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SQL Based Web Application for Zoo Management System

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Abstract - This paper depicts and projects the web-based Zoo Management System development that was built to achieve the aim of simplifying zoo operations. To replace manual processes with a single point of management for animals, staff, visitors, ticketing and events. Developed with PHP, MySQL, HTML5, and JavaScript, it provides full functionality for fast data handling and ease of use. Main highlights such as animal health, staff scheduling, online tickets, and media gallery are available. The UML diagrams helped in designing the architecture and modules of the system. After thorough testing, it was proven that the system works reliably, securely, and quickly. A modern zoo needs an exact solution that can improve operational accuracy and concurrently assist in accomplishing zoo goals—animal welfare, educational and entertainment goals for the visitors, which speaks to the power of digital transformation in modern-day zoo environments.

Key Words: Zoo Management System, Web-Based Application, Animal Record Management, Visitor Ticketing, PHP and MySQL

1.INTRODUCTION

The Zoo Management System is designed to streamline and automate various operational aspects of zoo management. This system aims to enhance the efficiency and accuracy of managing animal records, staff schedules, visitor information, and financial transactions. The implementation of this system addresses the limitations of the current manual processes by providing a centralized, integrated platform for all zoo-related activities [1].

The primary functionalities of the system include animal care management, staff management, visitor management, and reporting. Animal care management involves tracking animal health, diet, habitat conditions, and medical history. Staff management features include scheduling, task assignments, and performance tracking [2]. Visitor management covers ticketing, visitor information services, and feedback collection. Reporting capabilities enable detailed analytics and insights into various operational aspects, aiding in informed decision-making [3].

The system is developed using a combination of modern technologies, including a robust database management system (MySQL) and a flexible operating environment (Windows or Linux). The use of a relational database ensures efficient data storage, retrieval, and management, while the choice of operating systems provides scalability and reliability [5].

1.1. Existing System:

Most zoos today operate using traditional management methods that are largely manual or only partially automated. These methods involve:

- Paper Records: Animal health records, dietary logs, and habitat maintenance schedules are often kept on paper, making it difficult to access and update information quickly.
- Manual Scheduling: Staff schedules and task assignments are typically managed manually or using basic spreadsheet software, which can be time-consuming and prone to errors.
- Visitor Management: Ticketing and visitor information are often handled through separate systems or manually, leading to inefficiencies and potential customer dissatisfaction.
- Reporting: Generating reports on animal health, visitor statistics, and financial performance involves gathering data from multiple sources manually, which is time-consuming and error- prone [5,6].

1.2. Need for the System:

The proposed Zoo Management System addresses these challenges by providing a comprehensive, integrated solution that automates and streamlines various aspects of zoo management. The key needs for this system include:

- Automation: Automating routine tasks such as record-keeping, scheduling, and reporting to reduce administrative workload and minimize errors.
- Centralized Data Management: Creating a centralized database for all zoo-related information, ensuring data consistency and easy access for authorized personnel.
- Improved Animal Care: Providing tools for detailed tracking of animal health, dietary needs, and habitat conditions to enhance animal welfare and care.
- Efficient Staff Management: Offering features for automated scheduling, task assignments, and performance tracking to optimize staff utilization and improve operational efficiency.
- Enhanced Visitor Experience: Streamlining ticketing processes, providing better access to visitor information, and collecting feedback to improve the overall visitor experience.
- Comprehensive Reporting and Analytics: Enabling real-time data collection and analysis to support better decision-making and strategic planning.
- Scalability and Flexibility: Designing the system to be scalable and flexible, allowing for future enhancements and integration with other systems as the zoo's needs evolve [7,8].

By implementing the Zoo Management System, zoos can significantly improve their operational efficiency, data accuracy, and overall management capabilities. This system will not only enhance the care provided to animals but also improve the experience for staff and visitors, supporting the zoo's mission of conservation, education, and recreation.

