Design and Development of an Online Room Reservation System for Silverline Guest Lodge

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Design and Development of an Online Room Reservation System for Silverline Guest Lodge.

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Abstract*— *Collectively, the hotel industry is the most under automated segment of the international hospitality industry, with processing, management and distribution of data being handled manually. The use of a manual system is not only tedious and complicated, but also leads to inefficiency in business operations, unfavorable cash flow and a low revenue portfolio. This study presents the design and development of an Online Room Reservation System for Silverline Guest Lodge, that is aimed at replacing the manual system currently in use. A survey was conducted at Silverline Guest Lodge in Lusaka in order to gather system requirements. After design and modeling, the developed system was trialed on site and online reservations were captured successfully. The Online Room Reservation System presented in this study was developed using the iterative software development model. The software tools used in this study included Notepad++ Text Editor, PHP, MySQL, and Application Programming Interfaces (API's) for Stripe and PHP Mailer. The hardware tools used included a Hewlett-Packard (HP) Laptop computer running Microsoft Windows 10 Enterprise, with a Pentium (R) Dual-Core Processor. This study showed that the adoption of technology plays a critical role in the hotel industry with regard to improved operational efficiency, maintenance of a competitive advantage, increased revenue portfolio and enhanced customer satisfaction.

Keywords*—*hotel industry; hospitality industry; manual system; online reservation; customer satisfaction; iterative software model;

I. INTRODUCTION

The internet has become increasingly integrated into our daily lives. The proliferation of mobile internet devices means that people are rarely far from a communication device with which they can source or share information (Sullivan, 2013). Reservation systems are computer-based systems that store and distribute information related to travel and lodging services. Globally, hoteliers are fast adopting automation for information processing and management in all their operations, which include reservations and payments (Akazue, M. I. 2016).. Online reservation systems are becoming a very popular method for travelers to book their rooms. Customers can book rooms from the comfort of their homes over the internet with guaranteed protection of their private information (Delizo, G. and Esguerra, M., 2013). Online reservation systems provide an efficient means of storing, processing, accessing and confirming information. Without an efficient reservation system, all major aspects of managing a lodging establishment are negatively affected. For instance, while overbooking reservations guarantees a full house for the hotelier, it also leaves the customer who is turned away with a negative impression. This not only decreases the hope of repeat business but also ensures that the dissatisfied customer tells other prospective customers of their negative experience.

In this study, we develop and design an online room reservation system to help Silverline Gust Lodge overcome the challenges associated with manually processing, managing and distributing reservation data. We begin by first reviewing the literature on the hospitality industry, technologies, tools, and related applications that have been developed. We proceed to discuss the methodology used in the study, followed by a discussion on the design and modelling of the system. Next, we describe how the application works, then compare our application with related applications before we discuss the work and then conclude.

II. LITERATURE REVIEW

Origin of the Hospitality Industry

The fascinating history of the hospitality industry is almost synonymous with that of human civilization. It's colorful and spans centuries, if not millennia. People have been providing hospitality for weary travelers since our ancestors inhabited the earth about 100,000 to 200,000 years ago.

The age of antiquity, spas and bathhouses often provided sleeping facilities and were popular attractions for those seeking rest and relaxation. In medieval times, mostly cloisters and abbeys provided travelers with accommodation. It was also during this period that more and more inns and guesthouses were opened on popular trade routes to provide food and lodging for travelling merchants (Customer Alliance., 2019). Payment for accommodation began to be charged from 15th century onwards. The institution of inns came to be developed in several countries in Europe particularly in England and France. The English House of Commons declared the inn to be a public house and proposed social responsibility on the inn keepers for the well-being of the travelers. In the USA, another form of accommodation was started in 1934, called the tavern where people used to come for food, drinking and entertainment (Sukthankar, 2013).

Present Day Hospitality Industry

The hospitality industry has gradually become one of the largest and most diverse industries, employing hundreds of millions spread all over different sectors. Today, the industry includes categories of business and services linked to leisure, pleasure and customer satisfaction.

The hospitality industry, in general, is one of the world's fastest-growing industries. Travel and tourism have helped to ensure that this industry remains afloat despite the tough economic times that have made it impossible for many sectors to survive. A vital aspect that defines the hospitality industry is its reliance on other people's disposable income and free time. Because of this, businesses in the hospitality industry, whether they have to do with accommodation or transport, are targeted towards people that have extra income to spare and free time for relaxation (Jobs, S. 2019).. The industry has a strong focus on customer satisfaction, industry economics and levels of service provided. Fig. 1 shows the time-line of estimated international tourist arrivals world-wide.

Sectors of the Hospitality Industry

The industry consists of an innumerable set of categories, with customer service being the unifying factor. (Technosys, 2017). identifies four major sectors of the industry as follows:

- Lodging (hotels, lodges, guest houses etc.)
- Food and Beverages (F&B)
- Transportation
- Recreation

Lodging refers to accommodation for a certain period at a place of stay. Fancy hotels, lodges, hostels, campgrounds, motels and other businesses that provide a place for people to sleep overnight are all in the hotel industry. The food and beverage (F&B) segment is one of the largest segments of the hospitality industry. It comprises of establishments

primary engaged in preparing meals, snacks, and beverages for immediate consumption on and off the premises. When a restaurant is part of a hotel, services it renders can enhance the guest experience by providing excellent food and first-class customer service.

Services such as flights, trains, buses, cabs, ships, and so on are part of the transportation sector of the hospitality industry. The sector facilitates the industry as guests can reach their desired designation, travel around and go back. Also, cruise lines offering part transportation and part leisure and entertainment services have attracted many tourists to popular tourist destinations across the globe. Any activity that people undertake for rest, relaxation, and enjoyment falls under recreation in hospitality industry. It refreshes a person's body and mind. The recreation segment is a very diverse. In general, there are three types of recreation businesses, namely:- entertainment, attractions, and events

A. *Hospitality Industry in Zambia*

The hospitality industry offers opportunities for revenue generation in both the private and public sectors, whilst at the same time, stimulating needed economic activities that deliver conservation, social and financial benefits to the nation. The excellent investment opportunities in hotel development are evidenced in the substantial number of operators established in the country. Zambia has a wide range of standards when it comes to places to stay - from five-star hotels, luxury lodges, rustic bush camps, guesthouses and campsites. This illustrates the abundant investment opportunities in (Zambia Zambia Development Agency, 2014).

The promotion of private sector driven hospitality has seen an increase in tourist arrivals, prompting the industry to adopt the use of technology in order improve service delivery, enhance customer satisfaction and maximizing revenue portfolios. Incentives have been put in place to ensure that hospitality flourishes as it is a major generator of much needed foreign exchange. In recognition of the sectors potential to contribute to economic development in terms of inter alias, foreign exchange earnings, employment and income generation, contribution to government revenues, promotion of rural development as well as acting as a catalyst to sustainable development, the Government of the Republic of Zambia, in the year 1996, reclassified the hospitality industry from a social to an economic category (Ministry of Tourism, 2007).

The Hotel Industry

The hotel industry has become an important part of a much larger hospitality industry. The industry comprises businesses that provide services, primarily accommodation, food and beverages. This industry is continually changing. Hotels are rising to target specific age groups and lifestyles. In this vein, understanding and satisfying the needs of hotel patrons is always of paramount importance (Castilloa, Asib, Berberabe, Mandigmad, and Sarmientoe, 2014). The hotel industry refers not only to hotels, but also to many other forms of overnight accommodation facilities, including lodges, hostels, motels, guest houses and inns. However, it does not usually include long-term or permanent forms of accommodation. A common area of confusion relates to the difference between the hotel industry and the hospitality industry, with many people mistakenly believing that the two terms refer to the same thing. While there is a cross-over, the hospitality industry is broader in scope and includes a number of different sectors. The hospitality industry is concerned with leisure in a more general sense and as a result, it covers accommodation, restaurants, bars, cafés, night clubs and a number of travel and tourism services. The hotel industry by contrast, is solely concerned with provision of accommodation and related services (Revfine, 2019). The type of hotel is determined primarily by the size and location of the

building structure, and then by function, size, target market, service level, amenities, and industry standards (Wilson-Mah, 2019). Table 1 shows the classification of hotels by size, location, market function, level of service, and ownership and affiliation.

A hotel reservation system (HRS), commonly known as a central reservation system (Bemile, Achampong, and Danquah, 2014). is a computerized system that revolves around storage and distribution of information concerning resorts, hotels, lodges and a host of other lodging facilities.

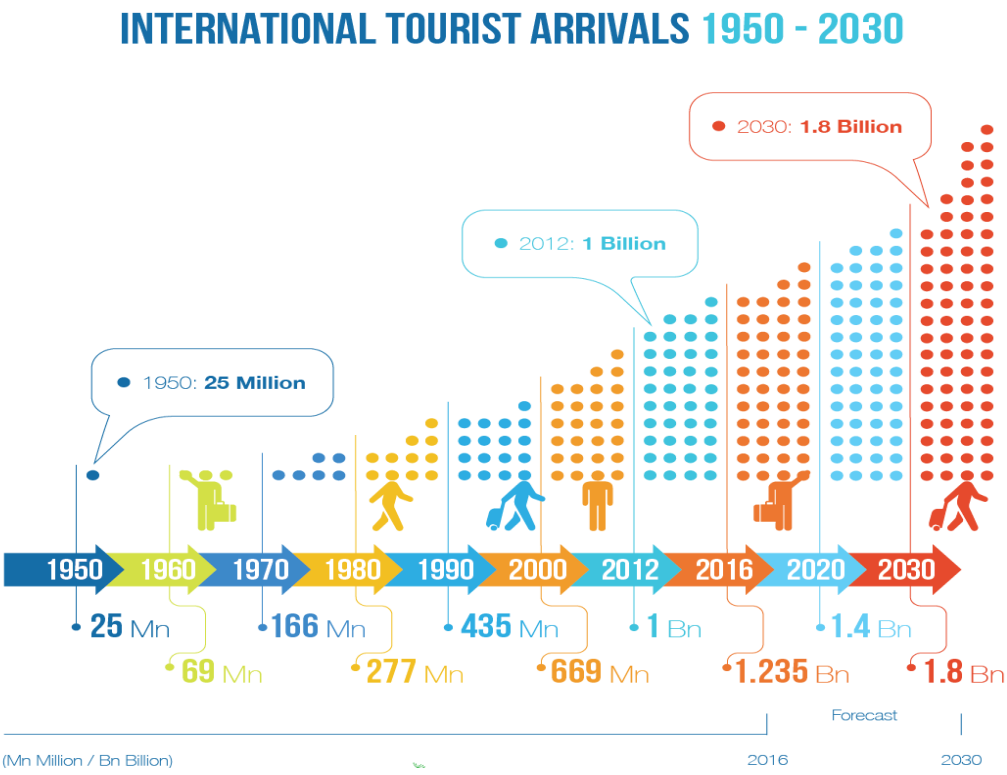

Fig. 1. International Tourist Arrivals
Source: (WTO: International Tourism Timeline 1950-2030, 2017)

B. *Central Reservation and Global Distribution System*

In information systems (IS) research, literature refers to systems such as the central reservation System (CRS) and global distribution system (GDS). An information system consists of a set of interrelated components that function to provide required information for a specified purpose as and when needed. Large systems may comprise a number of sub-systems which work together to support the overall function of the main system (Gould, H., 2016).. Fig. 2 shows the elements that comprise an information system.

A hotel central reservation system CRS) is made up` various modules, that include reservation, profiles, groups and blocks, rate and inventory control, administration, reporting, global distribution interface and property management system (PMS) interface. (Provab, 2013).

A global distribution system (GDS) is the term that is now often used to describe multi-national central reservation systems. A GDS is an information system that is composed of databases, data management and processing system, and telecommunications network. Specialized databases provide information on the availability of services (transportation, lodging and others), and

the price of these services (Raymond and Bergeron, 1997).

The data management and processing sub-system has the following functions:

- real-time management of available services,
- data base updates,
- display and access management
- price optimization,
- ticketing, and management of service chains

The global network is accessed through dedicated terminals or workstations by the airlines and intermediaries. Ideally, CRSs and GDs are logistical function systems. Ideally, CRSs and GDs are purely for logistical functions. They store current information about all available service providers and have necessary infrastructure to transfer such data (Felicen and Ylagan, 2016). Fig. 3 shows the principal structure of a global distribution system.

C. *Guaranteed and Non-Guaranteed Reservations*

Fig. 4 shows the process of making a reservation for accommodation. A guaranteed reservation entails that the hotelier will hold a room for the guest until a specific time following the guests scheduled arrival date (i.e. Check-out time or any time the lodging property chooses). In order to guarantee a reservation, guests might opt for one of the following payment methods:

- Prepayment guaranteed reservation
- Credit card guaranteed reservation
- Advance deposit or partial payment
- Travel agent guaranteed reservation
- Voucher or Miscellaneous Charge Order

A non-guaranteed reservation on the other hand entails that the hotelier agrees to hold a room for the guest until a stated reservation cancellation hour on the day of arrival.

