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Fostering a Humane and Green Future: Pathways to Inclusive Societies and Sustainable Development



Development of a Web-Based Database System for Reservation and Venue Management with Data Visualization

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Abstract: A web-based database management system (DBMS) offers numerous advantages to businesses. The primary advantage of a web-based DBMS is enabling businesses to streamline their daily operations. Bazaar City is the largest shopping complex east of Metro Manila, focusing on the rental of commercial spaces such as shopping stalls for business owners, event spaces, and a paintball facility. They handle massive data processing daily through venue and event reservations, monthly and yearly sales computation, and business transaction monitoring. Even though the company already has a website, major business transactions are not included and are mostly done manually, making it difficult for the company to manage all these services. To attract more customers, the company plans to increase sales and improve its marketing strategy. About all these issues, the researcher enhanced the website by incorporating a venue and reservation management system via the implementation of a DBMS, as well as data visualization to assist the company in making future decisions. The proponents used the Rapid Application Development (RAD) method, and the three-tier architecture for the system development. To test the acceptability of the system, respondents were given survey questionnaire and asked to what extent they are satisfied or dissatisfied with each item on a five-point scale with descriptive anchors ranging from (1) "strongly disagree" to (5) "strongly agree". Using simple average method, the findings have far-reaching implications for the company's business processes. Aside from the visualization component, forecasting is recommended to help the company achieve its goal of using its data for future decision-making.

Key Words: Data Analytics; Data Visualization; DBMS; Rapid Application Development; Web-Based System

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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 (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, 2015).

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, and paintball facility. Their daily business processes involve managing, monitoring, and tracking their sales as well as reservations in paintball, events, and stall facilities.

A web-based venue and reservation management system is currently not used by Bazaar City to carry out its everyday operations for paintball, events, shopping booths, and food booths.

2. CONCEPTUAL FRAMEWORK

The IPO Model was used in the study to identify the requirements for system development. As shown in Figure 1, the proponents conducted interviews, researched the study's background, gathered client requirements, brainstormed on development tools and techniques, and reviewed studies and literature to lay a solid foundation for pursuing the study.

To pursue a more appropriate approach in developing the study's prototype, the proponents used the Rapid Application Development (RAD) method, which allows the group to quickly design, review, and iterate system features and functionalities. Throughout the system's development, the proponents continuously gather feedback from users to tweak whatever needs tweaking so that the final output will

satisfy the clients. Finally, the study is presented to Bazaar City for evaluation to test its acceptability.

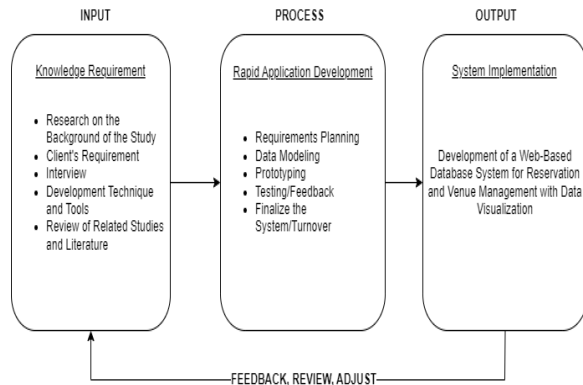


Fig. 1 IPO Model of the Study

System Modules

The Bazaar City's web-based venue and reservation management system successfully incorporates four modules. Their corresponding features derived from problems identified in Bazaar City's service processes. The IPO model was used to identify and understand user inputs, as well as to develop processes to produce the desired output. The system includes the following modules: (1) Paintball Management – where real-time reservation of the clients is seen; (2) Stall Management – where clients can see the floor map of the venue and reserve; (3) Event Management – where a calendar feature was provided to see available slots for the event; and (4) Report Generation – where monthly, quarterly, and annual reports, such as sales per operation, profits, and other data, will be displayed and used to make decisions.

2. 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 (Beynon-Davies, 1999). When compared to other software development



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models, RAD can offer key differences that make its methodology worth applying. 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.

The proponents designed an Ishikawa diagram where several problems on data retrieval and summarization were identified. As a result, inaccurate reservation information and inaccurate sales computation complicate the company's productivity because everything is managed manually by different employees, resulting in poor handling of important data for the business's daily transactions.