1.3. Scope Of Work

The scope of the Zoo Management System encompasses a comprehensive range of functionalities and features designed to enhance the efficiency, accuracy, and effectiveness of zoo operations. The system aims to integrate various aspects of zoo management into a cohesive platform, providing tools for managing animals, staff, visitors, and financial operations [9]. The key areas within the scope of the system are outlined below:

- **Animal Management**
  - Animal Records: Maintain detailed records for each animal, including species, age, health history, dietary needs, and habitat requirements.

- Habitat Management: Monitor and manage habitat conditions, ensuring that environmental parameters such as temperature, humidity, and cleanliness are maintained at optimal levels [2].

- **Staff Management**
  - Staff Scheduling: Automate staff scheduling, ensuring adequate coverage for all zoo operations and reducing scheduling conflicts.
- **Visitor Management**
  - Ticketing System: Implement an efficient ticketing system for booking, purchasing, and managing visitor tickets, both online and on-site.
  - Visitor Information: Provide visitors with access to information about zoo exhibits, animal shows, feeding times, and educational programs.
  - Feedback Collection: Enable visitors to provide feedback on their experience, helping the zoo to identify areas for improvement and enhance visitor satisfaction [3].
- **Reporting and Analytics**
  - Operational Reports: Generate reports on various aspects of zoo operations, including animal health, staff performance, visitor statistics, and financial data.
- **User Management and Security**
  - User Roles and Permissions: Implement a robust user management system with defined roles and permissions, ensuring that only authorized personnel have access to specific functionalities and data.
  - Data Security: Ensure the security of sensitive data through encryption, secure access controls, and regular security audits.
  - Backup and Recovery: To guard against data loss and guarantee company continuity, put backup and recovery protocols into place.
- **Usability and Accessibility**
  - User-Friendly Interface: Design the system with an intuitive and user-friendly interface, making it easy for staff and administrators to use.
  - Accessibility: Ensure that the system is accessible to all users, including those with disabilities, by adhering to accessibility standards and guidelines [10].

By addressing these areas, the Zoo Management System aims to provide a holistic solution that not only improves the day-to-day operations of the zoo but also enhances the overall experience for animals, staff, and visitors. This system will support the zoo's mission of conservation, education, and recreation by ensuring that all aspects of zoo management are handled efficiently and effectively

2. METHODOLOGY

To develop an effective Zoo Management System, it is essential to analyze existing systems and understand their features, strengths, and limitations. This section reviews several popular zoo management systems currently in use, highlighting their functionalities and identifying areas for improvement that the proposed system aims to address, is a comprehensive management system widely used by zoos and aquariums worldwide. It provides tools for managing animal records, ticket management, vacancy, and zoo annual programs.

2.1 System Architecture

The application is implemented in the classical three-tier architecture:

- **Presentation Layer:** Developed front-end using HTML5, CSS3, Bootstrap, and JavaScript for responsiveness and friendly user interface.
- **Business logic Layer:** The middle tier is developed using PHP language (versions 5.6 and 7.4) that deals with processing of data, business logic, and acts as a link between the UI and the database.
- **Zoo Database:** MySQL 8.4. The database layer, in the context of a zoo interaction, is responsible for all things zoo; including, but not limited to, animal records, visitor logs, tickets information, and zoo controls [7].

This is an architectural pattern to allow for a clear-cut division of concerns, thus providing better security and maintainability.

2.2 Technology Stack

Table -1: Tools used [10,11]

Layer	Tools / Technologies
Frontend	HTML5, CSS3, JavaScript, Bootstrap
Backend	PHP 7.4
Database	MySQL 8.4
IDE	VS Code
Hosting OS	Windows 10
Web Server	XAMPP (Apache)
Browser Support	Google Chrome v125+

2.3. Key Modules

- **Animal Management**

This particular software module allows zookeepers to record extensive information about the animals in their care, such as species, gender, date of birth, feeds, enclosure information, and health records. It also allows for improved care by providing real-time updates and reporting on animal health.

