I.J. Information Technology and Computer Science, **2023, 2, 35-53**
Published Online on April 8, 2023 by MECS Press (http://www.mecs-press.org/)
DOI: 10.5815/ijitcs.2023.02.04

Design and Implementation of a Web-based Document Management System

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Received: 24 August 2022; Revised: 03 November 2022; Accepted: 07 December 2022; Published: 08 April 2023

Abstract: One area that has seen rapid growth and differing perspectives from many developers in recent years is document management. This idea has advanced beyond some of the steps where developers have made it simple for anyone to access papers in a matter of seconds. It is impossible to overstate the importance of document management systems as a necessity in the workplace environment of an organization. Interviews, scenario creation using participants' and stakeholders' first-hand accounts, and examination of current procedures and structures were all used to collect data. The development approach followed a software development methodology called Object-Oriented Hypermedia Design Methodology. With the help of Unified Modeling Language (UML) tools, a web-based electronic document management system (WBEDMS) was created. Its database was created using MySQL, and the system was constructed using web technologies including XAMPP, HTML, and PHP Programming language. The results of the system evaluation showed a successful outcome. After using the system that was created, respondents' satisfaction with it was 96.60%. This shows that the document system was regarded as adequate and excellent enough to achieve or meet the specified requirement when users (secretaries and departmental personnel) used it. Result showed that the system developed yielded an accuracy of 95% and usability of 99.20%. The report came to the conclusion that a suggested electronic document management system would improve user happiness, boost productivity, and guarantee time and data efficiency. It follows that well-known document management systems undoubtedly assist in holding and managing a substantial portion of the knowledge assets, which include documents and other associated items, of Organizations.

Index Terms: Document Management, Quality, Information System, Workflow, Document, Organization, Automation.

1. Introduction

Records or document management systems have their roots in the early 1970s when computers were used in businesses as recording and archiving or storage devices for papers [1]. However, with the increased accessibility of computer technology in the western world, the history of document management took a dramatic turn in the 1980s [2].

As their significance and use had grown over time, document management is described as the organization and upkeep of paperwork about particular tasks and procedures. The evolution of an organization now heavily relies on document management. It is crucial to efficiently and securely distribute the correct paper to the appropriate individuals. Companies can arrange all of their information, in all of its forms, in one location with the help of document management. No matter the size or industry, streamlining business processes and boosting efficiency are key concerns for all organizations.

Document Management System (DMS) is described as the use of computer systems or software to store, manage and track electronic documents and electronic images of paper-based information. Furthermore, it can be defined as a quick and easy-to-use system that managers and other employees can utilize to save time and effort while processing, storing, finding, coordinating updates, retrieving, and sharing information between them [3,4]. In view of the fact that document management system increases operational effectiveness and productivity, the Electronic Document Management System (EDMS) has been embraced by numerous companies and sectors to improve work productivity and efficiency of the transactions.

Document management has permeated all public sector and private sector operations. This is because various documents are being used in the day-to-day business transactions by banks, the construction and manufacturing industries, the justice system, transport and logistics, insurance, education, etc. To function, government departments and organizations also rely on the information contained in various papers to operate. Also, for most firms to continue to be competitive and operationally effective and efficient, automation has evolved into the core of strategy planning in

most modernization programs if most organizations are to remain competitive and operationally successful and efficient [5-8].

These automated systems, on the one hand are vital in facilitating processes for exchanging information between management levels, operations, and stakeholders and on the other, they boost an organization's efficiency, viability, visibility, and competitive advantage[1][2][3][4][5][6]. The majority of developing countries still use traditional paper documents management systems (DMS), but there is also an increase in electronic content that is stored on workstations and servers, such as emails, web pages, and database packages that are kept on workstations and servers. One of the most crucial management tools is an electronic document management system (EDMS), which is frequently used for integrated data collection in a facility or organization. Nevertheless, depending on the needs of the institution or organization, this need should be executed carefully.

Recently, it has been passionately argued how information systems (IS) may give an organization a competitive edge. However, it has been suggested that what gives the competitive advantage is not the Information System (IS) solution but rather their usage. These systems are expensive and difficult to utilize since they are always evolving. Research has shown, for instance, [4, 9] looked at the possibilities of evaluating the success of information systems as well as developing a new model for assessing the successful implementation of information systems by combining the ideas of the Technology Acceptance Model and the revised DeLeon and McLean IS success model.

