System Analysis and Design of Hotel Information System using Design Thinking Methodology

Maria Shaina A. Apolinar, Michael Matthew Kristofer B. Regala, and Janelle Anne I. Santiago, Grace Lorraine D. Intal
School of Information Technology
Mapua University
1191 Pablo Ocampo Sr. Ext, Makati, Metro Manila, PH
msaapolinar@mymail.mapua.edu, mkbregala@mymail.mapua.edu.ph,
jaisantiago@mymail.mapua.edu.ph, gldintal@mapua.edu.ph

Abstract

The Philippines is one of the world's most well-known tourist destinations, with hotels and services located all over the country. Due to the current pandemic crisis's demands, hotel management's current system has struggled to keep up with the new normal, resulting in significant changes and the loss of some business scope and profit. The researchers used design thinking to empathize with the people, identify the problem, and create solutions that resolved the difficulties and customer experience at the hotels. In conducting the methodology, there was a significance related to health limitations and mandated protocols, manual registration, waiting time, a shortage of staff and workloads, customer satisfaction, and advertising, which were the most prevalent difficulties in the current manual process of hotels and most of the computerized hotel systems that were experienced by using the first design thinking method, Empathize. The researchers utilized Personas, Points of View (POVs), and How Might We (HMWs) to identify the results through the problems and needs from the general idea of the empathizing method. The results of using the design thinking methodology were having an improved system with an efficient database and information systems design regarding hotel management with the emergence of compliance on health protocols and requirements, lessened waiting time, efficient workplace, customer satisfaction, and effective advertisement were attained. Therefore, the researchers conducted system planning, analysis, and design by addressing challenges in developing functionality design into the User Interface, aided by reports and interviews with hotel employees and customers.

Keywords

Automated System, Hotel Reservation, Database, User Interface, Guest Satisfaction

1. Introduction

Tourism plays a significant role in a country's economy, specifically in the Philippines which the hotel management contributes vastly to the tourism and business industry. It has a significant economic impact, as many hotels in every part of the Philippines cope with human processing rather than automated processing because, before the pandemic, it was still manageable even without automation. However, there were times when they were inconsistent with their employees regarding trends and preferences emerging through the clients. As customers seek comfort and security similar to their homes in their chosen hotels, it also affects a management system's performance which later on affects the ability of the country to compete in regards to businesses and tourism. As a result, to keep up with their fast-paced lives, customers must demand continuous improvements in the quality of the hotel management system and hotel services such as room reservations. Emerging hotel trends and client preferences significantly impact the ever-changing community, such as the emergence of a pandemic, which completely changes the perception of the need for an automated system for streamlining internal and external processes. Automation is beneficial not only for creating features but also for all activities involved in the hotel management system, which can enhance the Philippines' economy if given the priority and application shown in other nations. A factor of an automated management system is the exploration of possibilities on how other countries can increase tourism and advance their economies, such as system software for internal productivity, artificial intelligence, environmental sustainability, mobile-friendly, guest preferences and reviews, and time-efficiency. The researchers have chosen the hotel management system to restore tourism, support entrepreneurs and business persons, and boost economies that have been greatly influenced negatively by the pandemic. Researchers plan to integrate technology with hotels to automate and provide an efficient

system that attracts tourists and clients for that to happen. This paper aims to use design thinking methods to analyze the current system, identify needs and opportunities while developing hotel management processes, and create a better design to implement the system.

1.1 Objectives

- To investigate the fundamental causes of poor performance and client dissatisfaction with the Philippines' present hotel management systems.
- To assess the pain points' impact and identify the hotel management's and clients' needs and opportunities.
- To develop a better system design appropriate to the difficulties that arise before and during the pandemic.

2. Literature Review

According to Cobanoglu et al. (2011), Hotels frequently use technology as a value-added service to help differentiate themselves and improve client happiness. It explains why technology and automation are so crucial in hotels. The study examines hotel guest satisfaction utilizing a web-based and internet-based electronic guest feedback system. Furthermore, Prasad et al. (2014) studied hotel management by focusing on the components of the visitor experience that are most important in generating satisfaction ratings. Management implications include using web-based technology to improve satisfaction with hotel operations. The findings reveal that guest ratings of staff service quality, guest room quality, security, and service difficulties directly influence value, contentment, and the intention to return and refer. Hotel management greatly benefits directly from the automation of hotel processes and system (Phillips, 1984). Since the pandemic started, it plumbed down the hotel management system as a business which COVID-19 is a reason to risk disadvantages in the workforce and the system. Withholding the adjustments, it indeed made a significant change transforming many businesses into automated systems, yet insufficient need by the guidance of system analysts and designers. To contain the spread of COVID-19, Nakamoto et al. (2020) discussed a pandemic management system based on symptom-based quick response (QR) codes. In this approach, public health authorities generate QR health codes depending on symptoms. QR codes have been formally accepted as electronic health certificates. Contact tracking, exposure risk, self-update, health care visits, and contact-free consultations are now used by a few local governments. This method reduces human mistakes and the expenses of a lack of coordination. It also improves containment measures' promptness, interoperability, trustworthiness, and traceability, which has aided government agencies in achieving successful containment and travel control. COVID-19 can be contained for a long time thanks to the design's credibility, interoperability, and long-term viability.