D. *Online Reservation (e-Booking)*

Online Reservation refers to making a reservation for a service via the Internet. Online reservation allows customers to book and pay for flights, accommodation, holiday packages, and other services from the comfort of their homes. Online reservations have become very popular, and are one of the fastest growing sales channels for the hospitality industry. The Internet has radically revolutionized physical and hand written bookings, by converting them to electronic bookings through the use a Central Reservation System (Shasha, and Weideman, 2016).

E. *Online Payment System*

A payment system refers to infrastructure consisting of institutions, instruments, rules, procedures, standards and technical means established to affect the transfer of monetary value among parties discharging mutual obligations. Payment systems may be physical or electronic and each has its own set of rules, standards, procedures and protocols. Standardization has allowed some of these systems and networks to grow at global scale, but there are still many countries and product specific systems (Joseph, 2015). An online payment system or electronic payment system is a mode of payment over an electronic network such as the internet. It is a method by which a consumer can pay for the purchase of goods and services without physical transfer of cash and cheques, irrespective of time and geographical location (Tyagi and Shukla, 2016).. A secure electronic financial transaction has to meet the following requirements:

- Ensure that communications are private
- Verify the identity of the client and server

- Ensure that data is transferred by a signed author

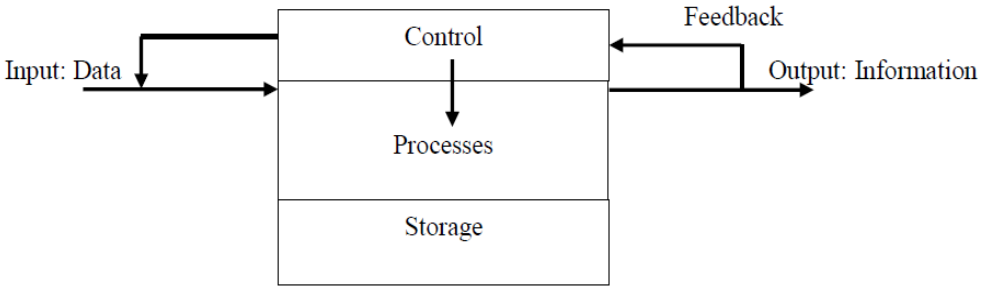

Fig. 2. Elements of an Information System
Source: (Gould: Systems Analysis and Design, 2016, p.9)

F. Modes of Online Payment

With advancements in technology, online payment systems (or electronic payment systems) have taken various forms including payment cards (credit and debit), digital and mobile wallets, electronic cash, contactless payment etc. Fig. 5 shows the trend in online payment methods worldwide.

(Tyagi and Shukla, 2016). states that a debit card is a banking card enhanced with automated teller machine (ATM) and point of sale (POS) features so that it can be used at merchant locations. A debit card is linked to an individual's bank account, allowing funds to be withdrawn at an ATM and point of sale without writing a cheque. A debit card holder pays directly through a bank for purchases. It replaces physical cash and cheques. In a debit card system, customers deposit in advance into their bank account and withdraw at the time of purchase. The use of debit cards is particularly high in most countries the world over, with a specific user base depending on the conditions and regulations attached to the issuance of debit cards by respective issuers.

A mobile wallet is created when a smartphone functions as a leather wallet. Using mobile wallets, users are allowed to install the application on their smart-phones which they can employ for making offline as well as online purchases. Mobile wallets are assumed to offer more convenience to customers in making transactions with the help of technologies which connect smart-phones and the physical world via sound waves, NFC and cloud-based solutions (Khan, Olanrewaju, Baba, Langoo, and Assad, 2017).

A credit card is a plastic card issued to customers for purchase of goods and services. They are the most commonly used online payment mode. The applicability of credit cards is a major factor that has contributed to their wide use throughout the world. Credit card companies have established a wide network for their customers ensuring a huge user base for a number of different transactions. Credit cards have an easy to use functionality of making online transactions in no time and from anywhere. Credit cards are easy to obtain and use as customers don't need to any extra software or hardware to use them. The card-holder authentication procedure is also simple, with the provision of a name, credit card number, and expiry date. Customers can create passwords and use them when they purchase goods and services online using credit cards (Bezhovski, 2016).

Electronic cash (e-Cash) also called digital cash is digital money that provides private customers with a safe, fast and low-cost means of payment on the Internet. Electronic cash is independent of any

network or storage device. The application of e-cash requires that both the merchant and the customer establish e-cash accounts at the issuing bank, which issue tokens to their customers. In this payment system, tokens are the payment instruments that represent monetary values (Mohammed, 2017).

Mobile Payment (MP) is a means of digitally processing contactless payments in which customers use mobile communication techniques together with mobile devices to initiate, authorization and actualize payment for goods and services. There are two types of mobile payment, namely, remote mobile and proximity mobile payment. Remote MP includes paying for purchases from a web merchant via a mobile phone. Proximity MP, on the other hand, is convenient for POS and vending machines. In such cases, instead of using a traditional payment method like cash or credit/debit card, customers make a mobile payment which relies on a proximity exchange of financial information. The proximity MP transaction happens in the presence of the customer removing security concerns of using a physical card (Cobanoglu, Yang, Shatskikh, and Agarwal, 2015).

Online Payment Gateway Model

The utilization of online payment systems provides a large number of advantages not only to vendors, but to clients as well. (Khan, Olanrewaju, Baba, Langoo, and Assad, 2017). states that a payment gateway acts as an access point to the national banking system. Every online exchange must go through a Payment Gateway to be handled. A payment gateway routes and confirms details of payment in secure conditions between banks and different factions. The payment gateway works basically as an encoded channel, which safely routes details of financial transactions from the purchaser's personal computer to banks for authentication and counter signature. Upon approval, the payment gateway sends back the data to the merchant consequently finishing the order, and giving confirmation. Fig. 6 shows the online payment systems hosted by some world-renowned financial transaction companies and Table 2 shows the functional process of making an online payment.

Security in an Online Payment Environment

The internet has played a key role in changing how we interact and how we do business. Because of the internet, electronic commerce has emerged, allowing organizations to more effectively interact with their customers and other corporations inside and outside their industries. Organizations are increasingly reliant on automated and interconnected systems to perform functions essential to their welfare. The benefits of such activities include improved information processing, communication and better service delivery to the customer. While the internet offers enormous advantages and opportunities for business, it also presents various securities risks (Mylonakis and Malioukis, 2010).

Mylonakis, and Malioukis, (2010), discusses some of security issues that are prominent in environments where transactions and all consequential monetary value are exchanged between parties discharging mutual obligations. The major risks found in an electronic environment include the following:

- Viruses
- Worms
- Trojans
- Hacking
- Denial of Service (DOS)
- Credit card fraud
- Spoofing

Viruses are self-replicating computer programs that are designed to perform unwanted events. They

have the ability to replicate and spread to other files on a device. The most common viruses include macro-viruses, browser-redirectors, file infecting viruses, and script viruses. Worms are a special kind of virus. They are designed to spread from one computer to another over existing direct computer connections. Trojans on the other hand are malicious pieces of computer code that are disguised as legitimate software applications that trick users into running their embedded code. Computer hacking refers to unauthorized access to data that belongs to another person or organization for malicious purposes of personal appeasement.

A Denial-of-Service (DOS) occurs when a legitimate user is prevented from accessing computer or network resources by an illegitimate user. Credit card fraud refers to the unauthorized use of another person's credit card details for personal gain. Spoofing refers to an unauthorized attempt to gain access to data (or network resources) by pretending to be an authorized user of the system.

The purpose of security features is to protect data from unauthorized access, use, alteration, or destruction [27] and to securely transfer data without any form of interruption from an unauthorized users [28]. Security features do not necessarily guarantee security but are necessary for building secure systems. Security features have four categories, namely:

- Authentication
- Authorization
- Encryption
- Auditing
- Integrity
- Non-Repudiation

As a security feature, authentication verifies who a person says they are. It ensures that only authorized users logon to the system. Authorization allows authorized users to manipulate system resources in a specific manner. On the other hand, encryption is concerned with information hiding. As a security feature, encryption ensures that users are not spied on and that their data remains inaccessible to unauthorized users. The auditing security feature keeps a record of system-wide user operations.

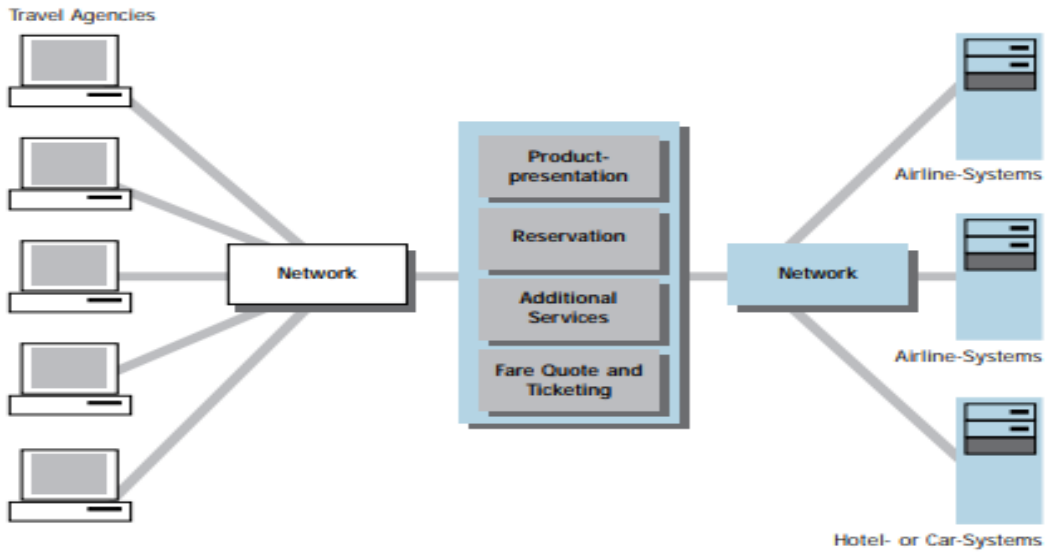

Fig. 3. Principal Structure of Global Distribution System.
Source: (Authors)

Merchants use audit trails to prove that a customer paid for a specific service or product. Another form of security feature is integrity. This security feature prevents unauthorized alteration of data, ensuring that data remains consistent. The last important security feature is non-repudiation which ensures that a party to a contract or a communication cannot deny the authenticity of their signature on a document or the sending of a message that they initiated.

G. *Web-Based Application Development Tools*

The term frontend is used to characterize an applications interface and services relative to the initial user of the interface and services. The term is mostly used to refer to the client-side of a software application. Robbins (2007). discussed frontend tools as outline in the section below.

Cascading Style Sheets (CSS) describe how the content on the page should look like. While (X)HTML is used to describe the content in a web page, it is Cascading Style Sheets that describe how the content on the page appears to the user. The way a page looks is called presentation. CSS is the official and standard mechanism for formatting and laying out web pages. CSS provides methods for controlling how documents will be presented in media other than the traditional browser on the screen, such as print and hand-held devices. It has rules for specifying the non-visual presentation of documents, such as how they sound when read by a screen reader. CSS is a great tool for automating production, as it allows developers to make global changes to pages on by editing a single style sheet document.

XML (eXtensible Markup Language) is a robust set of rules for creating other markup languages. There a number of XML languages used on the web, the most common being (X)HTML, which is HTML rewritten according to stricter rules of XML. There is also RSS (Really Simple Syndication), that enables content to be shared as data and read with RSS feed readers, SVG (Scalable Vector Graphics) that uses tags to describe geometric shapes.

HTML (HyperText Markup Language) is the language used to create web page documents. The updated version, XHTML (eXtensible HTML) is essentially the same language with stricter syntax rules. It is common to see HTML and XHTML referred collectively as (X)HTML. HTML is not a programming language but a markup language, meaning that it is a way of identifying and describing the various components of a document such as headings, paragraphs and lists.

JavaScript is a scripting language that is used to include interactivity and behaviors to web pages. The interactivity includes:

- Validating form entries
- Swapping out styles for an element
- Manipulate elements on web
- Keeping track of browser sessions
- Error and confirmation messages

The backend of an application is an enabler for a frontend experience. The backend is responsible for business logic, database interactions, and performance. Most code required to make an application work is at the backend. Welling and Tomson (2005), discussed backend tools as outlined in the section below.

PHP, abbreviated to Hypertext Preprocessor, is a server-side scripting language that is designed specifically for the web. PHP code embedded into a web page gets executed each time the page is visited. The embedded code is interpreted at the server-side, generating output that the user sees. PHP is an Open Source product, which means developers have access to the source code and can use, alter and redistribute it without any charge being affected. It is used for creating dynamic web pages that interact with the user and can include functionalities such as getting user input, manipulation of the input and storage of this data in a suitable DBMS. Using the Open Database

Connectivity Standard (ODBC), PHP can connect to any database that provides the ODBC driver. In addition to native libraries, PHP ships with a database access abstraction called PHP Database Objects (PDO), which allows access and promotes secure programming practices**.**

MySQL is a fast, robust, relational database management system (RDBMS). A database is used to efficiently store, search, sort and retrieve data. The MySQL server controls access to data to ensure that multiple users can work with it concurrently, to provide fast access to it and ensure that only authorized users obtain access. MySQL is a multi-user, multi-threaded server. It uses Structured Query Language (SQL), the standard database query language. It is non-proprietary, easily extensible and platform independent. Its downside is that it lacks a graphical user interface; therefore, there is need for the developer to know how the database works to make the most efficient use of MySQL.

