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A User-Centric Online Hotel Management Platform for Efficient Service Delivery

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Abstract:

With rapid growth of economy and tourism, there is an intensified competition can be seen in the hotel industry in today. To be in the competition, they need to continuously improve their management techniques and procedures. "Online Hotel Management system" is software developed by focus on these factors. Through this system, it will be able to manage various functions including room and hall reservations, ordering food, and managing employees and suppliers. We intend to develop this web application using React JS, Express JS, Node JS, and Mongo DB. This system addresses hotel management issues while avoiding issues that arise when tasks are carried out manually. In terms, the main objective of this whole process is to automate the day today manual tasks of this system. Therefore, this online hotel management system is designed to find a more practical, well-organized, and quick way of processing the service from the hotel for both nearby and distant customers by giving more user friendly and more GUI oriented experience.

Keywords: Hotel Management, Database, System Function, Reservation, Restaurant, Reviews, Employees, Data Analysis.

1. Introduction

The hotel industry, like any other sector, creates significant socio-economic opportunities for both owners and consumers [1]. Its primary purpose is to provide hospitality services to a wide range of clients, including locals, foreigners, business professionals, and tourists. Traditionally, customers often face challenges in securing accommodation, as it is common to search for hotels only after arriving at a destination. This involves physically checking hotel availability, and if no rooms are vacant, moving on to another nearby hotel. Such situations become even more inconvenient late at night, when customers may discover that all nearby hotels are fully booked. At times, if fortunate, customers might have access to the hotel's phone number to make a reservation, but even then, confirmation of room or food availability cannot always be guaranteed.

To address these challenges, we propose the development of a web-based Hotel Management System. This system enables customers to conveniently access information regarding rooms, food, and other services, and make reservations online at any time. Through this approach, customers can reserve rooms, order meals, and process payments seamlessly via a user-friendly platform. The system is designed not only to simplify room reservations but also to improve the overall hotel service experience by offering greater accessibility, transparency, and efficiency.

The motivation for this work can be drawn from real-world establishments such as the Wijaya Beach Hotel, founded in 1980. Initially a low-cost motel, it has evolved into one of the most favored destinations in its locality,

attracting both local and foreign visitors. The hotel is well-known for its food, beverages, scenic beachside environment, and welcoming atmosphere. Its facilities include an eight-room luxury bed and breakfast, complemented by a beachfront restaurant and bar serving a fusion of Asian and European cuisine. The serene lagoon, protected by a reef, ensures safe swimming all year round, further adding to its appeal. Such success stories highlight the importance of efficient management systems in maintaining customer satisfaction and sustaining long-term popularity.

Our proposed system consists of four main functional modules: Employee Management, Supplier Management, Room Reservation Management, and Food Management. From the customer's perspective, the platform allows users to view detailed room information based on specific requirements, select check-in and check-out dates, make payments online, and even cancel reservations by sending a cancellation request to the administrator. Customers can also browse and order food online, leave reviews, search for food or room details, and manage their own comments, bookings, and profiles.

From the administrator's side, the system offers tools to manage employees, rooms, food items, and suppliers through add, update, and delete functionalities. Administrators can also search records and monitor all reservations and orders within the system. By automating these operations, the proposed Hotel Management System significantly reduces manual workload and improves operational efficiency, making it a practical and scalable solution for modern hotel businesses.

The remainder of this paper is structured as follows: Section II reviews related research on information recommendation systems and their relevance to our approach. Section III outlines the methodology, including the technologies and tools employed, along with an overview of backend processes. Section IV describes the proposed hotel management system in detail, highlighting its main features. Section V presents a discussion of results and testing methods used for performance evaluation. Finally, Section VI provides conclusions and directions for future work.

2. Literature Survey

The primary purpose of the hotel industry is to provide hospitality services to consumers. Hospitality encompasses a wide range of fields within the industry, including accommodations, restaurants, event planning, and other tourism-related sectors (Law, 2009). If a hospitality company can offer valuable and engaging websites that attract visitors, it can ultimately gain significant benefits. In this context, promoting hospitality services effectively through a website becomes essential, as it helps attract more customers and reviewers for the system. Therefore, providing better hospitality services is a crucial aspect of any hotel management system.

With the current economic climate and the intense competition within the hotel industry, internet marketing has emerged as a highly effective strategy for differentiation. As noted by Srinivasa R. (2014), hotel management today is primarily carried out through internet-based systems [3]. The majority of the world now has access to technological facilities such as the internet, smartphones, computers, and laptops. With these tools, customers can book hotel rooms, order meals and beverages, and access other services through just a few simple online steps. This convenience is highly valued by customers as it saves time and effort. Our system functions as an e-commerce web application that provides a wide range of services, including room reservations and food ordering, in a user-friendly and efficient manner.

