ISSN 2278-3083
Volume 13, No.3, May - June 2024
International Journal of Science and Applied Information Technology
Available Online at http://www.warse.org/IJSAIT/static/pdf/file/ijsait031332024.pdf
https://doi.org/10.30534/ijsait/2024/031332024

Web-based Document Management System

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Received Date : April 23, 2024 Accepted Date : May 26, 2024 Published Date : June 07, 2024

ABSTRACT

This system digitizes the current paper-based document management system of an office in Pagadian City in the province of Zamboanga del Sur. The office is a unit of an executive department tasked to govern the primary education system of the entire country of the Philippines. Among its responsibilities, the office regularly disseminates and collects pertinent documents required by its executive department from various Elementary Schools within its locality through the School Principals. Currently, the processes involved in managing these documents to perform the necessary tasks are mostly traditional and paper-based. This system primarily provides a web-based electronic document management solution to the office unit, where the School Principals post, access, download, and submit documents online.

Further, this system enables the office to produce relevant reports useful in document inventory. This mechanism addressed the challenges experienced by office employees in collecting and managing pertinent documents. As a result, the dissemination, submission, and collection of relevant papers assigned by the office will be streamlined.

Key words: document management system, file management system, electronic document management, electronic document management system, web-based system, web-based electronic document management system, web-based document management

1. INTRODUCTION

Automation is crucial in today's office environments, making employees' work more accessible and straightforward. As a result, office workers become more efficient and effective at work. It is achieved through various technologies to transform office transactions and improve user-employee efficiency [1]. Document management is one of the many areas for automation in office environments. Although traditional document management, which uses papers, is still standard, especially in developing countries, new technologies have enabled many organizations to seamlessly move from traditional document management systems to their electronic form in facilitating managerial work through electronic file management and control [2]. An electronic document management system is a computerized system that enables the creation, capture, organization, storage, retrieval, manipulation, and controlled circulation of documents in the electronic format. Document management systems have long been utilized to manage significant traditional paper-related challenges in the efficiency of document storage, document retrieval, and information access [3]. Thus, document management systems enable employees to easily access information and documents, which positively impacts employee performance and increases productivity. In addition, these systems also allow organizations to interact with different organizations, especially when the architecture is web-based, thus ensuring the rapid distribution of information. It also indicates these systems' important role in the information flow between public institutions, the private sectors, and vice versa [4]. Web-based systems provide a seamless transaction and a convenient experience for the end-users [5]. Indeed, Information and Communications Technology can bring efficiency and convenience to various organizations through the digital transformation of traditional operations such as document processing [6].

An office in Pagadian City, in the province of Zamboanga del Sur, Philippines office's primary function is to monitor and establish communications among the elementary schools within the city or its jurisdiction as a unit of the cited executive department through the school Principals, particularly on the aspect of accomplishing the programs and services as per the national mandate. The programs and services are mainly facilitated for the welfare of the pupils, such as cleanup drives, celebration of nutrition month, free dental services, seminars, workshops, and the like. Accomplishing the mandated activities is crucial for the school principals since they will be monitored through the monitoring office per the executive department's requirements. For each accomplished program or service, School Principals will have to submit a document as

an accomplishment report based on a template issued by the executive department office via email containing the required details to specify what particular program was delivered. The concerned school principals submit the accomplishment report manually and hand the documents to the cited office. When the documents are personally received, they will be archived or managed by traditional mechanisms like keeping the papers in steel cabinets. This conventional mechanism does not support innovation.

Traditional document management systems are no longer sufficient to meet today's needs, especially for organizations that want digitization, innovation, and modernization. Therefore, organizations need to provide employees with a computing solution through digitization, like electronic document management for storing and archiving documents while at the same time providing them with an efficient system to perform their daily tasks [7]. With digitization through systems like an electronic document management system, organizations can efficiently process and capture relevant information and knowledge used for decision-making purposes [8]. Such systems provide numerous features and center around the optimization of documents and the utilization of data [9]. Thus, the massive advantages of electronic document management systems center on their ability to be efficient, the adequate use of physical space and technology, the transparency of the flow of the documents, flexibility about the physical location of employees, improved security, and the reduction of cost for printing, postage stamps, envelopes, and the like [10].

Several document management system studies and developments have already been conducted. Guo et al. [11] analyzed and presented the current state of electronic data management system implementation within the leading transportation agencies in the United States of America and developed a framework for selecting and implementing such systems for other agencies to promote efficient data-sharing among stakeholders. Abdulkadhim et al. [12] explored the common factors that influence implementing electronic document management systems in governments. The study found common factors from the existing studies related to the implementation process, demonstrating that technological, organizational, and user factors are common. Identifying these factors is helpful for future research on electronic document management system implementation issues.

