Cloud-based Hotel Management System

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Abstract- Traditional hotel management systems are paper-based and are hard to maintain, query and migrate. Technology is becoming an integral part of our day-to-day life and it is important that the service sector industries are up to speed with the evolving trends. Introduction of technology into management, allocation of resources and labour streamlines the process and stands to maximise profits. Hotel management systems through the collection of data, processing it and serving it to distinct interfaces aim to standardise hotel management while still granting a certain degree of freedom to the administration, finally achieving automation in a human-centric field.

Keywords: Database, ReactJS, ExpressJS, Firebase Firestore, Hotel management.

I. INTRODUCTION

In the 21st century, technology and progress go hand in hand, aligning and leveraging technology to fulfil our interests is a must to maximise profits. The use of information technology provides us with the tools that can greatly save us time and efforts while translating the saved resources into increased profits. The service sector can greatly benefit by integrating technology into the day-to-day operations be it assigning workforce, distribution of labour, customer management or resource allocation. It is important that all the tasks listed above see error-less execution to minimise the loss of resources.[1] This paper uses the Hotel Management industry as a reference. The traditional hotel management system that is based on a pen-paper model is outdated and has many shortcomings: it is time consuming to make entries and query them, it is not easily accessible and makes it hard to analyse thus increasing the resources required to draw analytic from the records, being hard to access quickly also reduces accountability among staff. The Hotel Management industry is a customer-centred industry. It is important to provide the customer with a transparent working of the services that are being provided to set clear expectations and it is also important to provide the customer an easy to access platform to communicate with the hotel administration.[2] The hotel management system aims to provide the same to the customers. The hotel management system is a model that could work for

virtually all service based industries letting managers monitor overall working of the entire operation making it easier for them to make split second decisions and keeping the operations in

order. The system will also provide transparency and ease of communication to customers bringing the demand-supply latency to a minimum. [3] The system will play the role of a communication bridge between the customer, the managers, the staff and the hotel infrastructure and this directly benefits the economic gains of the hotel. [4]

II. LITERATURE REVIEW

Traditional Human resource management lacks standardisation and structure, making it inefficient and this drives up the management costs. Human resource management can be made more efficient and cost-effective by the introduction of information technology in it. The relation between human resources and information technology is explored [5]

Ideation and development of a reservations system for hotels, taking into account various methods of reservation such as telephone, wechat and website. The applications developed use mature technologies such as HTML 5, .net, AJAX, Silverlight and related OS, DBS configuration. This application used MVC three-tier architecture. This paper explores SOA(Service oriented architecture) which is a method to design, develop and deploy applications in a computing environment. The paper focuses on the methods for development of a good hotel management system namely, System architecture design, implementation of unified messaging service, order management services, integrating payment API modules. However this paper fails to provide the reader with a well defined methodology to design a hotel management system that is capable of accommodating operations of different scales.[6]

There is a need for technology integration into the hotel management system, the hotels that are currently using digital means to handle their clients are using the B/S architecture. B/S architecture needs the client to install fat bulky applications which is a hassle. This paper does not however explore the options or possibility of using a light weight website on a client side using the B/S

architecture. This piece of literature explores a hotel management system that is based on the SSM Technology. A major drawback in the solution proposed is that the new users must perform sign up operations. Manual authentication is a huge drawback when it comes to hotel management systems when it comes to the users. There is a huge drawback in this paper.[7]

The B/S structure stands for Browser/Server structure consists of the presentation layer which is the browser, logic layer located on the web server and the data service layer which is located in the database, the UI for the application is implemented using the WWW protocol and a few transaction logic in the front-end. The main transaction logic is housed on the server-side; this forms the three layer architecture for the hotel management application. The advantages of the B/S system to develop this application are that the system maintenance becomes significantly easier when the B/S structure is implemented, the management models become more consistent and concentrated, the B/S structure is effective means of networking technology, the main business transactions can be concentrated into the server the client has no need to perform complex operations.[8]