In the same context, the Technology Acceptance Model (TAM), created by [10] based its foundation on reasoned action and assumes that people will be willing to utilize a particular form of technology if they believe it to be both helpful and simple to use. The likelihood that employees will use the new technology and accept it as value increases when more employees realize that the systems will make their tasks easier to do [11]. But [12] claimed that one of the TAM's drawbacks is the variable that relates to users' behaviour, which is invariably assessed using subjective criteria like behavioural intention (BI) and interpersonal impact. And because of these restrictions, this study chose to use the modified DeLeon and McLean IS model.

The life cycle management of information based on documents is supported by document management systems nowadays. Numerous studies have been conducted by academics around the world to compare the advantages of newly developed electronic systems and traditional document management systems and electronic document management systems in terms of user performance [13,14]. As new technologies evolve, Organizations have switched from traditional DMS to an electronic version because it makes the administrative job easier through file integration and control. According to earlier studies, an electronic DMS has several benefits, including budgetary, management, security, cooperation, performance, privacy, and systems integration [15]. Therefore, every firm needs to implement an electronic DMS to have effective management and administration system.

[16] defines an electronic document as an information container in electronic form that assembles data from several sources, in a variety of forms, about a given topic to satisfy the demands of a certain person. In the same vein, EDMS can be defined as a collection of data including various types of documents that may exist throughout a network and support numerous simultaneous accesses, updates, and modifications [16,17]. The use of EDMS in Nigeria was first reported in the 1990s in governmental organizations, and subsequently, in the middle of the 2000s, commercial businesses and universities adopted it in their daily operations [18]. However, [19] affirmed that the fate of EDMS at Nigerian universities was favourable

According to [18], few universities in Nigeria's Northwestern states maintain their electronic records following a formal document that serves as a policy guideline Others pointed the finger at a lack of technical expertise and a lackluster management commitment to the plight of EDMS, as well as the improper implementation of the 2001 Nigerian National Policy on Information Technology, which included one of its objectives on legislation "to protect government data, records, and information in digital form". Similarly, [20] highlighted insufficient employee training in record-keeping offices as a hindrance to efficient records management in a related study. They also identified a number of additional issues that contribute to poor record keeping in Nigerian academic institutions, including inadequate infrastructure, a murky policy gap, and a lack of knowledge.

Literature has revealed that there has been to date no electronic document management system for organizations, for the effectiveness in the management of electronic records and documents in implementation organization. There are only a few numbers of organization reports on the electronic document management system. However, the manual filing method employed by most organizations and firms has proven to be unproductive and tiresome. Also, the majority of issues with offices' correspondence and document management revolve around getting the appropriate information at the appropriate time. Authorities of today must contend with the difficulty of improving organizational performance and the effectiveness and quality of document management. The need to develop an automated EDM to efficiently organize and manage documents kept in both small and big volumes emerge in the context of the current

[1] F. Garrard, "How oil and gas firms can increase competitive advantage with technology", 10 September 2019.https://www.airswift.com/blog/automation-benefits-oil-gas

[2] N. Ismail, "Tech as a competitive advantage in logistics", 10 January 2018.https://www.information-age.com/technology-advantage-logistics-123470298/

[3] Business Intelligence, "Supply chain companies seek competitive advantage with automation", 8 April 2016.

[4] World Economic Forum, "The Future of Jobs Report 2018, Centre for the New Economy and Society", 2018.

[5] A. Bridgwater, "Without workplace automation UK businesses will fail, Technology/Robotics & Automation"

[6] T. Tobin, "What to consider as the Automation Economy Transforms Business Today", Nice Limited, 2017.

upsurge in the demand for an electronic document management system that can offer electronic storage, search, and distribution and other necessary facilities.

The main purpose of the study is to design and implement a user-friendly web-based system for engaging users in adequate management of documents and records, analyze the existing systems, model, design and develop the functionalities of the document management system based on the requirements gathered using Unified modelling language, develop a document system and evaluate the system. Employees, staff and the organization are likely to be efficient and productive when a system is in place that can help or assist them in automating all the procedures involved in document management, from receipt to correct dissemination and distribution, and retrieval. Currently, most organizations have heavily relied on the physical movement of processing documents, which does not necessarily involve forms of technology. The use of WBEDMS will speed up completion of work and quick search easy co-operation with other departments, increase productivity, provides up-to-date information, accurate information, and ease of use. It will also result in less time needed to retrieve documents or records, a reduction in the volume of paper records, thus getting rid of those big and ugly files, and saving a ton of money on paper.