On the other hand, Sambetbayeva et al. [13] presented an approach or a model of an intelligent document management system using machine learning techniques that ensured efficient employee performance in organizations. As a result, the Researchers were able to solve several problems related to the optimization of the document management process, which can be effectively helpful when applied to enterprises, government, and corporate institutions. A paper by Han et al. [14] discussed the application of cloud computing technology in the development of electronic file management systems and proposed an architecture based on it. The paper also provides a more detailed discussion of critical technologies for its implementation. Because it is built on cloud architecture, it can fully use cloud storage, cloud security, and cloud computing technologies to achieve unified, reliable, and secure management of electronic files. Another interesting study by Radzi et al. [15] discussed the necessary steps for document preparations for the archival institution or records repositories before digitizing the materials. The study indicated that document preparation is a process before the scanning process. Relevant topics included the types of documents collected for digitizing, the criteria for digitization, and the steps of document preparation. Specifically, this software development dealt with the following concerns:

1. How may the Web-based Document Management System be developed using the Waterfall Model:
    - 1.1 Requirements Specification;
    - 1.2 Planning
    - 1.3 Designing;
    - 1.4 Development/Implementation;
    - 1.5 Testing;
    - 1.6 Deployment;
    - 1.7 Maintenance;

2. How may the Web-based Document Management System be evaluated by the IT Experts based on the following attributes or criteria:
    - 2.1 Functional Suitability;
    - 2.2 Performance Efficiency;
    - 2.3 Compatibility;
    - 2.4 Usability;
    - 2.5 Reliability;
    - 2.6 Security;
    - 2.7 Maintainability;
    - 2.8 Portability

3. How may the Web-based Document Management System be evaluated by Employees of the cited office under an executive department based on the following attributes or criteria:
    - 2.1 Functional Suitability;
    - 2.2 Performance Efficiency;
    - 2.3 Compatibility;
    - 2.4 Usability;
    - 2.5 Reliability;
    - 2.6 Security;
    - 2.7 Maintainability;
    - 2.8 Portability

2. METHODOLOGY

2.1 Research Design

The Waterfall Model is used as the basis for developing this system. This model has been adapted as a research design methodology due to its structured and systematic approach. As a research design, the waterfall model involves a sequential or

linear progression through different phases, akin to a cascading waterfall. In addition, the development of this system also adopted the IEEE (Institute of Electrical and Electronics Engineers) Recommendation in Software Engineering. This recommendation refers to a set of standards and best practices established by the IEEE for developing, documenting, and maintaining software projects. These recommendations cover various aspects of software engineering, including requirements analysis, design, coding, testing, and documentation. By adhering to IEEE guidelines, software developers ensure that their projects are developed with high quality, reliability, and maintainability. These standards help in promoting consistency and interoperability in software development, making it easier for different teams to collaborate and understand each other's work. Additionally, following IEEE recommendations in software engineering enhances software products' credibility and trustworthiness, benefiting developers and end-users alike.

3. RESULTS

1. Design and Development of Web-based Document Management System

The Web-based Funds Collection System was completed through the waterfall software development model and by adopting the IEEE recommendation in software engineering. The phases involved in the entire development process are outlined and discussed below.

1.1 *Requirements Specification*

The requirements specification plays a crucial role in the development of software systems. It defines and documents the software's functional and non-functional requirements to meet the intended purpose and user expectations. In this phase, the developers have gathered data from the cited office under one of the executive departments of the Philippines in Pagadian City, province of Zamboanga del Sur concerning how documents are currently management through traditional and manual mechanism. Ultimately, the collected data will be used and become the basis for the succeeding phases of the development process.

1.2 Planning

The planning phase is fundamental in the entire development process. It is where project objectives, requirements, resources, and constraints are further defined and organized to ensure the successful execution of the software project. In this phase, the developers prepared a comprehensive plan that will serve as a guide throughout the project. This plan also serves as a blueprint that outlines the steps to be taken, resources to be used, and potential risks to be managed. Changes may occur during the development process. Hence, reviews and updates are essential should a new set of requirements arise during the course of the project.

