Pagadian Diocesan Schools Information Monitoring System through Data Visualization

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ABSTRACT

The Pagadian Diocesan Schools Information Monitoring System through Data Visualization is a web-based application meticulously developed to address the challenges of managing educational data across multiple schools within the Pagadian Diocese. Utilizing HTML, MySQL, PHP, CSS, and Bootstrap, the system streamlines the login process for administrators, enhances data monitoring, and provides a centralized view for superintendents. Through advanced data visualization tools, the platform presents essential metrics such as student population, income, and expenses, contributing significantly to the Pagadian government's education initiatives while adhering to ethical data usage practices. Continuous user feedback ensures the refinement of the system, guaranteeing efficient and effective data management within the Pagadian Diocese.

The study also encompasses the design, development, and testing phases of the system, following the Waterfall Model. Through rigorous testing, the system demonstrated commendable performance, stability, and security measures, with high user-friendliness and compatibility. The ISO/Logical Summary Report identified strengths in Functional Stability, Portability, Reliability, Security, Usability, and Maintainability, leading to a Total ISO/Logical Flow score of 90.94%. Overall, the system promises a smooth, effective, and dependable user experience, with room for improvement in UI design and error handling to enhance its performance further.

Key words: Education Data Management, Diocesan School Monitoring, Data Visualization Tools, Web-Based System

1. INTRODUCTION

The Pagadian Diocesan Schools Information Monitoring System through Data Visualization represents a significant leap forward in the realm of educational data management. This web-based system is meticulously designed to collect, analyze, and present crucial data from schools within the Pagadian Diocese [1]. Originating from a collaboration with various schools and adhering to ethical data use practices, this system seeks to enhance educational outcomes by providing a comprehensive understanding of student population, income, expenses, and other vital metrics.

Built on the foundation of research and innovation, the system draws inspiration from global efforts to improve education quality. The Philippine government's initiatives, exemplified by the School Information Monitoring System using Data Visualization, underscore the commitment to fortify the nation's education system [2]. By employing advanced data visualization tools, the platform ensures that administrators across different schools can effortlessly input, monitor, and analyze their school data [3].

This study is a proactive response to challenges in the current login system for school administrators, emphasizing the difficulties in data monitoring and the lack of a streamlined approach for superintendents to oversee individual institutions [4]. Intending to enhance login systems and overall data management processes, the research seeks to create an efficient and effective system tailored to the needs of multiple schools [5].

Embarking on this journey, the document aims to present a comprehensive summary of the web application, delineating its objectives and parameters [6]. Targeting school superintendents and administrators as primary users, the system offers increased efficiency in data analysis and seamless access to information [7]. The inclusion of communication features, including chat functionality, ensures a user-friendly experience.

The scope of this study is laser-focused on the monitoring of information within the Pagadian Diocesan Schools through data visualization. The system's capabilities span from

presenting and summarizing data using visualization tools to allowing users to have individual accounts, minimizing the administrative burden. Collecting and analyzing data from various Diocesan schools, visualizing records, and securely saving monthly records to a Database Management System (DBMS) are integral components. Moreover, the system empowers superintendents with the ability to change passwords, ensuring robust security measures.

2. METHODOLOGY

This section delineates the research methodology utilized in the investigation, covering aspects such as the research design, research setting, participants involved, instruments employed for research, procedure for data collection, methods of data analysis, and statistical approaches utilized.

2.1 Research Design

This section outlines the development of the Pagadian Diocesan Schools Information Monitoring System through Data Visualization. The study aims to address challenges in the current login system for school administrators, focusing on enhancing data management processes. Objectives include analyzing existing issues, identifying solutions, and developing a monitoring and visualizing school-related data. The scope encompasses data collection from various Diocesan schools, user account management, and the implementation of a centralized Database Management System (DBMS). The research methodology involves data collection through interviews and iterative development, followed by qualitative and quantitative analysis. Evaluation includes usability testing and feedback sessions. The expected outcomes include an efficient and user-friendly system, improved communication features, and valuable user feedback for further refinements.

3. RESULTS

The Design and Development of Pagadian Diocesan Schools Information Monitoring System through Data Visualization was completed by implementing the phases of the Waterfall Model, each of which is outlined and discussed below:

3.1 Requirements Specification

Defining requirements plays a critical role in software system development. It entails clearly outlining and formally documenting both the functional and non-functional requirements of the software, ensuring they align with its intended goals and user expectations. During this phase, the development team meticulously collected data from school principals of Pagadian Diocesan Schools and the Superintendent overseeing these institutions, identified as the primary end-users. The insights gathered in this phase significantly influenced the direction and focus of subsequent project stages.