Modularize the system and various needs using a feasibility study, then assess, examine, and provide a basic introduction. The logical framework is subsequently applied to each module's function. The management system's database architecture provides a theoretical basis for implementing the system. This approach of management is practical. Heavy computations are not rigid and organized, which is a fault in modern operating systems. Workload, data transfer, management statistics, boosting the hotels' competitiveness are inefficient and prone to errors. The fundamental goal of hotel management information is to keep track of everything in the hotel. The requirements for vast volumes of information data are required to store and handle enormous amounts of data. As a result, creating suitable data structures and databases can simplify the entire system. One of the most demanding challenges is effectively maintaining the needed data—the most important metrics for assessing a hotel's management. A sound information design system and data structure should reflect data accurately in changing circumstances comply with all regulatory duties at all levels of the business. It should be easy, quick, and handy to work on successful system development (Guo & Lu, 2014).

As stated, the researchers' goal was to learn more about automated hotel management systems and apply technology to tackle some of the challenges during hotel management's manual operations. Finding a place to stay or a hotel after arriving at a particular location is time-consuming and efficient to customer's demand. The ability to book a hotel stay over the internet is an excellent advantage, allowing travelers to book a hotel anywhere globally based on their preferences and interests with convenience and ease that look ahead over the internet as a remarkable advantage of the automated system. Furthermore, booking a hotel online is not only quick and simple, but it is also cost-effective. Online Computerized Hotel Management System (2014) "Websites allows customers to look around and see what services and amenities they have to offer. Users prefer online hotel management to traditional hotel management services in terms of ease of use, accessibility, and security in the research region."

3. Methodology

The design thinking methodology has been proven effective already in other research studies. According to Suzianti et al. (2020) from their case study entitled, "User Interface of Zakat Information System Redesign using Design Thinking Approach," the stages in the design thinking provides the most suitable solutions to the current problems that enable to meet the needs of the users in the system. This approach focused on upgrading the existing information system that has not been optimized yet. Another study from Altman et al. (2018), known as "Peer-reviewed: Design thinking in health care," states that design thinking results in sustainable processes in their system (health care) as they were able to increase their focus on the needs of the patients and the health care workers. The researchers analyzed all users in the system in applying the design thinking methods, and the data gathering methods include interviews and surveys.

4. Analysis of Current Situation

Empathize is the first design thinking method, and it allows researchers to maximize the use of personas, POVs, and HMWs in the analysis to solve the needs and challenges of current hotel management systems, allowing researchers to identify pain points and connect HMWs based on the functionalities of the proposed system.

4.1 Identification of Needs/Problems with Personas

Persona 1: As the manager of a hotel, he is concerned that the hotel's services may suffer, which results in reduced clients and low finances. The hotel manager needs to entice more hotel customers to boost their finances because the pandemic has made people anxious about going out. Also, with the pandemic, the fees for hotel services increase, so customers cannot afford the new prices. So, the questions arise. How might we make the customers loyal to the hotel? How might we use the pandemic to provide more support to the guests?

Persona 2: This hotel guest thinks that the hotel's work methods and customer service remain inefficient. As a concerned hotel customer, she requires fast and secured hotel services with affordable pricing. From this situation, how might we reduce the time filling up forms and papers in the check-in and check-out of the hotel? How might we advertise other automated hotels so that the demand for that hotel increases?

Persona 3: As a hotel employee who strives to provide excellent service to his customers while afflicted by the pandemic, he is terrified that he will lose his job due to the hotel's financial difficulties. In the interview, he mentioned that their services are delayed due to the lack of workforce at the hotel. He needs a way to serve more customers efficiently since the hotel fired other employees, resulting in delayed services, so how might we accommodate the guests effectively?