The requirement from the application is being an interactive platform for the customers, the staff, the administrators and the owners to visit, the application must be easy to query and there must be the means to customise the query according to the system administrator. There exist customer information management needs, the customer information management includes analysis of customer information to increase customer satisfaction and to improve the enterprise competitive ability. The main goal of this analysis is to reduce sales cycles and the cost of sales. [9]

III. METHODOLOGY

A. Requirements from the Application

The hotel industry is a service based industry and communication is key in management situations. Defining what information is relayed between individuals is extremely important. The information that is being communicated needs to be objective as it being subjective in nature would need for it to spend more time and effort to interpret and would delay the time taken to retrieve it and process it defeating the purpose of integrating technology into the management. Therefore it is important to define certain parameters for a few select variables and assign the correct and adequate ranges to facilitate the customer to properly convey their requirements to the hotel administration.[10] To efficiently implement all this functionality it is important to select the right technology, the application to be efficient needs to have three interfaces, one for the administration, one for the staff and one for the customers.[11]
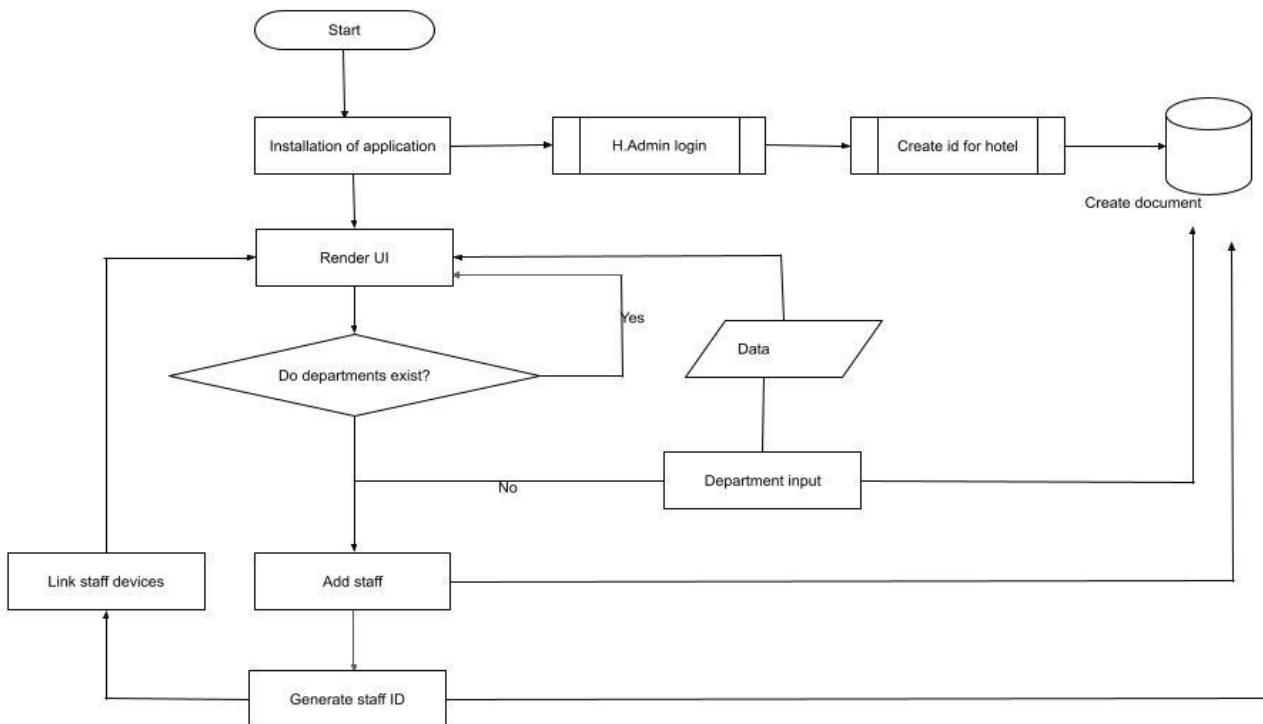

Figure 1. Administration working flowchart

The administration application should have a dashboard to facilitate easy interpretation of data and it should include the controls to how the customer interface is rendered. The staff interface should be easy to understand and minimalistic to avoid clutter and confusion, it must convey where the staff is needed and what their assigned task is and instructions from supervisors. The client interface needs to have a number of variables representing the services the customers could require during their stay with the hotel[12]. These variables must be custom set by the hotel administration catering to what services the particular operation offers. This application will consist of three main parts. The interface for each user group, APIs to serve information and a relational database to store all the data that is collected from the user groups[13].

