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The Development of a Room Division Application Implementing an Intelligent Planning System (IPS) to Enhance Hotel Operational Performance

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Abstract. *Businesses, regardless of size, must continuously adjust to fast-paced technological advancements to remain competitive, particularly in the hotel industry. The Room Division plays a vital role as the heart of the hotel business, serving as the frontliner. A significant number of hotels have implemented technological advancements inside their operational room divisions, particularly in the front office and housekeeping departments. However, there are only a limited number of apps that can provide automation for analyzing the effectiveness of room attendants using delegation systems. A prototype of the hotel room division application based on the Intelligent Planning System (IPS). The IPS module provides automated analysis with rapid and precise outcomes, minimizing human involvement and reducing the likelihood of human mistakes. The research is conducted by applying the Software Development Life Cycle (SDLC) with the waterfall model, which includes planning, development, testing, and implementation stages. The prototype's anticipated outcome is to serve as a viable solution, with innovative features potentially benefiting the hotel's operational room division.*

Keywords *: Hotel Application, Room Division, Intelligent Planning System, Hotel Technology*

INTRODUCTION

Technology plays a crucial role in various aspects of life and business, including the hospitality industry. In the digital age, the hotel sector faces the same challenges as other businesses. Adaptability, innovation, and integration are the keys to digital transformation in the hospitality industry (Liu et al., 2021). With the growth of the tourism industry in Indonesia, the hotel industry must also compete in terms of speed and service. The current competition emphasizes digital transformation. Digital transformation in the hospitality sector has become an indispensable need from business activities. The support of technology can enhance the guest experience during their stay (Buhalis & Leung, 2018).

Industry 4.0 technology is transforming the modern business landscape, significantly impacting operational efficiency, driving product and service innovation, and changing the overall market dynamics (Malyzhenkov, 2023). By leveraging Artificial Intelligence (AI), Internet of Things (IoT), and data analysis, companies can increase productivity, reduce

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production costs, and meet customer needs more quickly and accurately (Umachandran et al., 2019). Additionally, these technologies enable the adoption of new business models, such as mass customization and digital platforms, allowing companies to compete more effectively in the global, interconnected economy (Бошняку, 2023).

In the hospitality industry, technology plays a vital role in enhancing guest experiences and streamlining operational processes. Hotels worldwide offer a range of facilities and activities, such as fitness centers, spas, and various dining options, catering to diverse preferences and needs (Bharwani & Mathews, 2021). In Indonesia, the hospitality sector is rapidly embracing Industry 4.0 technologies, leveraging Artificial Intelligence (AI), Internet of Things (IoT), and data analysis to improve service quality and operational efficiency (Firdaus et al., 2022). By adopting smart solutions like AI-powered guest services, IoT-enabled room controls, and advanced analytics for predictive maintenance, Indonesian hotels are well-positioned to compete on a global scale and deliver exceptional guest experiences in the digital age.

The implementation of technology in the hospitality industry is transforming hotels, restaurants, and even the use of robots to enhance guest experiences and operational efficiency. Hotels are leveraging AI-powered chatbots for personalized guest interactions, self-check-in kiosks for seamless arrivals, and mobile apps for keyless room access and in-room controls (Buhalis & Cheng, 2020). Restaurants are using AI-driven menus to recommend dishes based on customer preferences and IoT-enabled kitchens to streamline food preparation and delivery (Kaur et al., 2023). Robots are also making their way into the hospitality industry, assisting with tasks such as room service delivery, housekeeping, and concierge services (Tuomi et al., 2021). As technology continues to advance, the hospitality industry will further embrace these innovations to redefine guest experiences and maintain a competitive edge in the digital age.

