



ENHANCING HOTEL MANAGEMENT THROUGH DIGITAL AUTOMATION

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ABSTRACT

"Enhancing Hotel Management Through Digital Automation" is to design and develop a Property Management System (PMS) that will be available through the Internet and will serve as a platform to carry out various hotel management tasks, including room booking, customer check-in and check-out, customer reservation, checking the availability of the rooms, billing, and keeping track of customers' details. Manual management of hotels entails lots of paperwork and requires much time to do certain things, thus making the process vulnerable to human error. For this reason, the proposed system helps in automating some of these tasks by introducing a digital platform to make the management easier. It is important to emphasize that this system includes an easily accessible interface that can be used by hotel managers to handle various tasks more efficiently. In order to provide users with reliable performance and efficient processing, the application has been developed using modern web technologies. As a result, it becomes possible to reduce the time spent on doing certain administrative tasks and improve management decisions at hotels. For creating a convenient platform, modern web technologies have been used. Due to the ability of the software to maintain good records and provide the users with necessary information about the work at any moment, it will facilitate decision-making and enhance customer satisfaction by reducing waiting time while making a reservation or checking into the room. In addition, correct billing and other services will be ensured.

KEYWORDS : Hotel Management System, Digital Automation, Property Management System (PMS), StayGrid PMS, Room Reservations, Guest Management, Billing Management, Web-Based Application, Real-Time Data Management, Customer Experience, Hotel Management, Online Booking System, Database Management, Operations Management, Reservation Management, Hospitality Automation, Service Management, System Automation, Resources Management.

INTRODUCTION

The rapid development of service industry has made hotel management more important, because the efficiency of administration and the quality of customer service is the foundation of the growth and operation of enterprises. Hotels do a lot of things on a daily basis. They book rooms, check guests in and out, keep track of room availability, bill customers, and maintain customer records. Doing all these activities manually can be challenging, time consuming and error prone. Paper systems and traditional ways of working can lead to problems such as double-bookings, delays to service, inaccurate records and additional work for staff.

The main goal of this project is to create an efficient and reliable hotel management solution with the help of digital automation. StayGrid PMS demonstrates that modern technology can make hotel administration easier, more accurate and lead to a more structured and effective management process.

Literature Survey

The need for effective administration and record management has increased the significance of digital automation in hotel management. Many researches have pointed out the role of Property Management Systems (PMS) in helping hotels to manage reservations, customer records, billing and operational activities in a centralized digital platform.



S.No	Author(s) & Year	Title of the Paper	Findings / Summary	Relation to Present Work
1	Jeevanjot Singh, Amanjot Singh Mavi, Kiranpreet Kaur (2023)	Comprehensive Review on Web-Based Hotel Management System	The study explained that web-based hotel management systems improve reservation handling, room management, billing, and customer record maintenance.	This paper supports StayGrid PMS by showing the importance of web-based automation for hotel management activities.
2	Avneesh Pathak, A. Singhal & B.K. Rana (2021)	Review on Hotel Management System	The research discussed system modules such as room booking, database management, billing, and performance analysis. It explained how structured modules improve management processes.	This supports the modular design of StayGrid PMS including booking, guest management, and billing.
3	Bai Li, Nanyi Jiang, Joey Sham, Henry Shi & Hussein Fazal (2019)	Real-World Conversational AI for Hotel Bookings	This study focused on digital booking systems and showed that automated hotel reservation systems improve booking speed and customer interaction.	This supports the reservation management and real-time access features included in StayGrid PMS.
4	Arunasalam Sambhanthan & Alice Good (2013)	Critical Success Factors for Positive User Experience in Hotel Websites	The research emphasized that simple website design, easy navigation, and accessible features improve user satisfaction and system usability.	This supports the development of a user-friendly interface in StayGrid PMS.
5	Treebo Technology Team (2025)	AI-Powered Hotel Management System as SaaS	The study explained how centralized digital systems improve room tracking.	This supports the centralized and digital automation .