Persona 4: This hotel supervisor is in charge of the housekeeping department and he is concerned about the pandemic's impact on his workplace. As a strict housekeeping supervisor, he needs to supervise the housekeeping effectively so his employees would not lose their jobs and they cannot attract guests due to the pandemic. With that, how might we use the pandemic to innovate the housekeeping management in the hotel? How might we keep the guests entertained?

Persona 5: Another hotel guest frequently books a hotel room and he is worried about the hotel's security regarding his information to the front desk to process his reservation and check-in. He is also irritated when the hotel's manual processes take up his time because he has appointments. As an engineer who meets with his clients, he needs to be in a clean, secured hotel and has fast services so that his time would not be consumed much by hotel processes. For this persona, how might we ensure safety for the data of the hotel guests?

4.2 Flowchart of Current Process

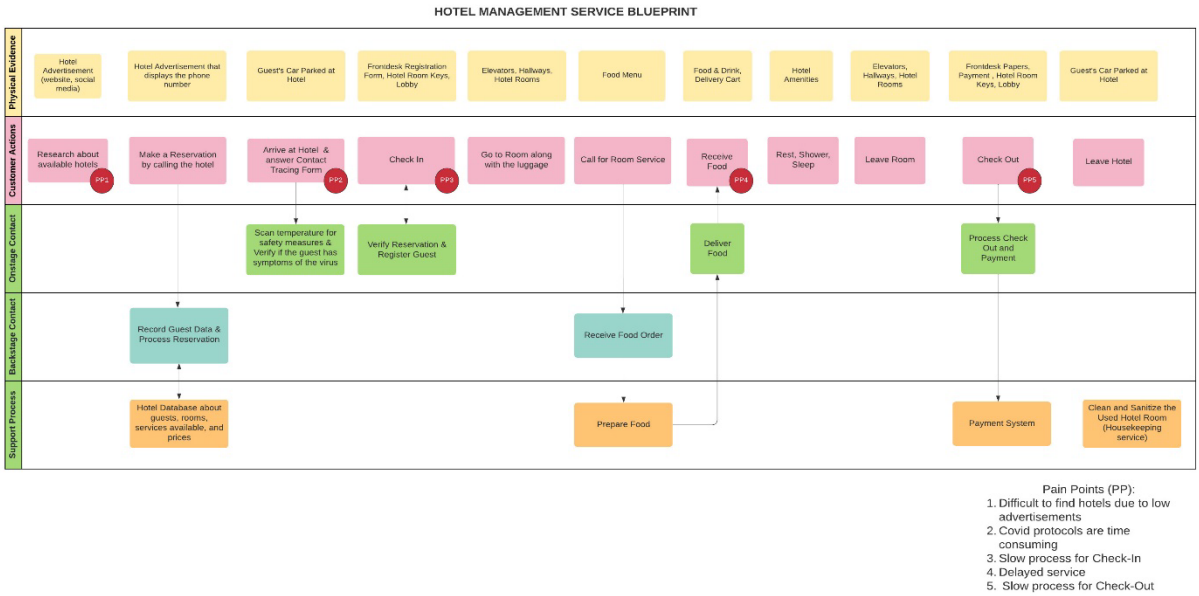

Figure 1. Current Process for Hotel Service Blueprint

DAS Solutions (2020) “To attract customers more; the booking process should be simple, user-friendly and smooth for the users to easily understand the interface”. The Hotel Management System begins with the customer looking for available hotels within the desired area that satisfies them. It has been a problem for both the customer and the hotels themselves since other hotels cannot advertise their services and offer due to the lack of finances and guests brought by the pandemic that also lowers the customer rate. In this pandemic we cannot always expect things to go as smooth as we planned, resulting to several no shows that could potentially mess up the income that the hotel acquires. Asenova (2018). As said by one of the interviewees, it is frustrating for him that they cannot attract more guests. It is time-consuming for the customer, but when the client can look for one, they will book a hotel room directly by calling the hotel. “Handling the booking service manually could take an awful lot of time”. Mirani S. (2021). The staff would record the client's data in the hotel database, and the staff would also present the available rooms, services, and prices to the customer. The employee would also process the reservation in the hotel system. Any effort being made in hotels leads to customer satisfaction (Patel et al, 2014) (Figure 1). A contact tracing form will be given for safety measures during the pandemic as the guest arrives at the hotel. It will record the arrival time, and the staff will scan them for the temperature to check whether the guest has symptoms of the virus. This process for safety is also time-consuming from the perspective of the client. The current process of the hotel includes manual verification of the reservation, which slows down the guest from entering their booked room because people expect that after the reservation, all they must do is get the hotel room key and rest. After processing them, the guests go to the hotel room and their luggage. Clients must not let other people hold their stuff for safety purposes to avoid spreading the virus. Then, the guest would call for room service to order food and drink. Hotel staff would receive the order, prepare the food, and deliver it to the guest's room. It is also a problem when the delivery gets delayed since only a few employees are left in the hotel (based on the interview). According to Lacalle (2021), “Understanding the customer by his/her buying patterns can help build a more sustainable relationship”. The hotel can better help their customers with their service by providing a survey in premises to also better understand their customers in what they would appreciate with the hotels’ service. The guest can now enjoy the hotel room until they leave. Before leaving the hotel, the guest should check out first, give back the hotel room key, and proceed with the payment. The front desk staff would process the payment for the hotel room plus the services. It will be recorded in the payment system of the hotel. It is included in the pain points since this manual process prolongs the guests from leaving the hotel. When the guest pays the hotel, employees will clean and sanitize the used hotel room so other guests can avail the room.