To prepare industry-ready human resources for the rapidly evolving hospitality landscape, educational institutions must integrate digitalisation and emerging technologies into their curriculum. This will ensure that future hospitality professionals are well-versed in the latest tools and techniques shaping the industry (Oktadiana, 2012). By collaborating with industry partners and incorporating hands-on experiences with AI, IoT, and other advanced technologies, educational institutions can better equip students to meet the evolving needs of hotels, restaurants, and other hospitality businesses. As a result, graduates will be better prepared to contribute to the digital transformation of the hospitality industry and drive innovation in this dynamic and ever-changing sector (Deri & Ari Ragavan, 2023).

To prepare graduates for the digital transformation of the hospitality industry, Telkom University's Lingian Hotel serves as a service solution. As a laboratory for students on the Diploma of Hospitality programme, Lingian Hotel provides a hands-on, immersive environment for students to learn and innovate in the hospitality sector. By working with cutting-edge technology and gaining practical experience in a real-world environment, students are better equipped to contribute to the digital transformation of the hospitality industry upon graduation. As an integral part of the academic programme, Lingian Hotel empowers students to drive innovation in the hospitality sector and adapt to the evolving needs of hotels, restaurants and other hospitality businesses in the digital age [priyantoro].

In the digital age, many hotel industries have adopted applications for recording operational activities, such as reservations, room attendant performance, and room status updates. These web-based or desktop applications streamline processes and enhance efficiency for front office operations (Singh & Puri, 2021). However, at Lingian Hotel, manual recording methods, such as using Excel, are still employed for transactions and reporting. This outdated approach leads to inefficiencies and less effective data collection.

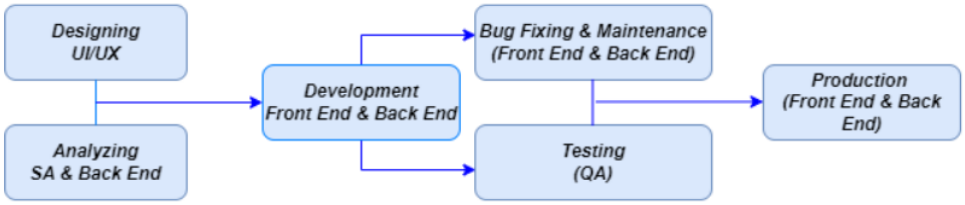
The Intelligent Planning System (IPS) is a modern solution designed to overcome the limitations of traditional Enterprise Resource Planning (ERP) systems in hotel operations (Sepulveda & Deporter, 1987). ERP tools are widely used for data collection and management, particularly for technical tasks and analysis. IPS, however, offers advanced automation capabilities that deliver fast and accurate results with minimal human intervention to minimise errors (Chistyakova et al., 2022). By streamlining coordination paths and optimising task delegation through its native algorithm, IPS increases efficiency and reduces workload imbalances. The IPS module, Intelligent Man Power Planning System (IMPPS), is a key feature that enables efficient task allocation, ensuring minimal missed work or uneven workloads for each employee (Wang et al., 2015). This innovative technology enables hotel businesses to operate at an advanced level, optimising their processes and resources for maximum efficiency and succes.

In conclusion, the Intelligent Planning System (IPS) has been developed as a cutting-edge solution to address the challenges faced by the hospitality industry and enhance operational performance. The efficacy of IPS has been demonstrated through research conducted at Lingian Hotel, a laboratory for students in Telkom University's Diploma of Hospitality programme. The subsequent sections of this paper will outline the research methodology, using the SDLC waterfall model, and present the results and discussion, focusing on the business process of the application. In summation, the outcome of this research is the

prototype of a Room Division Application that implements IPS, which serves to demonstrate the potential of the Intelligent Planning System (IPS) to revolutionise hotel operations and drive innovation in the digital age.

