Web-Based Venue and Reservation Management System with Data Visualization

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Abstract: A web-based database management system (DBMS) offers numerous advantages to businesses. One of the extant problems businesses experiences is difficulty managing data across the organization. The primary advantage of a web-based DBMS is enabling businesses to streamline their operations. Bazaar City is the biggest shopping complex East of Metro Manila and focuses on renting out commercial spaces, which includes shopping stalls for business owners, event spaces, and paintball facility. In a daily basis, Bazaar City handles massive data processing through venue and event reservations, computing of monthly and yearly sales, and monitoring business transactions such as confirmed booking, cancelled reservations, and rental collection. Though there is an existing website used by the company, major business transactions are not included on the website, and are mostly done manually, which causes the company to have difficulty in managing all these services. Moreso, the company aims to increase their sales, and improve the marketing strategy to attract more clients. With all these problems, the researcher proposed to improve the existing website by adding the venue and reservation management system through the implementation of a DBMS, and data visualization to aid the company in making future decision with the existing data gathered from their daily transactions. The proponents used the Rapid Application Development (RAD) method, and the three-tier architecture for the system development. Currently, the proposed study is still on going, and is being prepared for user acceptance testing.

Key Words: Database Management System; Reservation System; Rapid Application Development; Data Visualization; Web-Based System

1. INTRODUCTION

A web-based database management system (DBMS) offers numerous advantages to businesses. One of the extant problems businesses experiences is difficulty managing data across the organization. According to North (2021), a web-based DBMS is defined as the application in which data can be easily managed and accessed through the Internet, whereas a DBMS stores and handles data in the database (Raza, 2018). The primary advantage of a web-based DBMS is enabling businesses to streamline their operations. As such, this type of system enables businesses to have centralized data in which all the

data is stored and maintained in one database. This is beneficial for businesses that have the need to retrieve data from various sources (Januzaj, Ajdari, & Selimi, 2015). Furthermore, it is beneficial for a business to make use of a web-based DBMS to increase its efficiency, accessibility, collaboration, and flexibility. Shifting into a web-based database management system may also result in an increase in business performance.

Bazaar City is the biggest shopping complex East of Metro Manila and focuses on renting out commercial spaces, which includes shopping stalls for registered business owners and event spaces. Furthermore, it has a paintball facility in which customers book a slot and play. Their daily business processes involve managing, monitoring, and tracking their sales as well as reservations in paintball, events, and stall facilities.

Currently, Bazaar City does not make use of any web-based venue and reservation management system to accomplish its daily operations in paintball, events, shopping stalls, and food stalls. The company's operations involve recording reservation information in a logbook, filing documents in a file cabinet, and the use of Microsoft Excel for the summary of sales. These activities are handled by different staff of different departments namely, the admin/operations department and the paintball department. As such, these methods cause difficulties in data management such as retrieval of data, summarization of data, and inaccuracy of necessary information. This study will encompass the reservation, booking, and payment operations done in the paintball, events, shopping, and food stalls facilities of Bazaar City.

The proponents of this study collectively aim to gather specific information about Bazaar City and its current processes. The study aims to develop a web-based venue and reservation management system with financial technology to support the operations of the business.

2.CONCEPTUAL FRAMEWORK

As seen in Figure 1, the conceptual framework of Bazaar City's web-based venue and reservation management system will include the modules and corresponding features from the problems identified in the processes of Bazaar City's event, paintball, and stall management operations. Furthermore, it includes the users, inputs and outputs of the system. The modules presented in the conceptual framework will be built by the team and its corresponding features will have other capabilities or features of similar systems to be used as basis.

