

The Design and Development of SOC Web-Based Document Management System

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Abstract

Nowadays, document management systems play a vital role in supporting the lifecycle management of document-based information. As such, this project aims to design and develop a web-based system for managing file documentation for the School of Computing, Universiti Utara Malaysia. Currently, the implementation of document management at the organization is carried out conventionally. The problem will arise when the searching process is required to find a related archive file. Consequently, it will consume more time to handle such matters. This project has applied the methodology of Rapid Application Development, which involves requirements planning, user design, construction, and cutover. The Unified Modelling Language was used to model the system and deliver related diagrams. This system was developed using the PHP programming language, MySQL and other related tools. The project focuses on the create, read, update, and delete operations for managing documents. The findings shows that this system's productivity increases, and user satisfaction has been heightened. In conclusion, the resulting prototype demonstrates the potential benefits, including improved accessibility, streamlined retrieval processes, and efficiency within the School of Computing.

Keywords: Document Management System, File Management, Online Document System

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I. INTRODUCTION

In the present day, document management systems play a crucial role in overseeing the lifecycle management of document-based information. Researchers worldwide have conducted numerous studies to evaluate both traditional Document Management Systems (DMS) and Electronic Document Management Systems (EDMS) in terms of user performance and have demonstrated the advantages of the newly developed electronic systems [1].

With the emergence of new technologies, organizations have transitioned from traditional DMSs to EDMSs due to their facilitation of managerial work through file integration and control. According to previous studies, EDMS offers numerous advantages, including management support, budgetary benefits, enhanced security, improved cooperation, better performance, increased privacy, and seamless system integration [2]. Therefore, every organization should adopt an EDMS to establish an effective management and administration system.

The primary motivation of this work is that the School of Computing(SOC), Universiti Utara Malaysia currently needs a system to manage document management efficiently. The current practice of managing the document is implemented conventionally. Filing systems in place for document management exhibit inefficiencies in locating documents and consume substantial physical space, leading to significant challenges faced by staff in the SOC. Many document management systems rely on file cabinets to organise documents. The staff merely store the document title in a table, inserting a document type code and saving the primary title as a standalone entry in a Microsoft Word table. Then, documents are kept in hard copy format, lacking a corresponding soft copy. This reliance on hard copies complicates locating specific documents, as staff must manually search through filing cabinets, consuming valuable time and effort.

This project is centered around developing a web-based document management system with the primary objective of streamlining the documentation process within the SOC. In order to achieve the primary objective, the secondary objectives need to be fulfilled as follows: 1) identify the requirements for a web-based document management system, 2) analyze and design the system based on the identified requirements, 3) develop the system based on the analysis and design. Regarding the project scope, a comprehensive web-based system is being developed for the SOC. Specifically targeting the main SOC office and administration, the system aims to enhance document management efficiency and streamline workflow processes. Its key objectives

are to provide SOC staff with tools for effective document organization, accessibility, retrieval, and collaboration, ultimately leading to significant improvements in work processes and productivity within the SOC office and administration. Staff and administrators are the two actors in this system. Except for account registration and document deletion, which will be played only by the administrator, both actors have the same privileges, including adding, updating, searching, and editing document information. The project adopted the Methodology of Rapid Application Development, incorporating stages such as requirement planning, user design, construction, and cutover. The implementation of the system was constructed using the PHP programming language and other related tools. The Unified Modeling Language (UML) diagrams were utilized to design the system effectively that will involve the yields of some related UML diagrams to make system easier to understand.

In a nutshell, the system offers numerous advantages to the SOC staff, as it simplifies and expedites finding their required data within the system. This system becomes indispensable for staff members, allowing them to access their documents anytime and anywhere through internet connectivity. Developing a web-based document management system enables SOC staff to streamline the documentation filing process, ensuring swift data retrieval and storage while effectively preserving information.

The rest of this paper is organized as follows: Section 1 presents the introduction, while Section 2 elaborates on the related work. Section 3 explains the methodology. Section 4 presents the design and development. Section 5 discusses the discussion. The last section draws the conclusion.

II. RELATED WORK

An Electronic Document Management System (EDMS) can be defined as a group of information containing various types of documents that may exist in different places within a network and support multiple access, update, and modification simultaneously and automatically [3], [4]. EDMS has been applied in different organizations across the world. It has helped organizations succeed in management strategy, budget, anti-corruption, security and privacy, user requirements, cooperation, and systems integration. Moreover, EDMS can help organizations achieve more efficient operations by reducing transaction costs, automating processes, improving capacity, minimizing errors, and saving on labor [2], [5].