Proposed System

The proposed system for this project is Property Management System which is a web-based Property Management System. This system is developed to automate and simplify hotel administration through a centralized digital platform. The system is designed to manage key hotel operations such as room reservations, guest registration, check-in and check-out, tracking room availability, billing, and maintaining customer records in an efficient and organized manner. The main objective of the proposed system is to replace the conventional manual methods with a reliable digital solution which improves the operational accuracy and saves time. Such methods often lead to problems such as booking conflicts, late updates to room availability, billing errors and difficulties in maintaining customer information. To solve these problems, The integrated system where all hotel related data can be stored, accessed and updated in real time. The proposed system presents a user-friendly interface that allows the hotel staff and the administrators to easily access the application and perform the daily tasks without any complexity. The room reservation module helps to manage the reservation efficiently by checking the availability of room and also avoids duplicate reservation. The guest management module saves customer details securely and ensures smooth check-in and check-out processes. Billing module automatically generates billing and keeps consistent records of payments. The system also offers real-time updates, so administrators can instantly view room status, booking information, and customer records. This helps us to make decisions and manage the operations of a hotel in an efficient way. As the system is web-based, it is easy to maintain and access using the devices available in the hotel environment.

System Architecture

Property Management System is designed with a web-based centralized architecture which combines users, application functions and database management in one system. The architecture provides effective communication between the hotel staff, administrators, and the system itself, proper data storage and fast access to information.

The architecture is mainly divided into **three layers: Presentation Layer, Application Layer, and Database Layer.**

1. The Presentation layer

The presentation layer is the user interface of the system Web Pages for Hotel Staff and Administrators to interact with PMS. The layer includes login pages, dashboard, room reservation forms, guest details pages, billing pages, and room availability screens. The interface is designed with simplicity and user-friendliness in mind, allowing users to access the modules they need and perform their daily tasks easily and efficiently.

2. Application Layer

The application layer is responsible for the core processing and business logic of the system. It takes the user request from the interface and process them as per the selected operation. The layer is responsible for processing reservations, registering guests, updating room availability, performing billing calculations, managing check-in and check-out procedures, and

validating entered information. It serves as a link between the user interface and the database to guarantee seamless workflow and precise execution of tasks.

3. Database Layer

It stores and manages all important information related to hotel. It contains room information, booking information, customer information, billing information, payment information and administrator information. This layer provides for safe data storage, quick data retrieval and real-time updates when new actions are made in the system.

The architecture works when the user logs into the system and performs some actions such as booking rooms or updating the guest details through the interface. The application layer processes the request . The database layer stores or updates the relevant information . The updated results are immediately displayed on the user interface.