5. System Design

5.1 Proposed System Design

One of the techniques and strategies utilized by researchers in system design is the use case diagram. The use case diagram is a graphic representation of interactions between numerous system components and a visual description of a system's and its users' details. It is a method for identifying, clarifying, and arranging hotel management proposed system requirements that serve as a guide for the system design (figure 2).

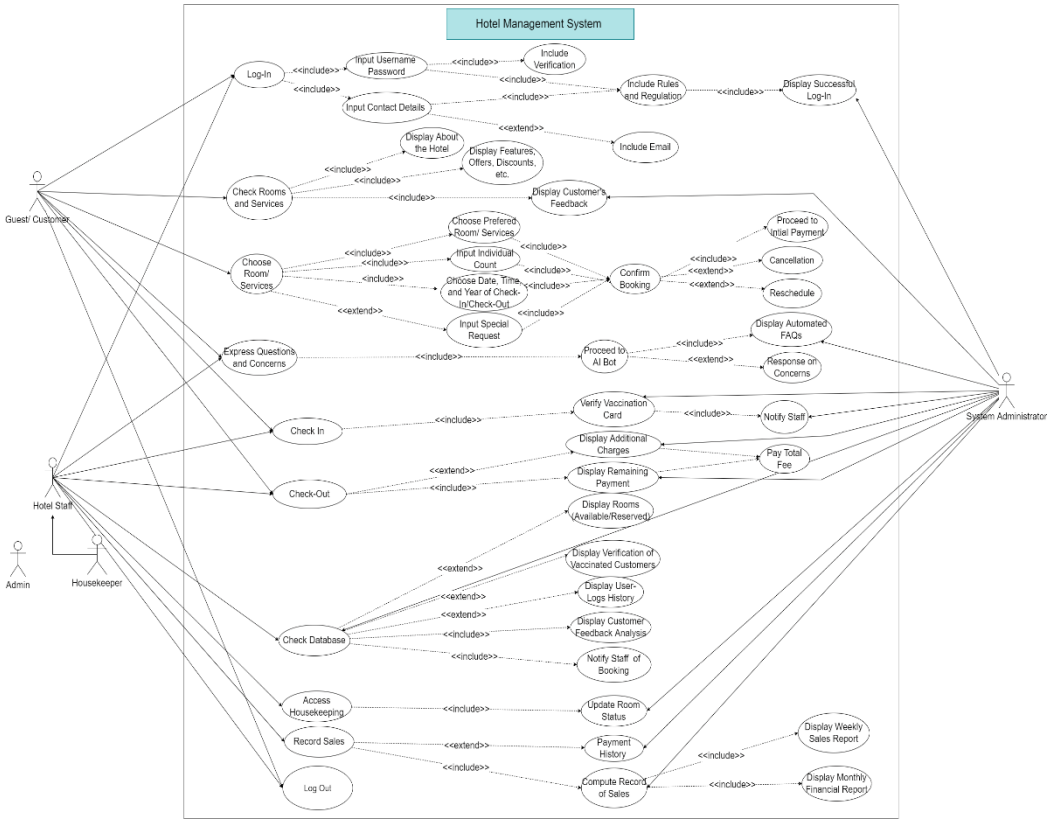

Figure 2. Proposed Use Case Diagram for Hotel System

The key actors in the figure are the guests/customers and the hotel employees, whom the generalization terms admin and housekeeper represent—also, the system administrator, who is a secondary actor. The design process has a main page that contains functionalities as follows: The Home Page Display serve as the central location of all directories from all other functionalities. First, Log-In includes entering contact information, which there is a functionality that is an extended use case for an email input was for newsletter, promotions, discounts, vouchers directed to their emails. However, the user may accept or reject the offer, yet on the homepage, even without signing up, can view those offers as well. Second, the Check Rooms and Services could display and book rooms and provide information about the hotel features, vouchers or promotions, and customer comments, which is a functionality that has central access for ease of use. Third, Choose Room and Services was a functionality with up-to-date booking and guest preference. Select preferred rooms or services, individual count (if there were an extra person for the maximum room limit, there would be additional charges and resources), and select a check-in and check-out date, time, and year. The reservation was another functionality made convenient for customers. They can choose hotel booking or service booking (such as spa, massage, swimming, gym, restaurant). It allows the hotel to profit from their other services instead of only from hotel rooms and guests. The advantage is that even though the hotel room may be complete, the other fully booked services can accommodate limited people, yet compromising. The special request is functionality that satisfies the customer's optional demand which is extended, then alerts housekeeping real-time before check-in. Following the input, a confirmation of booking will appear, including an initial payment online using PayMaya, GCash, or Credit Card. There are flexible cancellations and reschedule of customers' bookings which is extended can be optional through the Automated Bot to address their concerns. Fourth, Express Questions and Concerns would be an innovative