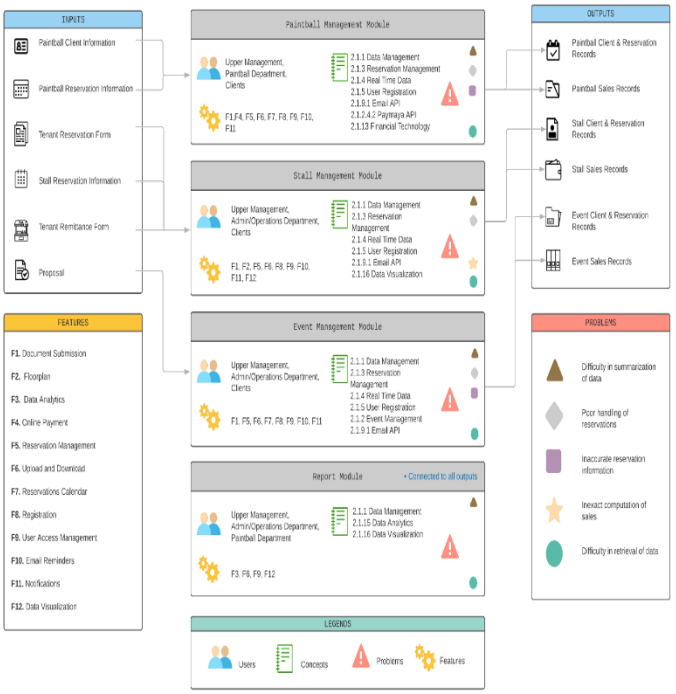

Figure 1. Conceptual Framework

Paintball Management Module

The paintball management module would be accessible by the upper management, paintball department and clients. The module focuses on solving the reservation issues and the summarization and retrieval of necessary data. The paintball department and the clients would be able to see real-time reservations to aid in the reservation process.

Stall Management Module

In the stall management module, the upper management and admin/operations department are given the ability to manage the stalls and reservations in Bazaar City. Its features consist of document submission, a floorplan, reservation management, an upload and download feature, registration, user access management, email reminders, and notifications.

Event Management Module

The event management module can only be accessed by the upper management, admin/operations

department, and its clients. This module enables the upper management and the admin/operations management to manage event reservations. This is where they would see the existing reservations and reservation requests from the external organizers.

Report Module

The reports module focuses on the visualization of data for the various operations that occur in Bazaar City which are accessible to the system users which would be upper management, admin/operations department, and paintball department. This is also where daily, monthly, quarterly, and annual reports such as sales per operation, total profits, and other data will be seen and used as a basis for decision making. Moreover, data visualization and data analytics would be used in this module to further assist Bazaar City in decision making. This module would solve the problem of difficulty in summarization of data as well as the difficulty in retrieval of data.

3. RELATED LITERATURE

According to Raza (2018), a Database Management System (DBMS) is a software that manages the storage and handles the retrieval of data from a database. Moreover, it enables users to easily read, add, edit, delete, and update databases through an interface. One of the purposes of a DBMS is to provide a user with an organized representation of the information inside a database (Mullins, 2021).

Web-Based Systems are applications that are normally used with the help of web-browsers. (Sturm, R., et al., 2017) They are usually very flexible and can offer so many different services on just one web page. These web-based systems make use of web languages to allow themselves to interact with different web browsers. Some examples of these web languages are HTML, XML, Javascript, etc. These systems are usually one of the easiest systems to access since all one will need to access them is Internet access and a device that has a web browser.

A Central Reservation System (CRS) is a type of system that allows the user to update information about a hotel or organization and its resources. Systems like these are usually updated in real-time to make sure customers' reservations don't overlap each other and cause problems for both parties. Reservations like these can be managed through distribution channels such as third-party booking websites, global distribution systems, and many more. Many organizations make use of reservation systems but have their own custom ways of reserving. Other than hotels, other organizations like restaurants, car parks, residential institutions manage their reservations through systems like these.

The input-process-output (IPO) model is an approach that is used for describing the structure of an information processing program or another program (Braunschweig, n.d.). It is a functional graph that identifies the inputs, outputs and the required processing to convert the inputs into outputs. The inputs represent the inputs of the user, the processing step includes the tasks required to transform the given input to the desired output, while the output is the result of the transformation.

Data analytics is the process of examining and analyzing raw data to make conclusions about the information that the data contains (Frankenfield, 2021). It reveals the trends and metrics in data which can then be utilized to optimize business performance and support further decision making. There are several steps involved in data analytics: the first step would be to determine the data requirements or how data should be grouped. Second would be the collection of data. Third and fourth would be to organize and clean up the data before analysis to fully utilize and ensure the accuracy of the data. According to the University of New South Wales (2020), descriptive analytics is a type of data analysis in which data previously collected are used, organized and presented through the use of line graphs, pie charts, and other forms of visual tools. Furthermore, descriptive analytics utilizes historical data as well as simple mathematical and statistical computations for further analysis. As such, the primary focus of descriptive analytics is to present data that has happened to the company.

According to Healy (2019), data visualization helps people communicate their ideas and findings through other people. These can happen with the help of graphs and visual representations like bar graphs, scatter plots, choropleth maps, and many more. Through data visualization, the user will be able to see the whole picture of the data and understand the story behind the information presented to them. There are also a number of tools that can be used to create these visualizations like Power BI, Tableau, and different others.

