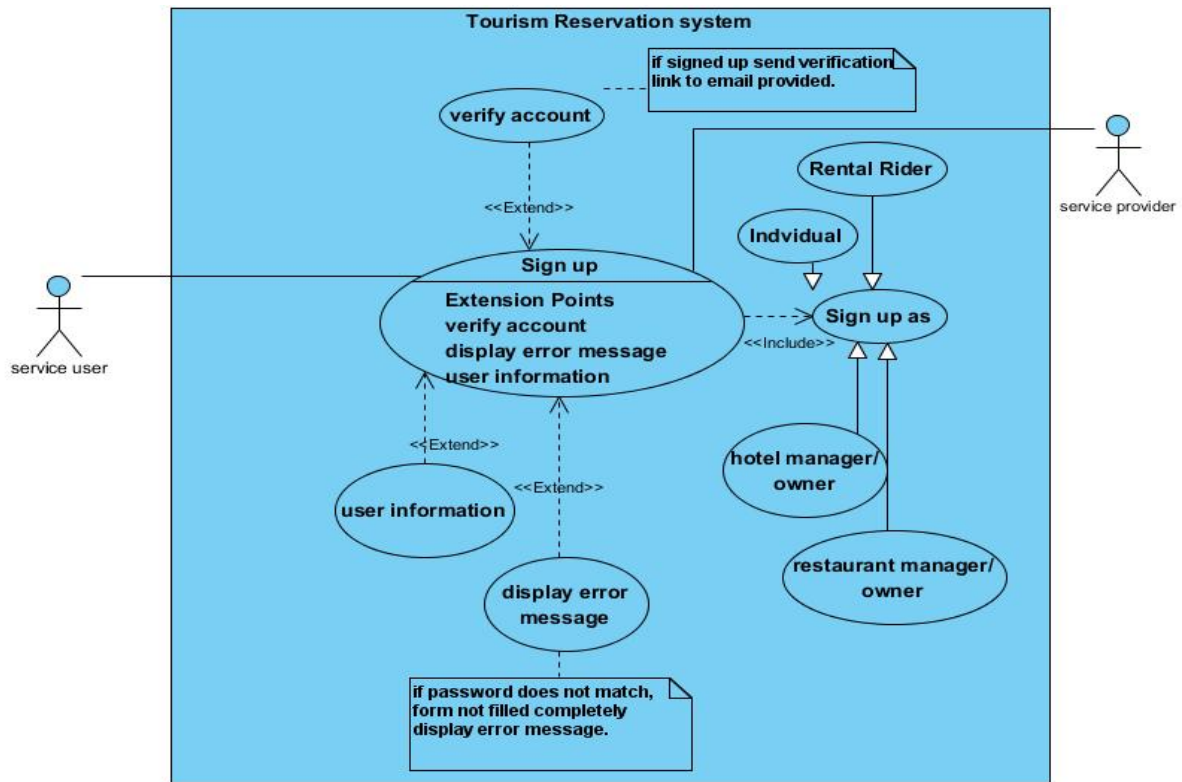
Figure 5 Module 1 use case diagram for sign up.
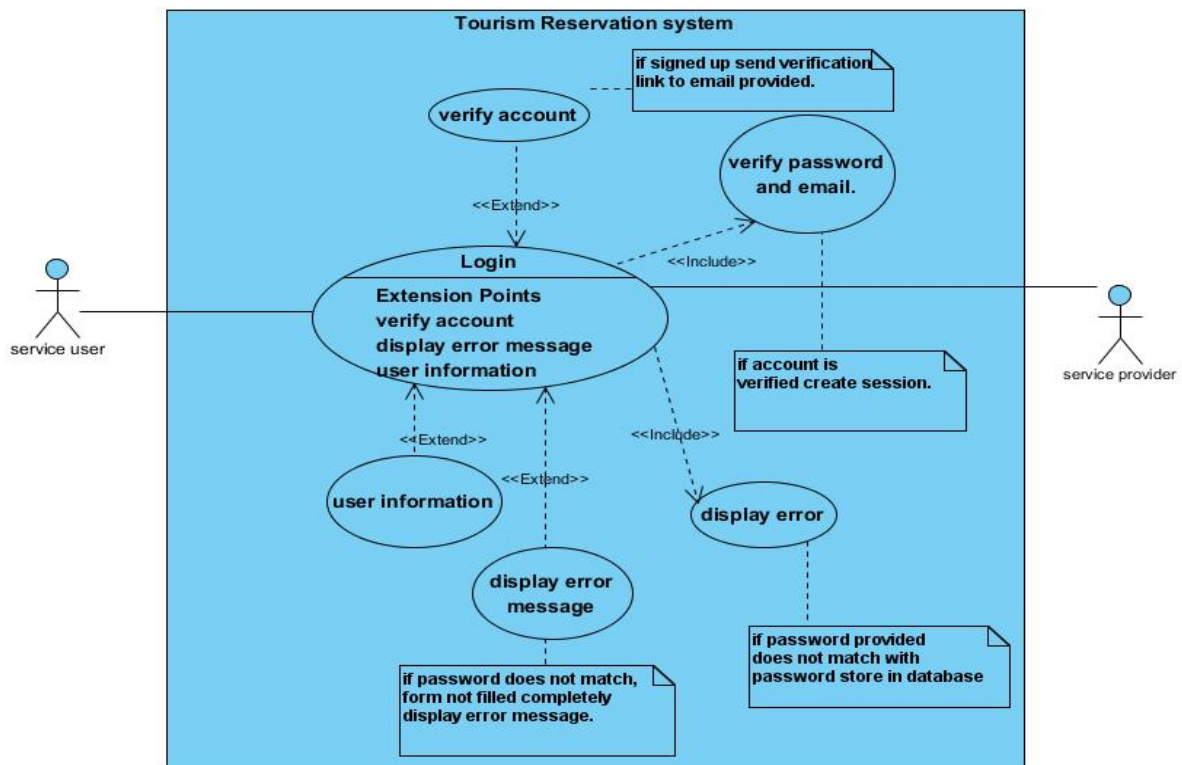
