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Hotel Reservation Management System

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Abstract: Hotel Time Johor Bahru is one of the hotel in Malaysia where located in Johor Bahru, Johor. The hotel currently uses BlogSpot blog for displaying hotel's details only without having a proper reservation system and relied on third-party hotel reservation platform. The problems faced by the hotel currently are there will be fewer profits earned since the hotel needs to pay the commission to the external booking portal each time a guest made a reservation from the respective booking portal. Besides, the hotel looks less impressive without having its own booking engine since some guests prefer the hotel's own booking system for reserving a room instead of using an external booking portal. The objectives of this project is to design a hotel reservation management system and then to develop a hotel reservation management system for Hotel Time Johor Bahru. In this project, the Waterfall model is applied to assist the project development. The system is a web-based system developed based on Structured approach. There are four programming language used to develop the system namely HTML, CSS, PHP, Javascript and the database used is MySql. The hotel reservation management system will automate the major operations of the hotel in areas of booking, accommodation, account details, inventory, reporting, housekeeping and provide online reservation for guests. Testing result shows that all the functions in the system are outputting as expected result. The system will improve the staffs' and customers' efficiency especially for those who are involved in record keeping, searching of customer's information and account details of customer's booking.

Keywords: management, reservation, structured, web-based, hotel

1. Introduction

Malaysia is a growing tourist destination, there has been a good rise in the number of hotels and resorts in Malaysia due to the broadening of the tourist sector. The rapid development and commercialization of Information and Communication Technologies (ICT) for travel and tourism industry have prompted hotels and other enterprises in this sector to increasingly adopt technologies into their businesses. Hence, a good developed system will help the hotels to enhance the operating efficiency, improve the service experience as well as provide a means to access markets on a global basis.

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Hotel Time Johor Bahru is one of the hotel in Malaysia located in Johor Bahru, Johor. The hotel is the choice of accommodation for some tourists due to the strategic location of the hotel that is surrounded by several mega shopping complexes and hundreds of entertainment outlets. Hotel Time Johor Bahru consists of 42 guest rooms. Each room is equipped with standard in-room amenities to ensure the maximum comfort of the room. Presently, Hotel Time Johor Bahru is still using BlogSpot blog publishing services to display the hotel details without having a proper online reservation system. The hotel relies on several third-party hotel reservation platforms and has to pay the commission for each of the reservation made by the guests from these booking portals.

Currently, the hotel owner is facing some problems due to not having his own booking engine. First of all, there are fewer profits earned since the hotel needs to pay the commission to the external booking portal each time the guest made a reservation in the external booking portal. There are also a huge losses of profits without having an own booking system in a long term. Moreover, the hotel looks less impressive without having its own booking engine since some guests prefer the hotel's own booking system for reserving a room instead of using an external booking portal. They might be disappointed and forced to change the target hotel if they cannot find the hotel's own booking system. This causes the losing number of reservation from time to time.

The objectives of this project are to design a hotel reservation management system and then develop the hotel reservation management system for Hotel Time Johor Bahru. Finally, the performance of the developed system is tested and evaluated to ensure that the system meets the customer requirements.

The Hotel Reservation Management System implemented for Hotel Time Johor Bahru will automate the major operations of the hotel in areas of booking, accommodation, account details, inventory, reporting, and provides online reservation for guests. The system will also track room and hall reservations, check the availability of rooms and allows end-users manage all room types and room services. This system consists of five domain modules which are the management module, report generating module, inventory module, reservation module, reward module and login with register module. Meanwhile, there are five end users for this system who are Administrator, Staff, Cleaning Staff, Front Desk Staff and Guest.

With Hotel Reservation Management System, guests will have many options to compare rates and services based on their requirement. Travelers or locals can book and secure a room to stay through online reservation before or without actually visiting the hotel. The hotel staffs can easily manage the inventory and rates of their hotel rooms and view the daily report of expenditures or incomes for data analysing. With the hotel reservation management system, the hotel owners can promote their services and create promotion packages and deals. The system will also be able to handle payment and transactions.

Moreover, this Hotel Reservation Management System can increase the hotel's overall sales and profits by receiving a direct online reservation. There is the financial benefit of spending less on commission payments and the hotel owner can directly engage the guests to their own advantage. Any reduction in the Online Travel Agency (OTA) commission costs will go directly to the bottom line as profit. Moreover, the system will reduce the chances of losing a reservation. This system provides a user-friendly environment to the hotel staff to carry out their duties more effectively and making customer booking easier by using the online reservation system on the website.

2. Literature Review

2.1 Background of Hotel Reservation Management System

A Hotel Reservation Management System normally consists of front-end and back-end system which are connecting one another. The front-end system can be the hotel own reservation website or the third-party channels such as Online Travel Agency (OTA) and Global Distribution System (GDS).

The guests can make all the reservation process through the front-end system such as select check-in or check-out date, check availability of room, view the price of each room, and book the room with total of nights they would like to stay. The data will transmit from the front-end system into back-end system immediately when a guest made an action such as booking a room. The back-end system also named management system is only visible to the administrator and the staffs of the hotel in order to manage their operations such as booking confirmation, checking guests in and out, reporting and analytics, update hotel's information showed in the front-end system, update inventory system and housekeeping.

According to Bedard [1], there are two types of main back-end systems which are always used by the hoteliers in order to manage its properties and operations. The two main back-end systems are Central Reservations System (CRS) and Property Management System (PMS). Bedard [1] stated that a CRS acts as a medium to update Availability, Rates and Inventory (ARI) between the PMS to hotel website or third party channel while a PMS is used to manage all of the needed management such as housekeeping, point of sale (POS), check-in or check-out, and other management tasks. Both CRS and PMS operate separately from one another, but sync together to match data between each other.

2.2 Central Reservation System (CRS) in Hotel

A CRS is used in the hospitality industry in order to manage the hotel's ARI within the hotel management system and share those information across the various distribution channels such as online travel agencies and GDS [2]. For instance, when a booking is made or rates either on hotel website or third party channels, the information will send to the CRS and then CRS will adjust the hotel's availability or rate on all of the channels in real-time. Figure 1 shows the interaction between the CRS, PMS, hotel website, and the third-party channels.