First Level DFD- Hotel Management System

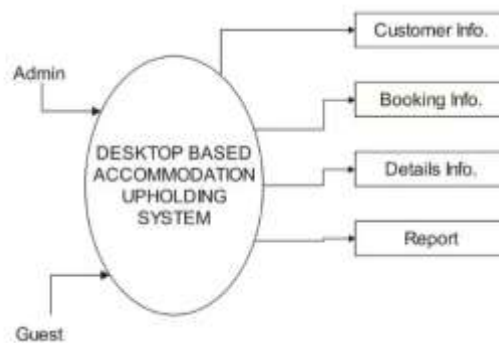


Fig.1 System Architecture

Data Flow Diagram

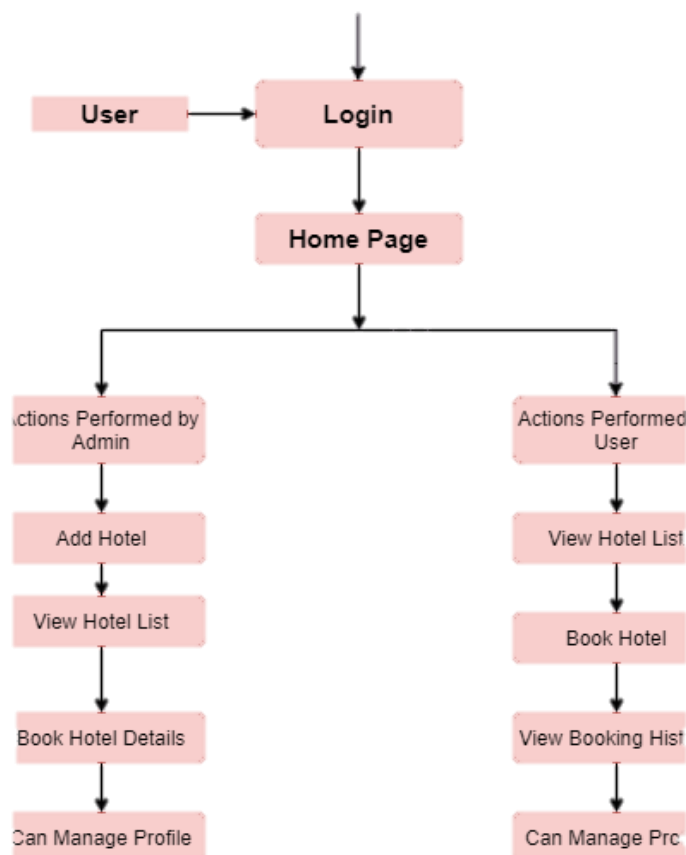


Fig.2 Data Flow Diagram



A simple data flow diagram (DFD) for enhancing hotel management through digital automation **illustrates how guest requests, reservations, and back-end operations connect.**

To visualize this process, it is best broken down into three core tiers: **Guest Actions, The Digital Hub (Automation), and Hotel Operations.**

1. Level 0: The Context (High-Level Flow)

Guest interacts with the system → Digital Automation Hub processes the data → Hotel Staff & Systems execute the service.

2. Level 1: The Detailed Data Flow

The step-by-step digital journey functions as follows:

Step 1: Guest Interaction & Booking

- **Input:** Guest browses the hotel website, selects dates, and makes a payment.
- **Data Flow:** Guest details, room preferences, and payment tokens go directly into the

Digital Automation Hub (the Property Management System or PMS).

Step 2: Automated Processing

- **The Hub:** The automation hub acts as the brain. It instantly updates room inventory, triggers an automated confirmation email/SMS to the guest, and updates the hotel's central database.

Step 3: Pre-Arrival & Check-In

- **Input:** Guest uses a Digital Concierge or mobile app to request early check-in or specific room amenities.
- **Data Flow:** The Hub receives these requests, automatically reassigns room availability, and notifies the housekeeping staff of the specific requests.

Step 4: In-Stay Automation

- **Input:** Guest makes an in-stay request (e.g., extra towels, room service) via a smart TV or app.
- **Data Flow:** The Hub translates this request into a digital ticket and routes it straight to the appropriate department's dashboard (e.g., Housekeeping, Point of Sale (POS) system for food/beverage).

Step 5: Check-Out & Analytics

- **Input:** Guest uses mobile check-out or a lobby kiosk.
- **Data Flow:** The Hub processes the final folio, triggers an automated digital invoice to the guest's email, marks the room as "dirty/needs cleaning" for Housekeeping, and securely stores the guest's feedback in the CRM (Customer Relationship Management) module for future marketing.

Limitations of Enhancing Smart Platform Management System

- The system needs a reliable internet connection to work smoothly.
- Currently, the software has limited user permissions and roles.
- Training is needed for employees to use the software.
- The effectiveness of the system relies on accurate data entry by users.
- Data integrity and security can be achieved by monitoring and proper backups.
- There are limitations in integrating the system with other booking sites and payment options.
- The system works best for small and medium hotels.
- The system requires regular updates to run smoothly.
- There could be compatibility issues with various devices and web browsers.
- Limited advanced functionalities are available in the system currently.

Conclusion and Future Enhancement

The project "Enhancing Hotel Management Through Digital Automation" proves the successful development of StayGrid PMS, which is a web-based Property Management System aimed at simplifying and automating hotel management operations. The software performs all necessary activities related to room reservation, registration of guests, check-ins and check-outs, billing services, room availability control, and client record management. Use of the web-based system helps save efforts on routine operations, avoid record management mistakes, improve the accuracy of operations, and save time. Thanks to the convenient interface, hotel managers can have access to all required information and organize records in order to make well-considered decisions quickly. All hotel management operations are simplified through using one single platform. Therefore, the presented project proves the significant role played by digital automation in modern hotel management. Such solutions allow increasing productivity, simplifying the management process, and improving its efficiency. StayGrid PMS can be used as an effective tool helping managers implement efficient structured management practices in hotels.

Future Enhancement

- Online reservation integration with booking engines for reservations management.
- Secure online payments gateway for online transactions.
- Report generation and analytical features to track performance.
- Booking related automated mail and SMS reminders to guests.
- Access rights based on roles for staffs and department managers.



- Supporting mobile application for mobile users convenience.
- Artificial intelligence enabled room booking prediction and suggestions.
- Features for managing customer reviews and feedback management.
- Hotel chain management under one roof.

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