RESEARCH METHOD (11 PT)

This application is built by applying the Software Development Life Cycle (SDLC) using waterfall method (Araujo et al., 2022). It's a linear and sequential method where each phase of the development process is completed before moving on to the next as shown below:



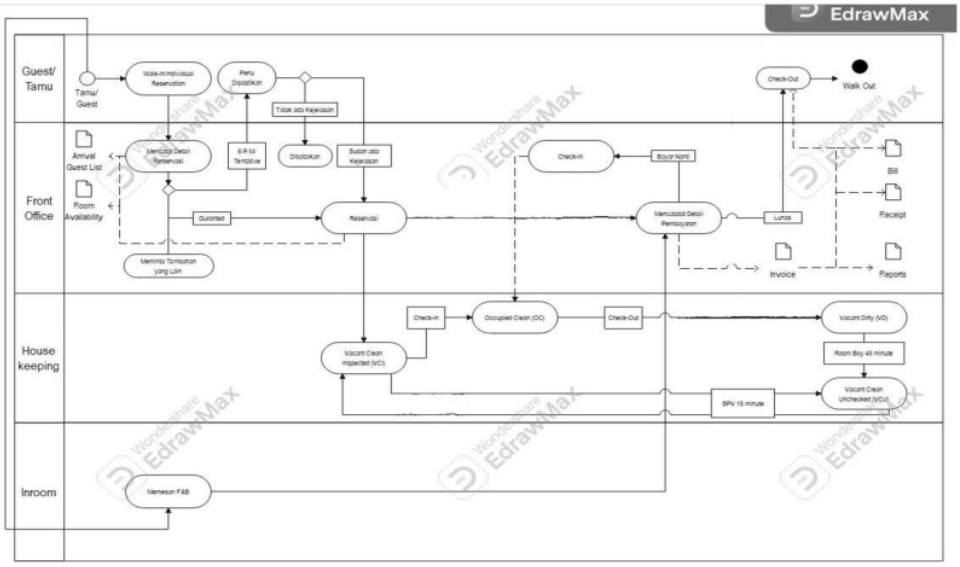
The development of an application involves multiple stages, each with specific roles and responsibilities. Here's a detailed breakdown of each phase:

1. Designing
    - The User Interface/User Experience (UI/UX) designers focus on creating a seamless and enjoyable experience for users. They collaborate with the Analyst Team to ensure the design aligns with the application's objectives.
    - System Analysts (SAs) are responsible for outlining the application's requirements. This includes selecting the technology stack, defining the architecture, and mapping out the data flow. Back-end developers are involved in designing the Entity-Relationship Diagram (ERD), which determines how data will be stored and managed.
2. Development & Bug Fixing & Testing
    - Once the design is complete, the Development Team takes over. This team is usually split into Front-End Developers and Back-End Developers.
    - Front-End Developers are responsible for creating the user interface and managing user interactions. Back-End Developers focus on server-side logic, database management, and other backend processes.

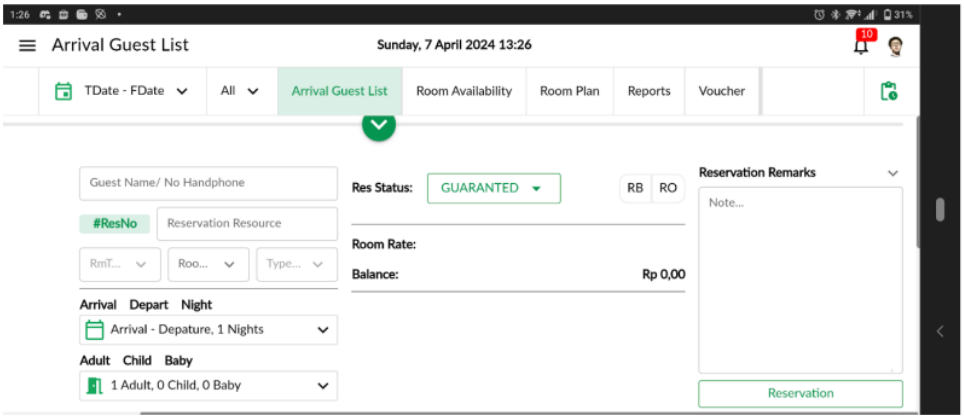
- After development, the Quality Assurance Engineer (QAE) team tests the application to ensure it meets the required standards. They use both automated and manual testing techniques to detect bugs and other issues.
- When the QAE team discovers a bug, they report it to the Development Team. The Front-End and Back-End Developers then work together to fix the identified issues. After applying the fixes, the QAE team retests the application to confirm that the bug has been resolved. This cycle continues until the application is stable and ready for production.