Figure 6 Module 2 use case diagram for login.
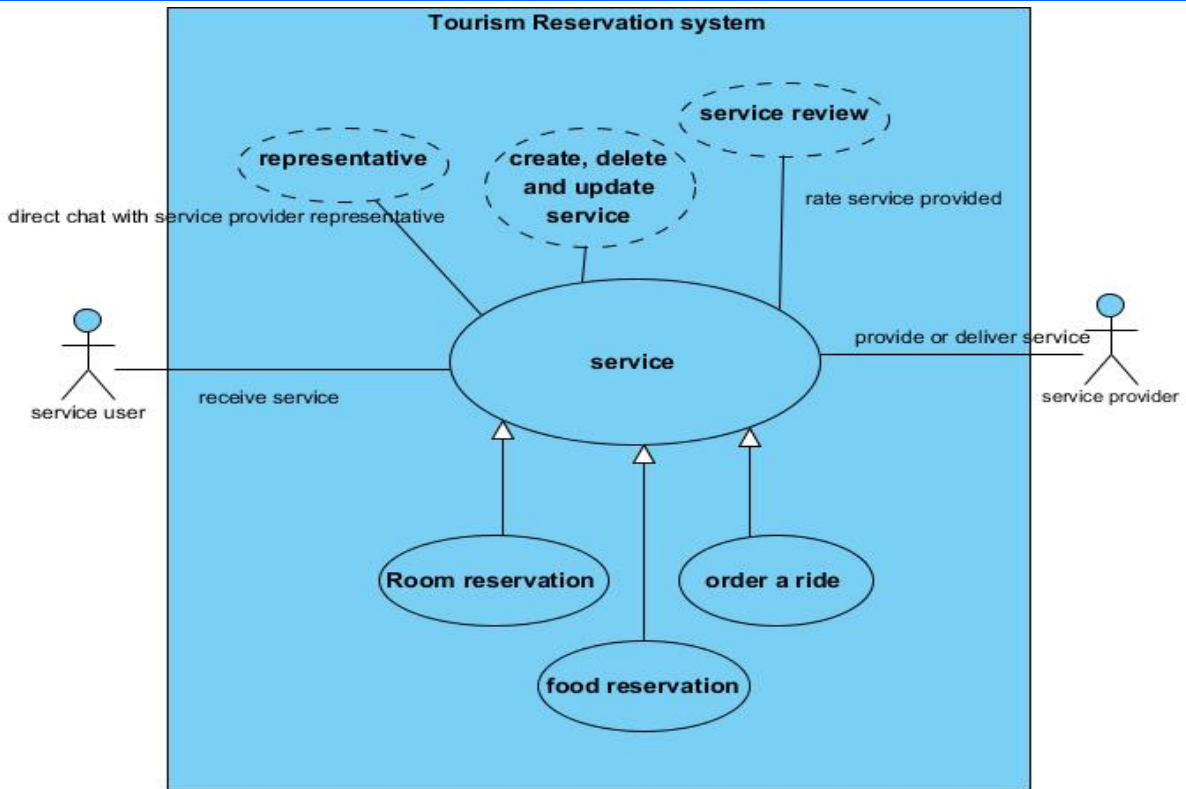