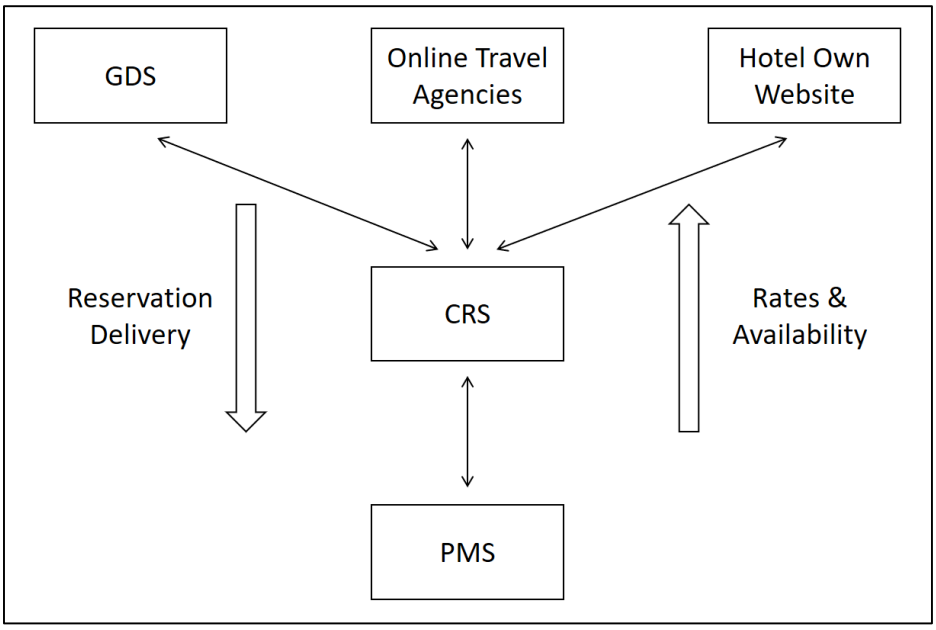

Figure 1: Interaction between the CRS, PMS, hotel website, and the third-party channels.

Judd et al. in [3] described CRS as, "a central source of reservation data and typically comes with or at least seamlessly integrates into the booking engine and channel manager which ensures that hotel rooms are not overbooking across different channels." For example, when a hotel room is booked by a guest through the hotel website, the CRS will receive information from the hotel website and shares it with PMS, then finally PMS will send the updated information back to the CRS and CRS pushes the updated information to both hotel website and third-party channels in real-time. This will avoid the overbooking by different guests in different channels who make the same booking at the same time.

Also, CRS allows hotel revenue managers to create various offers and promotions for different channels and able to adjust the pricing of room quickly across all channels.

2.3 Property Management System (PMS) in Hotel

According to Moyeenudin et al. [4], PMS is replacing paper-based registers which is used in hotel industry at the earlier stages. Due to the rise in technology, there are many PMS vendors are available in market and hoteliers can choose their own PMS based on their hotel design by referring to the size and the type of the property. A PMS is a system that facilitates a hotel's reservation management and administrative tasks [5]. The common important functions including front-desk operations, reservations, channel management, housekeeping, rate and occupancy management, and also payment processing. In general, PMS facilitates the main processes in a hotel related to internal and external operations.

A modern PMS combines multiple work environments in a single piece of system. Depending on the provider, the combination of modules and functions can vary, and functionality of one module can be slightly different. Figure 2 shows the basic structure of hotel PMS.

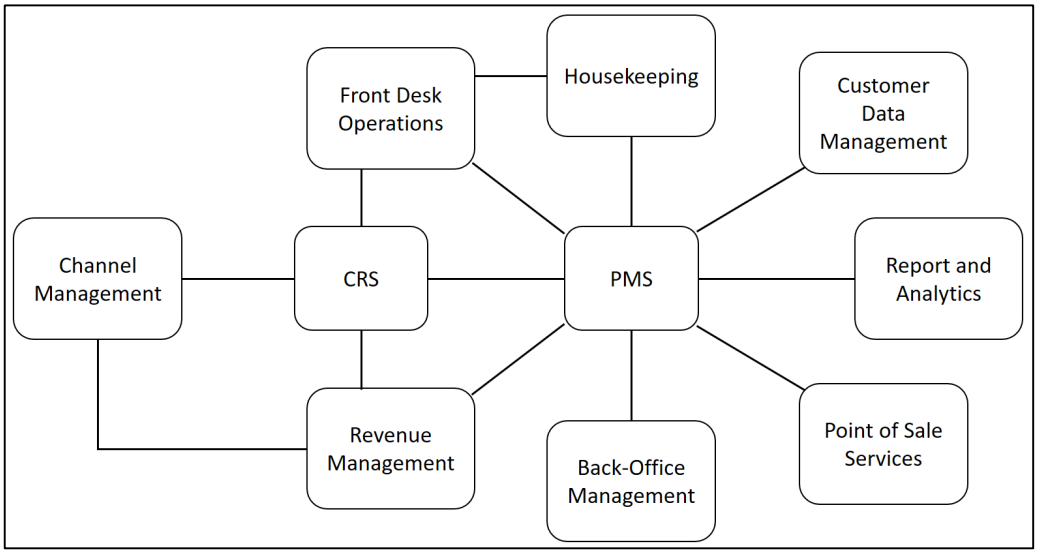

Figure 2: Basic structure of hotel PMS.

It is hard to divide the function of PMS into more or less important because all of them are necessary. Regardless of property type, hotel PMS must have a CRS with a website booking engine and front-desk operations module. A CRS may be available as a separate module of PMS or implemented in the internal PMS with little weight, depending on the requirement of hoteliers. If the PMS connects a hotel directly to the third party web site, it is a one-to-one relationship and it may take huge time to configure for each and every site [6]. That explains why CRS comes important to work with PMS. Other essential modules usually include channel management, revenue management, housekeeping, customer data management, report, and analytics. For certain big hotels and resorts, they need POS services and also back-office modules. In the developed system, PMS is implemented to help in managing the administrative tasks including front-end system but CRS is not implemented in PMS since it will take long period for implementation.

2.4 Web-Based System

According to Kambala [7], a web-based system is an application that is accessed via HTTP. It means that the system must run in a web browser. Currently, all of the hotel reservation management systems used by the hotels are web-based type system. There are a lot of significant benefits when developing a web- based type system such as easy installation and maintenance, low development costs,

easy data sharing and collaboration, accessibility anywhere, increased efficiency and reduced hardware costs. Therefore, most of organizations more prefer to develop their systems in web-based type system since it has a promising future.

2.5 Responsive Web Design (RWD)

According to Schade [8], Responsive Web Design (RWD) is a web development approach that used to design web pages which will respond to the user's behavior and environment based on screen size, platform and orientation. RWD is one of the web design which important to achieve the need for a different design and development phase for each new gadget on the market.

Currently, most of the web-based systems are designed responsively and automatically fitted to the device's screen size. It is convenience and supports users with differently sized viewports. In responsive design, the page elements will reshuffle to fit with the screen size of devices based on the user's behaviour. For instance, when the user switches from a laptop to an iPad, the website will automatically switch to accommodate for resolution, image size and scripting abilities. In other words, a responsive website should have the technology to automatically respond to the user's preferences.

2.6 Existing System: Glex Hotel Reservation System

Glex Hotel Reservation System is used by Glex Hotel in order to operate their hotels in Malaysia [9]. The system offers guests to check the availability and the price of the rooms in Glex Hotel through the website before coming to the hotel. Besides that, it also allows guests to reserve the room by entering the check-in and check-out date with the number of persons who will stay in the hotel and the number of total night they would like to stay in the hotel.