This paper is arranged into an introduction. Section 2 provides an overview of document system, its approaches, the theory used in the creation of the document information system and classification of document management system. The section also discusses related work on document management. The next section discusses the system design and methodology. Section four presents the document system implementation and provides the analyses of the outcome obtained while section 5 provides a summary of the study.

2. Literature Review

Document management systems have many definitions, some of which are as follows: A proprietary computer system called a document management system scan, stores, and retrieves documents that an organization receives or creates. Systems that assist with streamlining publishing, indexing, storing, and retrieval of electronic data resources within an organization are also known as document management systems [21]. We can conclude from the foregoing definitions that document management systems are created to help a company manage, create, store, and flow documents by offering a central repository. A well-organized document management system is essential for organizations because of the needed volume of documents they handle each day.

There are a variety of document management systems created by organizations based on their needs and budget for the efficient operation of their businesses. This variety of systems consists of electronic document management systems, desktop document management systems, online/web-based document management systems, and classic document management systems. The first and most established technique of document maintenance was the conventional document management system. At that time, small and medium-sized businesses organization employed this type of filing to organize their internal records. Pigeon-hole filing, cardboard, box, and wire filing systems are a few examples. To make up for the traditional file system, which fell short of expectations in terms of upholding files and documents for a business environment, the modern document filing system was established. People started the contemporary filing systems after discovering some faults. This approach can be broadly divided into two categories: horizontal and vertical filling techniques. But as desktop computer systems proliferated, a new era of document management techniques called for the introduction of electronic document management solutions. The usage of software applications to create and organize company files and records digitally has advanced ever since the development of electronic computing.

A desktop document application's collections and features were improved as a result of innovations in information technology, leading to the creation of an online document management system. This piece of software allows web browsers to operate a document management system. The life cycle of documents within an organizational environment has become more efficient, effective, and searchable as a result of the recent shift to processing and maintaining documents online. The selected document version ensures that the information in this category is always current. Another advantage offered by contemporary document management systems is document sharing.

Utilizing an online document management system, which is designed to provide staff with a convenient and pleasant workspace, has a wealth of features and advantages (M-Files Inc., 2014). The document management systems like Bluedoc, M-Files, Dokmee Home Management, Paperport, Suti DMS, OpenDocMan, LogicalDOC, Microsoft Sharepoint Online, and others are notable examples of online-based document management systems[7][8][9].

Since the advent of the personal computer in the workplace, electronic documents have been a topic of discussion. The generation of electronic document management occurs here. EDMs are particular documents created using computer hardware and software, saved on digital media, and communicated over networks, including documents created using digital technology and transformed from analogue sources to digital format. EDM's features include storage management, document retrieval, information sharing, and support for document creation through integration with other applications. It also offers document viewing, editing, access, and version control.

Furthermore, electronic document management systems (EDMS) have gained prominence with the widespread use

[7] bluedoc. (2007). Retrieved january 21, 2015, from blue project.ro: http://www.blueproject.ro/bluedoc/

[8] Office Gemini. (2015). Retrieved january 21, 2015, from Dokmee: www.dokmee.com

[9] PaperPort Professional. (2015). Retrieved january 21, 2015, from Nuance Communications: http://www.nuance.com/for-business/by-product/paperport/index.html.

of computers in companies as a result of the development of document management systems with the advent of information technology. Additionally, one of the main operations in many businesses, particularly in government agencies, is the digitization of documents within the content of e-transformation. For example, the Turkish e-government transformation process heavily utilizes inter-operational systems, such as electronic documents and communications. The significance of EDMS in use has so expanded as a result of these advances. The dynamics of documentation were altered when the documentation system was merged with the electronic world. According to [22], an electronic document management system is a software tools used to store, track, and modify electronic documents. The most crucial responsibilities of a DMS, according to [23], are: manipulating the documents, storing and indexing the documents for later retrieval, and interacting through the exchange of documents.