3.2 Planning

The initiation of the Pagadian Diocesan School Information Monitoring System through Data Visualization took place from February 8 to December 23, 2024, ensuring a meticulous and comprehensive approach. In the initiation phase throughout February, the project's scope and objectives were defined, and the clients, including school superintendents and administrators, were identified. Simultaneously, critical data from various affiliated schools was meticulously collected to lay the groundwork for the upcoming phases.

The planning phase, spanning from February to May, involved the creation of a detailed Gantt chart, prioritization of tasks, and comprehensive documentation of system features. This period served as a crucial foundation for the subsequent phases, ensuring a systematic and well-organized development process. Moving forward, the designing phase, occurring between March and September, delved into the creation of essential diagrams, such as the Use case Diagram, Data Flow Diagram, and Entity Relationship Diagram. The emphasis was on meticulously planning the system's structural framework and functionality, laying the groundwork for the coding and development phase.

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From March 9 to October 5, the coding and development phase unfolded, where the team translated the conceptual designs into a tangible web-based application. Utilizing a combination of HTML, CSS, PHP, Bootstrap, and MySQL, the development team brought the envisioned system to life. This intricate process demanded consistent updates, rigorous testing, and meticulous coding to align the system's functionality with the predetermined requirements.

The subsequent testing phase, spanning from September 20 to December 23, was dedicated to evaluating the system's performance, conducting thorough user acceptance testing, and gathering valuable feedback. This phase played a pivotal role in identifying and rectifying errors, ensuring a seamless user experience. As the project approached its final stages, the deployment and feedback collection phase, running from December 1 to December 23, marked the official launch of the system. Continuous monitoring and feedback collection from end-users, particularly school superintendents and administrators, remained paramount during this period.

Finally, the last phase from December 24 to December 31 encompassed the finalization and documentation process. The development team made necessary adjustments based on the feedback received, and a comprehensive documentation process was undertaken, ensuring clarity in system structure, features, and functionalities. This detailed documentation aimed to facilitate future maintenance and updates, contributing to the longevity and sustainability of the Pagadian Diocesan Schools Information Monitoring System through Data Visualization.

3.3 Designing

The Pagadian Diocesan Schools Information Monitoring System through Data Visualization is a comprehensive system precisely designed to assist the Superintendent in the challenging control of each school within the diocese. Using innovative data visualization techniques, the system provides a full overview of important school data, including school information, teacher and staff, student population, and financial data. Additionally, this platform enables School Administrators to comfortably input and manage data, contributing to a collaborative and streamlined monitoring process for the Superintendent's evaluation.

a. Technical Specification

The Pagadian Diocesan Schools Information Monitoring System through Data Visualization was composed of the following components: Website, Hardware, Superintendent, and end-users.

The website serves as the interface through which both end-users and administrators interact with the system. It has been developed with a set of web-based software components, carefully chosen and implemented by the developer: HTML, PHP, MySQL, JavaScript, Bootstrap, and CSS.
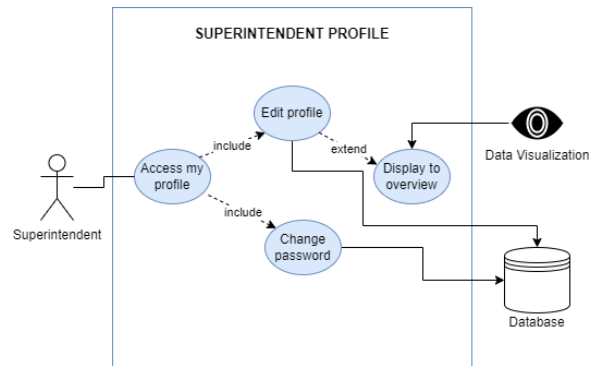
b. Use-Case Diagram