functionality answered by an automated bot in a chat type interaction, which may present automated frequently asked questions or, in the event of concerns, would be provided manually by an admin which optional in the system, but directed by an automated bot. Fifth, Check-In provides a method for confirming immunization cards by QR code which is also functionality for safety, health, and mandated protocols. It will alert personnel to direct guests to their rooms or other amenities. Sixth, Check-Out would display the total amount due, including any additional charges, from the remaining and initial payments. Finally, Check Database might hold critical information that the hotel could use as a value-added service, such as room availability or reservations for walk-in clients. On the other hand, it saves essential information in specific cases, such as user logs history in case of anomalous system access, which would help address significant concerns. There was a function that documented clients who had been verified of certification of complete vaccination. There was also a feature that captured customer input, preferences, and problem analysis, which would help the hotel handle concerns and develop ideas. Also, it notifies the housekeeper in real-time without a radio because the housekeeper has access to the system, which is the housekeeping management capable of checking the status of the room by the check-in and check-out of the customers. Eighth, Access Housekeeping was a significant element in inspecting and sterilizing the room before the customer's arrival, allowing for a flexible workspace. Ninth, Record Sales was the recording of which the accountant, finance, and HR would be held responsible for payment history, a computed record of sales with a weekly sales report, and a monthly financial report backed up by cloud-based storage. After all, Log Out is a vital aspect of security since it protects the current user's access and prevents unauthorized actions. These features are simple to use and may decrease redundancy, work delays, and waiting time (Figure 3).

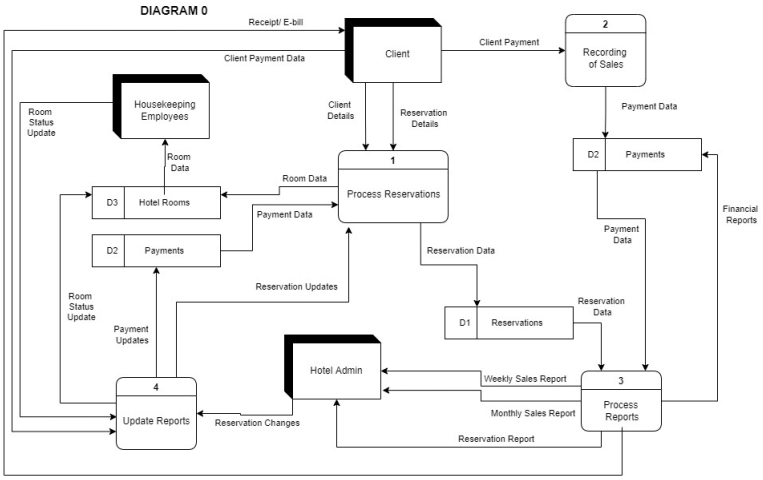

Figure 3. Diagram 0 DFD of Hotel System

The DFD was used to recognize the processes of various functionality. As shown in the diagram, there are four processes in the hotel system design: Process Reservations, Recording of Sales, Process Reports, and Update Reports. Each receives input from external entities such as clients, hotel admin, and housekeeping employees to produce corresponding outputs to make the system effective. It is significant to the paper to determine the flow of the data input and data output of the processes in the system.