- **Staff Management**

Managers can assign jobs, grant workdays, and observe performance with the help of administrative access. Scheduling made easy Automation minimizes room for human error and helps distribute even coverage across sections of the zoo.

- **Visitor Management and Ticketing**

The current module is handling visitor registration, ticket bookings (regular, student, child), the ticket history. It is used for both online and offline and reduces hassle for the purchaser as well as the time to serve them.

- **Event and Gallery Management**

Creating educational content or shows where zoo administrators can add, edit or delete any event. Also included is an image and video gallery to keep your visitors interested.

- **Vacancy Management**

It should be possible to post the job with a complete description including type (temporary/permanent) of job, a job description, and the last date for applying, authors say.

2.4. Security and Data Integrity

RBAC was adopted for a secure access of the system. There are levels of privilege for admins, staff, and visitors. Passwords are encrypted and database access is limited to authenticated users. To guarantee data integrity and aid in recovery in the case of a system breakdown, regular backup and validation processes were implemented [5].

2.5. Development Process

It uses the iterative model so that it could gains feedbacks, be improved and cycled. Periodic testing and code review helps to keep all features compatible to user requirement and as well as software engineering standards [7].

3. RESULTS

To enhance the operational efficiency of zoo-related tasks, such as managing the animal records, scheduling the staff visitors and the events, the Zoo Management System was developed and implemented. The system was been tested using valid test data in a simulated environment, and all core modules were extensively verified for functionality using structured test cases.

3.1. System Functionality Outcomes

- **Animal Management:**

The admins would be able to add, update, delete and retrieve records of animals with species, gender, date of birth, and habitat data. Demo inputs were used to verify feeding schedules and medical history features.

- **Visitor ticketing:**

The system facilitates how a visitor can book the ticket online generating e-tickets for Children, Students, and others. Storage and retrieval of ticket history and stats worked.

- **Admin panel:**

Which allowed admin users to administer classifications and to view bookings, events, staff listings, and system reports all from one panel.