A Use Case Diagram visually presents the different ways users, or "actors," interact with the system to accomplish specific goals or tasks. The diagram consists of actors, use cases, and their relationships, providing a clear and concise overview of the system's functionality.
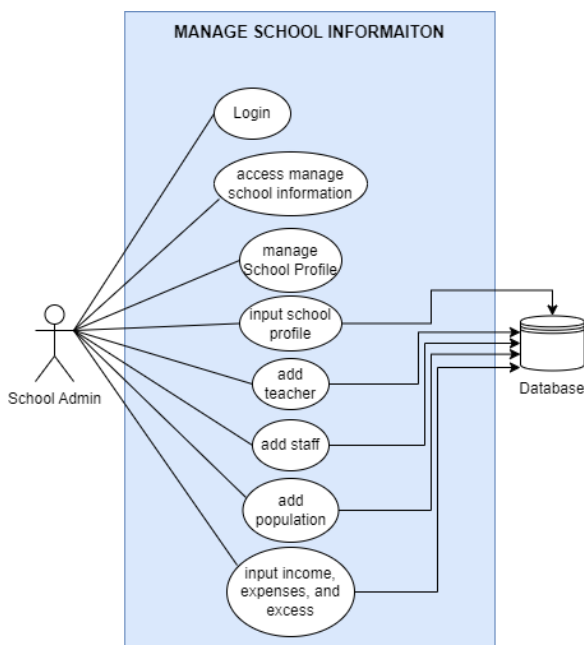

Figure 1: Manage School Information

Figure 1 shows the manage school information use case. It is the process by which a school administrator manages a school by entering data such as the school profile, teachers, staff, population, income, and expenses.

Figure 2: Use Case Diagram of Superintendent Profile

Figure 2 depicts the Superintendent Profile; since the Superintendent has a given account, the developer ensures that it also has security that allows the Superintendent to view and edit its profile, and also to change the password.
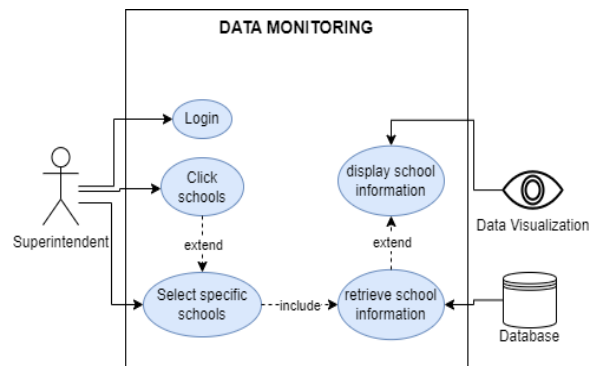

Figure 3: Data Monitoring of the Superintendent

Figure 3 shows the administrator has finished entering data into the system, the data is saved into the database and is monitored by the superintendent. By monitoring the data, the superintendent must select specific schools, and the school data will be displayed.

c. Interface Design

Interface design plays a crucial role in the usability and effectiveness of the Pagadian Diocesan Schools Information Monitoring System through Data Visualization. The interface involves the thoughtful arrangement of visual elements, such as buttons, icons, and navigation menus, to enhance user interactions and overall user experience. The goal of interface design is to facilitate efficient and enjoyable interactions between users and the system, considering factors like aesthetics, usability, and accessibility. The interface should also be designed to be accessible to all users, regardless of their level of technological proficiency.
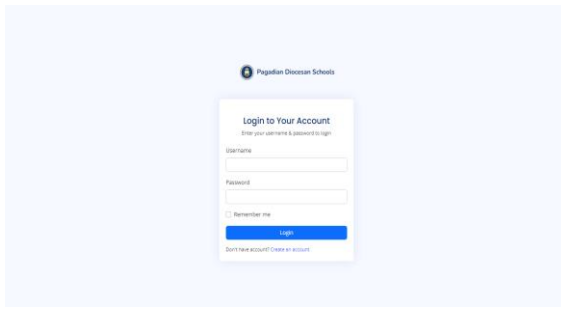
Figure 4: Account Registration and Login

Figure 4 shows the account registration and login page of the system, catering to both new users who wish to create a new account and current users with existing accounts.
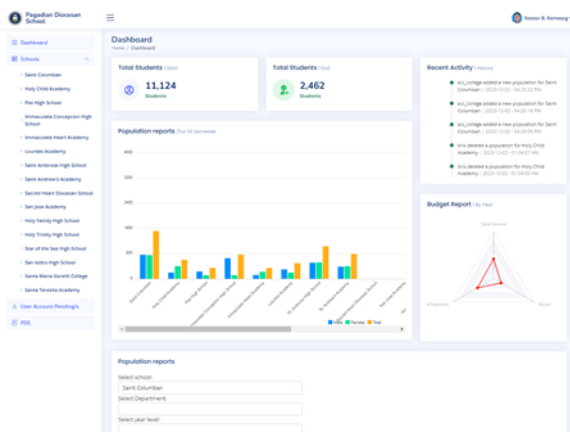
Figure 5: Schools' Superintendent Main Interface

Figure 5 shows the dashboard of the Schools' Division Superintendent, where reports and data visualizations are presented in the form of graphs and analytics.