Figure 7 Module 3 use case diagram for service rendered.
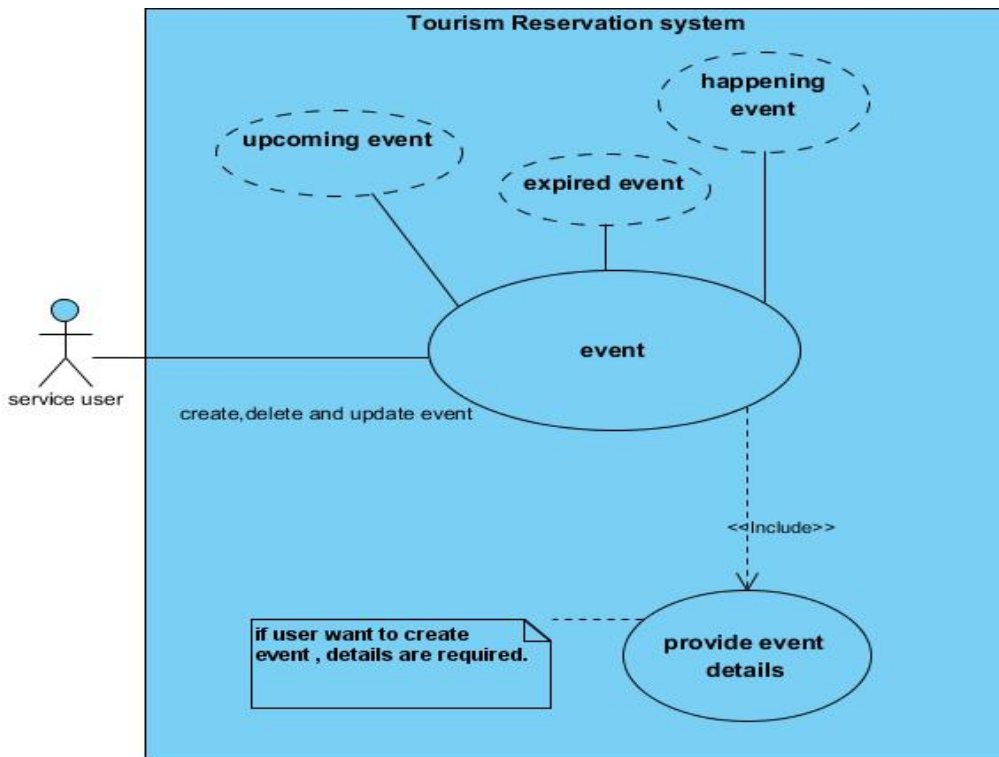
Figure 8 module 4 use