B. Structure for the Application

The application not only caters to the customers but also facilitates the communication between the staff.The application needs to have well defined communication routes that are established between the sender and receiver of information based on the nature of the information, as shown in Figure 1. The application first broadly classifies the entire operation of the hotel into 3 major sections, the hotel kitchen, the housekeeping staff and the infrastructure. These three sections cater directly to the customer and have a direct impact on the customer experience. Any and all requests that the customers make in these regards must be relayed to the relevant staff and the relevant managers. The application must then check the staff schedule to accommodate the staff that is busy at the given time and assign free staff to cater to the customers requests.

C. Functionality for the Application

This working should follow a black box model when it comes to the customers and the staff, as shown in Figure 2. The customer must only be relayed the information about what staff member has been assigned to cater to them and only the staff member assigned must know where they are required.

The managers however should have an in depth report of the time and the duration of the task and an overview of what each customer needs and what every staff member is assigned to. The staff must be able to communicate with their supervisors in case of emergencies and this must be implemented using a notification feature so that minimum subjective communication is required thus saving time. Similarly, specific instructions should be conveyed to the staff at the managers will through the application.
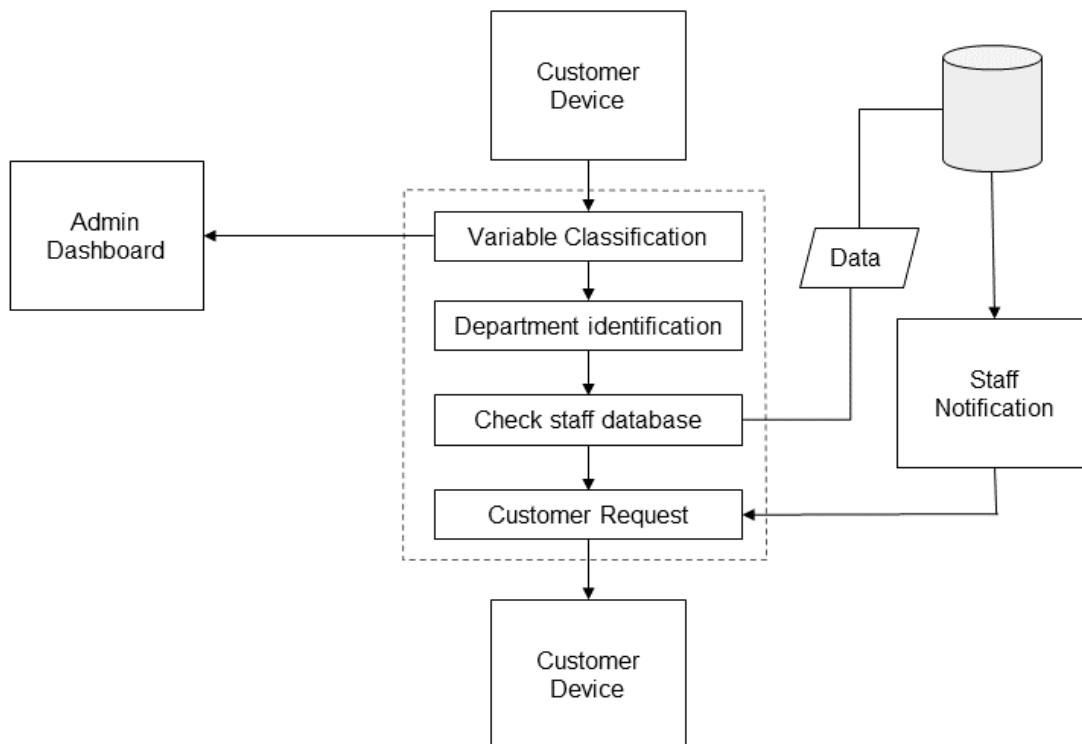