EDMS has been used in governmental and public organizations. EDMS implementation studies in the government sector began to grow in the early 2000s [6]. To provide productivity, space saving and a general improvement in business processes, government organizations are increasingly implementing EDMS to transform service delivery within the organizations and to citizens [7], [8]. In addition, applying EDMS in governments can be used to reduce operating costs and minimize office space for filing and reducing the cost of labor [9].

Angala et al. [10] developed and implemented a web-based document management system at Ilocos Sur Polytechnic State College, Philippines, as a tool for capturing, storing, organizing, retrieving, and managing documents and files in a centralized digital environment. Researchers discovered that respondents were very satisfied with how the document management system was used to arrange, store, track, and manage paper files on campus after testing it with 40 respondents. Meanwhile, another EDMS has been developed by Azman et al. [11] for Cameron Highlands District Education Office, Malaysia, to manage audit documents sent by their staff. The system has been developed using waterfall methodology and evaluated by several respondents. The result shows that the system could improve document management quality while retaining the same workflow process. Arifin [12] has designed an EDMS to assist the staff of Ibnu Sina Batam Junior High School, Batam, in storing and collecting incoming and outgoing mail data online. The author employed the Unified Modeling Language (UML) diagram to model the system and used the Object Oriented Analysis Design (OOAD) as a software process methodology to develop the system.

Wicaksono [13] has conducted a study and developed a web-based application for managing documents in a higher education environment. The author suggests a thorough system requirement process and high-level management should be involved in tackling users' acceptance of EDMS systems. In addition, The study by Hwang et al. [14] concluded that most institutes consider document standardization to be very important, in which 76% of institutes (19 out of 25) answered that a systematic document management system was necessary, moreover, due to the capabilities of EDMS in creating, saving, distributing, archiving, and accessing documents by searching according to desired criteria. Başbüyük and Ergüzen [15] have developed an application for Kırıkkale University that can be accessed twenty-four hours through EDMS's web-based infrastructure. The developed system can be accessed from inside or outside the university using any mobile device with internet access, such as a PC, laptop, or tablet. However, security for documents in the system has not been provided and a digital signature is recommended. This lack of security has been solved as part of the application developed for polytechnic institutions using digital signatures.

III. METHODOLOGY

The methodology that has been employed for the development of the document management system in this project is Rapid Application Development (RAD). RAD enables organisations to develop software faster while lowering development costs and maintaining software quality. This method is accomplished through a series of tested methods for developing applications in a specific line [16]. Figure 1 shows that the methodology encompasses several key stages: requirement planning, user design, construction, and cutover.



Figure1 The Rapid Application Development Phase

The requirement planning phase will involve several tasks, such as investigating the current issue of this project, defining the project's requirements, and finalizing the requirements with the approval of each stakeholder. In this case, developer must understand the SOC staff's specific needs and translate them into comprehensive requirements. Several interview sessions were conducted with SOC staff during the requirement phase to get unambiguous requirements. Then, a thorough analysis was conducted based on the gathered requirements. Apart from the interview session, several studies have been carried out by looking at several resources from the Internet and research papers. The deliverables of this phase will produce a list of functional and non-functional requirements for this system. Then, several UML diagrams were produced, such as use case diagrams, sequence diagrams, etc., using the StarUML tool.

When this project's scope has been defined via its requirements, it will move to the phase of user design through multiple prototype iterations. This phase will explore and validate ideas, gather early feedback, and identify potential issues or improvements before investing significant time and resources in creating a fully developed prototype or final product. In this phase, the prototype was developed using the following tools: Figma, PHP, CSS, HTML, JavaScript, MySQL, Bootstrap, and Visual Studio Code. The system must provide easy navigation, document categorization, and search capabilities. In addition, this phase made the SOC staff collaborate with developer to ensure that her requirements are met at every stage of the design process.

Then, the rapid construction phase will convert the prototypes from the design phase into the working model. Because most problems and changes were addressed during the extensive iterative design phase, developers can build the final working model faster than they could using a traditional project management approach. This phase has been divided into the following smaller steps: rapid construction preparation, development of applications, and system testing of code. This phase ensures that everything runs smoothly and that the end result meets the client's expectations and objectives.

Lastly, the final phase, named cutover, involves several activities, including final testing, deployment, and training. The final testing has been performed before the system is released to ensure it meets all functional requirements. This includes usability testing and user acceptance testing with the SOC staff. After the system has passed all the tests and has been approved by stakeholders, it is deployed on a live web server and hosted. Then, the SOC staff was instructed on how to use and maintain the system.