case diagram for event.
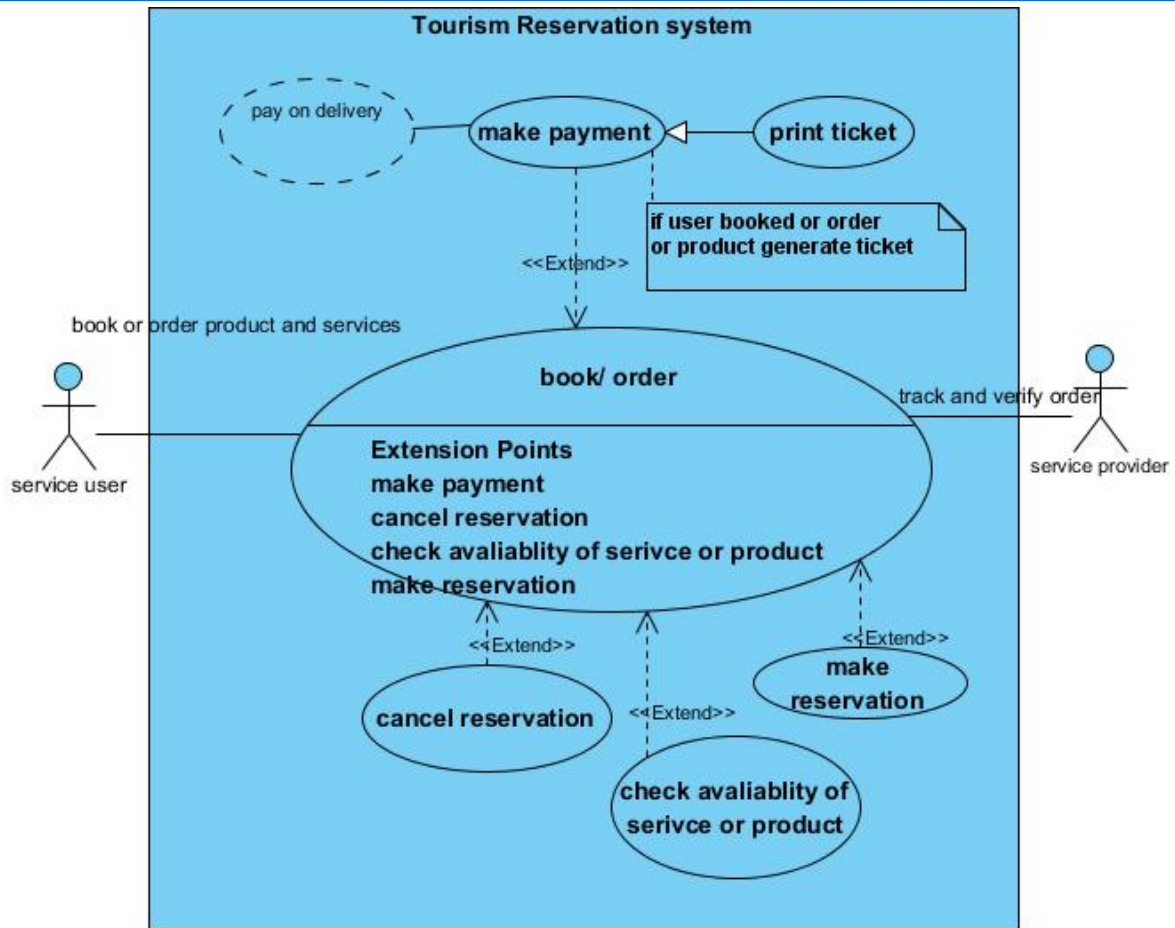
Figure 9 module 5 use case diagram for booking.