2.7 Existing System: innRoad Property Management System

innRoad is a cloud-based property management system designed to meet the needs in hospitality industry including hotels, motels, resorts, Bed and Breakfast (B&Bs), lodges and campgrounds [10]. innRoad provides a customized booking engine that matches the look and feel of a property's website. innRoad property management system lets staff handle day to day operations. Checking guests in and out, managing which rooms are clean or dirty for housekeeping, and running customized reports are all supported. Room inventory and rates are automatically synched across multiple sources through a direct connection with online travel agencies including Expedia, Booking, TripAdvisor, Airbnb, and more.

2.8 Existing System: Cloudbeds Property Management System

Cloudbeds is a cloud-based hotel management system suitable for small to midsize hotels, vacation rentals, and hostels [11]. Cloudbeds is able to receive reservations from a number of channels, including online travel agencies like Booking and Expedia, Facebook, an online booking engine or from walk-in customers. This system offers a drag and drop calendar of all rooms and reservations, and users can see who changed, cancelled, created, moved or adjusted a reservation. Inventory can be synced automatically from the system to booking engines, online travel agencies and other online marketplaces. The system also offers support for multiple languages and currencies. Users can set up taxes, fees and policies to be applied per room, per item or in a custom combination.

2.9 Comparison with the Existing Systems

Table 1 illustrates the comparison between the developed system of Hotel Time Johor Bahru with the similar systems on the market.

Table 1: Comparison between the developed system of Hotel Time Johor Bahru with the similar systems on the market.

Features	Glex Hotel Reservation System	innRoad Property Management System	Cloudbeds Property Management System	Hotel Time Johor Bahru Reservation Management System (Developed System)
Target user	Guests	Admin and Staff	Admin and Staff	Guests, Admin and Staff
User Login	Yes	Yes	Yes	Yes
Register Account	Yes	Yes	Yes	Yes
Room Reservation	Yes	No (In front-end system)	No (In front-end system)	Yes
Room Confirmation	No (In back-end system)	Yes	Yes	Yes
Checking guests in and out	No (In back-end system)	Yes	Yes	Yes
Reporting and Analytics	No (In back-end system)	Yes	Yes	Yes
Housekeeping	No (In back-end system)	Yes	Yes	Yes
Update Inventory System	No (In back-end system)	Yes	Yes	Yes
Central Reservation System	No (In back-end system)	Yes	Yes	No
The Need of Database	Yes	Yes	Yes	Yes

3. Methodology

A methodology is a framework used to plan, control, and structure the process of developing the system or researching the data [12]. Nowadays, there are a lot of software development methodologies defined in software development. These methodologies have their own Software Development Process Models. Each process model has its own unique and particular life cycle in order to ensure the success in process of software development. The software development process model used in this project is the Waterfall model.

Waterfall model is termed as waterfall because the model develops systematically from one phase to another in a downward fashion [13]. Each phase is designed for performing specific activity during the Software Development Life Cycle (SDLC) phase. It was introduced in 1970 by Winston W. Royce [14].

In this project, Waterfall model is chosen and each of the phases mentioned in Waterfall model is applied in order to complete the project. This is because the customer requirements of the project are very well known and the product definition is stable. Besides that, the technology and tools used are understood and the project is short and not complicated. Therefore, Waterfall model is the most suitable methodology can be applied in this project. There are five main phases in the waterfall model which

are planning, analysis, design, implementation, and testing. Figure 3 shows the SDLC phases of Waterfall model.

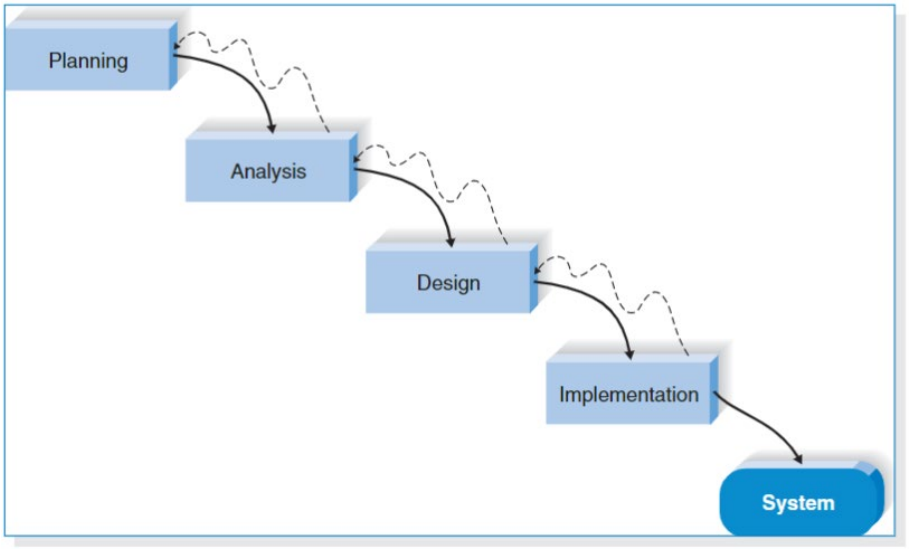

Figure 3: SDLC phases of Waterfall Model [15].

3.1 Planning Phase

Planning phase is a process of defining the objectives and scopes of the project. It is the most fundamental and critical organizational phase since a beginning of a project is started from this phase. All the objectives and scopes must be determined and understood well in this phase before goes into the next phase.

There are three primary activities involved in the phase:

i. Identification of the system for development
The important task in this step is establishing an initial problem, opportunities and directives that triggered the project. The problems arise by the current system are learned and analysed by asking several type of questions to the system owner and system users to gain more understanding to leading a possible new system. Afterward, the scopes and constraints of a new system are determined.

ii. Feasibility assessment
After the identification of the system for development has been completed, a feasibility study is conducted to determine a project's viability. In the end of this step, the project development time and cost are estimated.

iii. Creation of project plan
After all the elements of the project have done confirmed, a project plan is constructed into a Gantt Chart to gain an understanding of the likelihood that all potential time frames and completion date schedules can be met and that meeting these dates are sufficient for dealing with the needs of the organization.

3.2 Analysis Phase

Analysis phase is a process of defining the user requirements for an application to be built or modified. It involves all the tasks that are conducted to identify the needs of different stakeholders. In this phase, all requirements of the project are identified and analysed, then documented in a specification document. A feasibility analysis is further conducted in order to check if these requirements are valid or meet customer requirements.

There are four steps involves in this phase:

i. Eliciting Requirements
The requirements gathering process are done by communicating with the customers in this step.

ii. Analysing Requirements
The quality of the requirements is determined by identifying whether the requirements are unclear, incomplete, ambiguous, and contradictory. These issues are resolved before moving to the next step.

iii. Requirements Modelling
The requirements are documented in different formats such as use cases, user stories, natural-language documents, software requirement specification or use case specification.

iv. Review and Retrospective
The reflections on the previous iterations of requirements gathering are conducted in this step to make improvements in the process going forward.