Figure 2. Black box model for handling customer request

D. Technology for Implementation

The staff and the administration application need to be robust applications as they will be used heavily and frequently by the said user groups and they need to have a certain amount of offline usability in case of emergencies while the customer interface need to be made fast and web browser accessible as having to download bulky applications in consumer device is a hassle. Appropriate technology to set up these interfaces are browser based technologies as they have open source support and are easy to develop facilitating us to embed complex logic into these applications. The appropriate framework to develop these applications is ReactJS as it has a component based rich UI library and facilitates code reusability, it is also beneficial because ReactJS produces one page applications that helps rendering on low end devices easier and ensures usability across a wide range of hardware. ReactJS is used in the application for an easy distribution and deployment process. All three applications need to use and process the same data to output to the different applications, so a shared database is used to link all three interfaces to each other. Firebase is a noSQL database used to develop this application. Firebase firestore enables its users to store data in the form of documents containing javascript objects. As the entire application and all its layers are programmed Javascript this database maintains the homogeneity of the application. The API and the server for the management application need to perform complex calculations to decide data routes to the three interfaces. ExpressJS is the JavaScript framework used to design the server for this application as it is lightweight. Initially a database is created to store the client hotels.

Then separate tables are created for the rooms each operation has, each operation has a different database to accommodate the rooms, the fields in these documents are populated using the input gained from the hotel administration. Each field has either a range integer value or a boolean value.These fields are for facilities like duration of stay, the clean state of the room, housekeeping requirement, the kitchen orders, outstanding orders etc. These fields are then provided to the consumer interface for the customer to manipulate that values that the customer inputs are then communicated to the administrator and the staff using the backend logic programmed in the server.

IV. RESULTS AND DISCUSSION

It has become extremely crucial to introduce technology into industries to give the business a competitive edge over its rivals. Management is one of the sectors in service based industries that is prone to experiencing errors owing to miscommunication, improper allocation of manpower and resources. Management is also heavily objective when it comes to the day to day operations, that makes the introduction of technology into this field extremely easy.

This paper discusses an approach towards automating the operations of a hotel to a certain degree. While this solution does not completely eliminate the need for human staff and operators, it does however propose methods to improve the communication between the staff, managers and the customers resulting in proper allocation of time and resources.

The application uses a shared noSQL database to link three user interfaces together. The hotel administration is offered a choice to control the fields of the document for their respective organisation allowing a certain degree of freedom to the users. When one user group makes changes to the database the updated database rerenders the UI for the other two user groups. This makes for fast communication to the administration and clear instructions to the staff this reduces the time for operations and helps facilitate smooth management.

V. CONCLUSION

With increasing customer data, the efficiency of opeIn the view of the softwares available for hotel management and the current management techniques available, the application offers a greater degree of freedom and attempts to allow maximum customization by the hotel management. The application however is extremely complex and could prove difficult to get used to. The application used lightweight frameworks to keep the program agile. Though the application is meant to be used in house it is dependent on the internet for its operation. This application realises the information generated from the daily operations of a hotel and has an positive impact on the efficiency of the hotel

VI. REFERENCES

[1] Xu Wenyuan, He Xianghui: "Hotel Lobby Management Practices", Guangdong Economic Press,2005.10

[2] L.Tian, F.J. Zhong. Effects Of Information Technology On Human Resource Management Mode[J]. Modern Marketing (Academy Edition) 2014(5):91-93.

[3] M. Shan-Shan, S. Chun And X. Jing-Feng, "Design And Implementation Of Hotel Room Information Management System Based On Kendo Ui Front-End Framework," *2018 4th Annual International Conference On Network And Information Systems For Computers (Icnisc)*, 2018, Pp. 452-455.