3.4 Development Implementation

During this phase, the Pagadian Diocesan Schools Information Monitoring System through Data Visualization undergoes its tangible creation and coding. Following meticulous planning and design, developers translate detailed design specifications into functional code. This pivotal stage marks the concrete realization of previously outlined functionalities and features. Leveraging technologies such as HTML5, PHP, MySQL, JavaScript, Bootstrap and CSS, the system takes shape as a web-based application. Developed to address challenges in managing educational data across multiple schools, the system aims to streamline administrative login processes, enhance data monitoring, and provide superintendents with a centralized view. Through innovative data visualization tools, the platform presents crucial data on student population, income, and expenses in an accessible format.

3.5 Testing

During this critical stage, the system undergoes rigorous verification to ensure alignment with the established specifications from the planning phase. Comprehensive testing at various development stages is essential to consistently identify and address any potential issues. This meticulous testing process guarantees that the software meets the intended high-quality standards. The testing primarily focuses on validating the software's functional requirements, and the results have been highly positive and satisfying. We have meticulously analyzed the test results, integrating them with feedback gathered from surveys conducted during the testing phase. After evaluating key factors such as bug absence, performance, and system logic, the software achieved an impressive score of 56.62 points, representing an efficiency level of 94.37%. This score signifies more than just meeting technical standards; it reflects a seamless integration of features, reliability, and user-centered design.

3.6 Deployment

The deployment phase of this research is dedicated to preparing the system for integration into its target environment. This phase includes user acceptance testing, during which the system undergoes a thorough evaluation by both end-users and IT experts to ensure its seamless functionality in real-world scenarios. Following this trial and meticulous assessment, dedicated researchers compile a comprehensive summary of their findings. This detailed analysis serves as the basis for determining whether the system successfully meets the established acceptance criteria, signaling its readiness to progress to the next pivotal stage of development. As with other phases in the system development life cycle, deployment demands careful planning, coordination with the client, and additional testing to guarantee its successful application. During this process, various considerations are taken into account to ensure the seamless and effective integration of the system into daily operations.

3.7 Maintenance

3.7.1 IT Experts and Students Evaluation of the Information Monitoring system through Data Visualization

The researchers carried out an experiment on the website with 20 test subjects. Out of the group, there were 10 technical users and 10 non-technical users.

The system's consistent performance and ability to function as expected under various conditions are reflected in its impressive Functional Stability score of 97.70%, making it a reliable choice for users.

Showing a Reliability score of 90.31%, the system demonstrates reliability and ability to consistently execute its

planned functions in typical situations, essential for building trust with users.

The outstanding portability rating of 90.22% for the system indicates its ability to easily adapt and be used across various environments or platforms, which is crucial in today's diverse technology industry.

A system with a Usability score of 90.22% demonstrates its user-friendliness, indicating its intuitive, easy-to-use, and accessible nature, all crucial factors in ensuring a positive user experience.

The system's Performance Efficiency score of 91.25% indicates its capacity to optimize performance and reduce resource consumption, crucial for operational efficiency.

With a Security score of 89.25%, the system showcases strong data protection and defense against unauthorized access or breaches, an essential factor in the digital era.

4. CONCLUSION

Comprehensive testing of the system showed positive results in functional and non-functional aspects, highlighting robust performance in key user functions like Sign-Up, Log In, Profile Management, and School Information Management. Data Visualization and Activity Log functionalities also performed well. The Pagadian Diocesan School Monitoring System demonstrated commendable performance, stability, and security measures, with good user-friendliness and compatibility. The ISO/Logical Summary Report identified strengths in Functional Stability, Portability, Reliability, Security, Usability, and Maintainability, leading to a Total ISO/Logical Flow score of 90.94%. Overall, the system promises a smooth, effective, and dependable user experience, with room for improvement in UI design and error handling to enhance its performance further.

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