3 Result and Discussion
3.1 The sign up or registration, login interface and user interface

The registration interface gives user privilege to register either as a service user or service provider while the login interface gives user the privilege to access their information stored in the database after registration. This prevent multiple registration of users for the purpose of accessing the system again. The sign up or registration and login interface can be seen in Figure 10 and Figure 11.

The user access interface (Figure 12) comprises of the booked interface (Figure 13) through which the user can view, cancel and get details of booking, orders or reservations made on the system. The book interface display all the reservation made on the system and keep track of each one. The booked interface has been designed to enable automatic delete of an expired reservation. Setting interface (Figure 14) is where information of the user is update after registration while the Transaction interface is used to keep track of histories.
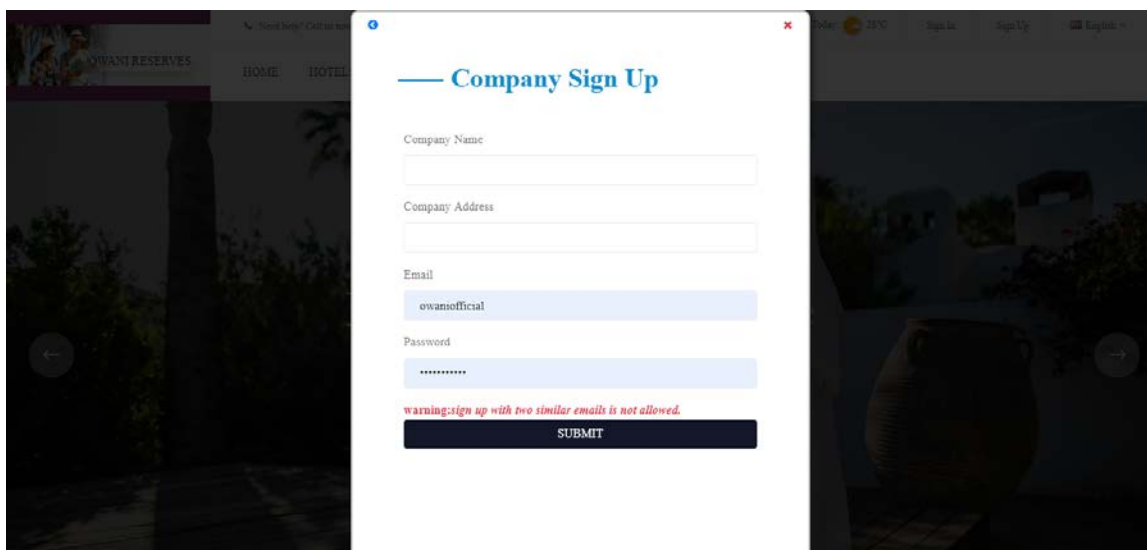
Figure. 10 The screenshot of the **sign up or registration** interface
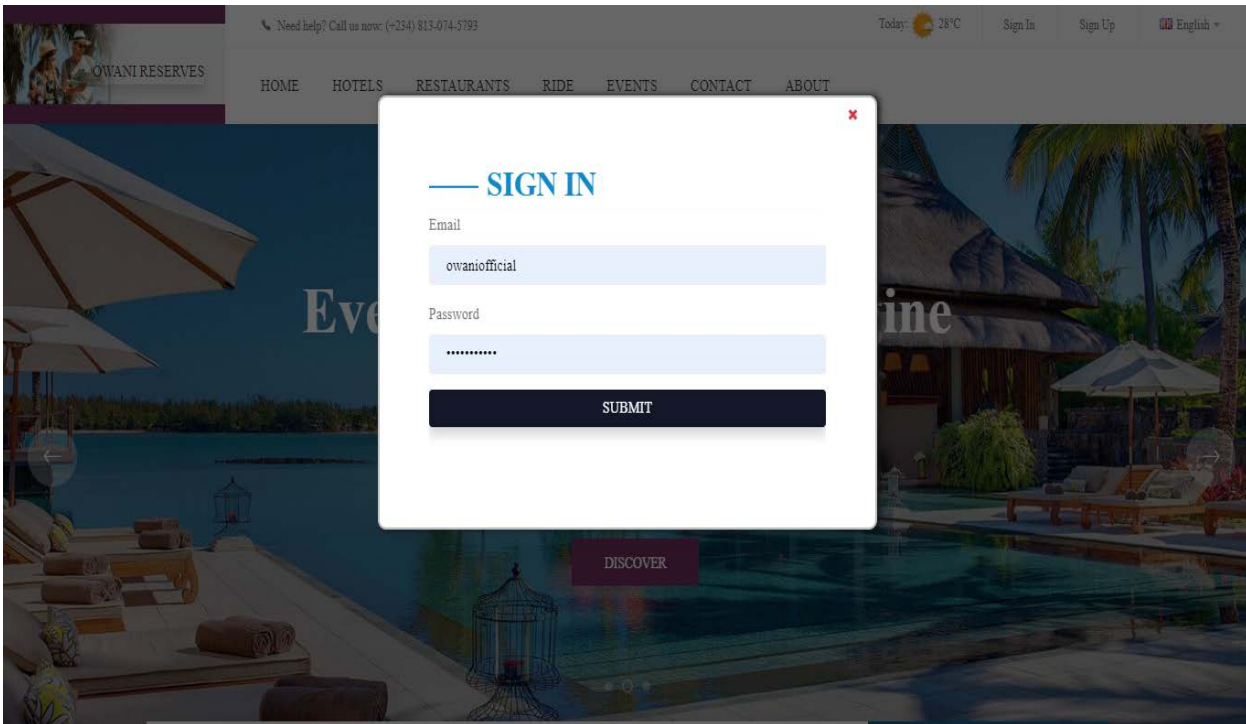
Figure. 11 The screenshot of the **login** interface