5.2 System User Interface

The user interface's challenge is to create a more straightforward solution for clients to organize travels from home while reducing physical contact. Since the pandemic, being automated has become increasingly vital and relevant. The researchers designed this user-friendly and secured UI so that the clients would not have trouble scrolling through pages and risk revealing personal information to untrustworthy services (Figure 4).

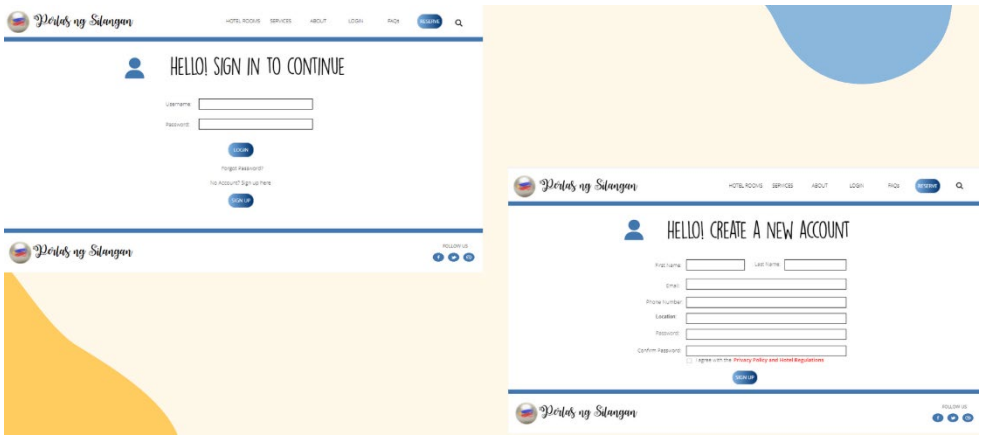

Figure 4. UI Log-in/Sign up

The customer or admin can access their account in the system by logging in. The customer can also register for an account to reserve their preferred hotel (Figure 5).

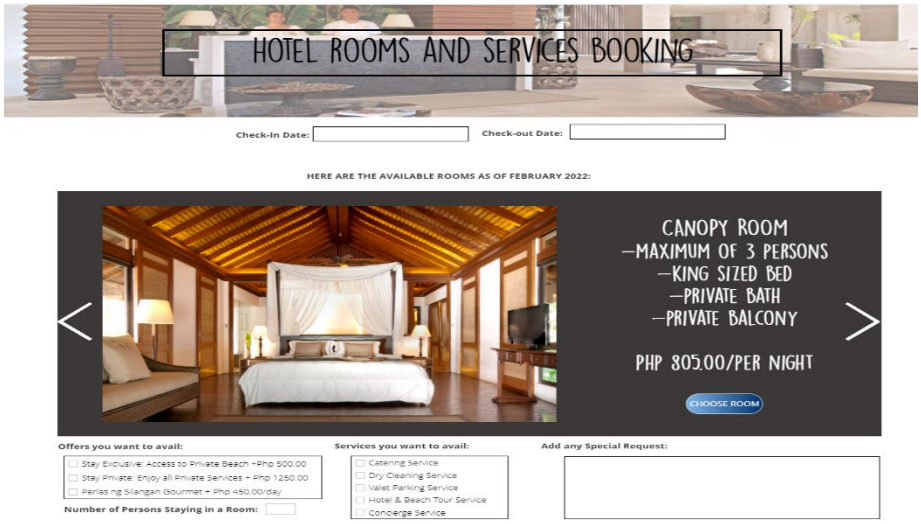

Figure 5. Booking page

The customer can now select from a variety of available rooms. The system will lead them to the pre-receipt or confirmation page once they've settled on a date and room. They have the option to cancel, reschedule, or continue to pay for the lodging they have reserved (Figure 6).