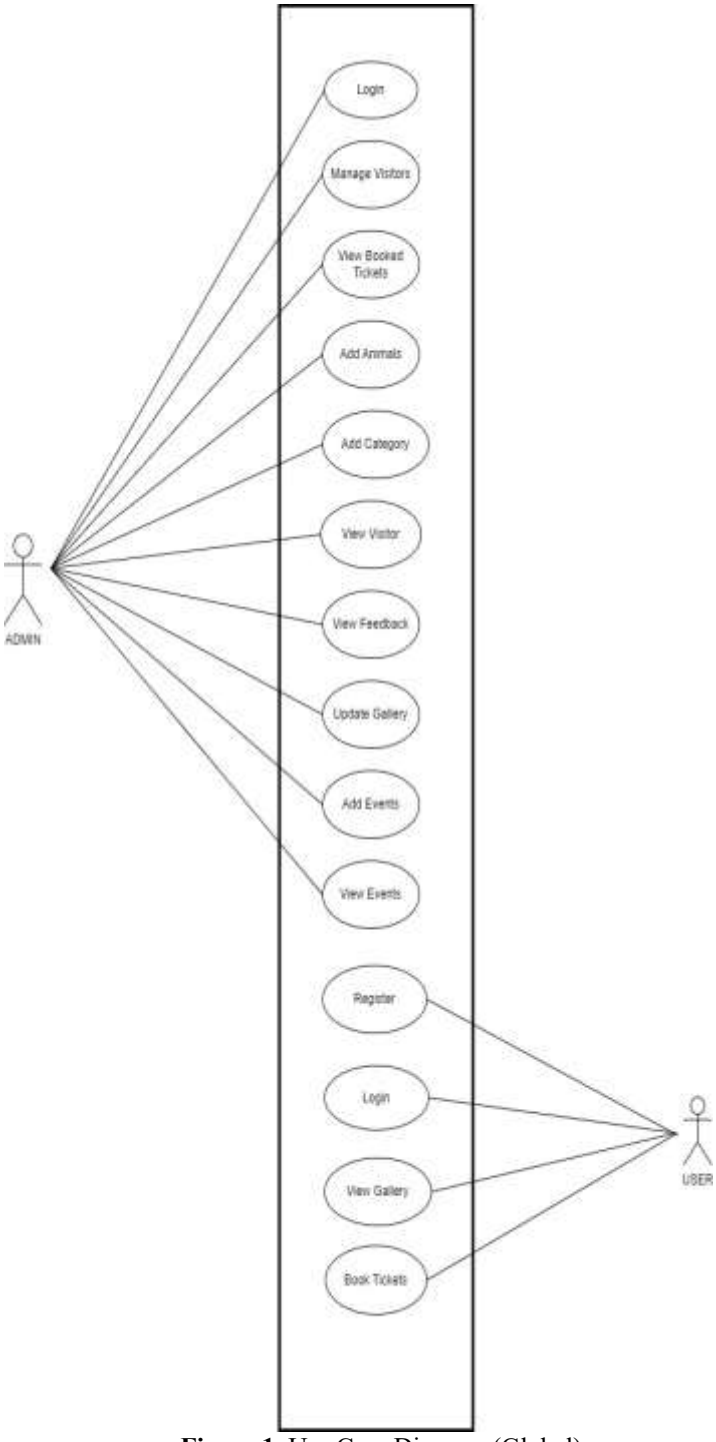

Figure 1. Use Case Diagram (Global)

- **User Interface:**

The design was responsive, had image and video galleries, an interactive “animal of the week” section and visitor orientation through a zoo map

3.2. Testing Outcomes

We had 10 primary test cases which included authentication, data insertion, updates, deletions, reports and ticket processing. Each of which reported a Pass status, meaning the expected outputs were manifested by actual system behaviour for each of the scenarios.