According to Kalaskar P. (2013), hotels are often classified as luxury establishments based on the amenities they provide, with star ratings such as five-star assigned accordingly [3]. To achieve these ratings, hotels must meet specific standards across a range of services and facilities. Similarly, Popat K. (2013) emphasizes that hotel systems require a dedicated and well-coordinated team that ensures smooth operations across all services, including administration, finance, room

service, employee management, and catering [3], [4]. In line with these requirements, our system offers a user-friendly platform to streamline hotel administration. It integrates several key management features, such as user management, staff and supplier management, room and reservation management, and restaurant management. These features allow administrators to manage hotel resources efficiently, thereby enhancing the property's overall performance and ratings.

Reviews and comments also play a vital role in the development of the hotel and travel industry. They not only guide potential customers but also provide valuable feedback for service providers [5], [6]. Customers using hotel reservation services can share reviews based on their experiences, which can then influence future guests' decisions. Our hotel management system incorporates a review management feature that enables customers to share comments and feedback according to their experiences.

After reviewing existing research on hotel management systems implemented in developed countries, we believe that designing such a web application in our context is both relevant and necessary. It can provide users with an improved experience while also contributing to the growth of the national economy.

3. Methodology

Our hotel management system is an e-commerce web application designed to support and manage the core operations of the hotel industry. To ensure efficiency and quality during development, we utilized various tools and technologies, including Azure Boards, GitHub, SonarQube, and Selenium**.**

3.1.Tools and Technologies Used

- **Azure Boards**

Azure Boards provides interactive and customizable tools for software development teams, with features such as calendar views, configurable dashboards, integrated reporting, and native support for Agile, Scrum, and Kanban processes. Using Azure Boards, we tracked tasks, issues, and code defects during project implementation. The Kanban board in particular enabled us to add, edit, and filter tasks, bugs, features, and epics effectively.

- **GitHub**

GitHub is an internet hosting service for software development that provides version control using Git. It facilitated easier merging and branching, allowing seamless collaboration among contributors. In addition to distributed version control, GitHub also supports access control, bug tracking, feature requests, task management, continuous integration, and wikis.

- **SonarQube**

SonarQube ensures the delivery of clean code by performing self-managed and automated code reviews. Integrated into the workflow, it continuously inspects the code, identifies issues, and enhances overall code quality control, which is a crucial step in software development.

- **Selenium**

Selenium is a suite of tools and libraries that automate web browsers. It provides playback tools for writing functional tests that can be executed across different browsers and supports writing test scripts in various programming languages.

Core Functions of the System

The system is designed around four main functions:

1. **Restaurant Management**
2. **Room Reservation Management**
3. **Review Management**
4. **Employee and Supplier Management**

Each of these modules implements CRUD (Create, Read, Update, Delete) operations to manage hotel operations effectively. The backend processes of these modules are carefully designed to ensure smooth integration and functionality.

3.2.Technologies Implemented

- **ReactJS**: An open-source, component-based JavaScript library developed by Facebook and Instagram, ideal for building reusable UI components and user interfaces in large-scale web applications.

- **NodeJS**: A cross-platform, open-source runtime environment built on Google Chrome's V8 engine, enabling efficient server-side and networking application development.
- **ExpressJS**: A lightweight and flexible NodeJS framework that simplifies backend development with middleware support, enabling shorter and more efficient code.
- **MongoDB**: An open-source NoSQL document-oriented database that stores data in JSON-like key-value pairs, offering high scalability and flexibility.

3.3.System Functionality

- **Add Function**: The admin can add food menus, room details, employee records, and supplier details. For food menus and room details, images can be uploaded, with their URLs stored as arrays in MongoDB. Customers can add food items to their carts, book rooms, and post comments or reactions to specific rooms. These details are stored in MongoDB using the POST method**.**
- **Update Function**: The admin can edit food menus, room information, employee records, and supplier details. Customers can update only their own comments on rooms and booking statuses (e.g., cancel a booking). Updates are processed using the PUT method, with changes saved in MongoDB.
- **Delete Function**: The admin can remove food menus, rooms, employees, suppliers, and customer booking details. Customers can delete only their own comments. The DELETE method is used for this operation. After any action, a pop-up message confirms success or failure.
- **Search Function**: Both customers and admins can search for component details by name. Information is retrieved from MongoDB using the GET method.
- **Report Generation**: The system includes a reporting feature for all components. Reports can be generated in PDF format for food menus, booking details, supplier details, and user data. A separate Excel report is generated specifically for all user information.