H. The Impact of ICT's on the Hotel Industry

The general perception held by customers is that most of the products and services offered by hotels are relatively the same. There is need to strive to cultivate a positive competitive edge as a way of standing out from the rest of the competitors. As a means of attracting repeat business, a vital tool for hotels is the acquisition and use of ICT's. Information and Communications Technology (ICT) involves the use of hardware, software and telecommunication devices to capture, store, retrieve, manipulate, convert, protect, send and receive data. (Ansah, Blankson and Kontoh, 2012)

With the advent of technology, the industry has evolved at a very fast pace in the past century. Numerous innovations have been pioneered, aimed at improving service delivery and customer satisfaction. In keeping up with competitors and changes in the industry, hotels are thinking of new ways of incorporate technology in order to provide guests with improved products, services and amenities. Most hotels have struggled to provide guests a quick and easy arrival process. A guest's first impression of the hotel strongly depends on the check-in and overall arrival process, which is

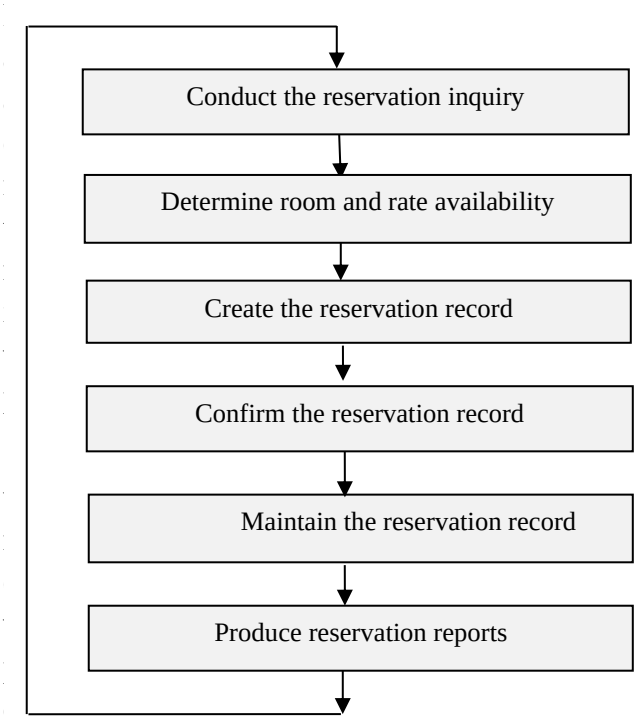

Fig. 4. Reservation Process
Source: (Authors)

services. Information must be able to flow quickly and accurately between customers, intermediaries and suppliers involved in servicing the needs of customers. ICT has become an almost universal feature of the hotel industry. Its power allows information to be managed more effectively and transported worldwide almost instantly. ICT continues to have a major effect on the methods of operation of the hotel industry, with its greatest impact being in the marketing and distribution functions. Given the manner in which ICT is reshaping the basic structure of both commerce and society in general, and customer increased demand for information, its importance to the success of hotels is projected to exponentially grow at a constant rate (Yousaf, 2011).

Delizo and Esguerra (2013), states that, the use of ICT's in the hospitality industry continues to be

in an invariable state of flux and is constantly unlocking new opportunities aimed at improving customer satisfaction and boosting internal efficiency. For the hotel sector in particular, the use of real-time, online reservation systems has made it possible for customers to make reservations for rooms and events, directly from a hotels website once they have confirmed availability of rooms and event schedules in accordance with the itinerary. Reservations that are made directly with a hotel provide customers with access to the hotels full cancellation policy and payment alternatives.

ICT's are one of the most useful and effective tools for managing the external environment of the industry. ICT's enable service providers to engage in effective communication with the customers by adopting and using appropriate ICT technology. Several social media networks like Facebook and Twitter can be used to interact with the customers. On the other hand, interaction with the customers can also be done by using video calling tools like Box Maul, Hotmail, Gtalk and Skype. Customers need to be updated regarding various products and services and in so doing, effective customer relations are maintained. (My Assignment Help, 2019).

I. Related Works

Bemile, Achampong, and Danquah, (2014). worked on the development of an online hotel reservation system for Hansonic Hotel in Accra - Ghana, that would enable guests to book and reserve a room of their choice after taking a virtual tour of the hotel. The study looked at replacing the hotels manual system that required guests to book for rooms or any other service by physically going to the hotel, calling the hotel on or using a third-party option. The tools used to develop the system included Dreamweaver, WAMP, PHP, JavaScript and CSS. The study concluded that the proposed system was able to securely keep track of guest information and that the hotels advertisement effort was complimented by virtual tours provided by the system.

Williams and Michael (2018), considered factors such as customer satisfaction and positive experience in the design and developed an online information and reservation system for Bulacan State University Hostel in the Philippines. The system included functionality such as creation of user accounts, updating of rates, bank payments, confirmation of payments via email, and generation of reports. The system was developed using ASP .NET for the frontend and Microsoft Access database for the backend. The developed system was evaluated using the ISO 9026. The software criteria used to determine the level of acceptability included functionality, accuracy, reliability, user-friendliness, and security. The architecture of the system composed of the input and output framework, software, and network infrastructure. The study concluded that the developed system was accessible remotely, allowing guests to make reservations and hotel staff to effectively and efficiently manage hotel processes.

Cho, Maw and Tin (2018). worked on the design and implementation of an online hotel reservation system for the Royal Hotel in Began, Myanmar. The objective of the system was to replace the manual system that the hotel was using. The system was a web-based solution developed using PHP, CSS and HTML as the frontend tools. The system was designed to automate the processes of booking, reservation, payments, modification of guest and reservation information, guest requests and feedback. The analysis of requirements was categorized into interface, hardware, software and risk management. The study concluded that the developed system would help the Royal Hotel to effectively and efficiently manage hotel reservation.

Ogirima, Awode, and Adeosun, (2014). developed an online computerized hotel management system (HMS) for Satellite Motel

Ilorin in Nigeria. The researchers utilized a computer system to solve some of the problems encountered during manual processes of hotel management. The system architectural framework showed the constraints imposed by the user requirements, available technology and tools. The noticeable components of the architecture were the database, web server, network and users of the system. Privacy, mobility, ease-of-use, security and cost were the critical assessment factors considered in measuring turnaround time, efficiency of service and end-user satisfaction. The study concluded that users preferred the online hotel management system (HMS) to conventional manual hotel processes.

III. METHODOLOGY

This study is an applied research aimed at improving operational processes and producing results of immediate real world practical application (Castro and Custodio, 2016).

The study used the iterative software development methodology. The system requirements for the application were formulated from a survey that was conducted at Silverline Guest Lodge in Lusaka – Zambia. The materials used in this study included hardware and software tools. The hardware used included a Hewlett-Packard (HP) Laptop computer running Microsoft Windows 10 Enterprise with a Pentium (R) Dual-Core Processor. The software included PHP, MySQL, Notepad++ and Application Programming Interfaces (API's) for Stripe and PHP Mailer. Table 3 gives the specifications of the hardware that was used in the study.

A. *Data Collection and Analysis Tools*

Data collection is a process used to gather information to be used in the assessment of performance, external evaluation, and self-evaluation. Instances hereof include email, telephonic discussions, web-based surveys and personal interviews, direct or participatory observation, questionnaires, case studies, expert's opinions, focus groups, literature investigation and content analysis of external and internal records. Three data collection tools were used for the purpose of this study, namely; interviews, observations and questionnaires. A self-administered questionnaire was used to conduct the survey.

Data analysis refers to the process of extracting, gathering, and eventually modelling raw data. The purpose of this process is to gather useful information that can be used to arrive at a conclusion or to predict results. The Statistical Package for Social Sciences program (SPSS) was used as the instrument for data analysis. The advantage of using SPSS is that data can easily be manipulated to investigate and report on a wide range of statistics. The information formatting can then be adapted to be displayed in table or chart format. SPSS also provides statistical analysis tools, that include descriptive statistics, discriminate analysis and advanced statistical analysis of variance (Shasha and Weideman, 2016). These functions were found to satisfy the requirements of the study in terms of analyzing the results of the survey.

B. *Sample Design*

The fundamental significance of sampling is the fact that it should be a representative extraction of a population. There were eighty (80) respondents who participated in the survey conducted at Silverline Guest Lodge. Fifty (50) were targeted, representing a 62.5% sample size. The population included one (1) lodge manager, ten (14) support

staff and sixty-five (65) guests. Purposive sampling was used to select the hotelier while random sampling was used to select support staff and guests. Using random sampling, each of the support staff and guests in the population had an equal chance of being selected for the survey. This approach ensured that researcher bias was eliminated.

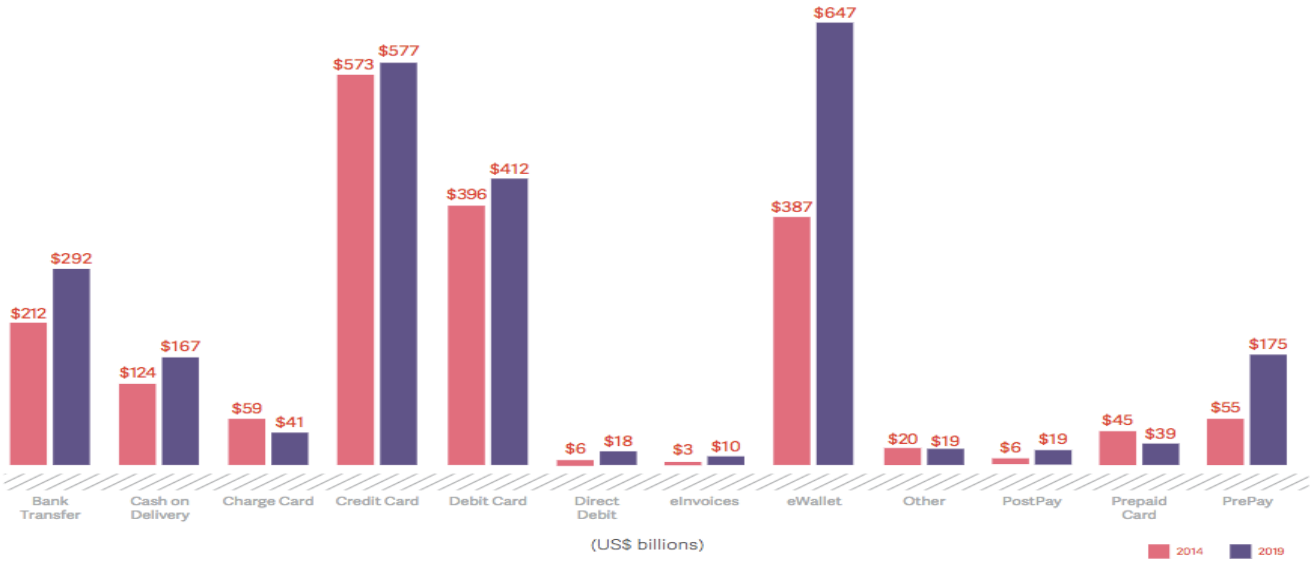

Fig. 5. Trend in Online Payment Methods
Source: (SecurionPay: Which payment method will become the popular in future, 2015).

C. *Software Development Model*

The iterative software model was adopted to realize the application. The systems development life cycle (SDLC) describes the requisite steps that are involved in developing an information system (IS). (Henry, 2016).

The concept of the systems development life cycle (SDLC) is composed of several stages starting from the planning stage, analysis phase, design stage, implementation stage up to system maintenance phase. Iterative software development breaks down development of a large application into smaller chunks. Using the iterative development model, feature code was designed, developed and tested in repeated cycles. With each iteration, additional features were designed, developed and tested until there was a fully functional software application ready to be deployed to the client. Working iteratively allowed greater flexibility to make changes. When requirements and design of a major application are done in the traditional method (sometimes referred to as BDUF or Big Design Up Front), there are always unforeseen problems that remain hidden until development begins. By working iteratively, the application was evaluated with each iteration, in order to determine what changes were needed to produce a satisfactory product for the client. (Rouse, 2011).

Mweemba, S (2014), states that the iterative software development methodology emphasizes design over documentation and is suited for small-to-medium projects. Fig. 7 shows the iterative software development model.

The advantages realized from using the iterative software development model in this study included the following:

- It generated working software quickly and early during the software life cycle
- It was more flexible and less costly to change the scope and requirements
- It was easier to test and debug the source code in smaller iterations
- It was easier to manage risk as risky pieces of code were identified and fixed during iterations
- Each iteration was an easily managed milestone

TABLE I. CLASSIFICATION OF HOTELS

Classification Criteria	Example
Size	▪ Under 50 rooms ▪ 50 to 150 rooms ▪ 150 to 299 rooms ▪ 300 to 600 rooms ▪ More than 600 room
Location	▪ Airport hotel ▪ Casino hotel ▪ City center hotel ▪ Resort hotel
Market Function	▪ Airport hotel ▪ All-inclusive resort ▪ Bed and breakfast ▪ Business hotel ▪ Boutique hotel ▪ Casino ▪ Conference center ▪ Convention center ▪ Extended-stay hotel ▪ Resort hotel ▪ Suite hotel ▪ Timeshare and condominium hotel
Level of Service	▪ Economy/limited service ▪ Luxury service ▪ Mid-level service
Ownership and Affiliation	▪ Chain ▪ Independent ▪ Franchise ▪ Family Business

Source: (Wilson-Mah, 2019)

Adopting the iterative software development model had the following disadvantages:

- More resources were required.
- Project progress was highly dependent upon the risk analysis phase.
- In some instances, defining increments required definition of the complete system.