[4] X. Lv, "Design And Implementation Of Hotel Reservation Management Platform Based On Soa

Framework," *2021 International Conference On Intelligent Transportation, Big Data & Smart City (ICITBS)*, 2021, Pp. 517-520.

[5] D. He, "Design And Implementation Of Resource Information Management Based On B/S Structure," *2017 International Conference On Computer Technology, Electronics And Communication (ICCTEC)*, 2017, Pp. 384-387.

[6] Jingda, Yang. (2013). Research And Design Of Hotel Management System Model. 10.2991/Icetis-13.2013.260.

[7] X. Zheng, "Research On The Application Of Information Technology In Human Resource Management," *2017 International Conference On Smart City And Systems Engineering (ICSCSE)*, 2017, Pp. 85-88.

[8] W. Wei And Z. Lou, "Design And Implementation Of Hotel Room Management System," *2019 Ieee Symposium Series On Computational Intelligence (SSCI)*, 2019, Pp. 956-961.

[9] Z. Zhong, "Implementation Of Hotel Intelligent Management System Based On Big Data," *2022 Ieee Asia-Pacific Conference On Image Processing, Electronics And Computers (IPEC)*, 2022, Pp. 1074-1078.

[10] L. Xu, "Application Research Of Information Technology In Modern Prison Management," 2021 International Conference On Education, Information Management And Service Science (EIMSS), 2021, Pp. 333-336.

[11] J. Yang, "Optimization And Implementation Of Hotel Data Hierarchical Management Method Based On B/S Mode," *2019 International Conference On Robots & Intelligent Systems (ICRIS)*, 2019, Pp. 282-286.

[12] F. Liu And J. Kang, "Construction Of Hotel Management Intelligence System Based On Process Data Collection And Optimization Algorithm," 2022 International Conference On Applied Artificial Intelligence And Computing (ICAAIC), 2022, Pp. 111-114.

[13] O., Ogirima. (2014). Online Computerised Hotel Management System. Journal Of Computation In Biosciences And Engineering. Volume 1.

[14] Effect Of Information Technology On Performance In Upscale Hotels, International Journal Of Hospitality Management, Volume 24, Issue 2, 2005, Pages 281-294, Issn 0278-4319.

[15] Ying F, Zhang J. Design And Implementation Of An Intelligent Hotel Room Controller [J]. Advances In Information Sciences & Service Sciences, 2013, 5(7):1248-1256

[16] Person T J. Mobile Entry For Hotel Guest Rooms:Us20160044472[P]. 2016.

[17] Xu Wenyuan, He Xianghui: "Hotel Lobby Management Practices",Guangdong Economic Press, 2005.10

[18] Lu Yiming, Liu Yulin, Ke Ting, Et Al. Research On Hotel Quality Management Based On Data Mining And Qfd-Taking Guangzhou " 7-Day Hotel Chain" Inn As An Example [J]. Management Observation, 2017,35 (22): 23-26.

[19] Zhu Haiyan, Tian Neiling. Study On The Influence Of Online Information On Online Booking Of Star Hotels And Economy Hotels In Xi 'an-Taking Ctrip Data As An Example [J]. Value Engineering, 2017, 36 (31): 3-6.

[20] Li Chuankai, Ye Fangchao, Kuang Fangjun. Design And Implementation Of Hotel Management System Based On Web[J]. Intelligent Computer And Application, 2018, 008(006):150-152,157.

[21] Yang Xinji. Design And Implementation Of Intelligent Logistics Transportation Management Service System[J]. Digital Technology And Application, 2019, 037(003):188-189.

[22] Hao Yangji, Liu Xiangru, Xie Chunlong. Design And Implementation Of Intelligent Management System For Communication Backup Power Supply[J]. Digital Design (Part 1), 2017, 006(004):76-77

[23] Sun Qinru. Research On Hotel Network Marketing Strategy From The Perspective Of Big Data-Taking Pipa Mountain Residence Hotel In Nanjing Zhongshan Scenic Area As An Example [J]. China Business Theory, 2017,23 (35): 47-48