Nevertheless, information technology and networks are changing the way professionals approach many business activities. Electronic Document Management Systems (EDM) are employed in a variety of business sectors, including manufacturing, banking, insurance, and engineering [24] The application of EDM systems can range from strategic to operational levels of organization management.

In addition, employing EDMS in government can save employee costs, operating expenditures, and the requirement for office space needed for filing [25]. [26] conducted a study on the topic and developed a web-based application for classifying documents. In his study, the author thinks that top-level management and a rigorous system requirement process should be used to address the user acceptability of EDMS systems. Besides, [27] stated that 19 out of 25 institutes indicated that a structured document management system was necessary, showing that the majority of institutes place a high priority on document standardization. [28] submitted that EDMS can produce, preserve, distribute, archive, and access documents by searching with the proper criteria

Around the world, EDMS is being used in several organizations. In terms of managerial tactics, financial constraints, measures taken to prevent corruption, protection of personal information, user needs, and system integration, it has aided businesses in achieving success [28, 29]. Additionally, according to [30, 31], EDMS can be utilized to assist firms in running their business more effectively by lowering transaction costs, automating procedures, boosting capacity, eliminating errors, and saving on labour. Public and governmental organizations have used EDMS. Early in the new millennium, there were more EDMS implementation studies conducted in the government sector [32]. Governmental agencies are progressively embracing EDMS to increase efficiency, save space, and enhance business operations to change how companies and citizens deliver services [33-35].

Today, the use of electronic documents and office automation technologies is forcing us to consider how to assess the issues with enterprise content management (ECM). Although ECM and document management systems are relatively similar. However, their approaches to organizing information are very different. The fact that both platforms offer fully centralized storage for digital files and information is what unites them. ECM, however, is a codified and dynamic set of strategies, methods, means, and tools used to collect, manage, store, protect, and transport information supporting important business processes throughout its lifecycle rather than a technology, methodology, or process. It also includes Document and web content management be it structured and unstructured, search, collaboration, records management, digital asset management (DAM), workflow management, capture and scanning from the time of production (or original publication) to archiving and disposal. In essence, ECMs assist in configuring massive volumes of unstructured data, and they are most frequently utilized by larger businesses that require a greater level of content management and that can support all organizational functions and processes. Thus, it is more advanced and powerful (Enterprise Content Management, aiim.org).

2.1. Approaches of Document Management System

The several approaches to document management ssystems include the traditional, web-based, integrated, model-based and enterprise approaches. The traditional approach of DMSs often uses a client-server architecture as their method of operation. Each client employs proprietary software to provide user interface and document access, while the DMS normally operates on an enterprise server system. Through a local area network, clients and the server are connected and for each desktop, this method requires expensive client software. The web-based approach contains a three-tier architecture as its foundation deployment strategy of the document management system. The system is made up of databases, document servers, and clients (tiers 1, tier2 and tier 3). In this approach, clients can access the server over the Intranet or the Internet, and the document server implements document management software and the document repository. Throughout distributed companies, this type of DMS software is used for workflow, process automation services, controlling and managing documents, and other tasks. Furthermore, users can typically access and read documents stored in one or more document repositories using the document client software, which typically consists of desktop and intranet (or internet) clients, from their PCs or Web browsers. These systems are not typically designed to manage extensible markup language (XML) documents, but some of the vendors permit that they can be set up to do so. The majority of a document's attributes, however, are kept on a structured or object-oriented database system in modern web-based document management systems.

The enterprise document management system (EnDMS) is a different technique that aims to organize an organization's paper and electronic documents in a way that makes it simple to find them in the case of a compliance audit, allowing them to be quickly recovered in such an instance. However, EDMS can be divided into many categories based on various criteria, such as architecture and application. An EDMS can be a desktop or standalone system, client-server system, web EDMS, or multi-tier EDMS as part of its architecture, but its use is primarily concentrated in

industries like engineering, e-government, manufacturing, construction, and production, land and estate management, and educational administration [36].

One of the finest approaches for developing EDMS is thought to be the integrated document management system [37-39]. Moreover, the integrated approach to document management system resembles the black boxes whose objective is to make it possible to easily retrieve information using reference data. Although the model-based method uses a single integrated database from which data can be retrieved using queries and written documents may be prepared almost automatically [40-42], it is not as flexible. The application service provider (ASP) model is a variation of this strategy in which a third party provides the application engine and modules across a network, primarily the Internet. Users can use the program to do all document management duties and store documents and other data in the provider's repository. The application is accessible to users via a web browser.