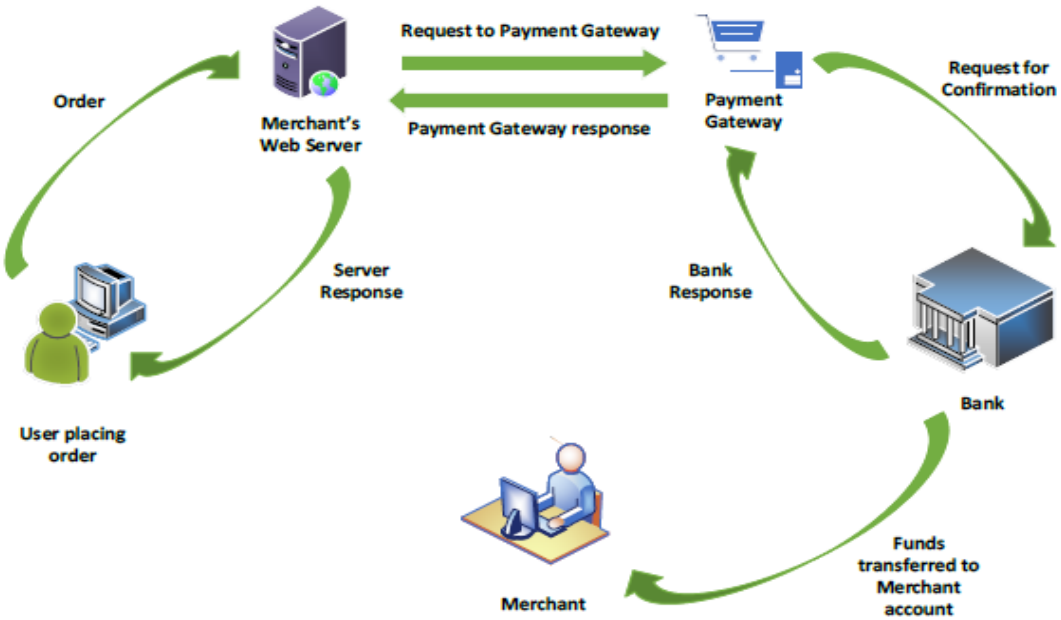

Fig. 6. Online Payment Process
Source: (Khan, Olanrewaju, Baba, Langoo, and Assad, 2017).

IV. MODELLING THE APPLICATION

A. *Class Diagram*

Fig. 8 shows the classes that were developed to model the application. The classes modeled the person, administrator receptionist, guest, occupant, credit-card, room, reservation, payment, rate, room-status, deposit and available-room entities in the room reservation mapping problem. The relationships among the different classes and methods of the classes are also shown. The user class inherits its properties from the person class.

TABLE II. ONLINE PAYMENT SYSTEMS

▪ Braintree ▪ Stripe ▪ PayPal ▪ Eway ▪ Samurai ▪ Serve ▪ V.me ▪ PesaPal ▪ WePay ▪ Square	▪ Authorize.Net ▪ 2CheckOut ▪ Dwolla ▪ GoPayment ▪ Icepay ▪ Amazon Payments ▪ Google Wallet ▪ Serve ▪ clearXchange ▪ Due

Source: (Authors)

The guest, receptionist and administrator classes inherit from the user class and also implement its methods. The guest class can have one or more instances of the deposit, credit-card and payment classes. It also can have zero or more instances of the reservation class. The reservation class can have one or more instances of the rate, occupant and available-room classes. The room class can have one or more instances of the room-status class. The administrator class can have zero or more instances of the reservation class. The receptionist class can have one or more instances of the room class and the available-room class can have one or zero instances of the room class.

B. *Entity Relationship Diagram*

Fig. 9 shows the ERD of the application. To develop the ERD, entities were first identified from the business rules. The second step was to identify the appropriate relationships, multiplicities and participation. The third step was to identify the primary and foreign keys of each entity. The fourth

step was to identify other attributes of each entity. After going through the steps outlined above, the ERD was reviewed and refined until the final ERD was developed. The attributes that were identified were the guest, room, reservation, transaction, room-amenity and category. The ERD design was aimed at maximizing query execution time. Selection of appropriate data storage software was critical to the success of this study.

C. *Reservation Sequence Diagram*

Sequence diagrams help in the identification of a detailed level of operations required to implement the functionality depicted by a use case model. Sequence diagrams show how objects in a system (or classes within code) interact with each other. Particularly, sequence diagrams show the order in which interactions occur. Fig. 10 shows the sequence diagram for making a reservation.

external users (actors) and the system under consideration or development. Use Case scenarios are used to illustrate, step by step, how users interact with the system, essentially capturing the

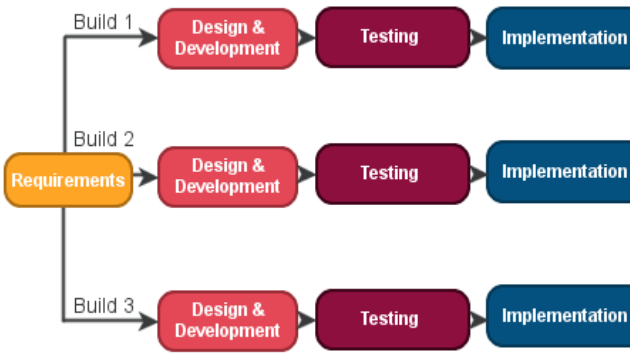

Fig. 7. Iterative Software Development Process
Source: (Authors)

TABLE III. HARDWARE TOOL SPECIFICATIONS

Hardware	Specification
Hewlett-Packard (HP) Laptop	• 500GB HDD • Pentium (R) Dual-Core CPU E5800 3.2 GHz • 4GB of RAM • Intel (R) G41 Express Chipset • 1600 x 900-pixel resolution • 64-bit Windows 10 Enterprise Operating System • 15 Inch LCD Screen

Source: (Author,2019)

D. *Context Diagram*

Fig. 11 shows the context diagram for the developed system. The diagram identified three (3) relevant actors of the system, namely:

- Guest
- Administrator
- Receptionist

E. *Use case Analysis*

Mweemba, S (2014), states that use cases define a goal-oriented collection of interactions between system behavior from the user's point of view.

In order to create relevant use cases for the system, the three actors previously identified in Fig. 10 were used as the basis for use case analysis. Fig. 12, 13 and 14 show the use cases developed for the system. The necessary steps that were followed in developing the use cases for the application are outlined below:

- Identifying all the stakeholders and users who would be beneficiaries in the use case diagram.

- Determining the needs of each and every user to be reviewed in a use case diagram. Typically, use case diagrams were produced for each subsystem, for each type of user, for use cases with the <<includes>> relationship, and for use cases that were of interest to specific stakeholders.
- Selecting use cases and actors for each potential communication need, in order to show and draw the use case diagram.
- Carefully naming each use case diagram and then noting how and when the diagram should be used to review use cases with stakeholders and users

V. SYSTEM ARCHITECTURE DESIGN

The system is designed based on the three-tier architecture in which the functional process logic, data access, computer data storage and user interface are developed and maintained as independent modules on separate platforms. Three-tier architecture allows any one of the three tiers to be upgraded or replaced independently. The user interface is implemented on static and mobile devices and uses a standard GUI with different modules running on the application server. The relational database management system (RDMS) on the database server contains the computer data storage logic. The middle tiers are usually multitiered. The presentation-tier occupies the top level and displays information related to services available on a website. This tier communicates with other tiers by sending results to the browser and other tiers in the network. The application tier is also called the middle-tier, business logic or logic-tier. This tier is pulled from the presentation tier. It controls application functionality by performing detailed processing. The last tier is the data-tire whose function is to house database servers where information is stored and retrieved. All data in the data tier is kept independent of application servers or business logic. Fig. 15 shows how the three-tier software architecture model is organized.

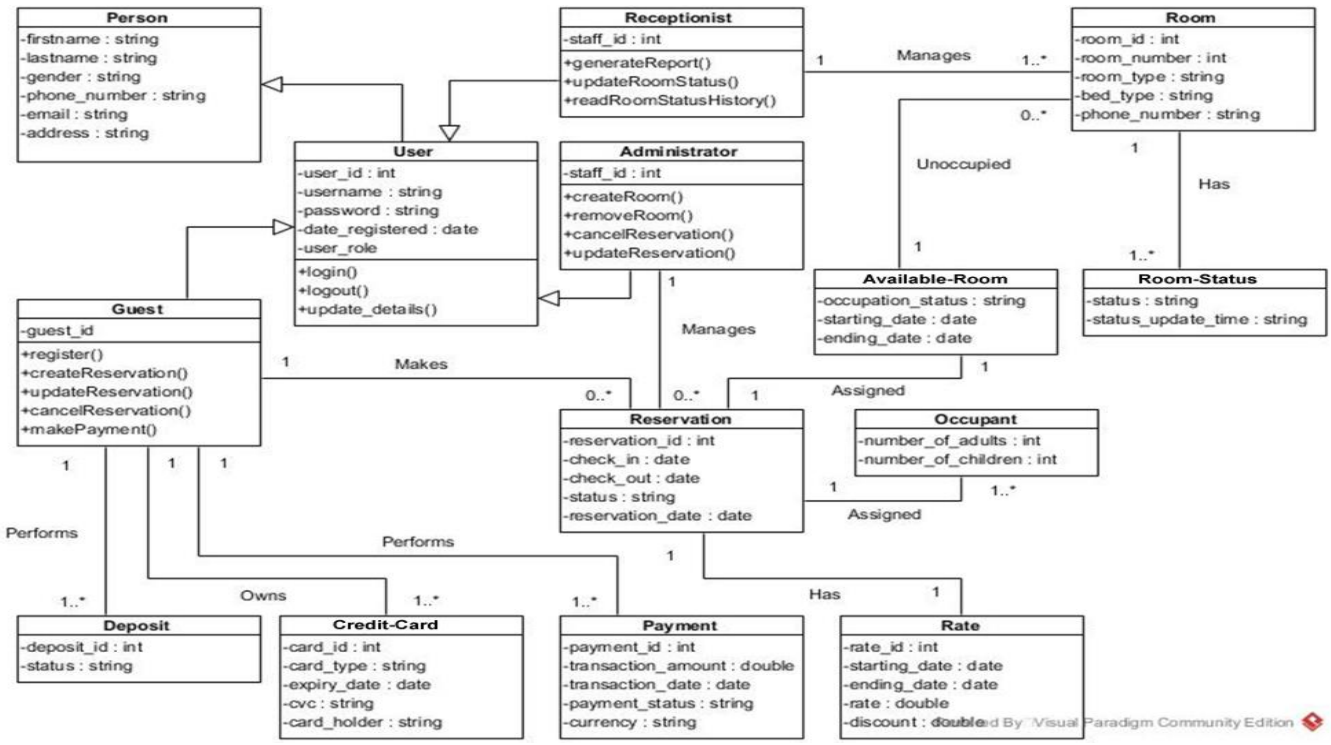

Fig. 8. Class Diagram :Source: (Author, 2019)

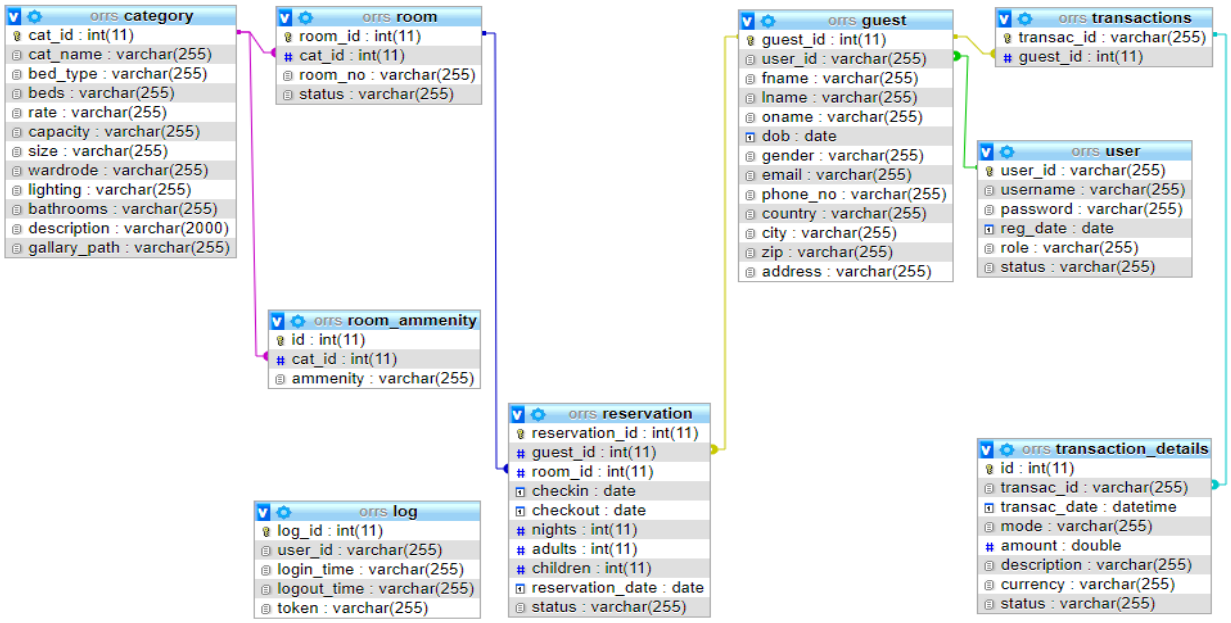

Fig. 9. Entity Relationship Diagram (ERD)
Source: (Authors)