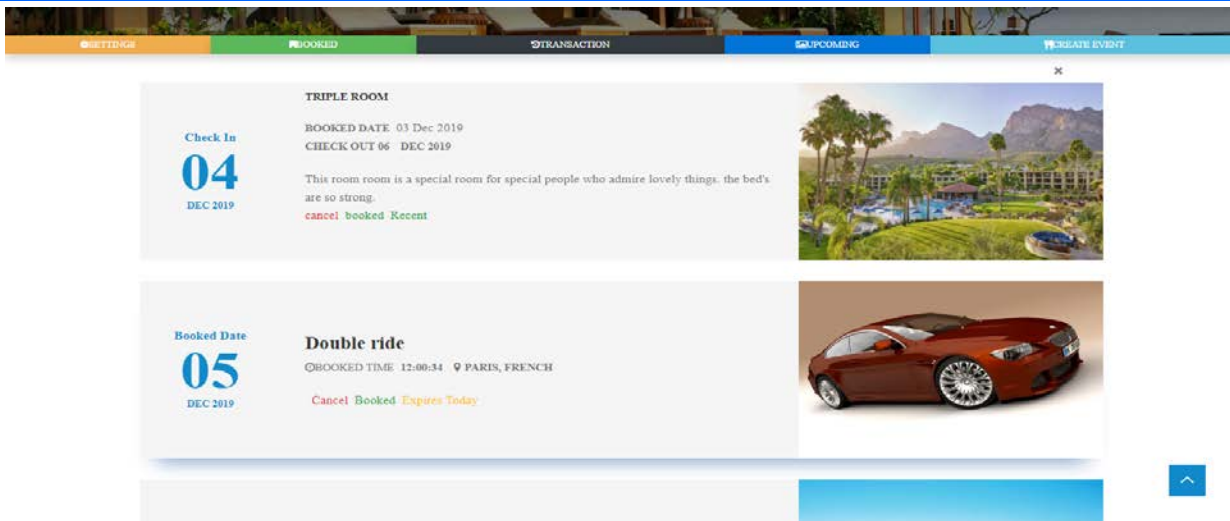Figure. 12 The screenshot of the user-access Interface
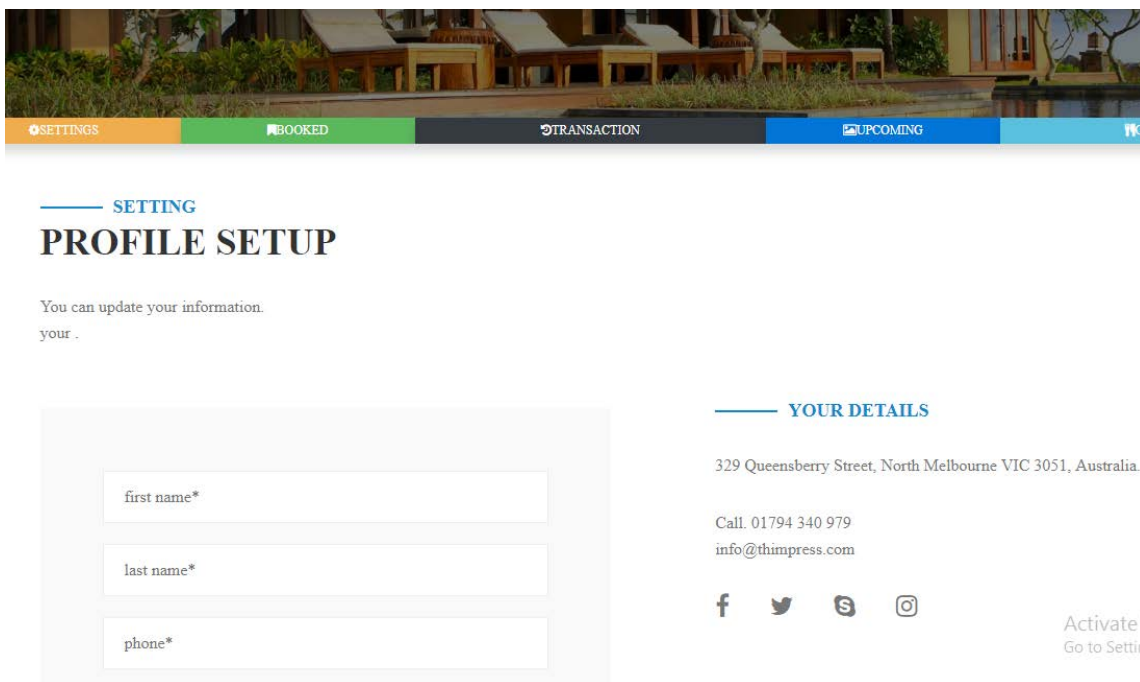
Figure. 13
The screenshot of the booked interface

Figure 14 The screenshot of the user access setting interface

Hotel access interface: The hotel access interface (Figure. 15) gives service providers (hotel owners) the privilege to showcase their various type of rooms and facilities to their clients before their clients can make reservation on a selected room over multiples of rooms available on the system.. The hotel access interface consist of setting interface, booked interface, setup-room interface and chat system etc. The screenshot of the hotel access interface and setup interface are shown in Figure 15 and Figure 16. Similar access interface such as restaurant access interface, user access interface, rider access interface etc are also available but they are not shown because of space.

Chat interface: The chat interface gives service provider and service users the privilege to communicate with each other irrespective of their various locations. The chat interface has been designed to store the communication between parties. Each service provider has an embedded chat system called message. The screenshot of the chat system for hotel access interface is shown in Figure 17.