4. METHODOLOGY

The study used the Rapid Application Development (RAD) method. The RAD methodology is an agile project management strategy which initially took the shape of the Spiral model but has changed to stand as its own over time. When compared to other software development models, RAD can offer key differences that make its methodology worth applying. A few of these would be that the methodology allows the project to be broken down into smaller and more manageable tasks. It also allows clients to get a working product delivered in a shorter time frame. In addition to that, the constant feedback and regular communication between the development team and stakeholders allow an increase in the efficiency of the entire design and development process. These differences prove to be suitable and beneficial to the work environment of the development team given the task-oriented structure that it provides.

In the requirements planning phase, the proponents conducted series of interviews with the client to better understand the problem. Business Process Model and Notation (BPMN) was created to provide a graphical representation of Bazaar City's business processes. This is to better understand and align the system to their business processes. An Ishikawa diagram was also used to illustrate the problems encountered by the client as shown in Figure 2.

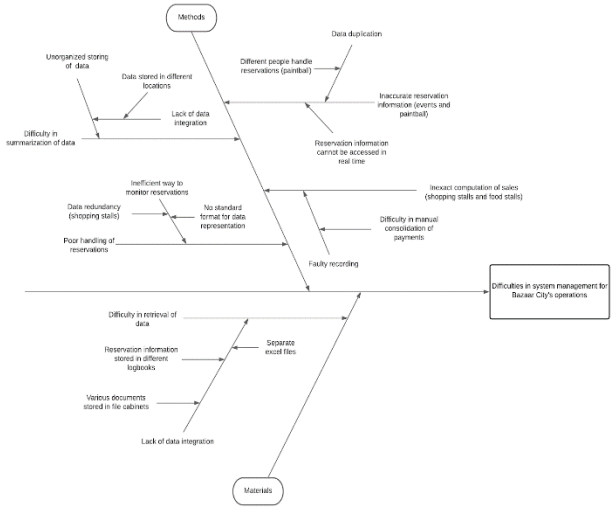

Figure 2. Ishikawa Diagram

The next phase would be user design where prototyping, testing, and refining takes place. After being able to define the requirements, the development team built various prototype iterations. The prototypes were rapidly developed to show to the clients. The clients then helped in the design process by testing the prototype iterations built by the development team to ensure that requirements are being met. The final model was made when the client and developer were both satisfied with the design.

The construction phase takes the prototype iterations and final model from the design phase and turns them into a working model. In this phase, the development team works together to construct the system as well as conduct unit, integration, and system testing to create a result that satisfies the expectations and objectives of the client.

The cutover is the fourth and final phase of the RAD methodology. This includes data conversion, testing, and changeover to the new system. This phase also involves end user training so that users of the system are prepared for when the system goes live.

3. RESULTS AND DISCUSSION

The researchers have designed and developed a web-based Venue and Reservation Management System that aids in streamlining the various reservation and renting processes that occur in the business. The system is intended to be used by clients of Bazaar City who are looking to make reservations for the activities found in the business. It is also used by Bazaar City's employees that handle these activities; these employees fall under the upper management department, paintball department, and admin/operations department.

There are four main modules included in the system: paintball management, stall management, event management, and reports. The paintball management module aids in handling paintball reservations, reservation fee payments, and recording of sales. The stall management module helps in handling stall reservations, tracking daily remittance sales and monthly utility expenses, and providing visual/digital information for stalls. The event management module assists in handling event reservations and recording event sales. The reports module focuses on providing monthly, quarterly, and annually sales reports to be used to aid in business decisions. With the implementation of DBMS, the system will be able to provide the business with real-time data in order to present its clients and employees with up-to-date information to provide the best possible service at any given time. It will also serve as a backup and storage for the important data that is used by the business.

To address the need of the client in terms of increase in sales and improvement of their marketing strategy, data visualization was incorporated to the monthly and yearly income reports, and reports on most rented stalls of the business. The data that are generated on these processes will be used by the client in future decision making. As sample screen shown Figure 3 and 4, reports would be automatically generated based on how the user would want it. Since the upper management would take a certain amount of time to gather information from many different sources, this amount of time to create reports would be greatly reduced in the proposed system. The data from all the other modules would be gathered to generate the information needed for each report. Another technicality would be that dashboards would show summaries of what the user would need to see to keep track of their work. Tables and graphs would be displayed on dashboards to help keep the user updated with how the business is going. For some dashboards, a stall layout would also be provided to add a visual aid so the user can see an overview of data in a more organized manner.