IV. DESIGN AND DEVELOPMENT

This section presents a web-based document management system's development process, focusing on system requirements and prototype development. The system requirements were gathered through extensive consultation with the SOC staff, ensuring their specific needs and expectations were considered. The prototype development phase involved creating a working model of the system, showcasing its core functionalities and user interface design. This iterative process allowed for continuous feedback and refinement, ensuring that the final product aligns with the staff's requirements and provides an efficient and user-friendly document management solution.

The system requirements for the document management system were carefully documented based on the feedback and input from the SOC staff. These requirements served as a foundation for designing and developing a web-based solution that addresses the staff's needs, enhances efficiency, and improves the overall document management process.

Table 1 lists the seven significant requirements produced from the requirements-gathering process. The requirements include logging in to an account, saving, updating, deleting, printing, searching, and displaying documents.

These requirements are categorized based on their priority: mandatory (M), desirable (D), or optional (O). This classification assists in prioritizing development efforts and ensures that the essential functionalities are addressed first.

Table 1: A List of Requirement

Num.	Requirement ID	Requirements Description	Priority
1	DMS01	Login account	
	DMS_01_01	Admin and clerk should be able to login to the system by using their registered username and password.	M
	DMS_01_02	The system should be able to show an error message to the admin and clerk if the name or password is wrong.	M
	DMS_01_03	Admin and clerk should be able to reset the password by clicking “Forgot Password”.	M
	DMS_01_04	The system should be able to send verification emails to the admin and clerk to allow them to reset their Password.	M
2	DMS_02	Save Document	
	DMS_02_01	The system should display a form that requires the client to fill out the following information: file name, code number, document title, date, sender, receiver, and document that needs to be uploaded.	M
	DMS_02_02	The clerk must fill out all the information before uploading the document.	M
	DMS_02_03	A successful store document will display the system.	M
3	DMS03	Update document	
	DMS_03_01	The system will show a page asking a clerk to look for the required document.	M
	DMS_03_02	The necessary information that must be updated will be filled in by the clerk.	M
	DMS_03_03	When the clerk provides incomplete information, the system will display it.	M
4	DMS_04	Delete Document	
	DMS_04_01	The system will allow clerks to delete documents older than five years.	M
	DMS_04_02	The clerk will allow for the deletion of chosen documents or all documents.	M
	DMS_04_03	The system will notify a user that the document was successfully deleted.	D
5	DMS_05	Search Document	
	DMS_05_01	The clerk will search for the desired document.	M
	DMS_05_02	The clerk will search for documents by using one or more combinations, such as title, sender, receiver, or date.	M
	DMS_05_03	The system will display an invalid document, and the clerk must search related documents.	M
6	DMS_06	Print Document	
	DMS_06_01	The system will display a list of the documents.	M
	DMS_06_02	The document needs to be chosen from the list and will be printed out.	M
7	DMS_07	Display Document	
	DMS_07_01	The list of documents will be displayed in alphabetical order.	M

The requirements outlined in Table 1 were translated into the functional components of the computer system. To represent and design these requirements, the appropriate modeling approach and tools were utilized. The Unified Modeling Language (UML) was employed as a visual representation and modelling technique in

this project. The models include use case and sequence diagrams to illustrate the system's behaviour. The diagrams were created using the StarUML as a modelling tool.

Figure 2 presents a use case diagram that depicts the interactions between the use cases and system actors in relation to the creation and management of the Document Management System. The diagram provides a visual representation of the various functionalities and features of the system, illustrating how different actors interact with the system to perform specific actions and achieve their goals. There are only two actors in the diagram that will interact with eight use cases such as save, update, delete document and others.