Pdf interface : The PDF interface create the summary of the entire reservation made and allow it to be downloadable via the user system. The printable reservation of room made is shown in Figure. 18 and Figure 19 shows the download interface.
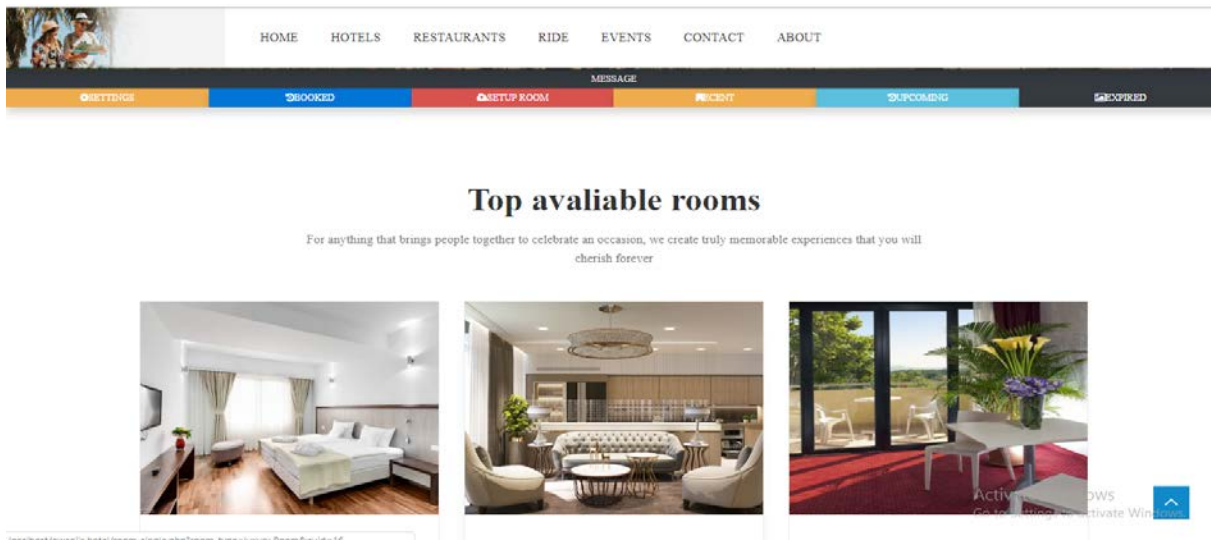
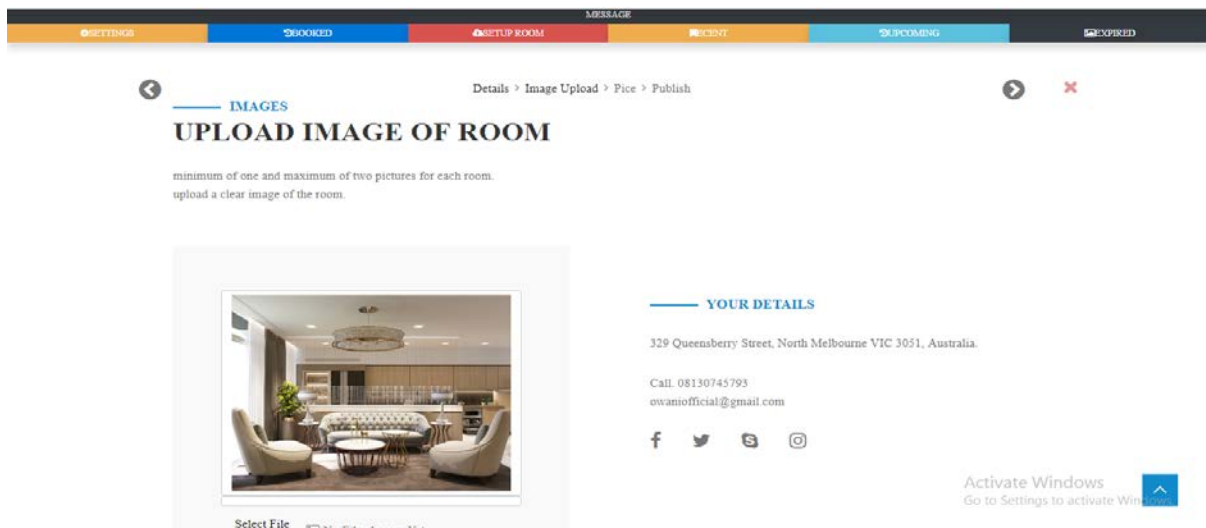Figure. 15 The screenshot of the hotel access interface