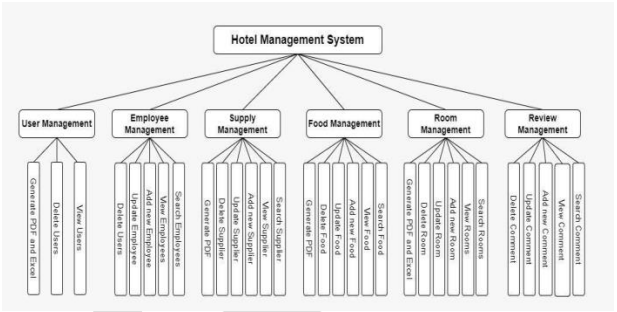

Figure 1: System Function Module Diagram

4. Proposed System

This system consists of four main interconnected components: the Website, the Admin Front-end, the System Back-end, and the Database Server. Both customers and administrators operate on the same platform. To access the system, users must first sign up or sign in with valid information, which is securely stored in MongoDB. Once logged in, users can follow the workflow based on their role and purpose.

A. Restaurant Management

The main objective of this module is to allow customers to order food items according to their preferences and to enable administrators to manage food menus.

After successfully signing in, a customer can navigate to the Restaurant page (as shown in Figure 2) to view the different types of food currently available in the hotel. Customers can select one or more food items, which are then added to their cart. The cart displays the selected items along with their quantities and automatically calculates the total price. Customers can increase or decrease item quantities either from the Restaurant page or directly in the cart. Once satisfied with their selection, they can proceed to make a payment by providing the required details. The system currently supports payments via credit card and debit card.

For menu management, the user must log in as an Administrator. From the Manage Restaurant page, the admin can view all available food menus, search for a menu item by name, add new menu items, update existing details, or delete items that are no longer in use.

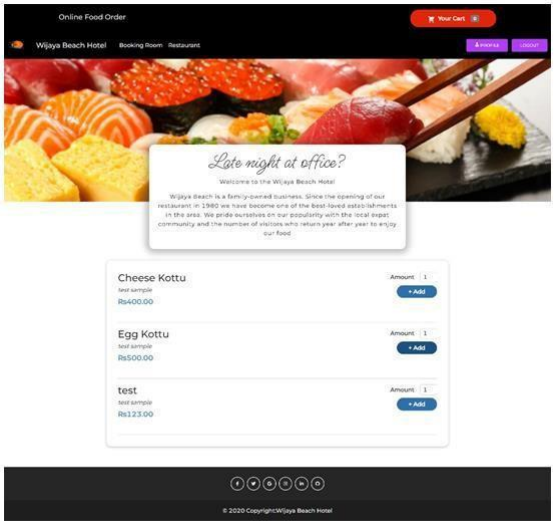

Figure 2: Restaurant page – Customer view

B. Room and Reservation Management

The main objective of this module is to facilitate room booking for customers and enable administrators to manage rooms and reservations.

When logged in as a Customer, the user can navigate to the Rooms page to view all available rooms in the hotel (Figure 4). Each room includes brief details to help the customer select a preferred option. To make a reservation, the customer enters the check-in and check-out dates. On the Booking page (Figure 4), the system automatically displays the total price, number of days, room details, and user details. Customers can then proceed to payment using a credit card or debit card. Additionally, customers can view their booking history and details from their profile.

When logged in as an Administrator, the user can navigate to the Manage Rooms page, which provides details of all rooms available in the hotel (Figure 3). From this page, the admin can search for rooms by name, add new rooms, update existing room details, or delete rooms that are no longer available. Room details can also be filtered by room type for efficient management.

The All Bookings page gives the administrator a complete view of all booking details. The system further provides a Report Generation feature: administrators can generate booking reports in both PDF and Excel formats, while customers can generate their own booking details report in PDF format.