3. Production
    - When all features are functioning correctly and the Project Manager has given approval, the application moves to the production stage. The Development Team handles deployment, ensuring that the application is live and accessible to users. After deployment, ongoing maintenance and updates are required to keep the application running smoothly.
    - By following this structured approach, each stage of the application development process is clearly defined, allowing for a smooth transition from design to production while ensuring that all roles and responsibilities are clearly outlined.

RESULTS AND DISCUSSIONS (10 PT)



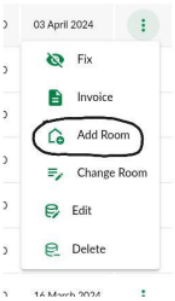
1. Reservation Creation
    a. Front Office - Reservation Resource
        - Guests can make a reservation in one of two ways:
            - Walk-In Reservation: Guests visit the front office desk and make a reservation with the Front Office staff.
            - Individual Reservation: Guests call Hotel Lingian to make a reservation over the phone (Currently, the only available remote method).
    b. Front Office - Creating a Reservation
        - Front Office staff select either the Arrival Guest List or Room Availability page to begin the reservation process.
        - Staff fill in the following details on the reservation form:
            - Guest Name and Phone Number
            - Reservation Resource (Walk-In)
            - Reserved Room
            - Arrival and Departure Dates
            - Number of Guests
            - Room Rate
            - Additional Notes/Remarks
            - Voucher (if applicable)



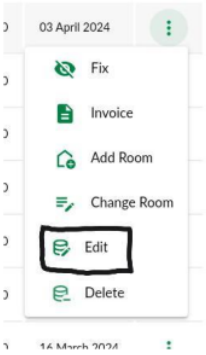
        - Staff ask guests for their reservation confirmation:
            - Guaranteed: The reservation is confirmed.
            - 6 PM Reconfirmation: The reservation must be reconfirmed by 6 PM tomorrow.

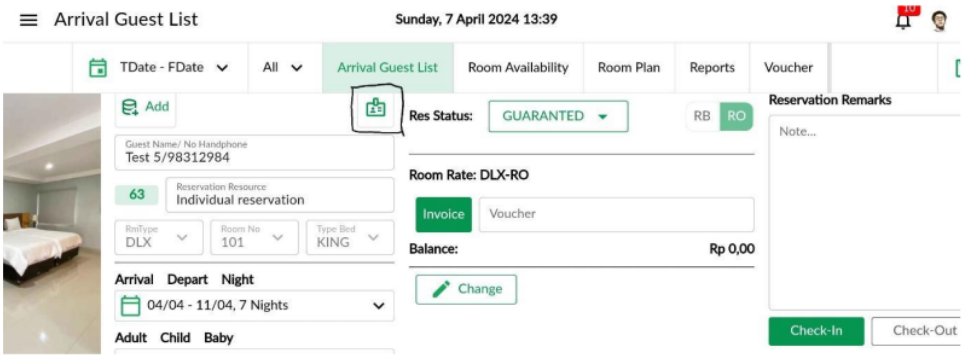
- Tentative: The reservation is uncertain.

- If guests need additional rooms, staff use the "Add Room" menu to create additional reservations.



- Staff can save additional guest information (e.g., ID or driving license) by selecting the "Edit" option and pressing the button with the card logo.