1.3 Designing

This phase is another crucial step in the software development process as it transforms the requirements gathered in the earlier phases into a detailed design that will produce another blueprint for developing the software system. The system is web-based that enables the concerned office of the cited executive department in the Philippines be able to electronically manage documents necessary for the main operation of the office.

a. Technical Specification

This system is composed of a web-based interface that enables an office to electronically manage pertinent documents. It also enables employees of the concerned office including their clientele download and upload pertinent documents as per requirement by the executive department the supervises the client of this system. The necessary hardware includes a PC. Because it is web-based, it is assumed that the end-users are connected to the Internet. The following components also serve as the building blocks of the system:

- HTML5
- PHP
- MySQL
- JavaScript
- Bootstrap
- CSS

b. Use Case Diagram

A use case diagram visually represents the functional requirements and the interactions of a system from the perspective of the end users. Its primary purpose is to provide a clear and high-level overview of how the end users interact with the system.

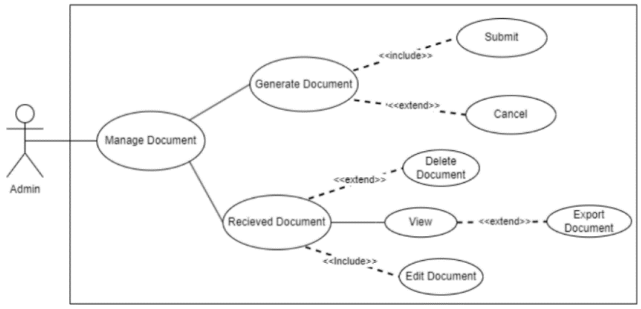

Figure 1: Use Case Diagram for Document Management of the Admin

Figure 1 depicts the functional requirements and the interactions of a system from the perspective of the Administrator or the employee within the concerned office

who is the project client by showing how an employee generate documents and receive the submitted documents.

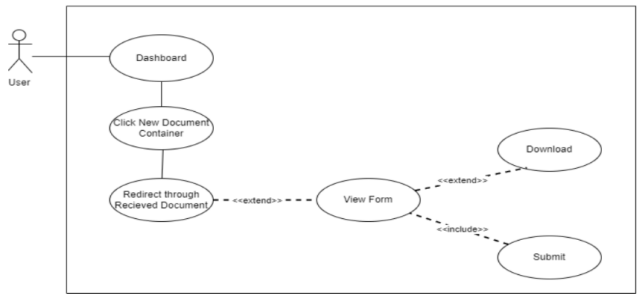

Figure 2: Use Case Diagram for Document Submission

Figure 2 depicts the functional requirements and the interactions of a system from the perspective of the end-users who are School Principals by showing how a user submits a pertinent document to the concerned office as per requirement of the executive department.

c. Interface Design

A system's interface design refers to the graphical user interface (GUI) or the command-line interface (CLI) that users interact with to perform relevant tasks or to access system functionalities. The design itself provides users with a seamless and efficient experience while interacting with the system.

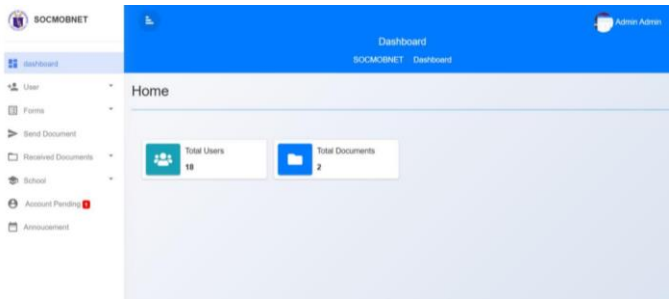

Figure 3: Admin Dashboard

Figure 3 shows the interface of the main dashboard on the Administrator's level where the concerned pertinent documents may be distributed to the schools within the locality through the School Principals who will download the documents and upload it back.

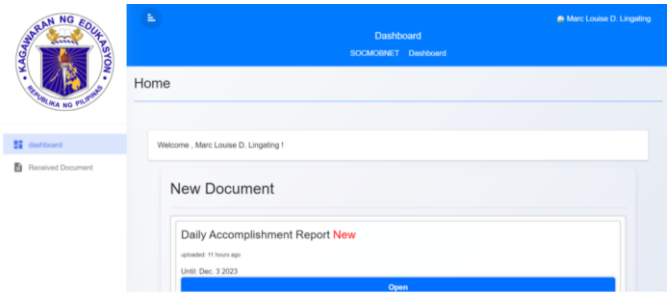

Figure 4: School Principal Dashboard

Figure 4 shows the interface for the school principal dashboard of the system where a School Principal will receive the required documents, upload it, fill it with the necessary details pertaining to the accomplished program, and upload it back to the office.