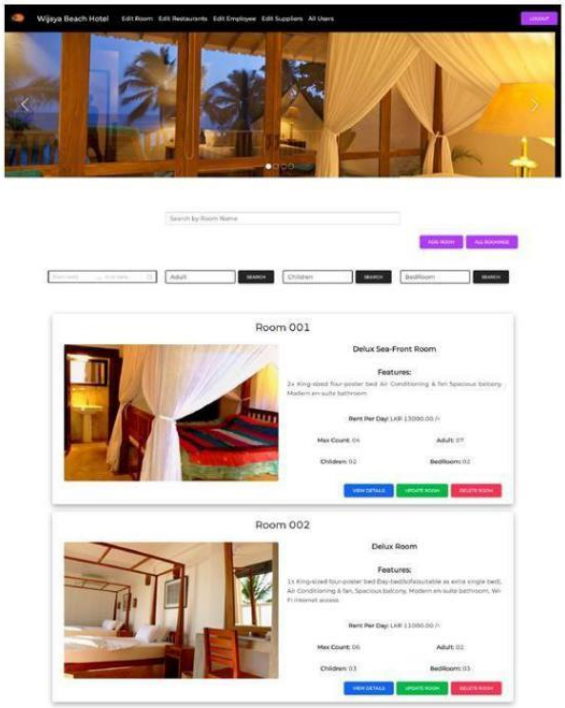

Figure 3: Manage Rooms page – Admin view

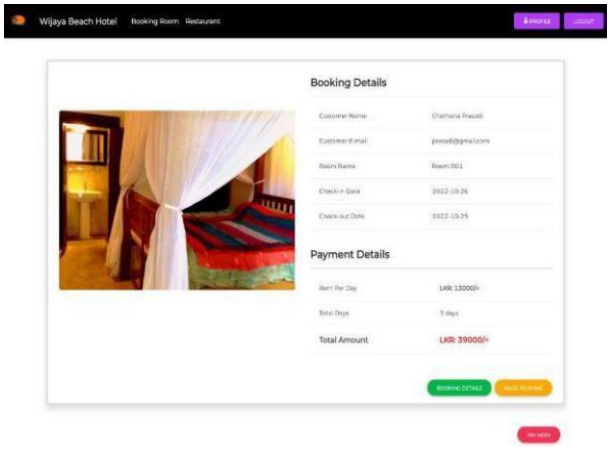

Figure 4: Booking page – Customer view

C. Review and User Management

The main objective of this module is to manage customer reviews for rooms and to handle user account details.

After successfully signing into the system, a Customer can share feedback based on their experience in the Booking Room page (Figure 5). This includes both written comments and ratings through a built-in rating system. Customers also have the ability to search for their comments, update them, or delete them if needed. Additionally, each customer can react (e.g., "heart" reaction) to comments left by others for the relevant room.

On the other hand, an Administrator can manage all registered users through the Manage Users page (Figure 6). From this page, the admin can view complete user details and remove users when necessary. Moreover, the admin can generate detailed reports of all user information in both PDF and Excel formats.

Figure 5: Booking page – Customer view

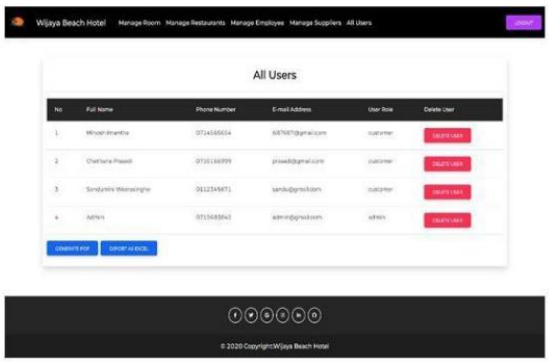

Figure 6: Manage Users page – Admin view

D. Employee and Supplier Management

The main objective of this module is to manage the details of hotel employees and suppliers who provide various goods and services to the hotel.

After successfully signing into the system, the Administrator can navigate to the Manage Employee page (Figure 7) to view all employee details. From here, the admin can search for employees by name, add new employees, update existing employee records, or remove employees who are no longer working in the hotel.

Similarly, the admin can navigate to the Manage Supplier page (Figure 8) to view supplier details. The admin can search for suppliers by name, add new suppliers, update supplier information, or delete suppliers who no longer provide supplies to the hotel.

Additionally, the system includes a report generation feature that allows the admin to generate detailed supplier reports in PDF format.