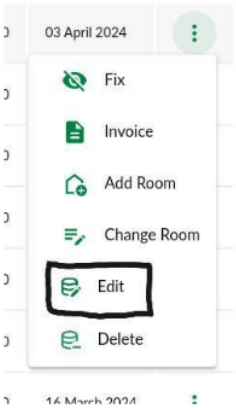


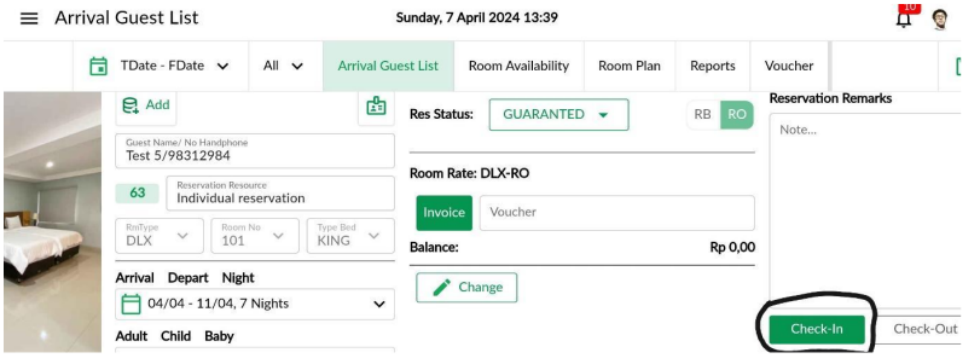
c. Front Office - Post-Reservation Activities

- Once the reservation is confirmed, staff perform several tasks:
  - Activation of reserved room account (for in-room services).
  - Change room workload system (for housekeeping).

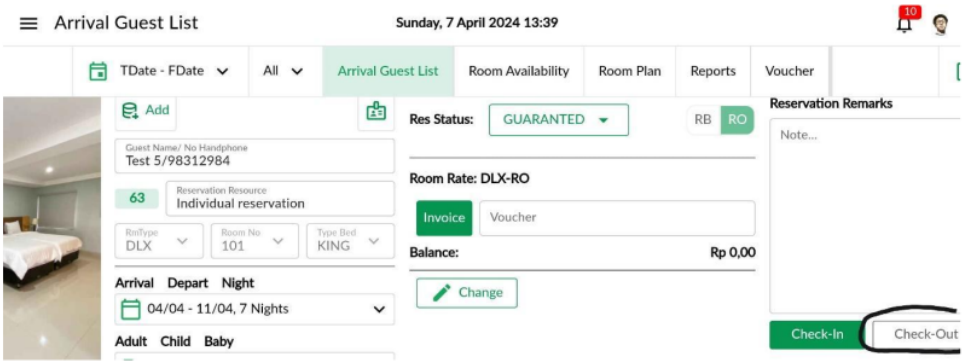
  - Change room status to OC (Occupied and Cleaned, for housekeeping).
  - Add Invoice for room rate (for front office accounting).
- The staff await the guests' check-in.

2. Check-in Process
   a. Front Office - Guest Check-In
      - Guests arrive at the front office desk to check in.
      - Front Office staff access the Arrival Guest List or Room Availability page and select the appropriate reservation.
      - Staff confirm the guest's name and reservation details.
      - Staff press the "Check In" button to confirm the check-in.
      - Following actions are taken after check-in:
        - Activation of reserved room account (for in-room services).
        - Change room workload system (for housekeeping).
        - Change room status to OC (for housekeeping).
        - Add invoice for room rate (for front office accounting).