Figure. 16 The screenshot of the hotel setup interface

Figure. 17 The screenshot of the chat system for hotel access interface

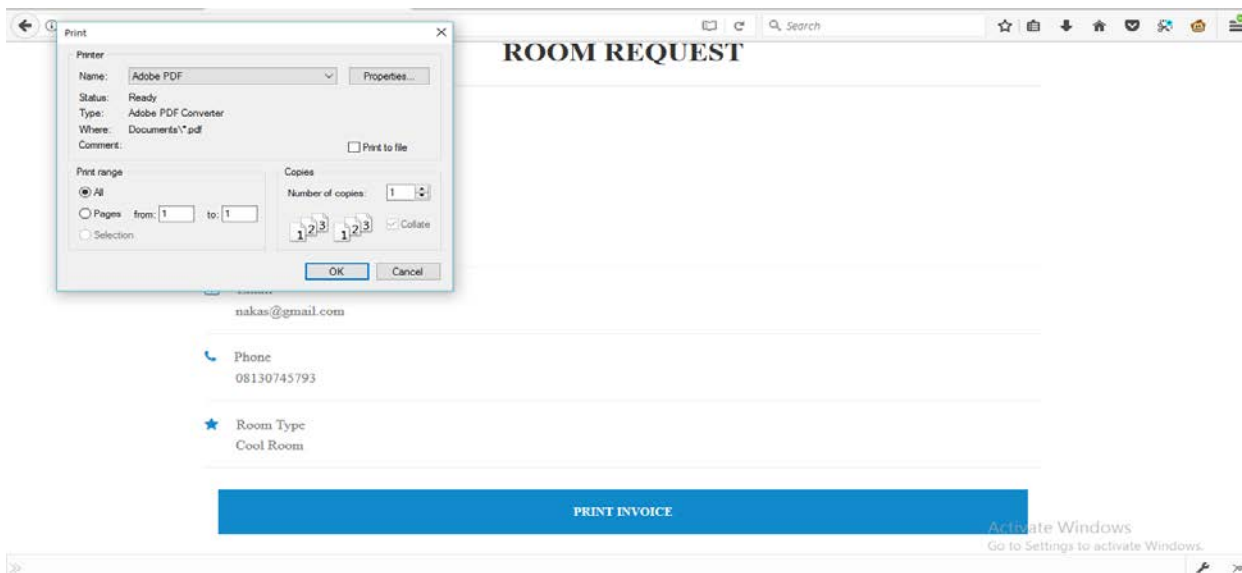Figure. 18 The screenshot of the printable reservation of room

Figure. 19 The screenshot of the printable reservation download interface.

The admin panel interface: The admin panel interfaceis the part of the system that is used to monitor and control the functions of the Tourism Reservation System. It comprises of hotel, restaurant, rider and user interface; which shows the detail of registered users. It also include room, ride and food interface; which shows the information of the uploaded data from each of the access interface. The screenshot of the admin user interface is shown in Figure 20, admin hotel interface is shown in Figure 21 and the admin booked room interface is shown in Figure 22.

Database structure: The database of the system consists of fourteen (14) tables which include the following; Owani_user; which store service users details, owani_hotel,

owani_rider and owani_restaurant (which store service providers details), owani_booked, owani_ride_request and owani_order (which keep track of reservation made service providers), owani_food, owani_ride, owani_room (which keep track of the uploaded details from the service providers), owani_comments, owani_replys (which keep track of the chat data between service user and service providers), owani_image; which keep track of uploaded images, owani_pin; track of logged in admin. Figure 23, 24, 25, and 26 show the database table of owani_hotel, owani_booked, owani_comment and owani_pin for the Tourism Reservation System respectively.

Figure. 20 The screenshot of the admin user interface

Figure. 21 The screenshot of the admin hotel interface

Figure. 22 The screenshot of the admin booked room interface

Figure. 23 The screenshot of the owani_hotel table

Figure. 24 The screenshot of the owani_booked table

Figure. 25 The screenshot of the owani_comments table

Figure. 26
The screenshot of the owani_pin table

4 Conclusion

Development of tourism reservation system web application is presented. The system has been developed using an iterative incremental methodology. The languages and tools used in the software development includes, PHP, JavaScript, and CSS. Importantly, HTML has been use as the building block and programming language for the system. Data flow and case diagrams are used to design the system and they show how data and information flow on the system. The implementesystem is hosted using WAMP server and then tested using some sample dataset.

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