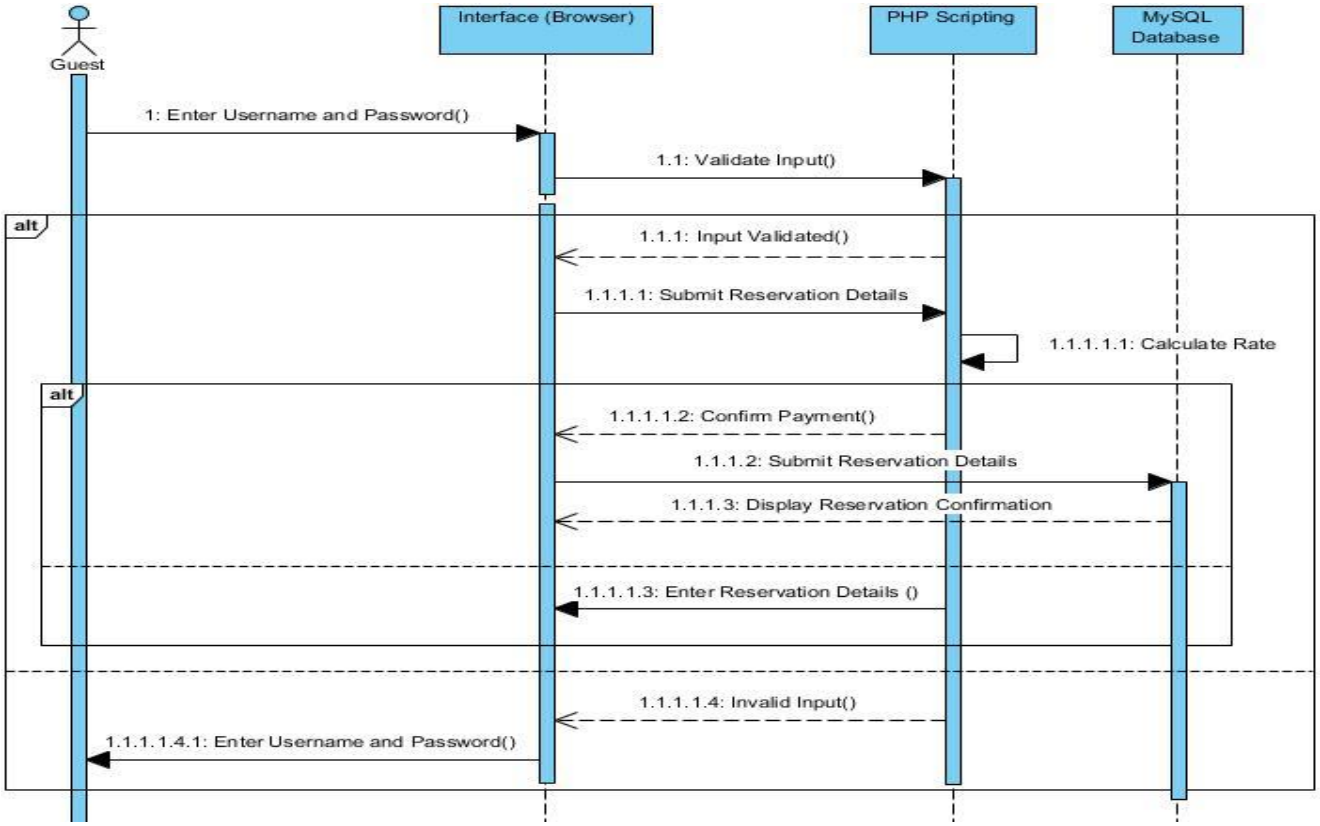

Fig. 10. Reservation Sequence Diagram
Source: (Authors)

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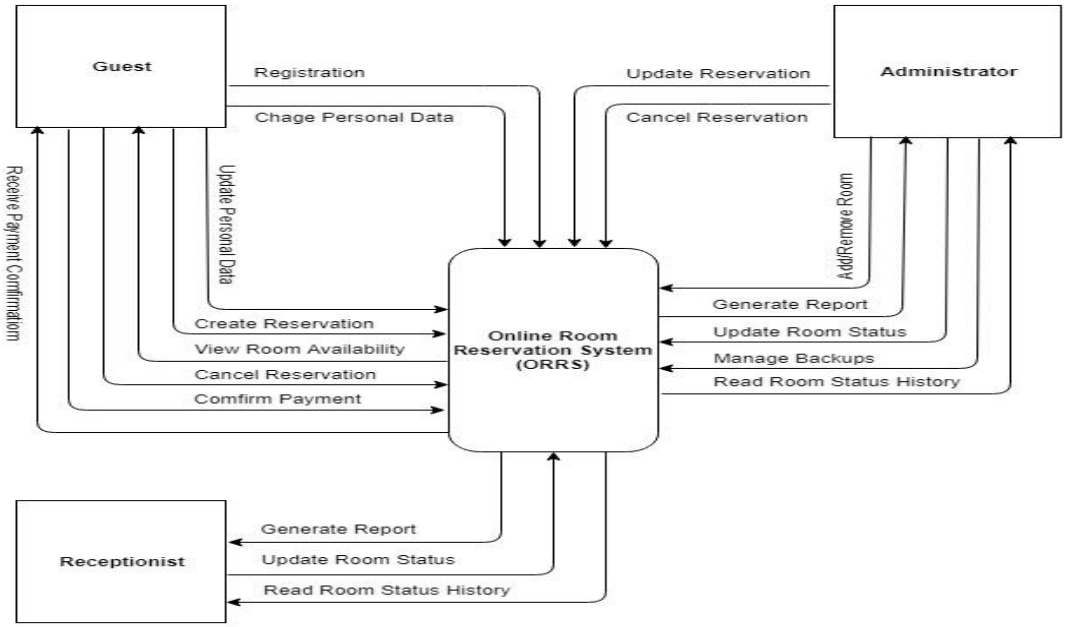

Fig. 11. Context Diagram: Source: (Authors)

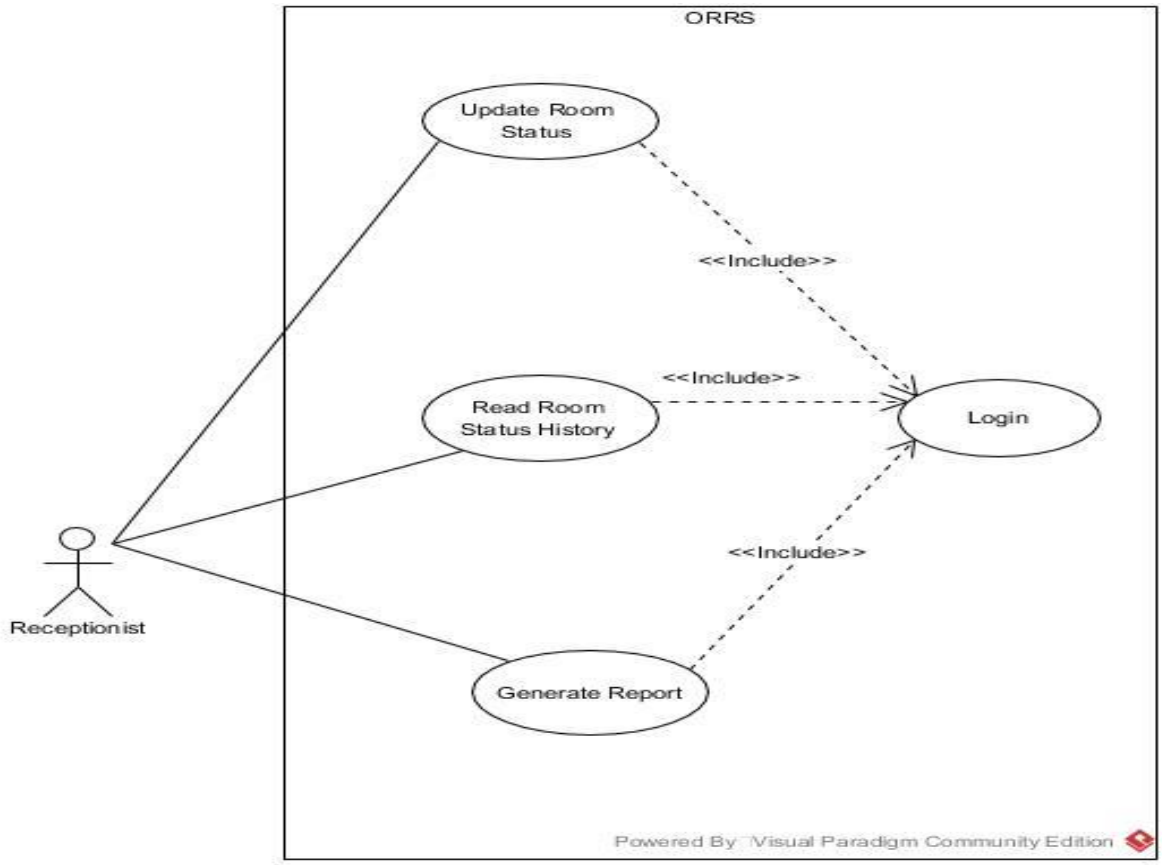

Fig. 12. Receptionist Use Case Diagram: Source: (Author, 2019)

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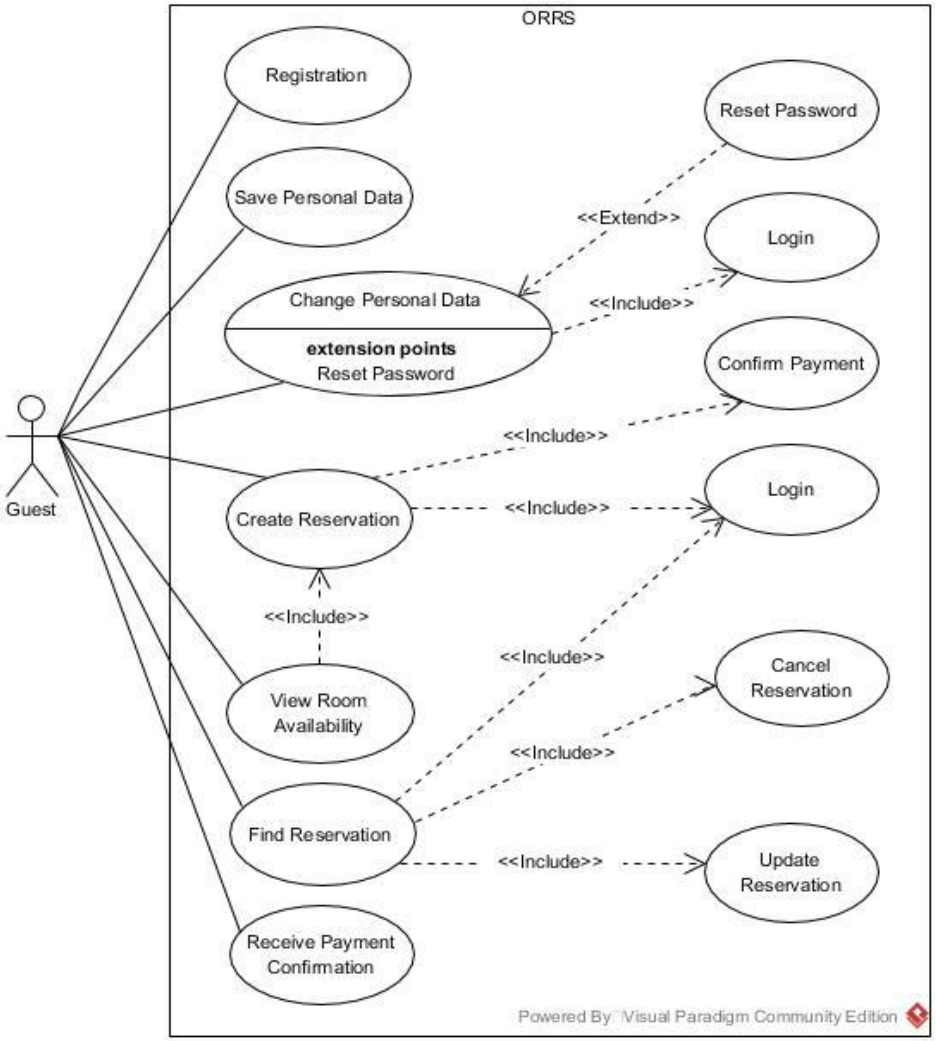