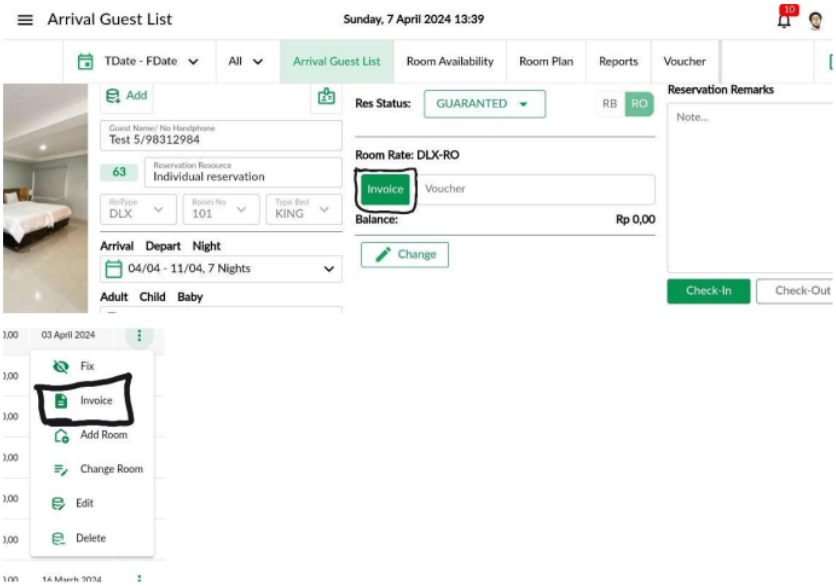




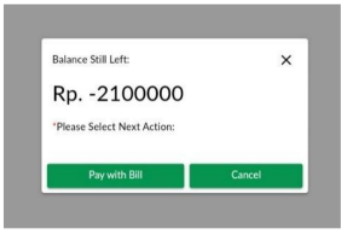
3. Check-out Process
    a. Front Office - Guest Check-Out
        - Guests arrive at the front office desk to check out.
        - Front Office staff access the Arrival Guest List or Room Availability page and locate the appropriate reservation. Once found, staff can select the edit option.



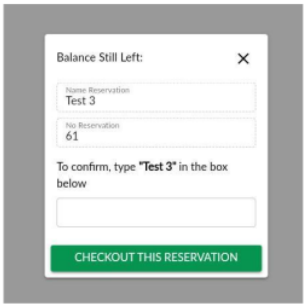
        - Staff check if there are any outstanding payments. If the balance is greater than zero:
            - The guest can pay directly:
                - Staff press the "Invoice" button or select the "Invoice" option.
                - Staff complete the payment process.



- If the guest prefers to pay via bill:
  - Staff press the "Check Out" button.
  - Staff press the "Pay With Bill" option to complete the billing process.

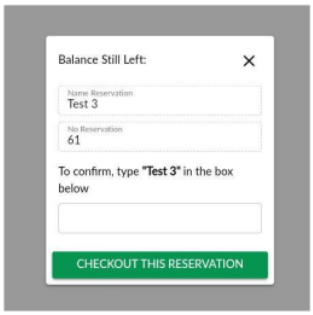


  - Staff completes the Check Out confirmation.



- If the balance is zero:
  - If the balance is zero or after payment is completed, staff press the "Check Out" button to finalize the check-out.

- Staff complete the check-out confirmation.



- The reservation is then marked as checked out.

CONCLUSION

In conclusion, the results and discussion of this research demonstrate Hotel Lingian's systematic approach to front office operations, encompassing reservation management, check-in, and check-out processes. By efficiently handling guest interactions and accommodating various requests, the hotel ensures a smooth and satisfactory experience for its guests. To further enhance operational efficiency and guest convenience, the implementation of digital solutions for reservation management and payment processing is recommended. Furthermore, regular staff training sessions can help maintain consistency and proficiency in handling diverse guest scenarios.

As stated in the "Introduction" chapter, the development of the Intelligent Planning System (IPS) aims to address the limitations of traditional Enterprise Resource Planning (ERP) systems in the hospitality industry. The research conducted at Hotel Lingian showcases the potential of IPS to revolutionise hotel operations and drive innovation in the digital age. The compatibility between the research objectives and outcomes is evident, as the "Results and Discussion" chapter effectively demonstrates the efficacy of IPS in enhancing hotel operational performance.

Furthermore, the application prospects of this research extend to the broader hospitality industry, where similar challenges in operational efficiency and guest satisfaction persist. Future studies may explore the integration of IPS in different hotel settings and investigate its impact on various aspects of hotel operations. By building upon the findings presented in this paper, researchers and practitioners can continue to drive innovation and contribute to the sustainable growth of the hospitality sector in the digital age.

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