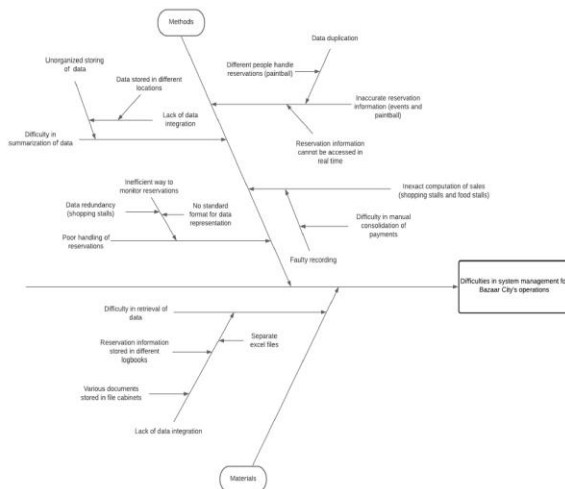


Figure 2. Ishikawa Diagram

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, and presented them to the clients for feedback.

3. RESULTS AND DISCUSSION

The researchers designed and built a web-based database system for venue and reservation management system to help businesses streamline their reservation and renting processes. A sample screen of the website is shown below:

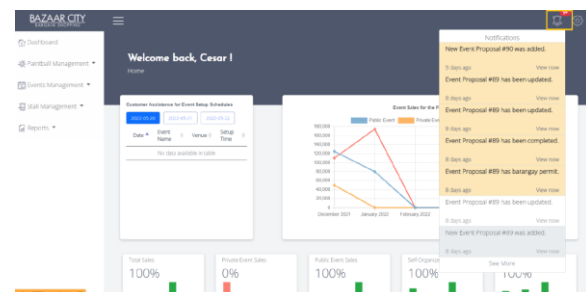


Figure 3. Employee's Home Page

The system is intended for use by Bazaar City customers who want to make reservations for the company's activities. It is also used by Bazaar City employees who handle these activities; these employees are classified as upper management, paintball, and admin/operations. The five (5) employees were all selected as the respondents of the study.

To test the acceptability of the system, respondents were given survey questionnaire and asked to what extent they are satisfied or dissatisfied with each item on a five-point scale with descriptive anchors ranging from (1) "strongly disagree" to (5) "strongly agree". Using simple average method, the tables below present the user acceptance test results, as evaluated by the Bazaar City's employees.

Table 1. Evaluation Results for the Paintball Management Module

Criteria	Average
How do you feel about seeing the taken timeslots when viewing paintball reservation calendar	5.00
How do you feel about the paintball form and the easy creation of paintball reservations?	5.00
How do you feel about the taken timeslots that are disabled in the paintball reservation form?	5.00

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How do you feel about the automatic computations in the reservation form?	5.00
How do you feel about having a paintball reservation list to see all your reservations?	5.00
How do you feel about having filters in the paintball reservation list for easier searching?	5.00
Total Average	5.00

Table 1 shows that all five respondents were pleased with the efficiency of the paintball management module, which allows the user to easily search for venue availability for reservations through the use of the calendar system as seen in Figure 4, as well as the automated computation of the fee once the reservation has been processed.

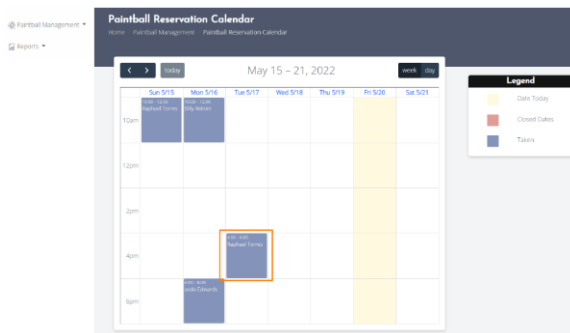


Figure 4. Paintball Reservation using a Calendar API

Table 2. Evaluation Results for the Event Management Module

Criteria	Average
How do you feel about having an event reservation calendar to view booked dates and venues?	5.00
How do you feel about having an event reservation list to see all your proposals?	5.00
How do you feel about having filters in the event reservation list for easier searching of proposal?	5.00
How do you feel about navigating through the event reservation list?	5.00
How do you feel about the event reservation form?	5.00
Total Average	5.00

According to Table 2, all five respondents were pleased with the new event management module processes. The calendar interface makes it much easier for users to book an event and upload event proposals without leaving the website's interface. The

user can also view all submitted proposals, which increases the company's productivity.