Fig. 13. Guest Use Case Diagram: Source: (Author, 2019)

Fig. 14. Administrator Use Case Diagram: Source: (Author, 2019)

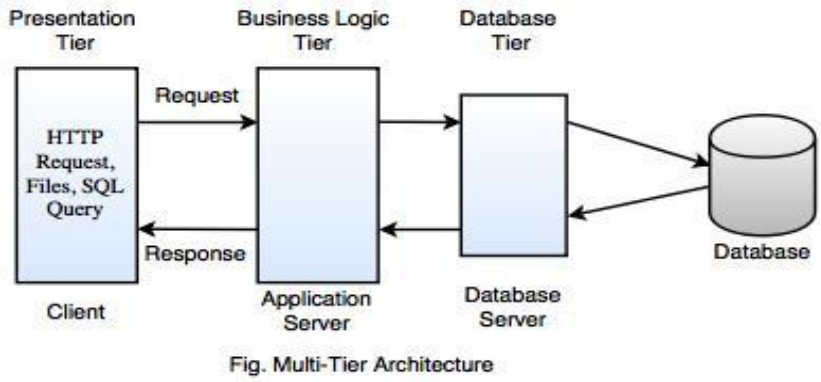

Fig. 15. Three Tier Software Architecture
Source: (Authors)

VI. USER INTERFACE CONSIDERATIONS

The application has a similar look and feel for each and every page. Every page has the same header/logo, heading style, fonts, navigation menus etc. The use of color, text, fonts and graphics was carefully considered and used to ensure that the site has a visual appeal to visitors. The layout of each page has a good contrast between the text and background. This considerably improves visibility as it is difficult to read text if it is the same color as the background. The application makes it easy for users to navigate. All navigation links are consistent and clearly labeled and redirect to the intended page/site. The application was designed to separate content from layout, so that page design could be altered from one location without having to edit every single page within the application file structure. The up-time and down-time of the application is at a minimum in order to allow for pages to load faster.

VII. OPERATION AND USE OF THE ONLINE ROOM RESERVATION SYSTEM

A. *How to Capture Room Details*

The capturing of room data by the system administrator is undertaken in two stages using two different screens. The first screen that is used is shown in Fig. 16. This screen is used to capture details relating to room categories, rates, capacity, gallery images and associated amenities. The system performs all the necessary validation checks to ensure that data remains consistent and that its integrity is maintained. When the save category button is clicked, room data is saved in a MySQL database. Each new entry in the database is assigned a unique identifier. Fig. 17 shows the screen that is used to assign categories and room numbers to each respective room. A room category is selected from the dropdown list and a room number is entered in the space provided. The system again performs all the necessary validation checks to ensure data consistency and integrity. When the save room button is clicked, all data is saved in a relational MySQL database.

B. *How to make a Reservation*

Fig. 18 shows the screen used for capturing reservation details as specified by the guest. These details include, arrival and departure dates, preferred room(s) and expected number of people. The system performs validation checks to ensure data consistency and integrity. When the guest clicks the proceed to payment button, the guest is redirected to the payment screen as shown in Fig. 19. This screen shows the details of the guest and

the total cost of the reservation. This screen provides for the guest to complete the payment for the reservation using a bank deposit slip of credit card. To pay using a bank deposit slip the guest clicks on the browse button to locate a deposit slip from the file system and proceed to upload it.

To pay using a credit/debit card, the guest enters their card details in the space provided. When the confirm payment button shown in Fig. 19 is clicked, the system will securely post the reservation details to the Stripe payment gateway in order for the payment to be processed. Fig. 20 depicts the confirmation message that is displayed to the guest upon successful processing of the payment. From this screen the guest is able to traverse back to their dashboard by clicking on the dashboard button. From the dashboard, the guest can manage their reservations and check the status of their transactions.

C. *How to Check-in and Check-out Guests*

Fig. 21 shows the check-in and check-out screen. From this screen, the receptionist or administrator is able to check-in and check-out guests by selecting a reservation from the list and clicking the checkin or checkout button respectively. This screen provides for searching and filtering for a particular reservation by typing in a key word in the search area. The screen also provides for limiting the number of records to view at a particular instance by selecting the number of rows to view from the dropdown selection input control.

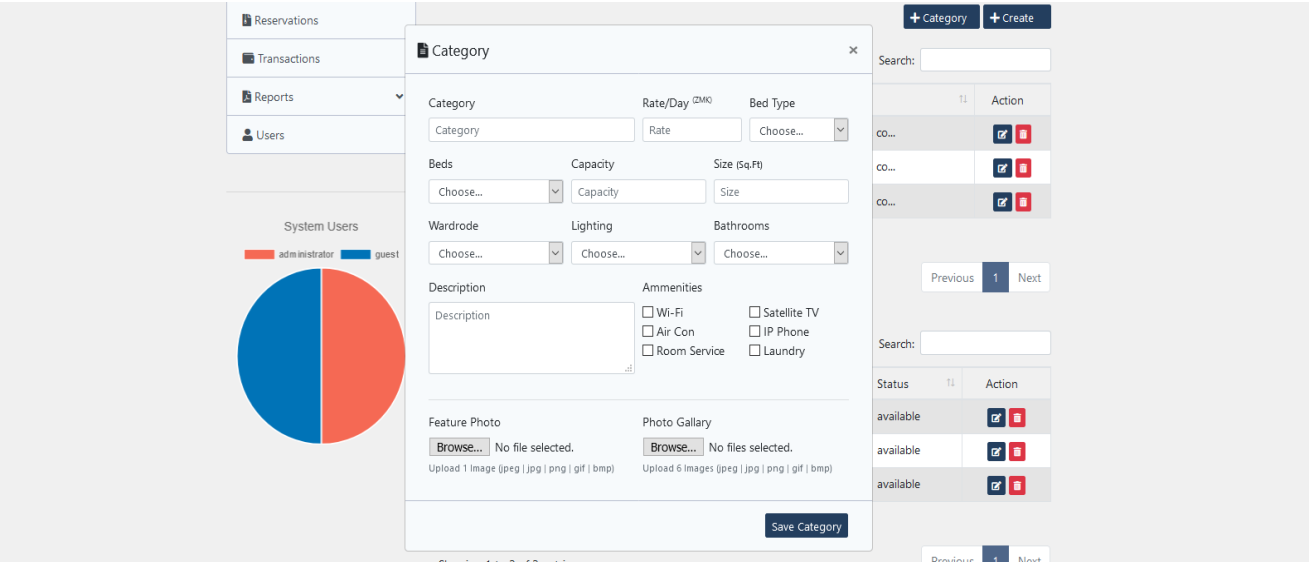

Fig. 16. Room Category Creation Screen
Source: (Authors)

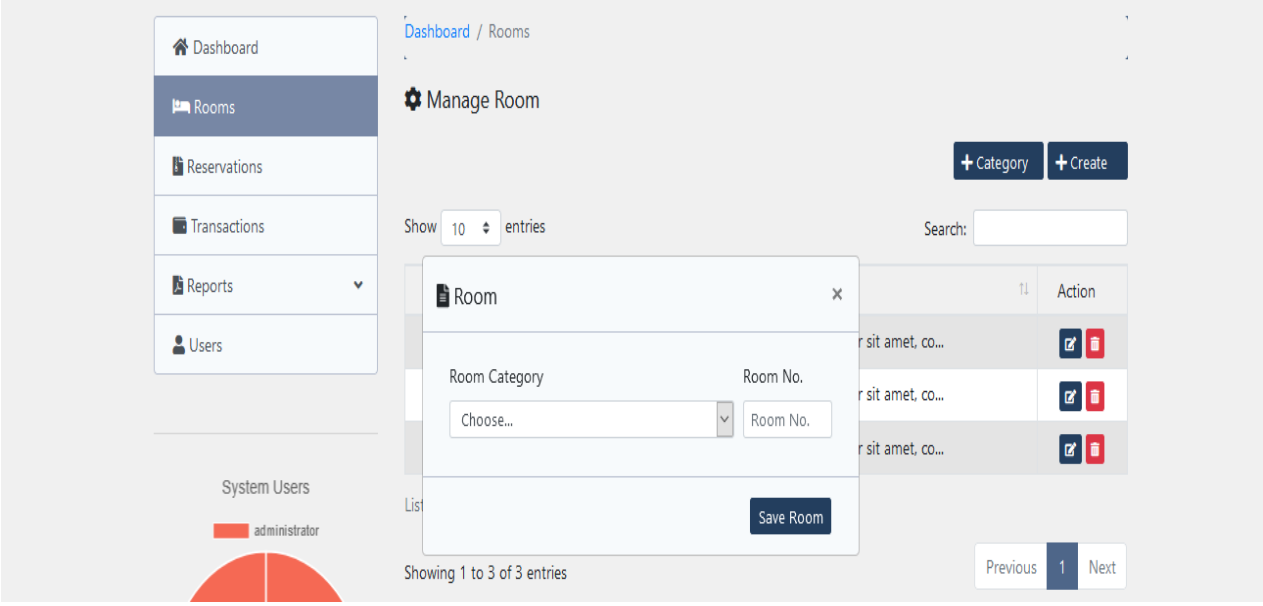

Fig. 17. Room Number and Category Assignment Screen
Source: (Authors)

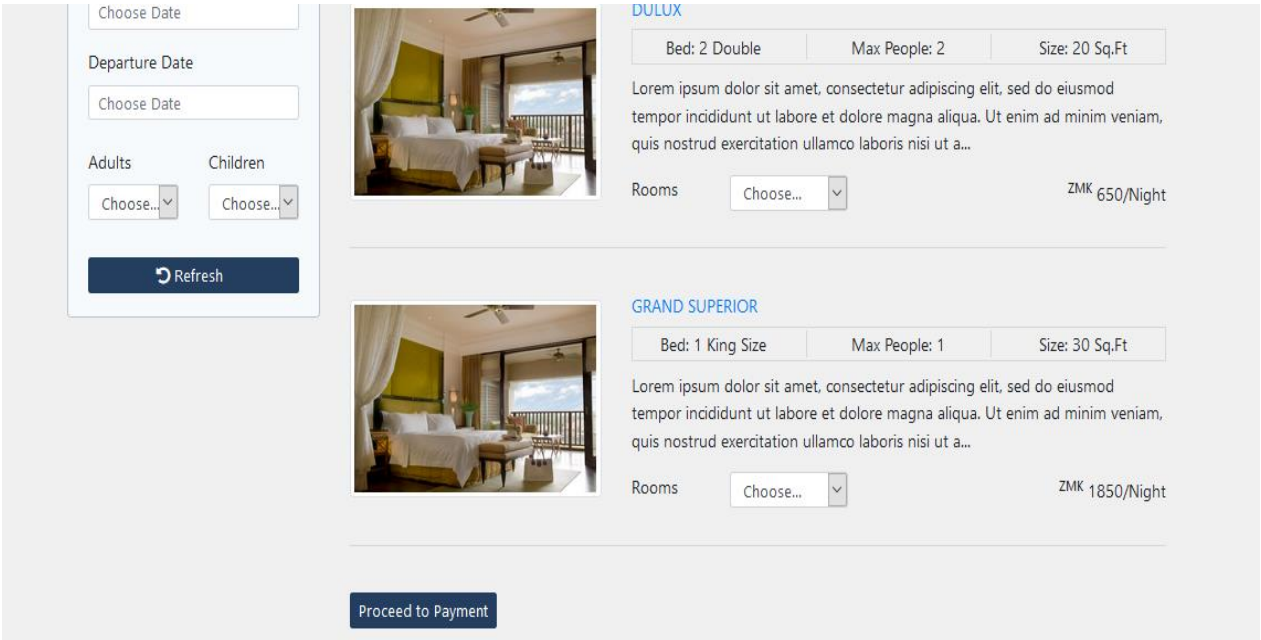

Fig. 18. Reservation Details Screen
Source: (Authors)

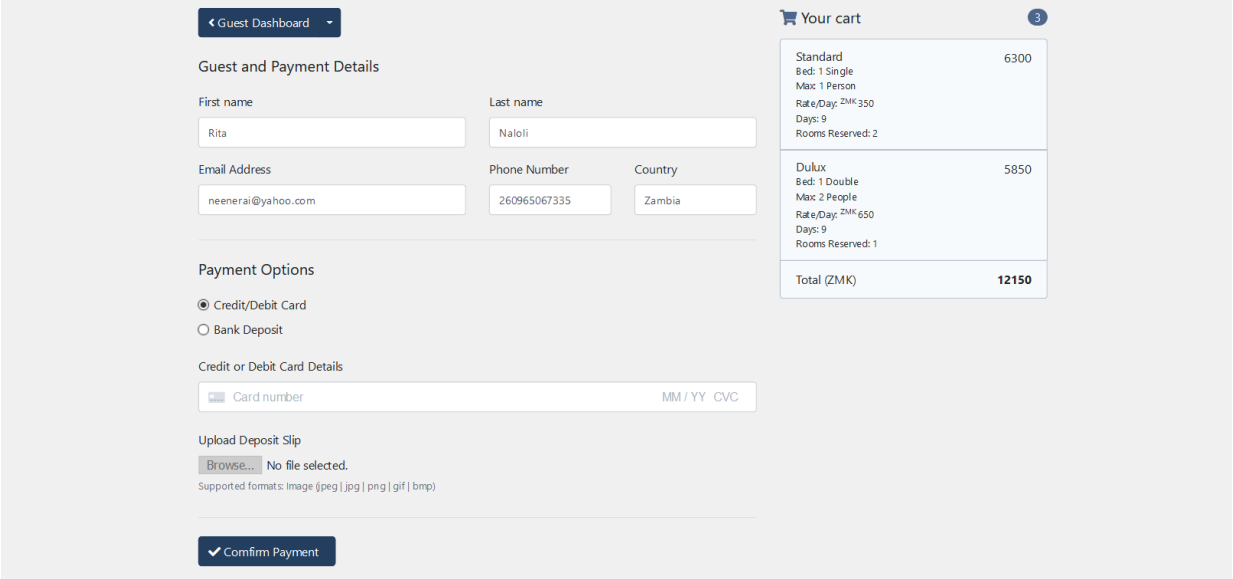

Fig. 19. Reservation Payment Screen: (Source, Authors, 2019)