2.2. Related Works

[2] addressed the challenge of using the paper concept of document and record management to design and implement an Electronic Document Management System. The authors analysed the current system and specified the requirement for developing the desktop application of EDMS based on the resources available. Furthermore, the requirement gathering and data analysis phase was carried out through the process of interview method and analysis of existing documents in the organization. The system architecture was designed and developed having three modules namely document management, document storage, document retrieval and sharing as well as other features such as the digital signature verification feature. However, the implemented desktop-based EDMS was tested and used by 30 users. [4] investigated the current electronic EDMS in enterprises, particularly construction firms. companies. The case study employed, attempted to evaluate "Aconex EDMS" with requirements, difficulties, and advantages, elicited from the contemporary Sri Lankan construction sector. A semi-structured interview and a questionnaire survey were used to perform the study. The paper also discussed the effective way of evaluating the EDMS using the technology acceptance model of the Information system theory. The findings of the study established the fact that the use of the document management system is beneficial and reduces complexity. [43] argued that managing information-containing electronic records and document management systems is important for educational institutions. To analyze and assess the current records and archive system at the University, the author conducted a study. A model was suggested for use by all Turkish universities to implement the records and archive processes following the principles and practices of records and archives management. However, when creating the application for the polytechnic institution, the Özdemirci's model was taken into account, and new features were included.

[44] addressed the difficulty encountered in retrieving documents and a record from a large volume of data to develop a framework of EDMS that would be tailor-made to the supply chain management department to be used in developing the EDMS for future research. The authors used an interview and discussion strategy to acquire information about the current workflow to understand the difficulties in managing or handling the documents. A proposed framework was designed using a UML class diagram and activity diagram and developed a Web-based database system. This allowed all input screens and forms of the developed system to be hosted online thereby, providing a secure location for storing and saving documents. [45] addressed the difficulty of the current manual filing and management of documents, particularly its security to achieve the attributes of data confidentiality, integrity and availability. The authors designed the proposed system's client-server architecture and implemented it by putting in place a document management system for small and medium-scale organization. Some of the features that were already available were improved in the system that was created in terms of security, optimal disk utilization, level of abstraction, and employee productivity. [46] addressed the issue underlining the efficient modelling of the electronic document system. To manage the information system and support the business operations of the Limited Partnership, the authors developed a model for an electronic document management system. The authors conducted their initial investigation to identify the difficulties present. The proposed system was analyzed in terms of task, user, and system development, and designed using use case and context diagrams from the unified modelling language. A McLean theory-based entity relationship diagram was used to define the proposed system's model. In addition, the interfaces for the proposed document management system, which are made up of 4 modules, were designed and validated by 8 interviewees. The outcome demonstrates that using the proposed system improves employees' performance.

Airlangga University began working on its own Electronic Document Management (EDM) as E-office at the end of 2013. This is because the application known as SIKD was deemed too wide and did not meet its needs. Moreover, the initial E-office system was developed and evaluated by students using Technology Acceptance Model (TAM). The result yields a 3.41 average mean value which saw an overall acceptance rate of the EDMS by the university community. However, the system requires modifications and improvements. Furthermore, an additional investigation on Electronic Document Management (EDM) was conducted in 2015 [47]. The author used a quantitative technique in the study using a questionnaire tool with 36 responses. After successfull implementation, the data was analysed using DeLeon and McLean's information system theory model. The outcome of the implementation demonstrates a statistically significant correlation between system quality and intention to use, information quality and user satisfaction, system quality and intention to use, and intention to use with net profit of 75% success rate. [48] addressed the issue of ineffective and inefficient storage as well as the time and cost during the process of document retrieval and storage. The author used descriptive methodologies and a qualitative approach in the study. Similar to this, information was gathered through a combination of field observations, interviews, and document analysis. The system was implemented to

support the office management of the institution.