Table 3. Evaluation Results for Stall Management Module

Criteria	Average
How do you feel about having a shopping stall reservation list to view the reservations?	5.00
How do you feel about having filters in the shopping stall reservation list for easier searching?	5.00
How do you feel about filling up the shopping stall reservation form?	5.00
Total Average	5.00

Table 3 shows that all five respondents were pleased with the more user-friendly reservations form for stall management, which was not visible on Bazaar City's previous website. This automated stall selection and reservation as seen in Figure 5 allows both the company and customers to be more up to date on unexpected changes in stall occupancy.

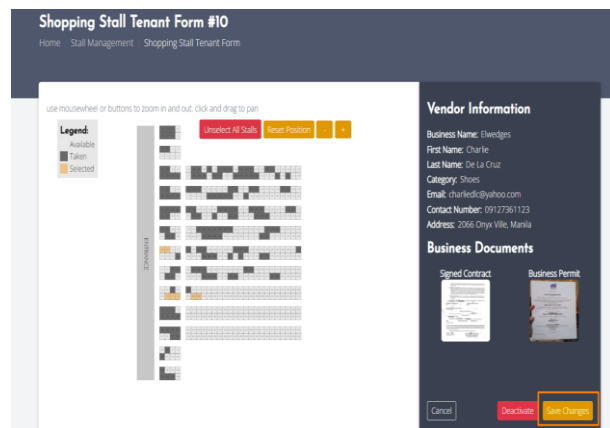


Figure 5. Visualization of the Stall Reservation

The reports generation module provides monthly, quarterly, and annual sales reports to aid in business decisions seen in Figure 6. With the implementation of DBMS, the system can now provide the business with real-time data to present the most up-to-date information to its clients and employees. It also serves as a backup and storage location for the company's critical data. Table 4 shows the evaluation results for the report generation module.

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Table 4. Evaluation Results for the Report Generation Module

Criteria	Average
How do you feel about the information given in the reports?	5.00
How do you feel about format of the reports?	5.00
How do you feel about having options (custom, quarterly, annually) when generating report?	5.00
How do you feel about being able to print the report?	5.00
Total Average	5.00

To address the client's need for increased sales and an improved marketing strategy, data visualization was incorporated into monthly and yearly income reports, as well as reports on most of the business's rented stalls. The client will use the data generated by these processes to make future decisions.

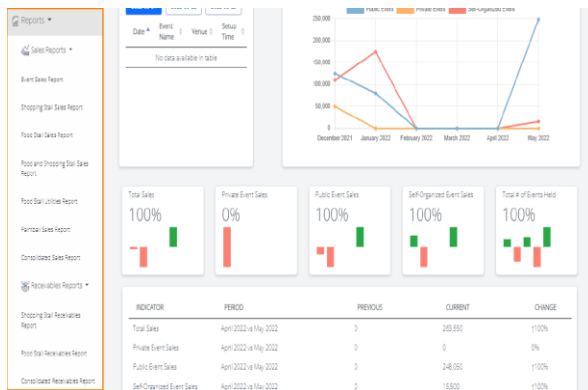


Figure 6. Report Generation Screen

Another added feature of the system was the payment system. The proponents 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.

4. CONCLUSION

There are only two user interfaces in the Bazaar City System: The Customer interface and the Employee interface. Any customer can access the Customer interface once an account has been created, while the Employees' interface varies according to the employee's position in the company. Upper

management has complete access to the system's modules, whereas ordinary employees such as encoders and receptionists may only have access to the system's basic features such as the creation and modification of reservations submitted by customers. The proponents carefully addressed the problems raised and discussed by the clients. Furthermore, the DBMS implementation will assist the company in having a central repository of vital data that is maintained and used by the company. Incorporating data analytics will also assist the company in making future decisions, as well as forecasting the trend of customer behavior. As seen in the UAT, all four modules received high satisfaction ratings from all system users. It demonstrates that the proponents met the requirements established by their clients.

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