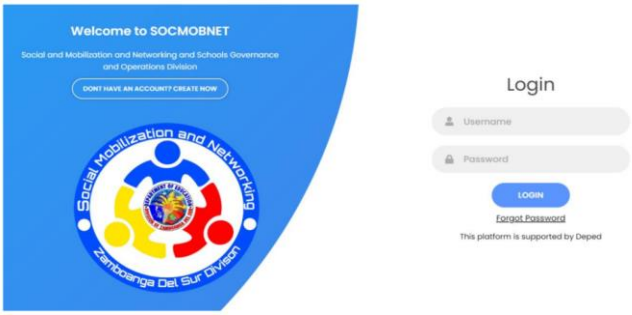

Figure 5: Login Interface

Figure 5 shows the interface for login process where end-users start before running the functions of the project.

1.4 Development/Implementation

The software or system's actual construction and coding occur in this phase. The planning and design phases were critical steps as this phase follows it. The developers in this phase wrote the code based on the detailed design specifications defined in the previous phase. Hence, this is the actual implementation of the outlined functionalities and features. As already specified, this system is a web-based application, and the actual development involved the technologies HTML5, PHP, MySQL, JavaScript, CSS, and Bootstrap as the underlying building blocks of the system.

1.5 Testing

This phase ensures that the system adheres to the requirements specified in the planning phase. Software testing is performed in other phases to regularly identify and manage issues to ensure the software meets the desired quality standards. The testing for the functional requirements yielded an overall positive and acceptable result and were found satisfying by end users. The system was also considered user-friendly, with satisfactory user feedback.

1.6 Deployment

Deployment is a phase that prepares the system to be integrated into the intended environment so it is available for use by the intended end-users. Like the other phases, deployment is also a critical step in the system development life cycle which will require planning, coordination with the client, and further testing to ensure its successful use. Currently, this system has already been formally accepted by the client and performs the necessary measures to formally deploy the project and start transforming the business processes into adopting the system's new mechanism to process the transaction. During this phase, the system developers are constantly collaborating with the employees of the concerned office under the executive department.

1.7 Maintenance

This phase refers to continuously managing the system's performance and functionality throughout its operation. It is also a crucial aspect of the system because it ensures that the system will continuously perform. According to the deployment plan, maintenance is performed by the system developers with the assistance of the client as soon as the system is integrated.

An in-depth analysis reveals that the systems' functionality paints a positive picture and closely aligns with its intended purpose. It demonstrates high efficiency and effectiveness, as evidenced by the positive evaluations and stress test results. Notably, 34 diverse users participated in the assessment, including technical and non-technical participants from various educational backgrounds. The stress test was conducted on January 20, 2024 which yielded an excellent result. This achievement demonstrates the system's stability and reliability under a heavy load, indicating its ability to handle real-world demands and deliver a smooth user experience for end-users. The results are the following:

- The functional requirements yielded 60% out of 60 in terms of Free of Bugs, Performance Requirements, and Logical Flow. The result taken from the stress test survey indicates perfect results indicating the system's capability and performance.

- A high mark in reliability, which is 92.75%, underscores the system's dependability in fulfilling its intended functions under normal conditions. This system fosters user trust and ensures a stable user experience.

- An impressive score for systems availability, which is 92.75%, indicates the system's exceptional uptime and consistent accessibility to users across various conditions. This reliability ensures that users can depend on the system whenever needed.

- User friendliness test yielded a score of 93.25% reflects the system's user-friendliness and intuitive design, making it easily accessible and navigable for its target audience. A positive user experience is paramount for the system's success.

- Performance efficiency scored 90.25% which signifies the system's ability to optimize performance while minimizing resource consumption. This operational effectiveness translates to cost savings and enhanced user experience.

- Security aspect scored 88.25% which indicates the system's robustness in data protection and its ability to defend against unauthorized access or breaches. This aspect is crucial in safeguarding sensitive information in the digital age.

- Maintainability scored 93.75% which highlights the system's ease of updates, modifications, and troubleshooting. This system ensures its long-term sustainability and ability to adapt to evolving needs.

4. CONCLUSION

In conclusion, the test results confirm the success of the development of the system, integrating all desired features effectively. It ensures security by granting authorized personnel access to the system. The system's efficiency lies in its automated approach. Usability is prioritized, providing a user-friendly interface for executing all necessary functions. Usability is prioritized, providing a user-friendly interface for executing all necessary functions.

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