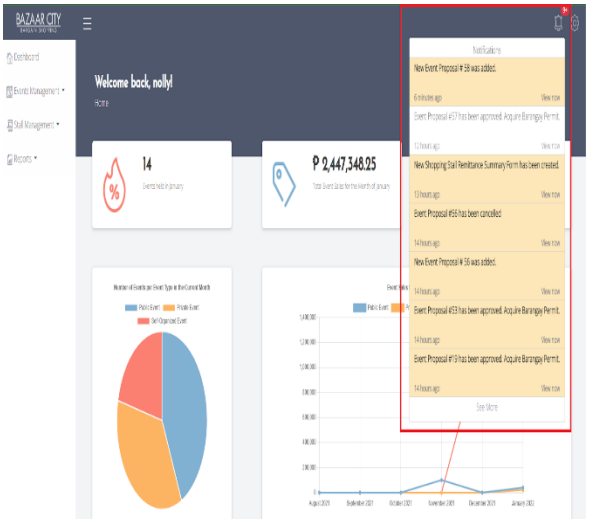

Figure 3. System Dashboard

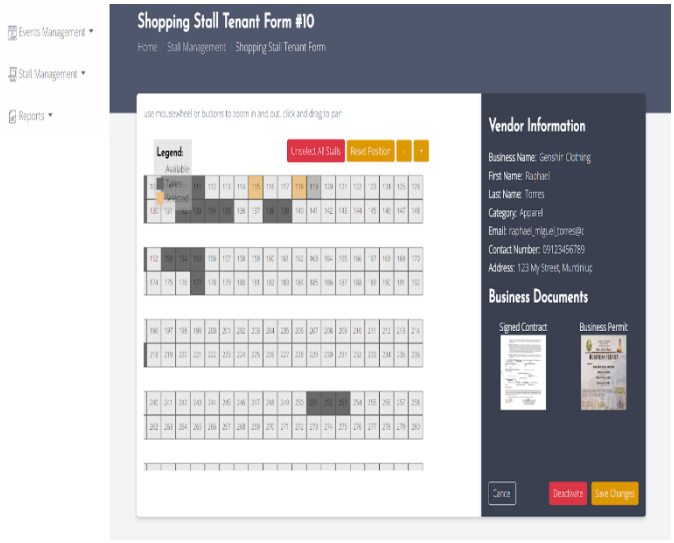

Figure 4. Stalls Reservation

Another added feature of the system was the payment system (see Figure 5). The proponents of the study made use of PayMaya SDK which includes functionalities that enable web applications to connect to PayMaya's API and allow payments to be accepted online. Bazaar City would need to have a PayMaya account that will be used to accept and store paintball reservation payments from the customers. Paintball customers would need to have VISA or MasterCard Cards (credit, debit, or prepaid) to be able to pay for paintball reservations in PayMaya.

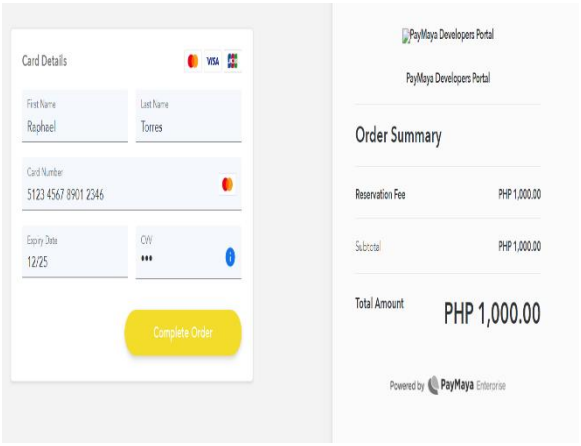

Figure 5. Payment API

4. CONCLUSIONS

Bazaar City System only has two user interfaces, the Customer interface, and the Employee interface. The Customer interface can be accessed by any customer, they only need to register an account in the site itself and login into the system. The Employees' interface has different level of access due to different employee's position in the company. Upper management has all the access to the modules of the system, while ordinary employee such as encoders, and receptionists may only have access to the basic feature of the system such as creation and modifications of reservations submitted by the customers. All problems that were raised and discussed by the clients were carefully addressed by the proponents by developing the web-based features of the business processes. Moreso, the implementation of the DBMS will help the company to have a central repository of vital data that are maintained and used by the company in computing monthly and yearly sales and keeping of customer records for future references. Incorporating data analytics, will also help the company in making future decisions, and could also help them to forecast the trend of customer behavior, where it can be of big help to boost their sales and reach the appropriate market. With the knowledge of sophisticated systems that are present and readily available in the market today, the creation of the proposed study aims to be specifically designed or tailor-made to cater Bazaar City in maximizing their efficiency and streamlining their various business processes. The proposed study is still currently under progress and development with features including data visualization and data analytics. The features mentioned will provide Bazaar City with further analysis into their business to increase the efficiency of growth and quality of decision making towards their goals and objectives. User acceptance testing will also be conducted on the end users of the system in order to gain important constructive feedback as well as identify the system's acceptability after completing system development.

5. ACKNOWLEDGMENTS

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