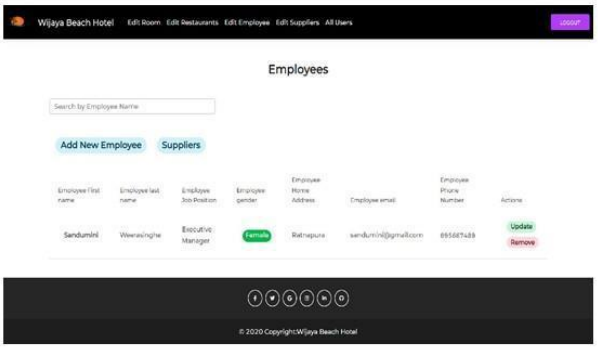

Figure 7: Manage Employee page – Admin view

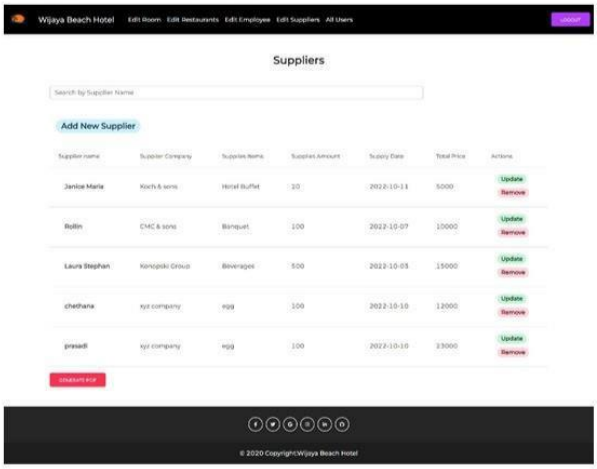

Figure 8: Manage Supplier page – Admin view

5. Discussion

For testing, Selenium and SonarQube were used to verify system functionalities. In Selenium, test cases are executed to confirm whether functions perform as expected. For example, Figures 9 and 10 show test executions for the Login page and the Booking page. SonarQube was used to identify system-related issues such as blocking errors, critical

errors, major issues, and minor issues. Blocking and critical issues must be resolved by the developer to ensure a high-quality report and maintain clean code. Figure 11 presents the SonarQube dashboard, which displays metrics such as bugs, code coverage, and code smells.

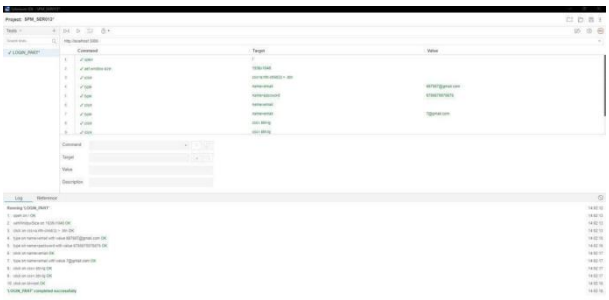

Figure 9: Selenium IDE Test Script of the Login

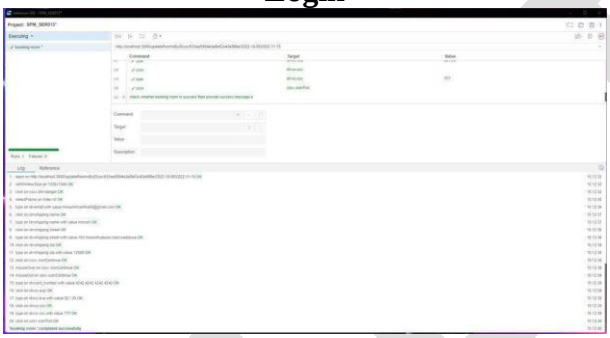

Figure 10: Selenium IDE Test Script of the Booking

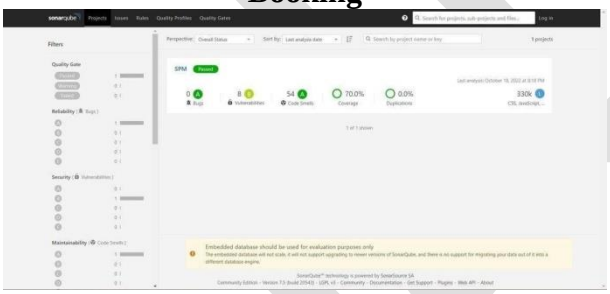

Figure 11: Project Overview Dashboard in the SonarQube

6. Conclusion

In conclusion, this application has the potential to save time and reduce the workload of the administration if used effectively. A key feature of the system is that customers can make reservations for suitable accommodations and meals without physically visiting the hotel. The application provides multiple filters that allow customers to quickly find rooms that meet their specific needs. Additionally, customers can add a variety of food items to their cart and conveniently pay for both food and room reservations using debit or credit cards. This makes the overall booking process simple and user-friendly. Customers can also read reviews of rooms before making a selection and contribute their own reviews after their stay. Upon completing a reservation, the system generates a booking receipt, while also allowing customers to submit cancellation requests if required.

Overall, this system not only reduces administrative labor but also enhances customer satisfaction, encouraging repeat visits to the hotel. For future development, we plan to create a mobile application in addition to the existing web-based platform, making the system even more accessible and convenient for customers.

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