Besides that, a Context Diagram and Data Flow Diagram (DFD) are created in this phase in order to visually represent systems and processes that are complex and difficult to describe in text. At the end of this phase, a Context Diagram, Data Flow Diagram (DFD), Entity-Relationship Diagram (ERD), and Requirement Definition are created.

3.3 Design Phase

Design phase is a process of defining elements of a system like modules, architecture, components and their interfaces and data for a system based on the specified requirements. In this phase, the requirement specification from the requirement analysis phase is studied and the system design is prepared. The hardware and system requirements such as data layers, programming languages, user interface and which database should be used are specified during this phase. Lastly, the overall system architecture is defined. In the end of this phase, the flowcharts and the user interface design of the system are created.

3.4 Implementation Phase

The project takes shape and become visible to outsiders during the implementation phase. This phase involves the construction of the actual project result by using four programming language which are HTML, CSS, PHP, and Javascript with the use of MySql database. With the input from the system design phase, the system is developed by separating it into each small programs called units and then develop them one by one. Each unit is developed and then tested for their functionality in the next phase. The output of this phase is the fully completed of the system.

3.5 Testing Phase

Testing phase is focus on the investigation and discovery of the system. Developers find out whether their code and programming work according to the customer requirements during this phase. In this phase, all the units developed in the implementation phase are integrated for performing integration testing to ensure the functionality works as expected. Then, each of the test case and the result is documented into the test cases report. Any anomaly case found in the system is debugged until all the test cases are stated success. The output of this phase are the test cases report.

4. Analysis and Design

4.1 System Requirement Analysis

System requirement analysis is a process of defining the functional requirement and non-functional requirement of the developed system. Functional requirement analysis describes what the system should do, while non-functional requirement analysis describes the system's operation capabilities and constraints that enhance its functionality.

4.1.1 Functional Requirement Analysis

This section will describe the functionalities that are developed in the system as shown in Table 2.

Table 2: Functional requirement of the developed system.

No	Modules	Functionalities
1.	Registration Module	• The system should allow the new guest to register a new account before login. • The system should only allow the admin to register a new account for new staff. • The system should not provide admin account registration.
2.	Login Module	• The system should allow the guests to login into the system using email and password. • The system should allow the admin and staff to login into the system using user ID and password. • The system should check the ID/email and password inputted by user whether valid or invalid. • The system should display login failed message if user input invalid ID/email or password. • The system should redirect the user into the main page of system once login successfully.
3.	Reservation Module	• The system should display the room availability according to the check in and check out date selected by guest. • The system should allow guest to reserve room by selecting the number of room to reserve and the check in date and check out date. • The system should allow front desk staff to confirm or cancel the room reservation by guest and send notification email to guest after confirmation is made. • The system should allow front desk staff to change room for guest if necessary. • The system should allow front desk staff to check guest in and out.
4.	Report Generating Module	• The system should allow admin to generate and view the daily report of the overall activities in hotel.
5.	Management Module	• The system should allow admin to set and display the promotion of the hotel. • The system should allow staff to update room availability of the hotel. • The system should send the notification to cleaning staff about which room need to be cleaned when the guest checks out from room. • The system should allow cleaning staff to update the cleaning status of room after the cleaning process is done.
6.	Inventory Module	• The system should allow staff to update the inventories of each room in the hotel.
7.	Reward Module	• The system should allow guest to exchange the voucher code by using reward points gained from each payment to discount the total payment amount in next reservation once. • The system should allow admin to manage the rewards shown in the front-end system.

4.1.2 Non-Functional Requirement Analysis

This section will describe the requirements that are not directly concerned with the specific functions delivered by the system as shown in Table 3.

Table 3: Non-functional requirements of the developed system.

No	Requirements	Descriptions
1.	Performance	• The interaction between the user and the system should not be more than 10 minutes. • The system should be able to use anytime.
2.	Operational	• The system should be user friendly. • The system should be easily maintained and updated. • The system should be able to work on any web browser
3.	Security	• The system should only allow admin to generate and view the report. • The system should only allow all users to access their own account with user email and password. • The system should use encryption to avoid bots from booking.
4.	Cultural and Political	• The system should not contain any icons that could be considered offensive in any market country.

4.2 User Requirement Analysis

User requirement analysis is a process of defining the expectation requirement should be in the system from user. In other words, it defines what can user able to do or perform in the developed system as shown in Table 4.

Table 4: User requirement for the developed system.

No	User requirements
1.	All users should be able to input the user ID/email and password for login purpose.
2.	Guest should be able to register a new account.
3.	Guest should be able to view room availability according to the selected check in and check out date.
4.	Guest should be able to reserve room by selecting number of room to reserve and check in and check out date.
5.	Guest should be able to receive notification message for the room reservation confirmation.
6.	Guest should be able to exchange voucher code by using reward points gained from each payment to discount the total payment amount in next reservation once.
7.	Administrator should be able to register a new staff account for new staff but cannot register a new admin account.
8.	Administrator should be able to generate and view the daily report of the overall activities in hotel.
9.	Administrator should be able to set and display the promotion of the hotel.
10.	Front desk staff should be able to confirm or cancel the room reservation made by guest.
11.	Front desk staff should be able to check guest in and out.
12.	Front desk staff should be able to change room for guest if necessary
13.	Staff should be able to update room availability of the hotel.
14.	Staff should be able to update the inventories of each room in the hotel.
15.	Cleaning staff should be able to receive notification about which room need to be cleaned when the guest checks out from room.
16.	Cleaning staff should be able to update the cleaning status of room after the cleaning process is done.

4.3 Hardware and Software Requirement Analysis

Hardware and software requirement analysis is a process of defining the hardware and software needed for the developed system. Table 5 shows the hardware requirements specification while Table 6 shows the software requirements specification for the developed system.

Table 5: Hardware requirements specification.

No	Hardware	Specification
1.	CPU (Central Processing Unit)	Intel Core i7-5500U CPU with 2.40GHz
2.	RAM (Random Access Memory)	12.0 GB
3.	Hard Disk	512 GB SSD
4.	Graphic Card	AMD Radeon R5 M330

Table 6: Software requirements specification.

No	Type	Software	Functionality
1.	Programming Tool	Atom	Act as code editor for coding system.
2.	Programming Language	HTML, CSS, PHP, JavaScript	Design and build the environment of system's components.
3.	Design Tool	Microsoft Visio 2016	Create and edit context diagram, data flow diagram, entity relationship diagram, and flow chart.
4.	Server Application	XAMPP	Act as a cross-platform web server for access to the database.
5.	Database	MySQL	Design and build database.
6.	Operating System	Microsoft Window 10	An operating system that has been used for the development of the system.

4.4 System Analysis

System analysis is a process of visually the data flow and processes in the developed system by using each different technique. There are three types of technique are used to visually the developed system which are Context Diagram (CD), Data Flow Diagram (DFD), and Entity Relationship Diagram (ERD). The purpose of using these techniques is to visually the developed system that are complex and difficult to describe in text. With visualizing all the elements of the system, that will be easier to identify any shortcomings and then eliminate those shortcomings in order to create a robust system.