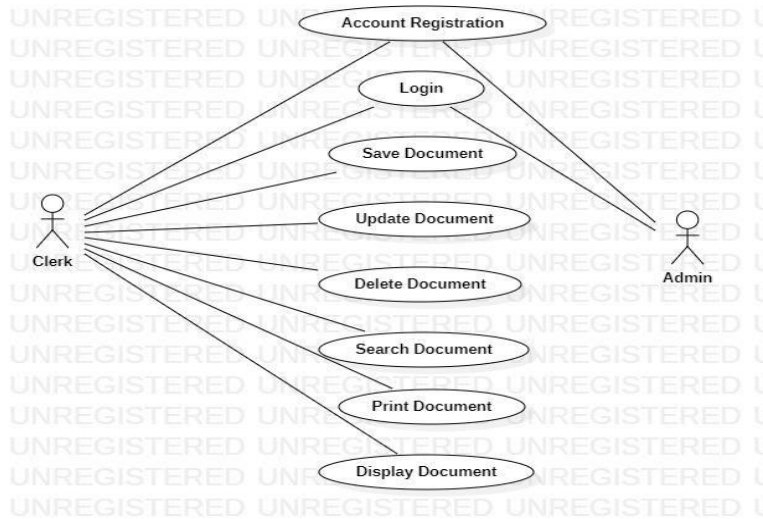


Figure 2: Use Case Diagram

Through these models, the functionality and structure of the website are effectively depicted, providing valuable insights for the development process. Figure 3 shows the sequence diagram involving several classes in saving a document in a database. In this scenario, there is only one actor will interact with the related classes such as SaveDocumentPage, DMSController, and DocumentDB.

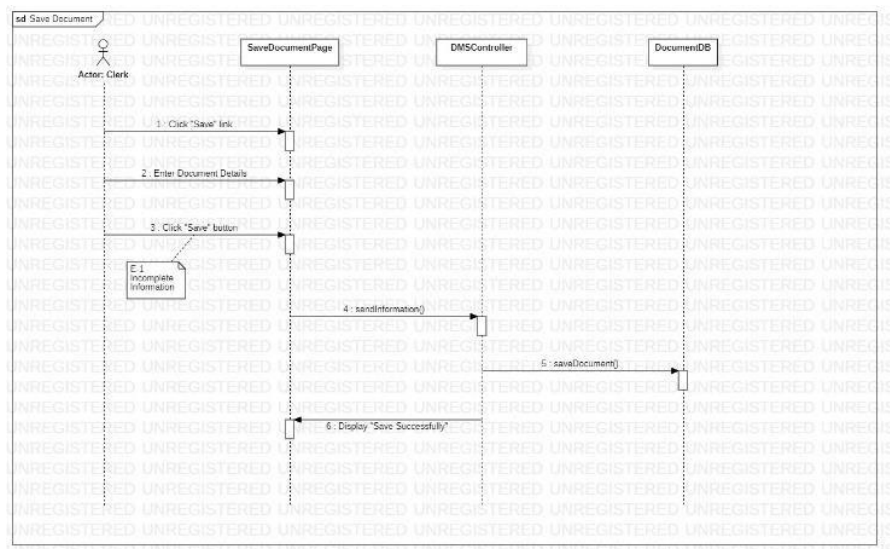


Figure 3: Sequence Diagram of Save Document functionality

A prototype of the web-based system was developed to demonstrate the requirements outlined in the previous section. This prototype is a tangible representation of the software requirements, allowing users to interact with it and provide valuable feedback. Software prototyping is a widely used approach to gather comments and suggestions from users by allowing them to experience the prototype firsthand. Through this iterative process, the prototype can be refined and improved to meet the users' needs better. The development of

the prototype ensures that the website's functionality and features align with the specified requirements, providing a solid foundation for the subsequent stages of the project.

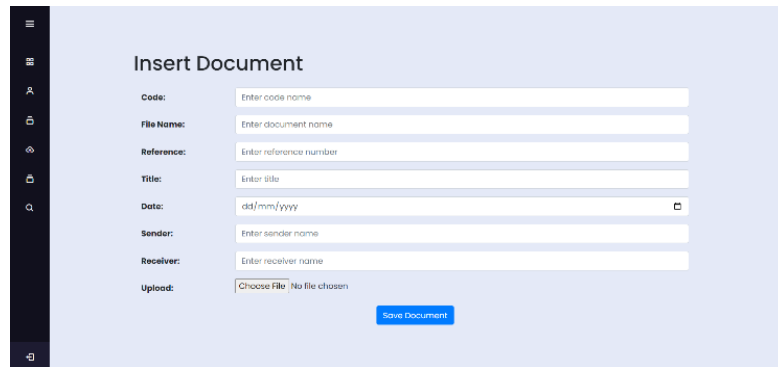


Figure 4: Screenshot of Insert Document Page

Figure 4 depicts the insert document page, which is accessible to both administrators and users. This page provides the functionality to upload documents, with the restriction that only PDF format files are allowed. The information needs to be filled up by users are code, file name, reference, title, date, sender, receiver, and upload.