[49] investigated the issues of producing, sharing, copying and archiving manually or semi-automated in an ineffective manner. The N-tier architecture of the proposed system was designed using JavaScript, ASP.net and C# program language. The author developed a web-based EDMS application for Kırıkkale University that is readily available. The developed system is ubiquitous and can be accessed from any location within and outside the university using any internet-enabled mobile device. However, the developed system lacks adequate security for document control, access and retrieval. The limitation posed by this system spurred the design and implementation of EDMS with enhanced security features being implemented by Mahmood and Okumus. [50] examined the issues facing organizations in Nigeria when it comes to maintaining proper and secure document management The goal of the work was aimed at creating and implementing an improved document management system for a government organization. The author employed an object-oriented Analysis and development methodology (OOADM) approach using a waterfall method and designed the system. using Unified modelling language. Moreover, the author developed a three-tier system architecture using HTML, CSS, JavaScript with PHP programming language and MySQL for the programming and designing of its database. The result from the study shows that the developed document system helps in the efficient and secure organization of the organization's documents and records.

[51] investigated the current document management problems in Higher Education institutions based on the QMS of ISO 9001. In the study, the author examined the existing documents management system and specified the requirements for the development of a new system. The proposed system was designed using a unified modelling language context diagram, flowchart and entity relationship diagram to design the data structure Moreover, the employed a software development methodology, particularly the Spiral Model as the framework for the EDMS. Besides, the proposed system was developed using Rapid Application Development and implemented using Visual Basic and Microsoft Access. The data for the study was obtained through interviews and questionnaires and further analyzed and evaluated using the statistical range, t-test based and Likert scale on the function, speed and cost. The result showed that the new system performed better than the existing manual document system.

[52] addressed the challenge of existing electronic and paper-based DMSs in a sample small size Jordanian contracting firm. The authors used questionnaire surveys and interviews with contractors, contractors' representatives, and DMS practitioners in several small businesses to accomplish the study's goal of examining and evaluating the elements, processes, motivations, and difficulties of both existing and proposed DMSs. The study's findings indicated increased productivity in terms of the effectiveness and performance of the procedures for managing building projects. [53] addressed the efficiency of Part-time employees' operations, which results from their ignorance of and incapacity to use the electronic document management system. A research population of 203 users was used in this quantitative investigation and, 134 employees were selected using a random sampling technique. Similarly, Multiple linear regression (MLR) analysis was used to analyze and evaluate the data obtained in the study to test the effects of various dependent and independent factors. The result revealed that the organization's adoption of EDMS significantly affects the employees' commitment, job satisfaction, and performance. A web-based higher education with electronic documents was developed by [54]. The authors addressed the difficulty of submitting research proposals and community work, which is constantly done using the conventional way, in an attempt to design the electronic document management system. The authors employed a waterfall model as its development methodology to analyze, design, code and test the developed system. The result shows that the effectiveness of the system increases research and service production levels of the organization

Despite these consistent problems associated with poor document management within an organization, the administrators, students, workers and the public irrespective of their domain application still implements most document management and organization using a manual system or pattern that uses a book register to track the application procedure for documents that are not yet implemented. Here, documents applications such as letters, memos, drafts and classified information documents are received, recorded and approved by some people at the centre. All document application types must wait until they return before being accepted, documented, and authorized; otherwise, unforeseen delays in document approval will occur. The system's primary flaw, however, is that it was all primarily centered on the dispersal and circulation of information. No current works have examined the use of the internet as a tool for omnipresent data production, access, update, or deletion, especially in our public workspace, government, and higher education institutions.

3. Methodology

Toward accomplishing the objectives of the study on the development of a web-based electronic document system, the existing system was analyzed and an Object-Oriented Hypermedia Design Methodology (OOHDM) was adopted to develop the proposed web-based document management system. This is a model-based method for creating high-quality and sizable hypermedia applications, information systems, multimedia presentations, etc., with various activities, such as conceptual design, navigational design, abstract interface design, and implementation.