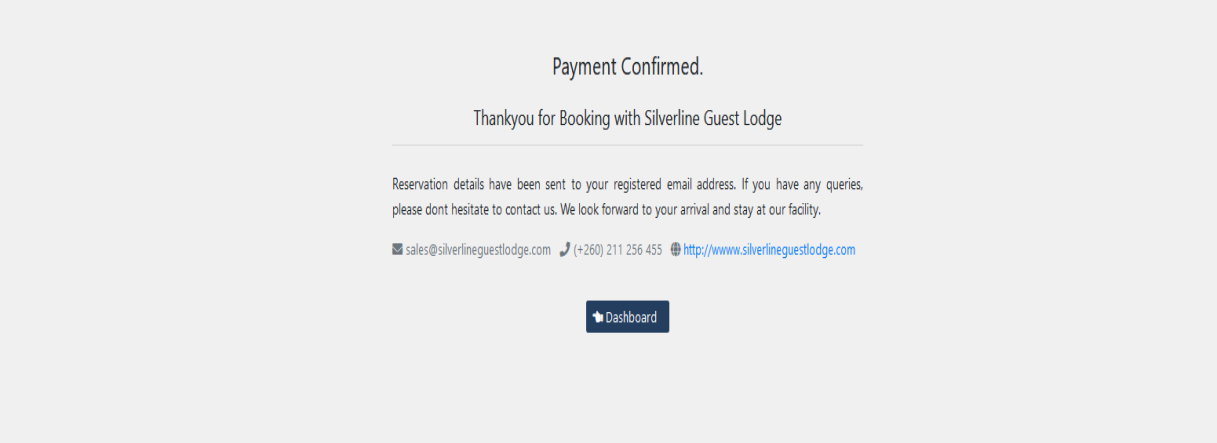

Fig. 20. Payment Confirmation Screen: Source: (Authors)

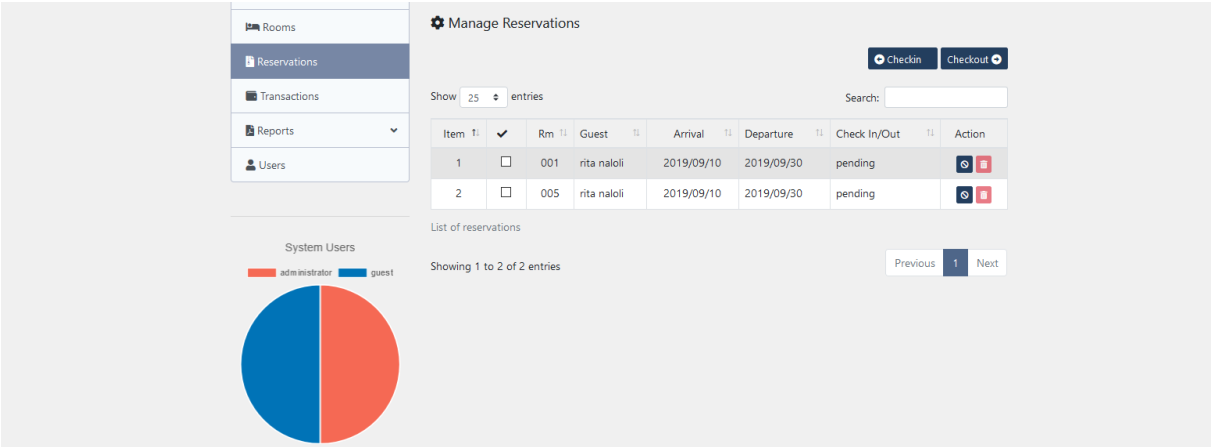

Fig. 21. Check-in and Check-out Screen
Source: (Authors)

VIII. COMPARISON OF THE ONLINE ROOM RESERVATION SYSTEM WITH RELATED APPLICATIONS

Table 4 shows a comparison of the developed system and related reservation systems based on system characteristics.

IX. SURVEY RESULTS

In this section the results of the survey conducted at Silverline Guest Lodge are discussed. There were eighty (80) respondents and fifty (50) were targeted, representing a 62.5% sample size. The Statistical Package for Social Sciences (SPSS) application software, Version 20, was used to analyze the data that was gathered from the questionnaires distributed to respondents.

A. Demographics

The results of the survey showed that 34% of respondents were between the age of 20-29, 38% were between the age of 30-39, 20% were between the age of 40-49 and the remaining 8% of respondents were above the age of 50. Furthermore,

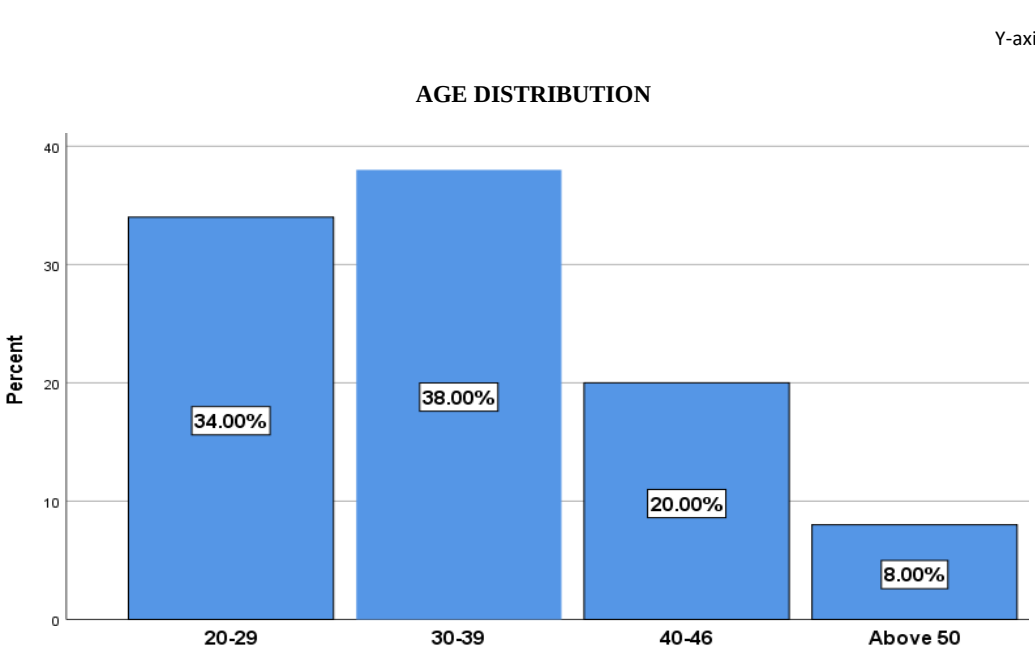

Fig. 22. Age Distribution of Respondents

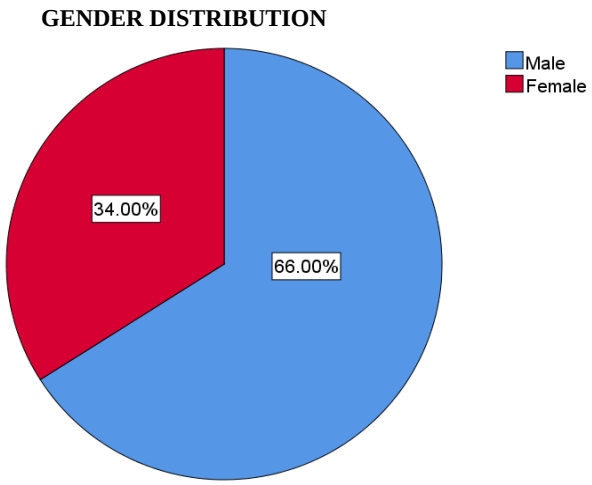

Fig. 23. Gender Distribution of Respondents
Source: (Authors)

the survey showed that 66% of the respondents were female and 34% of the respondents were male. Fig. 22 and 23 show the age and gender distribution of respondents respectively.

B. *Questions and Responses*

TABLE IV. COMPARISON WITH RELATED APPLICATIONS

Characteristic	Developed System	Related Systems
Mobile First	Yes	No
Multiple Payment Options	Yes	No
Payment Gateway Integration	Yes	Some
Multiple Reservations	Yes	No

Source: (Author, 2019)

Respondents were also asked if they had at one point ever used a reservation system to book for accommodation. The results of the survey showed that 34% of the respondents had used a reservation system to book for accommodation, while 66% of respondents had never used a reservation system to book for accommodation. Fig. 24 shows the level of usage of a reservation system to book for accommodation.

The survey further asked respondents if they would prefer making a reservation for accommodation without having to make a call or physically go to the premises of the lodging facility. The results of the survey showed that 90% of respondents agreed that making a reservation from a website as opposed to having to call or physically visit the premises of the lodging facility was certainly preferable, while 10% of the respondents disagreed that making a reservation for accommodation over the internet was a preferable mode of making reservations for accommodation. Fig. 25 shows the acceptance levels of making reservations via the internet as opposed to physically calling or going to the premises of the lodging facility.

Respondents were asked to rate their ability to

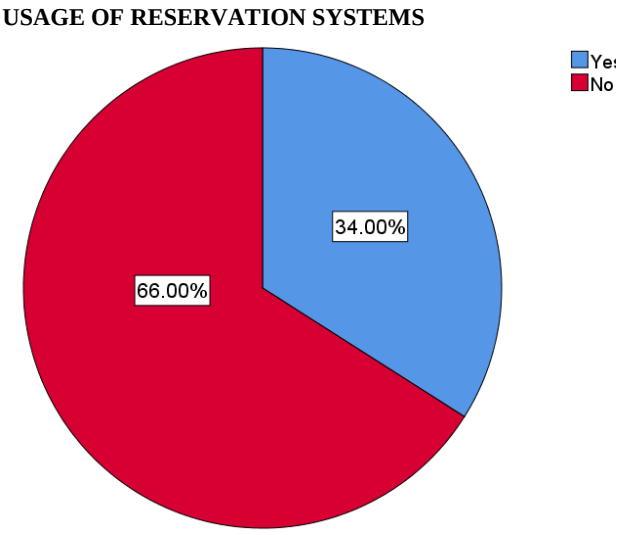

Fig. 24. Use of Online Reservation System: Source: (Author, 2019)

access and use the internet. The results of the survey showed that 5% of respondents had basic skills, 47% had average skills, 38% had advanced skills while 10.00% accounted for respondents who possessed expert abilities to use tools and technologies to access products and services offered online. Fig. 26 shows the ability of respondents to access and use the internet.

The survey also asked respondents if the time taken during the reservation process determined their level of satisfaction with the services offered by the lodging facility. The results of the survey showed that 84% of respondents were satisfied with the services offered by a lodging facility when the reservation process was done within the shortest possible amount of time, while, 16% of respondents contended that the time during reservation did not determine their level of satisfaction with the services offered by a lodging facility. Fig. 27 shows the respondent level of satisfaction with services offered by a lodging facility.

Lastly the survey asked respondents if they preferred to make a reservation at their own

convenient time rather than during the working hours of the lodging facility. The results of the survey showed that 84% of respondents preferred to make

reservations at a time that was convenient to them rather than making reservations that are tied to the operating hours of the lodging facility, while 16% of respondents preferred to make reservations during the stipulatedoperating hours of the lodging facility. Fig. 28 shows respondent preference for the ideal time to make a reservation.

X. DISCUSSION

The lack of computer-based systems in the hotel industry ultimately culminates into an increase in inaccurate bookings, customer dissatisfaction, poor inventory records and overall yield management. Processing, management and distribution of room reservation data is a tedious and complicated task to be performed manually. Adoption of automation continues to play a critical role in the hotel industry as it accords hoteliers an opportunity to maximize reservations, enhance revenue portfolio, service delivery and customer satisfaction. The application developed in this study can be adopted by any facility that offers accommodation services and seeks to improve its internal operational efficiency and service delivery through automation.