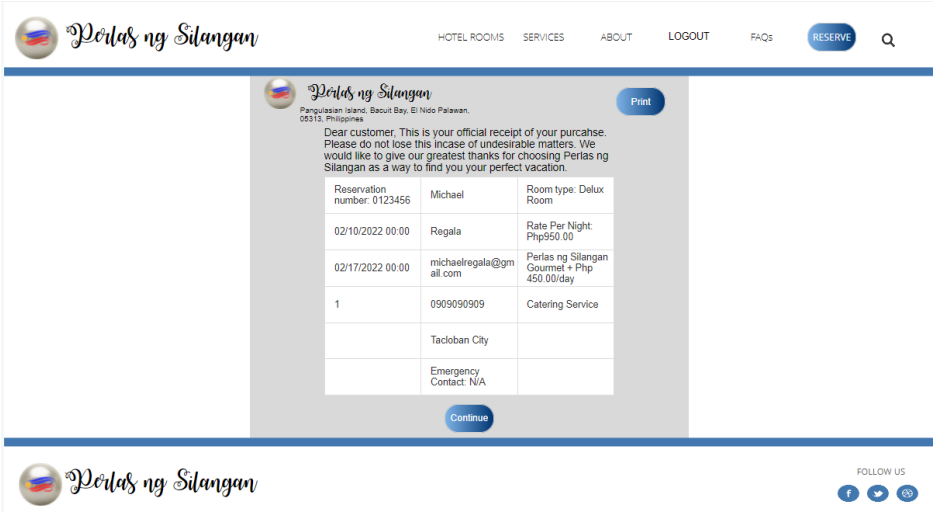

Figure 6. Customer Receipt

After the customer has made their decision, the system will take them to the payment page, where they can pay using digital money such as GCash, PayMaya, or a Credit Card. The customer will receive confirmation from the hotel that their payment has been received after they have selected a payment option. Then, they would be directed to the receipt page by the system.

6. System Evaluation

Many hotels do not have a proper automated system based on their operations. Many manual processes take time, and people at the front desk occasionally make simple mistakes that waste time. Customers are particularly wary of handwritten information because it might be easily misplaced. Another pointless requirement is that the customer waits for another 10 to 20 minutes after completing the registration form. Customers would not have to wait or return to the hotel if we implemented our proposed solution because we created a simple system to use and accessible to adults. In our proposed system, we have provided a secure and trusted system so that customers' personal information, where they live, and their payment information, are kept safe. The system also includes an easy-to-understand interface so that clients may use it without difficulty. It can also make special requests, such as groceries or extra beds, so they do not have to go through the walking to the front desk, especially since we are in the middle of a pandemic. Customers might choose to pay with digital money, such as the use of Gcash, via Card, or Paymaya, so that it would not be a problem for them to go outside their own homes. Because we are amid the pandemic, our primary concern is the safety of our customers and employees. Because health is our top priority right now, there should be limited or much better avoiding any physical contact with many people. This health protocol is highly implemented by both our personnel and our consumers.

7. Conclusion

The customers, employees, and owners continuously demand improvements on their current system, mainly due to the pandemic that forces them to adjust and work on changes that would not affect their profit, satisfy the customers, and maximize the workforce. The researchers chose the hotel management system to aid in restoring tourism, supporting businesses and business people and strengthening the pandemic's economies. To do this, researchers plan to focus on identifying gaps and possibilities while establishing hotel management processes and improving the system's design. The researchers concluded that the design thinking methodology aided them in recognizing the problem and solving it by planning to create a design for a proposed system. It challenges assumptions to create innovative functionalities relevant to the beneficiaries' demands. The method relies on how people interact with their environment, what might be the situation today, such as a pandemic, and how people use the current system, as well as their feedback and experiences, which allows researchers to recognize a hands-on approach in determining a specific functionality for specific problems. To further identify, compulsory health restrictions have been developed due to the pandemic, which the researchers addressed by employing QR codes to identify and certify immunization. It should be introduced to remove physical contact in conjunction with the current use of paper and pen discouraged. Some functionalities have lower customer and employee interaction, such as real-time alerts for employees and

housekeeping management, designed to prepare everything. The customer's particular requests reduce waiting time and provide excellent service that makes the customer happy. As a result, the proposal considered the issues from every angle when developing system design functionalities. However, the system design needs more analysis and ideation. The researchers highly recommend the same study for further analysis and system implementation in the future.

References

Altman, M., Huang, T. T., & Breland, J. Y, Peer-reviewed: Design thinking in health care. Preventing chronic disease, 15. 2018

Cobanoglu, C., Berezina, K., Kasavana, M. L., & Erdem, M., The Impact of Technology Amenities on Hotel Guest Overall Satisfaction. Journal of Quality Assurance in Hospitality & Tourism, 12(4), 272–288, 2011. https://doi.org/10.1080/1528008x.2011.541842

DAS Solutions, Available: https://dassolutions.eu/reservation-system-for-your-hotel/, Accessed on Febuary 17, 2020.

Guo, G. & Lu, Y., Design and analysis of hotel management system based on information technology. Qingdao Hotel Management College, 2011.