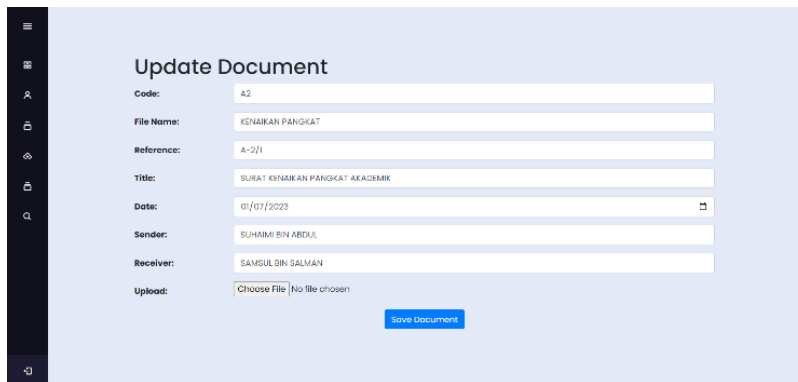


Figure 5: Screenshot of Update Document Page

Figure 5 illustrates the Update Document page, which is accessible to both administrators and staff members. This page provides the functionality to update the details of a document within the system.



Figure 6: Screenshot of Search Page

Figure 6 depicts the search document page, which is accessible to both administrators and staff members. This page provides the functionality to search for documents based on various criteria, such as the

document title, sender, and receiver. Users can easily retrieve specific documents that meet their search criteria by entering the relevant information in the search fields. This feature enhances the efficiency of document retrieval and allows users to locate the desired information prompt.

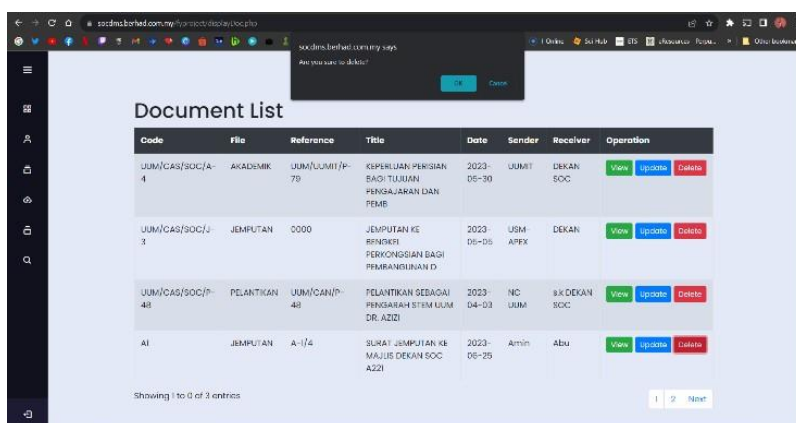


Figure 7: Screenshot of Delete Page

Figure 7 shows the screenshot for the delete operation. When a user attempts to delete a document, the system will display a confirmation message as a reminder to seek user confirmation before proceeding with the deletion process. This added step aims to prevent accidental deletions and allows users to double-check their decision before finalizing the action.

V. CONCLUSION

The results of the project's implementation align closely with its objectives of developing a web-based document management system for the School of Computing (SOC) at Universiti Utara Malaysia (UUM). The feedback and data collected from stakeholders demonstrate the effectiveness and usability of the system in enhancing document management processes within the SOC. The client expressed positive sentiments regarding the system's functionality, ease of use, and potential benefits for their work efficiency.

The implications of the project's results are significant. The web-based document management system offers a more efficient and streamlined approach to document handling, reducing reliance on manual paperwork and improving accessibility and retrieval. This can lead to time savings, increased productivity, and enhanced collaboration among SOC staffs. The system's user-friendly interface and tailored features address the specific needs of the SOC, contributing to a positive user experience and improved document management practices.

However, it is essential to acknowledge the limitations of the system. The project's implementation focused on the SOC at UUM, and its findings may not directly apply to other institutions or departments. Furthermore, while efforts were made to address user feedback and requirements, there may still be areas for improvement. Ongoing updates and maintenance will be necessary to address any potential limitations or challenges. When comparing the project with related works or existing solutions, it stands out in terms of its tailored design for the SOC and its emphasis on user-friendliness. The project's customized features and usability set it apart from generic document management systems that may not address the specific needs of academic institutions.

In terms of future improvements, potential enhancements include the integration of advanced search functionalities, document version control, and integration with other systems used by the SOC. Further user feedback and iterative testing can help identify areas for refinement and ensure continuous system improvement. Additionally, exploring opportunities for mobile accessibility and integration with emerging technologies can further enhance the system's capabilities.

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