The researcher achieves a balance between trade-offs and the five criteria determining the quality of the strategizing when designing scenario-based strategizing approaches for a web-based document management system employing scenario-based hypermedia design methodology (SHDM). The author proposed a disaggregation and

personalized visualization of the necessary reasoning process into its fundamental cognitive processes in order to maximize adaptability, flexibility, and complexity tolerance. The re-aggregation in an organized, clear, and accessible "reasoning architecture" enables the author's strategy-making to interactively rethink and base discoveries on common assumptions, cause-and-effect connections, and priorities. This modular method allows for the use of different tools and input sources as well as the ability to reorder the processes. Additionally, in the current study, the proposed method was assessed using various fundamental standards, such as methodology evaluation standards, environmental standards, and standards for system properties, to demonstrate how the system was created in accordance with the application requirements. The level of coverage can roughly be expressed by an integer number, just like the criteria used to access the suggested approach and the environment in which the implementation is carried out. Additionally, the OOHDM, a proposed approach that was employed in this study, was assessed using a framework made up of seven (7) representations that followed various kinds and numbers of phases, which were clearly visible in the OOHDM. The representations comprise the general category (for environments such client-server architecture, external tool integration, extensibility, and quality) as well as the common criteria, conceptual design model, abstract navigational model design, user-interface & run-time behavior design.

A DFD was provided during the analysis phase to represent the system boundary and to distinguish the target application system from outside environments. Additionally, a scenario is given to determine the users' informational and navigational needs. Similar to a use case, a scenario is a series of actions. Application systems and object data models are modeled and created during the object-modelling phase using scenario sets of Class diagrams. The pathways that enable hypermedia navigation are created by developers during the navigational design phase. the class diagram, where each associative relationship is examined. After then, scenarios are altered and used to determine the needs for navigation. The informational components of the domain classes in the class hierarchy diagram are grouped into navigational units to provide an explicit view, such as the user interface, during the navigation design process. The logical structure and user interface are currently generated during the implementation phase using a range of system settings, including different DBMSs like RDBMS or OODBMS, and development tools like CGI, HTML, and JAVA.

More specifically, for the document management systems evaluated for hypermedia applications, the following are observed: OOHDM seems to be the most powerful methodology for most of the application types as compared with other approaches such as entity relationship (Relationship Management Design Methodology), component based, hybrid based and open hypermedia system approach.

3.1. Analysis of the Proposed System

The proposed system is based on the engagement of users and others on a web-based platform towards documents easy access, sharing, retrieval, enhanced security, increased productivity and development with colleagues and clients over the network. A model is developed with the main focus to facilitate the storage and extraction of documents from a database that relates to the process of an administrator receiving, approving and issuing documents for the employees and other clients to use. The data flow diagram of the proposed system is depicted in Fig.1. Admin, departmental staff and secretary are the external entities of the system that interact together. The progress report and feedback are the data flows that serve as the collection of several pieces of information. Creation of entitlement (new staff) and granting of access by the admin, and feedback are activities that are performed for some specific reasons. It allows an Admin to create accounts and grant entitlements to secretary and departmental staff and other officers on the platform. The form secretary captures, receives, scans and uploads documents, memos, and newsletters, which include faculty, department board meetings, seminars and participation in other activities going on within the university environment. The report can then be viewed online by departmental staff who can only access, view, search and share documents, and reports using personal data on the system or any Internet-enabled device. The departmental staff can also make their comments through the same medium. Similarly, the secretary uploads a document, the employees can view and print the document for their use. In addition, as opposed to the conventional file system, it might offer a secure location to store the papers, making it easier for the department to retrieve them.

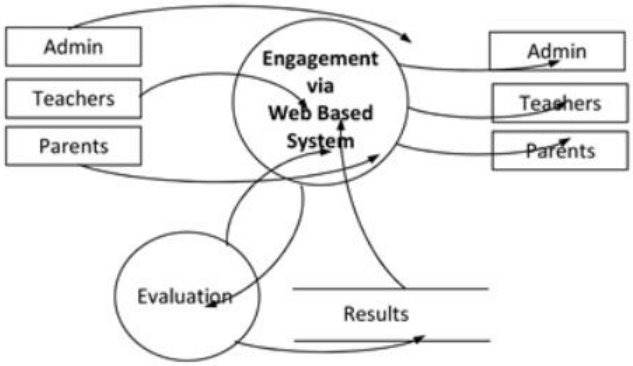

Fig.1. Data Flow Diagram of the Proposed System.

The proposed solution seeks to address recurring issues brought on by inadequate document management in an organization. This system introduces systematic document management and takes into account some elements related to the correct management and arrangement of documents to support work being done and advancement. Additionally, it promotes the use of electronic methods for tracking document workflow and simple document retrieval. It also takes into account how often papers are processed electronically, promoting the development and exchange of content inside a company. Some of the functionality provided by this system are full-text search, multi-user access, content creation, storage, and structured filing, full document retrieval, document workflow, and document version control.