PREFERRED MODE OF RESERVATION

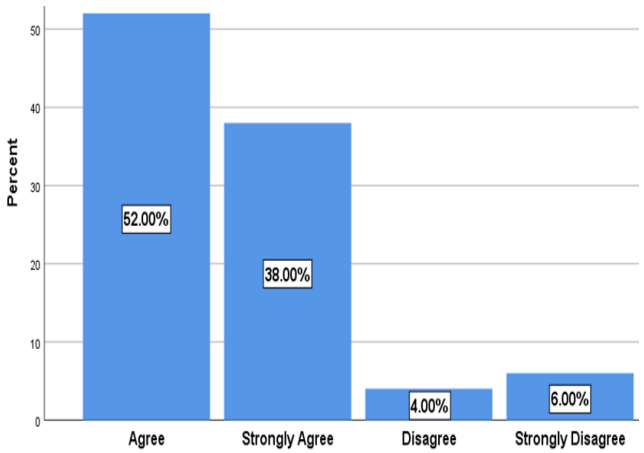

Fig. 25. Preference for making Online Reservation: Source: (Authors)

ABILITY TO USE THE INTERNET

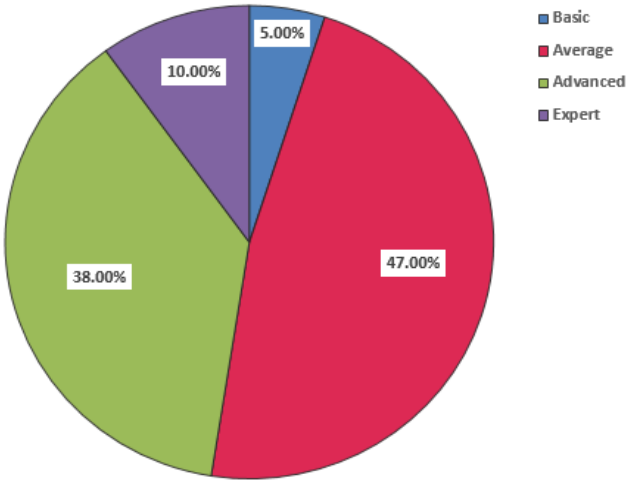

Fig. 26. Ability to Access and Use the Internet: (Source: Authors, 2019)

X-axis: Satisfaction (S)
Y-axis: Percentage (%)

CUSTOMER SATISFACTION AND SERVICE DELIVERY

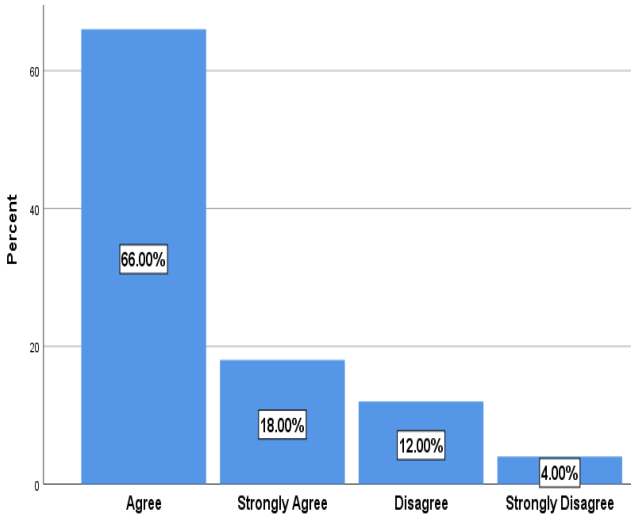

Fig. 27. Level of Satisfaction with Services Offered Source: (Authors, 2019)

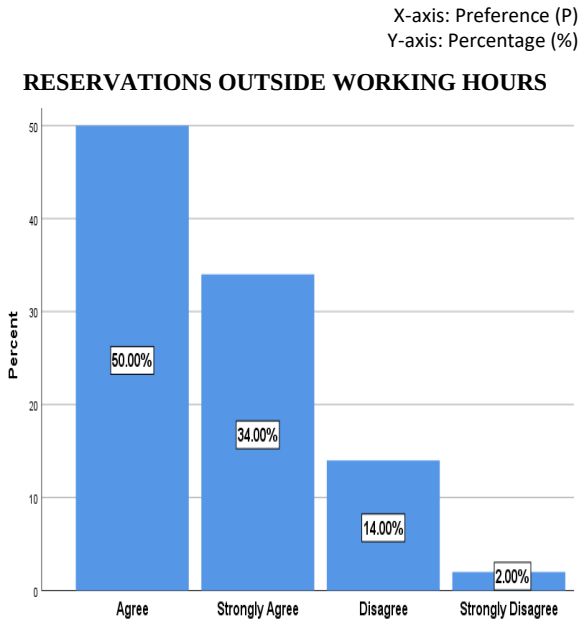

Fig. 28. Preferred Reservation Time
Source: (Authors)

XI. CONCLUSION

In this study, the design and development of the online room reservation system was presented. Software tools that included Notepad++, PHP, MySQL, and API's for Stripe and PHP Mailer were used in the design and development the application. A review of related online room reservation applications was conducted. The review showed that these applications lacked the ability to process multiple reservations in a single booking operation. The applications also lacked the ability to offer multiple payment options to customers and were not intrinsically mobile first. This study showed that the adoption of technology plays a vital role in the hotel industry with regard to enhancing operational efficiency, maintaining a competitive advantage, maximizing revenue portfolio and increasing customer satisfaction.

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XIII. REFERENCES

[1] Sullivan, J. (2013). *The Effects of Social Media in the Hotel Sector: A report for WinHotels*. Bachelors Thesis. Helsinki Metropolia University of Applied Sciences.

[2] Akazue, M. I. (2016). Enhanced Hotel Management Information System for Multiple Reservation Booking. *International Management Review*, 12(1).

[3] Delizo, G. and Esguerra, M. (2013). Online Hotel Reservation and Management System for The College of International Tourism and Hospitality Management (CITHM). *International Journal of Computers & Technology*, 10(1).

[4] Customer Alliance. (2019). *A Brief History of the Hotel Industry - From the Stone Age into the digital world*. [online] Available at: https://www.customer-alliance.com/en/articles/hotel-industry/# [Accessed 7 Jun. 2019].

[5] Sukthankar, S. (2013). A Study on Growth of Hotel Industry in Goa. *Journal of Humanities and Social Science*, 11(2).

[6] Jobs, S. (2019). *Hotel Industry Analysis and Market Statistics*. [online] Global Hospitality Portal. Available at: https://www.soegjobs.com/hotel-industry-analysis-market-statistics/ [Accessed 13 Jun. 2019].

[7] Technosys, E. (2017). *What are the sectors in the hospitality industry?* [online] Quora. Available at: https://www.quora.com/What-are-the-sectors-in-the-hospitality-industry/answer/EZee-Technosys [Accessed 7 Jun. 2019].

[8] Zambia Development Agency (2014). *Tourism Sector*. Lusaka: Government Printers, pp.2-3.

[9] Ministry of Tourism (2007). *Tourism Policy for Zambia*. Lusaka: Government Printers, p.6.

[10] Castilloa, R., Asib, L., Berberabe, D., Mandigmad, M. and Sarmientoe, M. (2014). Importance of Computerized System to Reservation and Front Office Operations of Hotels in Batangas, Philippines. *Internattional Journal of Sciences: Basic And Applied Research*, 16(1).

[11] Revfine. (2019). *What is the Hospitality Industry?* [online] Available at: https://www.revfine.com/hospitality-industry/ [Accessed 7 Jun. 2019].

[12] Wilson-Mah, R. (2019). *Introduction to Tourism and Hospitality in BC*. [ebook] Montreal, Quebec: Pressbooks. Available at: https://opentextbc.ca/introtourism/chapter/chapter-3-accommodation/ [Accessed 7 Jun. 2019].

[13] World Tourism Organization (2017). *International Tourism Timeline 1950-2030*. [image] Available at: http://media.unwto.org/sites/all/files/inf_timeline-01.png [Accessed 7 Jun. 2019].

[14] Gould, H. (2016). *Systems Analysis and Design*. 1st ed. Bookboon, p.9.

[15] Bemile, R., Achampong, A. and Danquah, E. (2014). Online Hotel Reservation System. *International Journal of Innovative Science, Engineering & Technology*, 1(9).

[16] Provab. (2013). *What is Hotel CRS – Hotel Central Reservation System*. [online] Available at: https://www.provab.com/hotelbookingsystem/hotel-crs-hotel-central-reservation-system/ [Accessed 7 Jun. 2019].

[17] Raymond, L. and Bergeron, F. (1997). Global Distribution Systems: A Field Study of Their Use and Advantages in Travel Agencies. *Journal of Global Information Management*, 5(4).

[18] Felicen, S. and Ylagan, A. (2016). Effects of Computer Reservation System in the Operations of Travel Agencies. *Asia Pacific Journal of Multidisciplinary Research*, 4(4).

[19] Shasha, Z. and Weideman, M. (2016). *Measurement of the usability of web-based hotel reservation systems*. Masters. Shanghai Jiao Tong University.

[20] Joseph, O. (2015). Electronic Payment System in Nigeria: Its Economic Benefits and Challenges. *Journal of Education and Practice*, 6(16).

[21] Tyagi, H. and Shukla, A. (2016). The Study of Electronic Payment Systems. International Journal of Advanced Research in Computer Science and Software Engineering, 6(7).

[22] Khan, B., Olanrewaju, R., Baba, A., Langoo, A. and Assad, S. (2017). Compendious Study of Online Payment Systems: Past Developments, Present Impact, and Future Considerations. *International*

Journal of Advanced Computer Science and Applications, 8(5).

[23] Bezhovski, Z. (2016). The Future of the Mobile Payment as Electronic Payment System. *European Journal of Business and Management*, 8(8).

[24] Mohammed, M. (2017). *Online Bus Reservation System*. Bachelors. University of Khartoum.

[25] Cobanoglu, C., Yang, W., Shatskikh, A. and Agarwal, A. (2015). Are Consumers Ready for Mobile Payment? An Examination of Consumer Acceptance of Mobile Payment Technology in Restaurant Industry. *Hospitality Review*, 31(4).

[26] Mylonakis, J. and Malioukis, A. (2010). Identifying and Managing Enterprise Security Risks in Online Business Convergence Environments. *Business Management and Strategy*, 1(1).

[27] Niranjanamurthy, M. and Chahar, D. (2013). The study of E-Commerce Security Issues and Solutions. *International Journal of Advanced Research in Computer and Communication Engineering*, 2(7).

[28] Kakade, S. and Kharade, J. (2017). Security in electronic transaction. *International Research Journal of Engineering and Technology*, 4(4).

[29] Robbins, N. (2007). *Learning Web Design*. 3rd ed. O'Reilly Media Inc, pp.25-27.

[30] Welling, L. and Tomson, L. (2005). *PHP and MySQL Web Development*. 3rd ed. Indianapolis: Sams Publishing, pp.2-3.

[31] Ansah, A., Blankson, V. and Kontoh, M. (2012). The Use of Information and Communication Technologies (ICT) in Front Office Operations of Chain Hotels in Ghana. *International Journal of Advanced Computer Science and Applications*, 3(3).

[32] Dadashyan, I. and Watts, A. (2013). *Technology and the Hotel Industry: A Research Essay*. [online] Academia. Available at: https://www.academia.edu/16466034/Technology_and_the_Hotel_Industry_A_Research_Essay [Accessed 6 Jun. 2019].

[33] A, Yousaf. (2011). *The Impact of ICT in the Eyes of Hotel Managers (Cyprus)*. Master's Thesis. Södertörns University

[34] My Assignment Help. (2019). *Impact of ICT On Tourism and Hospitality Industries*. [online] Available at: https://myassignmenthelp.com/free-samples/impact-of-ict-on-tourism-and-hospitality-industries [Accessed 18 Apr. 2019].

[35] Williams, K. and Michael, A (2018). Design and Implementation of Reservation Management System Case Study: Grand Ville Hotels. *Journal of Information Technology and Software Engineering*, 8(243).

[36] Cho, E., Maw, P. and Tin, H. (2018). The Design and Implementation of the Online Hotel Reservation System. *International Journals of Advanced Research in Computer Science and Software Engineering*, 8(8).

[37] Ogirima, O., Awode, R. and Adeosun, O. (2014). Online computerized Hotel Management System. *Journal of Computation in Biosciences and Engineering*, 1(2).

[38] Castro, B. and Custodio, B. (2016). Managing Customer Reservations of BulSU Hostel through the Development of Online Information and Reservation System. *Journal of Advances in Information Technology*, 7(3).

[39] Shasha, Z. and Weideman, M. (2016). *Measurement of the usability of web-based hotel reservation systems*. Masters. Shanghai Jiao Tong University.

[40] SecurionPay (2015). *Which payment method will become the most popular in future*? [image] Available at: https://securionpay.com/wp-content/uploads/2016/09/GlobalPaymentsReportNov2015_pdf.png [Accessed 13 Jun. 2019].

[41] Henry, P. (2016). *Mobile Application Technologies in Food Supply Chain*. Masters. University of Zambia.

[42] Rouse, M. (2011). *iterative development*. [online] TechTarget. Available at: https://searchsoftwarequality.techtarget.com/definition/iterative-development [Accessed 18 Jun. 2019].

[43] Mweemba, S. (2014). *Employee Management System*. Bachelors Thesis. The University of Zambia.