4.4.1 Context Diagram (CD)

A CD illustrates the overall data flows between the system and the external entities. Figure 4 shows the CD of the developed system.

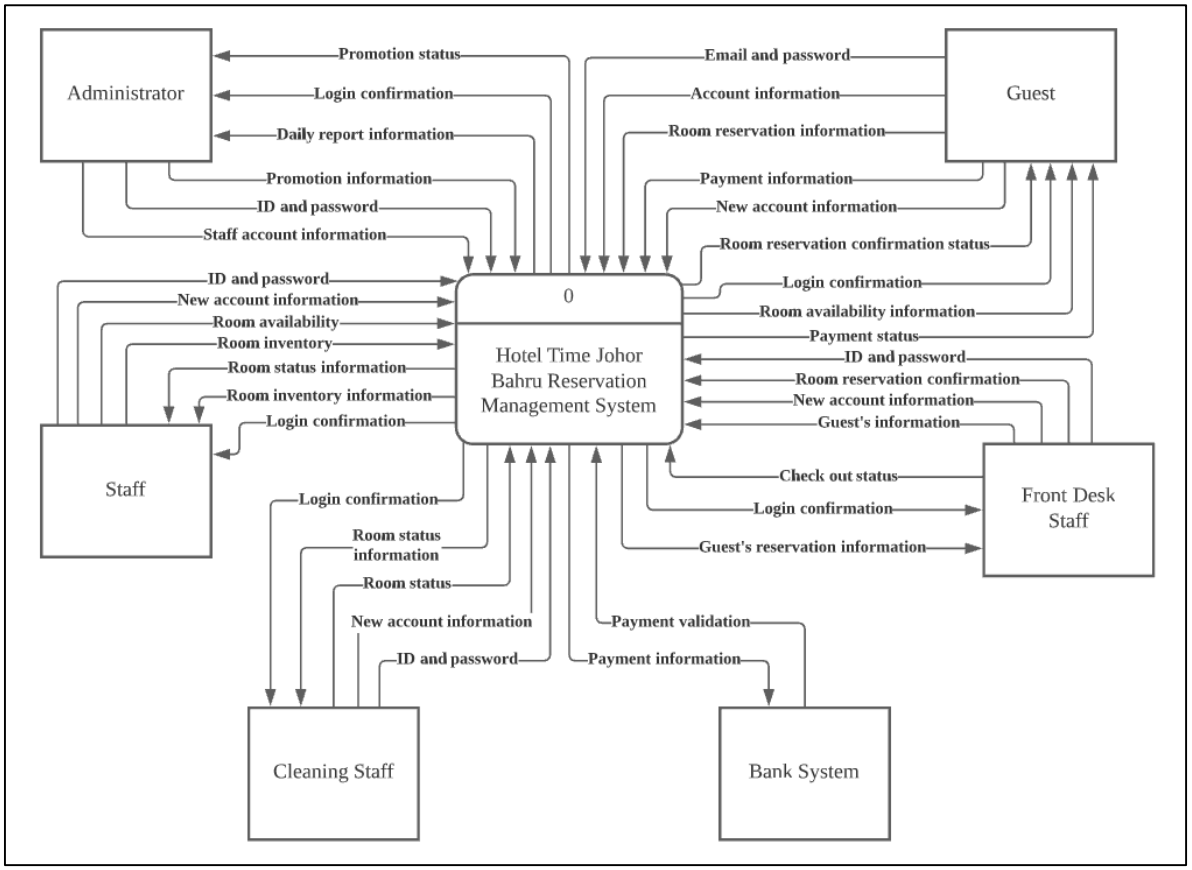

Figure 4: Context Diagram (CD).

Based on Figure 4, there are six (6) external entities in the CD, which five out of six external entities are the end users of the developed system, administrator, guest, front desk staff, staff, and cleaning staff, and the last external entity is bank system.

4.4.2 Data Flow Diagram Level 0 (DFD 0)

A Data Flow Diagram Level 0 (DFD 0) illustrates the overall data flows between the entities, main processes and the data stores. It is a decomposition view of the Context Diagram. Figure 5 shows the Data Flow Diagram Level 0 (DFD 0) of the developed system.