Hotel Check-In Form. [Photgraph]. SampleForms. https://www.sampleforms.com/hotel-check-in-form-template.html

Hotel Information System Request Form. [Photograph]. SlideShare. https://www.slideshare.net/vaohama/kc-hotel-information-system-request-form

Lacalle E., What are the advantages of using a central reservation system?. 6 advantages of using a central reservation system (CRS). Available: https://www.mews.com/en/blog/advantages-central-reservation-system, March 2, 2021.

Nakamoto, I., Wang, S., Guo, Y., & Zhuang, W, A QR Code–Based Contact Tracing Framework for Sustainable Containment of COVID-19: Evaluation of an Approach to Assist the Return to Normal Activity. JMIR MHealth and UHealth, 8(9), e22321, 2020. https://doi.org/10.2196/22321

Online computerized Hotel Management System. (2014). Journal of Computation in Biosciences and Engineering, 1(2). https://doi.org/10.15297/jcls.v1i2.02

Prasad, K., Wirtz, P. W., & Yu, L, Measuring Hotel Guest Satisfaction by Using an Online Quality Management System. Journal of Hospitality Marketing & Management, 23(4), 445–463, 2014.. https://doi.org/10.1080/19368623.2013.805313

Suzianti, A., Edrisy, F., & Mubarak, A. (2020, September). User Interface of Zakat Information System Redesign using Design Thinking Approach. Case Study: KNEKS. In 2020 The 6th International Conference on Industrial and Business Engineering (pp. 37-44, 2020.

Patel, D., Khirsariya, A., & Shah, JAutomated system for hotel room service. In 2014 2nd International Conference on Emerging Technology Trends in Electronics, Communication and Networking (pp. 1-6). IEEE.

Phillips, C., Automated hotel systems. Data Processing, 26(3), 33-35. 1984

Mirani S. 5 Advantages of using Online Booking Systems For Your Property. Available: https://www.hotelogix.com/blog/2021/08/11/advantages-using-online-booking-system-property/, August 11, 2021.

Asenova I. The Benefits of Online Booking Systems. Available: https://www.clock-software.com/blog/Benefits-of-online-booking-systems.html. April 2, 2018.

Biographies

Maria Shaina A. Apolinar is a Bachelor's Degree (B.S.) student of Information Systems at Mapua University. She is the current president of Information Systems Next Gen, a Mapua University organization in the School of Information Technology that focuses on the academic program Information Systems. During high school days in Dominican College San Juan, she was also the president of the Mathematics Club and a member of the Social Studies and Journalism Club. By 2018, she was recognized as the Most Promising Journalist from Dominican College and earned the Special Citation in the Field of Journalism Award. By 2020, she was then awarded Artist of the Year: Performing Arts- Visual Arts and the Gawad Talino Awards: Excellence in Mathematics.

Janelle Anne I. Santiago is a Bachelor's Degree (B.S.) student of Information Systems and a Secretary of Non-Academic Affair of the School of Information Technology Student Council in Mapua University. She was also part of the Information Systems Next Gen as a Student Council Representative. Currently, she was active in the platforms of engaging the student community, proactive assistance to students, and empowering student's voices. She was also a champion in Mapua Technical Communication Flash Talk competition of the Department of Arts and Letters 2021.

During her senior high school in a Science, Technology, Engineering, and Mathematics (STEM) strand, she has an experience and completed a research, Development of a Smart Phone Application for Monocrystalline Solar Panels.

Michael Matthew Kristofer B. Regala is a Bachelor's Degree (B.S.) student of Information Systems at Mapua University. He is the current Vice President of the Mapua Dance Community. It is an organization that encourages the youth to bring out the creativity in them. He was also Awarded as Best Athlete of the year in 2015. He was also Awarded as Best Vocalist in 2019 winning second place in the battle of the bands. He was also Awarded a Certificate of recognition: Specialty in Music, Arts, Physical Education, and Health in 2018 and was Awarded as Pioneering Scout of Tacloban Angelicum Learning Center in 2017. He was also a part of the debating team in 2015 and competed in the University of the Philippines. Their debate team would eventually win first place in the competition that was also held in the University of the Philippines.

Grace Lorraine Intal is a full-time faculty member in Mapua University. She is teaching Information Systems core courses in the School of Information Technology and masteral courses in the School of Industrial Engineering. She obtained a BS degree in Management and Industrial Engineering from Mapua University, master's in business administration from Pamantasan ng Lungsod ng Maynila and Master in Information Systems from Asia Pacific College respectively. At present, she is pursuing a Doctorate degree in Information Technology at the University of the Cordilleras. She is also an independent Management Consultant.