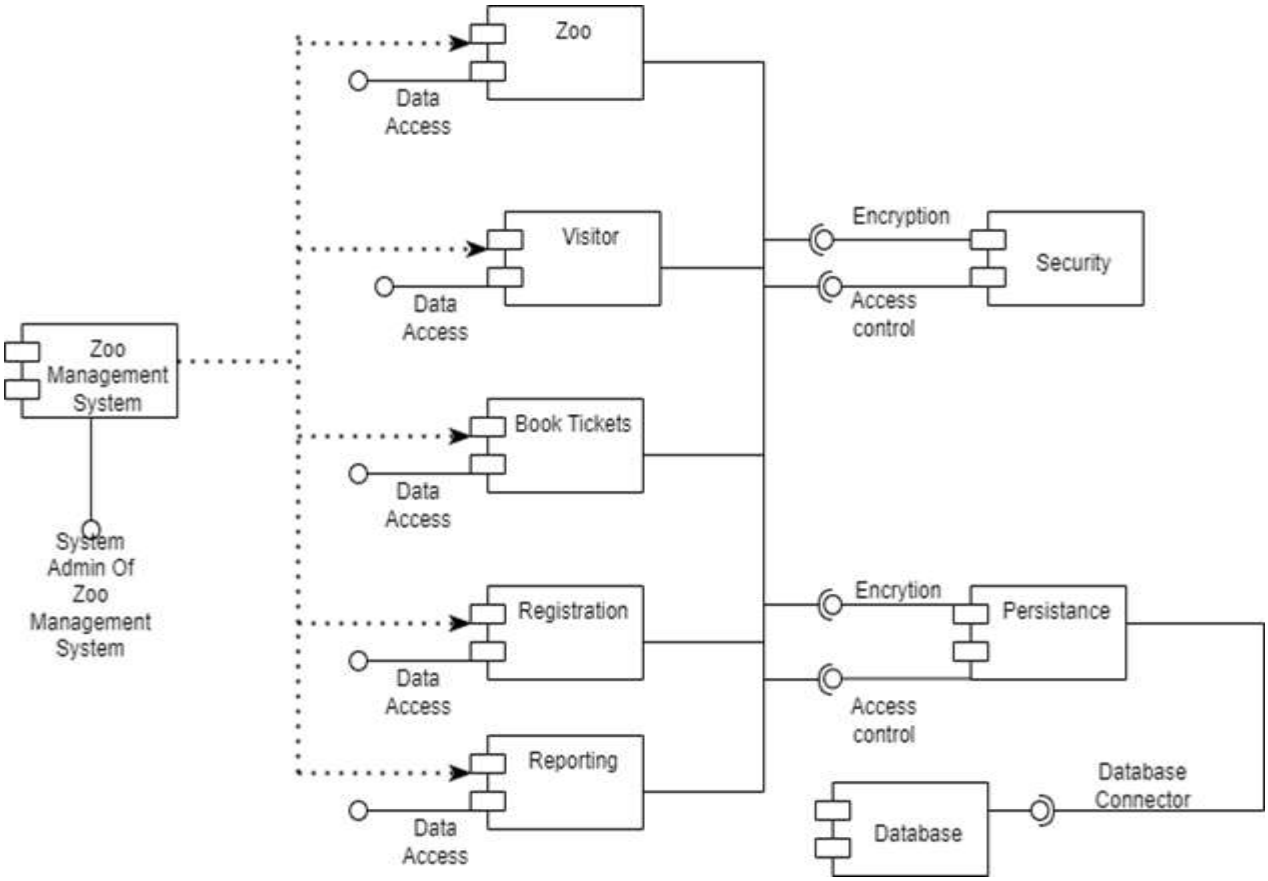

Figure 2. Component Diagram

Table -1: Test Cases

Test Case ID	Test Case Description
TC-001	Login Functionality
TC-002	Login with Invalid Credentials
TC-003	Add New Animal Record
TC-004	Search for Animal Record
TC-005	Update Animal Record
TC-006	Delete Animal Record
TC-007	Generate Daily Staff Schedule
TC-008	View Animal Feeding Schedule
TC-009	Purchase Tickets Online
TC-010	View Visitor Statistics

It stored all the data precisely, granted access based on roles, and handled user sessions & validations flawlessly. There were no critical bugs during the testing phase as reflected in the defect report. This ensured the confidentiality & integrity of data by encrypting password fields and ensuring that any restricted data was only accessibly by the appropriate user.

3.3. User Interaction and Usability

The user feedback received the from internal testers indicating that the interface was built intuitively and was easy to navigate. Admin and visitor module were well laid out, with appropriately labelled fields and standard page structure. With an easier to use layout, where even non-tech savvy users all got on to book tickets and get gallery easy.

3. DISSCUSSION

The outcomes show that Zoo Management System is a good solution for small to medium size zoos looking to digitise their operations. This modular architecture enables upgrades such as predictive animal health analytics, environmental sensors, or visitor insights based on artificial intelligence in the future. The system reduces administrative overhead while increasing the quality of animal care and visitor experience by combining core management functions all into one platform.

4. CONCLUSIONS

This literature came up with the best possible way to overcome the limitations of manual zoo operation by the introduction of centralized zoo management system in a web-based form. The efficiency gains from this system boost the ease of record-keeping for animals, scheduling of staff, and ticketing and event management. With a modular design, strong security, and adaptive interfaces, the entire system is designed to be user-friendly for both admins and visitors. Its performance, accuracy and scalability were verified through extensive testing. Innovative digital tools for modern zoo functions, animal welfare, visitor engagement and operations management. This solution exemplifies the potential of such approaches in the zoo environment.

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