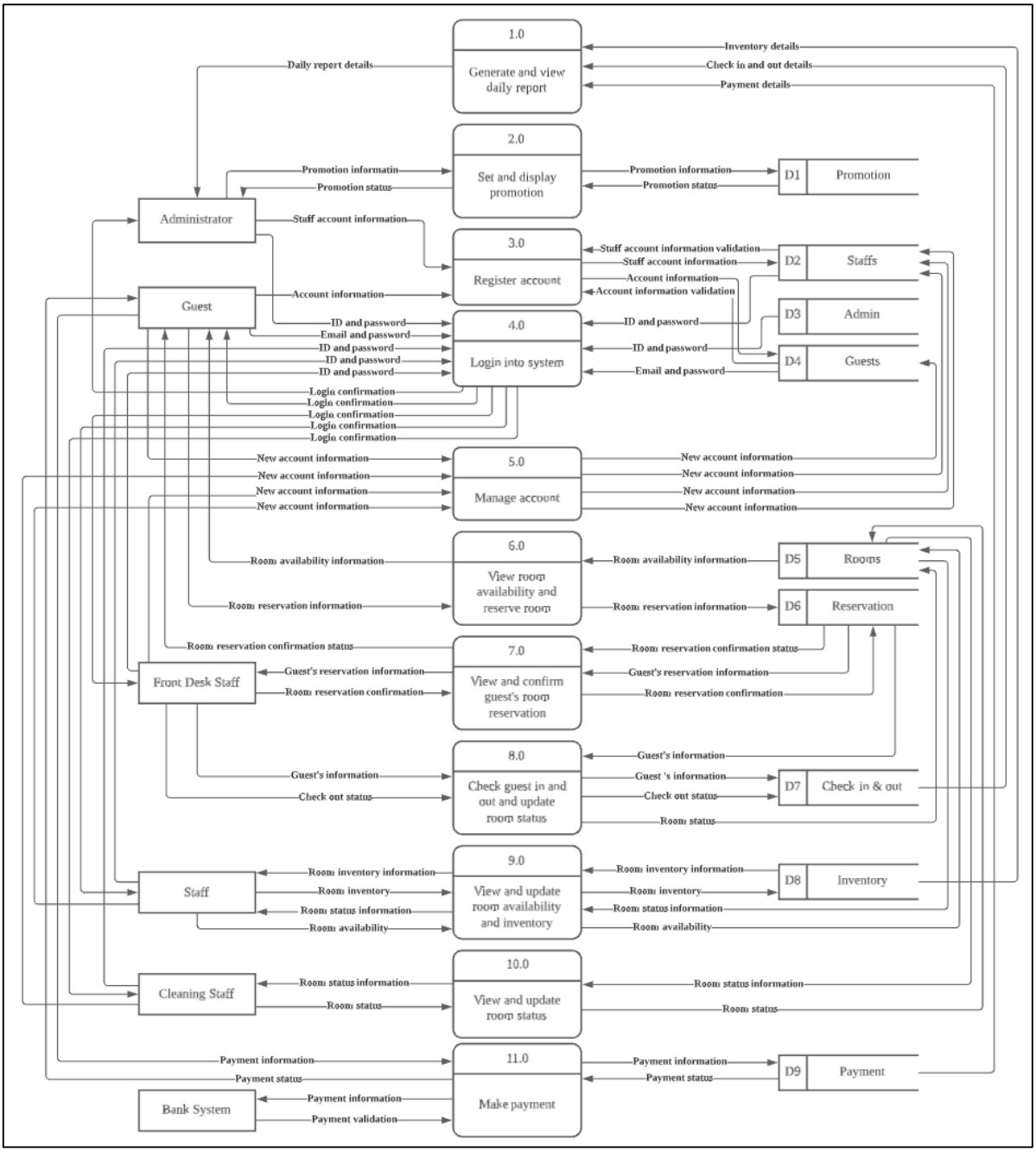

Figure 5: Data Flow Diagram Level 0 (DFD 0).

Based on Figure 5, there are six (6) external entities, ten (10) main processes, and nine (9) data stores in the DFD 0. The six external entities are administrator, guest, front desk staff, staff, cleaning staff, and bank. The ten main processes are generate and view daily report, set and display promotion, register account, login into system, view room availability and reserve room, view and confirm guest's room reservation, check guest in and out and update room status, view and update room availability and inventory, view and update room status, and make payment. The nine data stores are promotion, staffs, admin, guests, rooms, reservation, check in and out, inventory, and payment.

4.4.3 Entity Relationship Diagram (ERD)

An ERD illustrates the relationship between the entities stored in the database. It shows how the data in each entities connect to each other. Figure 6 shows the ERD of the developed system.

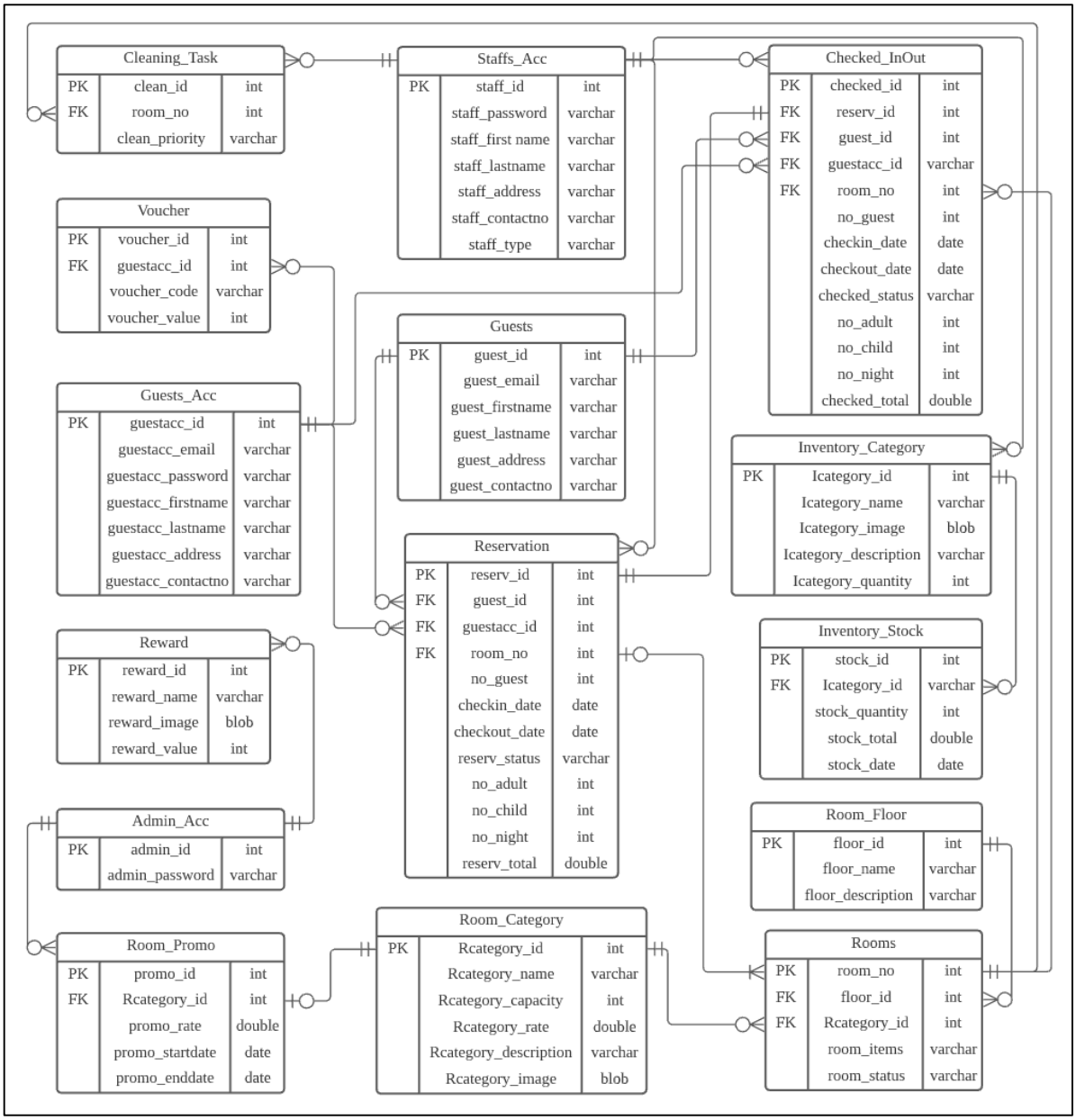

Figure 6: Entity Relationship Diagram (ERD).

Based on Figure 6, there are fifteen (15) entities in the ERD which are `Guests`, `Guests_Acc`, `Admin_Acc`, `Staff_Acc`, `Reservation`, `Rooms`, `Room_Category`, `Room_Floor`, `Room_Promo`, `Checked_InOut`, `Inventory_Category`, `Inventory_Stock`, `Cleaning_Task`, `Reward` and `Voucher`. Each of the entity has their own attributes which describe the components should be appeared in the developed system and the relationship shows how two or more entities related to one another.

4.5 System Design

System Design is a process of defining the elements of the system like modules, architecture, components and their interfaces and data based on the specified requirements for the developed system. After all the users' requirements were successfully analysed in the analysis phase, the project then proceed with the design phase. In this phase, both interface and database had been designed in order to help visualize the system before proceed with the system implementation. Two sections are described in this phase which are flowchart and interface design. These sections will fully describe the workflow of the system and the interface design for the developed system.

4.5.1 Flowchart

A flow chart is a type of diagram that represents a workflow or process. Each of the flowchart explains how each end user performs their own activities through the developed system. The workflows of each end user is visually by the flowcharts so that the architectural of the developed system is easy to understand. The flowchart for guest view room availability and reserve room process is shown in Figure 7 in the **Appendix A**.

4.5.2 Interface Design

Interface design provides roughly user interfaces that will be implemented into the developed system later. It provides a shape of how a developed system will be looked like. Figure for check room availability interface of developed system and figure for confirm reservation interface of developed system are shown in Figure 8 and Figure 9 in the **Appendix B**.

5. Testing

Testing is a process of verifying the developed system that meets the user requirements without happen any errors or bugs. In this phase, all the modules or functions in the system are tested one by one. It is required to verify that all the functions in the system are performed correctly according to the system design. There are two types of testing performed in this project, unit testing and user acceptance testing which described in following subsections.

5.1 Unit Testing

Unit testing is performed to ensure that all the units in the system are working correctly according to the system design without any errors or bugs. There are total of 144 test cases have been established in this testing. Table 7 and Table 8 shows the test reports for login module in hotel reservation system and hotel management system respectively.

Table 7: Test report for Login Module in hotel reservation system.

No	Test Cases	Expected Output	Actual Output
1	Click "Login" button without fill in any input field.	The system displays "Please fill out this field" message.	As expected output.
2	Click "Login" button without fill in one of the input field.	The system displays "Please fill out this field" message.	As expected output.
3	Enter correct email and password.	Login successfully.	As expected output.
4	Enter correct email and incorrect password.	Login fail.	As expected output.
5	Enter incorrect email and correct password.	Login fail.	As expected output.

Table 8: Test report for Login Module in hotel management system.

No	Test Cases	Expected Output	Actual Output
1	Click "Login" button without fill in any input field.	The system displays "Please fill out this field" message.	As expected output.
2	Click "Login" button without fill in one of the input field.	The system displays "Please fill out this field" message.	As expected output.
3	Enter correct staff ID and password.	Login successfully.	As expected output.
4	Enter correct staff ID and incorrect password.	Login fail.	As expected output.
5	Enter incorrect staff ID and correct password.	Login fail.	As expected output.

5.2 User Acceptance Testing

User acceptance testing was conducted in Hotel Time Johor Bahru at Johor Bahru, Johor by using questionnaire form. The end users consist of hotel manager, hotel staffs and the guest existing in the hotel at that time. There are total of five end users who took the user acceptance test. The five end users are one hotel manager, one front desk staff, one staff, one cleaning staff, and one existing guest during that time. Comments and feedbacks from the user acceptance testing are gathered and adopted to improve the system in the future. The feedback in questionnaire form for hotel manager has shown in **Appendix C**.

6. Conclusion

In conclusion, Hotel Time Johor Bahru Reservation Management System is a web-based system that helps hoteliers to manage their hotel more efficiency and also provides convenient path for guests to reserve the hotel's room based on their time and needs. By having this system, the hoteliers also can save a lot of money since the hoteliers will only simply pay the license cost for the software rather than having to pay commission to the third-party booking portal every time a customer places a reservation. However, there is a system disadvantage in the developed system which is the system does not include the channel manager which able to connect the system to the third-party booking portals. By this, the data between the system and third-party booking portals are unable to update synchronously during guest reservation or updating room availability, which may lead to the overbooking issues. For the future system development, the system can be improved by inserting the channel manager into the system which able to connect the system with the third-party booking portals in order to update data synchronously between them. Last but not least, the system can be implemented in application based or adding more recommended features in order to increase the system efficiency such as meal management or group reservation management.

Acknowledgement

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Appendix A

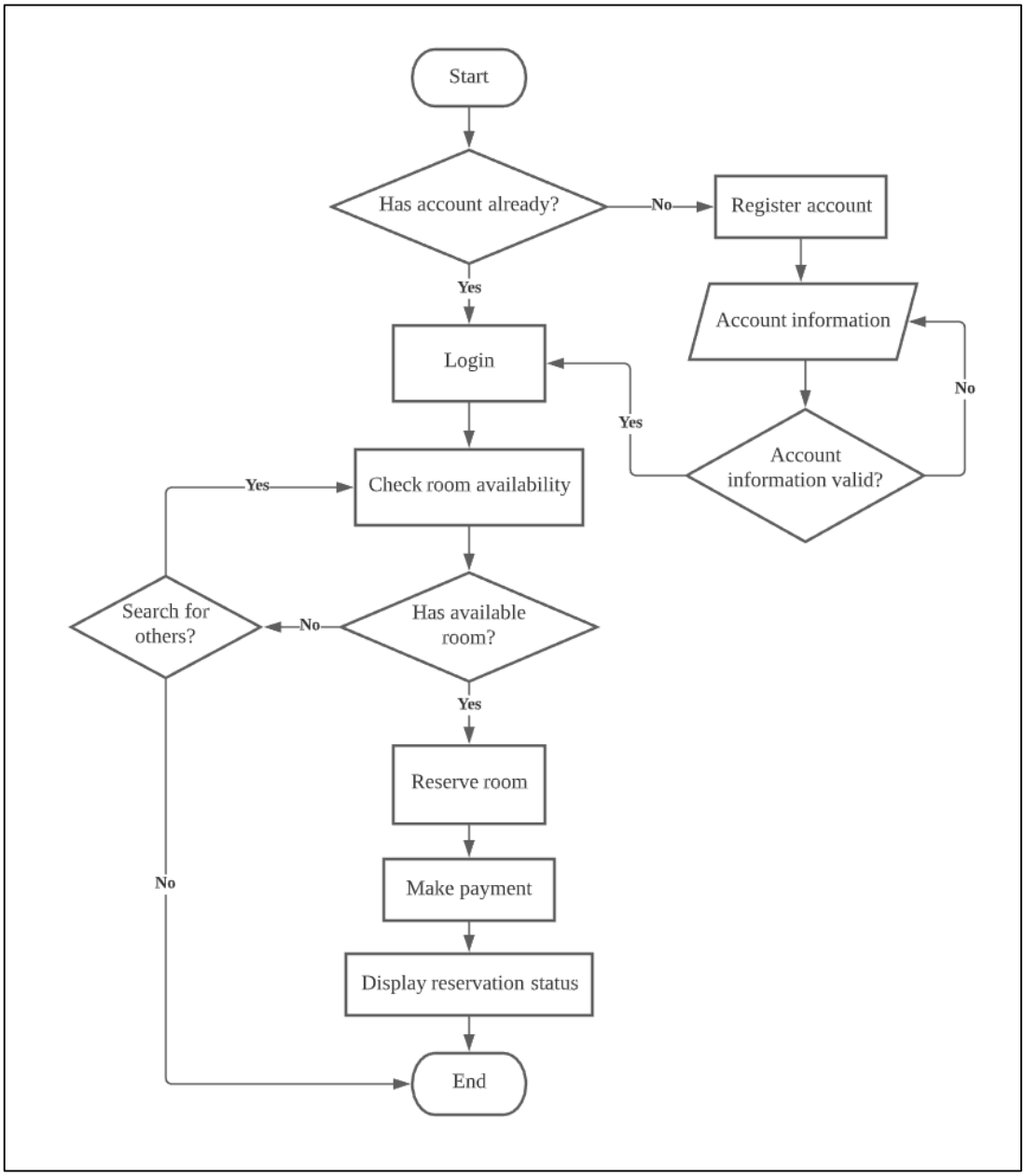

Figure 7: Flowchart for Guest view room availability and reserve room process.

Appendix B

Figure 8: Check Room Availability Interface of Developed System

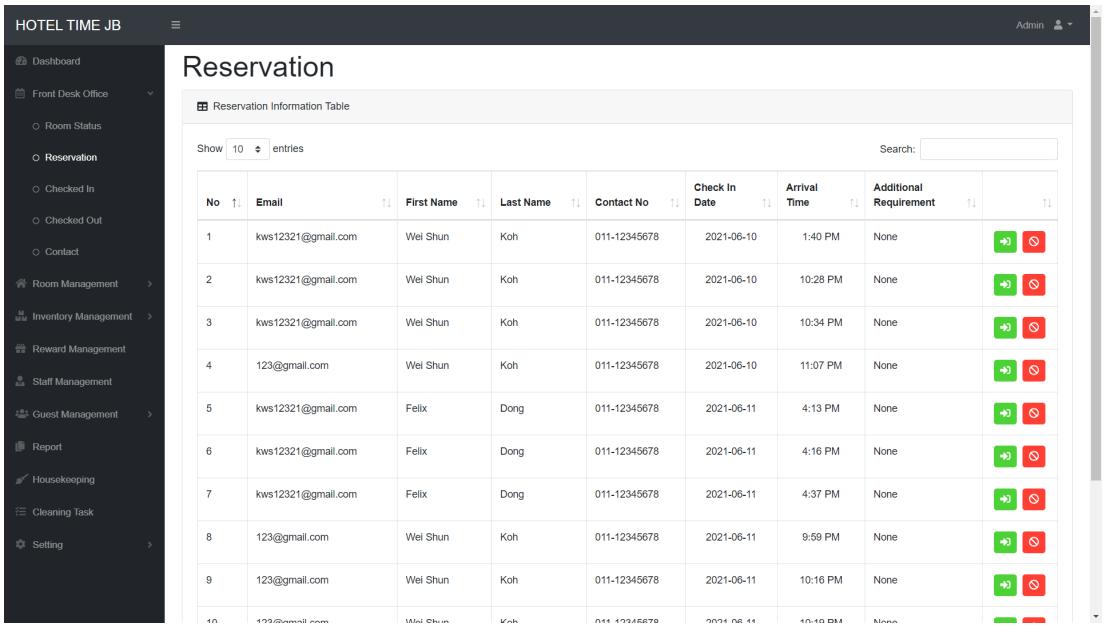

Figure 9: Confirm Reservation Interface of Developed System

Appendix C

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Hotel Time Johor Bahru Reservation Management System

User Acceptance Testing Form

Purpose: To test the developed prototype system to ensure that the system meets the requirements and evaluate the level of user acceptance.

For Hotel Manager

1 = Very Dissatisfied
2 = Dissatisfied
3 = Neutral
4 = Satisfied
5 = Very Satisfied

Please rank the following questions based on the scale provided.

No	Features	Rate
1	Overall interface design in hotel management system.	4
2	All functions in hotel management system.	4

References

[1] M. Bedard, "New Trends in CRS and PMS – Amadeus," Amadeus Hospitality, Jun 2019. [Online]. Available: https://www.amadeus-hospitality.com/insight/new-trends-crs-pms/. [Accessed November 13, 2020].

[2] R. Bemile, A. Achampong and E. Danquah, "Online Hotel Reservation System," International Journal of Innovative Science, vol. 1, Nov. 2014. [Online]. Available:

https://www.researchgate.net/publication/274079295_Online_Hotel_Reservation_System. [Accessed November 13, 2020].

[3] M. Judd and A. Guillot, "What is a CRS? (Central Reservation System)," Hotel Tech Report, Sep. 2020. [Online]. Available: https://hoteltechreport.com/news/what-is-a-crs. [Accessed November 13, 2020].

[4] H. M. Moyeemudin, S. J. Parvez, R. Anandan and K. Narayanan, "Data Management with PMS in Hotel Industry," International Journal of Engineering & Technology, vol 7, pp. 327-330, April 2018, doi: 10.14419/ijet.v7i2.21.12396. [Accessed November 14, 2020].

[5] Altexsoft, "Hotel Property Management Systems: Products and Features," Feb. 2020. [Online]. Available: https://www.altexsoft.com/blog/travel/hotel-property-management-systems-products-and-features/. [Accessed November 14, 2020].

[6] S. Brodows, "Should Your Inventory Be Managed Through the PMS or the CRS?", June 2006. [Online].Available:https://www.hospitalityupgrade.com/_magazine/magazine_Detail.asp/?ID=6. [Accessed November 15, 2020].

[7] C. Kambala, "The Benefits of Web-Based Application for Business," Aezion, Dec. 2020. [Online]. Available: https://www.aezion.com/2018/10/13/web-based-systems-benefits/. [Accessed November 15, 2020].

[8] A. Schade, "Responsive Web Design (RWD) and User Experience," Mobile & Tablet, Web Usability, May 2014. [Online]. Available: https://www.nngroup.com/articles/responsive-web-design-definition/. [Accessed November 15, 2020].

[9] Googolplex, "Glex Hotel Reservation System", 2013. [Online]. Available: http://book.glexhotel.com.my/jb/signature/. [Accessed November 16, 2020].

[10] M. Ozsu, "innRoad Property Management System", 2007. [Online]. Available: https://info.innroad.com/property-management-system. [Accessed November 16, 2020].

[11] R. Castle and A. Harris, "Cloudbeds Property Management System", 2012. [Online]. Available: https://www.cloudbeds.com/property-management-system/. [Accessed November 16, 2020].

[12] E. Grierson, L. Brearley, and T. Hamm, Creative arts research: narratives of methodologies and practices. Rotterdam, The Netherlands: Sense Publishers, 2009.

[13] Y. Bassil, "A Simulation Model for the Waterfall Software Development Life Cycle," International Journal of Engineering & Technology, vol. 2, no. 5, 2012. [Online]. Available: https://arxiv.org/pdf/1205.6904. [Accessed December 4, 2020].

[14] UKEssays, "The History Of The Waterfall Model Information Technology Essay", Nov. 2018. [Online]. Available: https://www.ukessays.com/essays/information-technology/the-history-of-the-waterfall-model-information-technology-essay.php?vref=1. [Accessed December 4, 2020].

[15] A. Dennis, R. M. Roth, and B. H. Wixom, System Analysis and Design, Fifth Edition. John Wiley & Sons, 2012.