3.2. System Design

As illustrated in Fig. 2, the system architecture was designed to provide the optimal depiction of the system's structure and viewpoints. The client interface, middleware, and database repository make up the bulk of it. The middleware tier receives and processes all communications. The XAMPP program was used to implement this. HTML was used to create the user interfaces (front tier), Apache served as the middleware, and MySQL served as the database, which can be accessed through the PHP MyAdmin tool. The use case shown in Table 1 was used to specify the system's requirements.

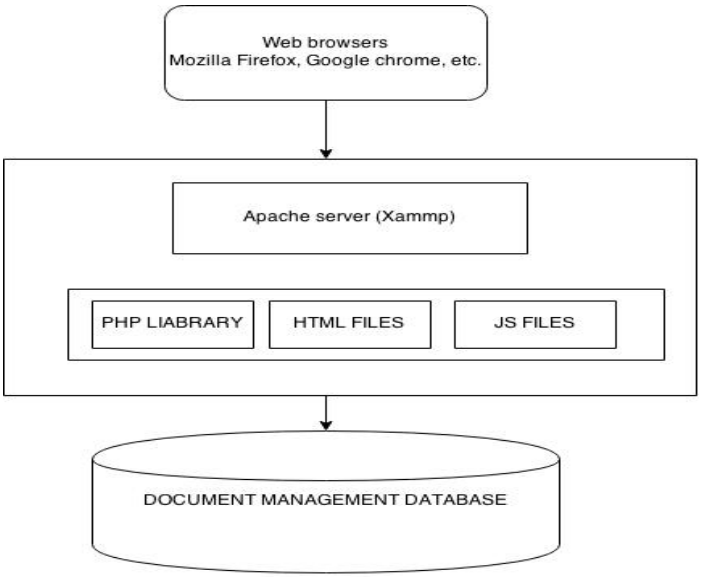

Fig.2. System architecture diagram.

Table 1. Use Case requirement for the proposed Document Management System.

USE CASE NAME	DESCRIPTION	ACTORS
Login	The user enters the username and password into the system to gain access	Secretary, Departmental Staff
Document capture and image scanning	All documents entering the department are captured and scanned by the system, and the physical copies are filed away in the cabinets	Secretary
Insert new entry	The essential details, including date, document type, source, and destination, are recorded together with the identified documents.	Secretary
Internal document workflow	This section demonstrates the document transfer process within the department's workforce.	Secretary, Departmental Staff
Create new document	This feature allows users to produce content (such as letters, memos, and reports) using designed document templates similar to Microsoft Word and then share those contents with other departmental staff members.	Departmental Staff
View existing documents	The created and saved documents in the file repositories are opened in this manner.	Departmental Staff
Document versioning.	Only one person is allowed to work on a document at once under this section A lock is created when a user checks in, and it is then released when the user checks out.	Departmental Staff
Document sharing	A user can authorize other employees to see, comment on, and share the document by using this attribute	Departmental Staff
Basic search and advanced search.	The user can get or recover documents using the required search criteria	Departmental Staff
Audit trails of entries	This displays comprehensive data on each incoming document that has been received by the system	Secretary
Admin panel	performs system maintenance and performance monitoring.	System Administrator

The proposed document system is depicted in Figs. 3, 4, 5, 6, 7 and 8 accordingly. The specifications for the new system were designed using the Unified Modelling Language Tools. The use case diagram outlines the system, as well as the secretary, departmental staff, Administrator, and the many roles that each actor plays within the system. The many objects and classes with their characteristics and methods are shown in the class diagram in Fig. 4. The several actions that a user can carry out after he has access to a system are described in Fig. 5. The sequence diagram in Fig. 6 illustrates how processes interact with one another. It displays time successions that are not well defined in other diagrams, like the flow of messages, sequence of events, and actions between objects. It examines object interactions that are time-ordered and how information is transferred from one stage to another.

The UML context diagram illustrated in Fig.7 shows the functional modelling elements that can be used independently as a useful tool. It enables a group or a single person to create a high-level model of a proposed system that determines the boundaries of the target system and how it interacts with key components of its surroundings. The system context diagram is a single illustration with the system of interest at the center and the objects that make up its environment that it interacts with on each side.

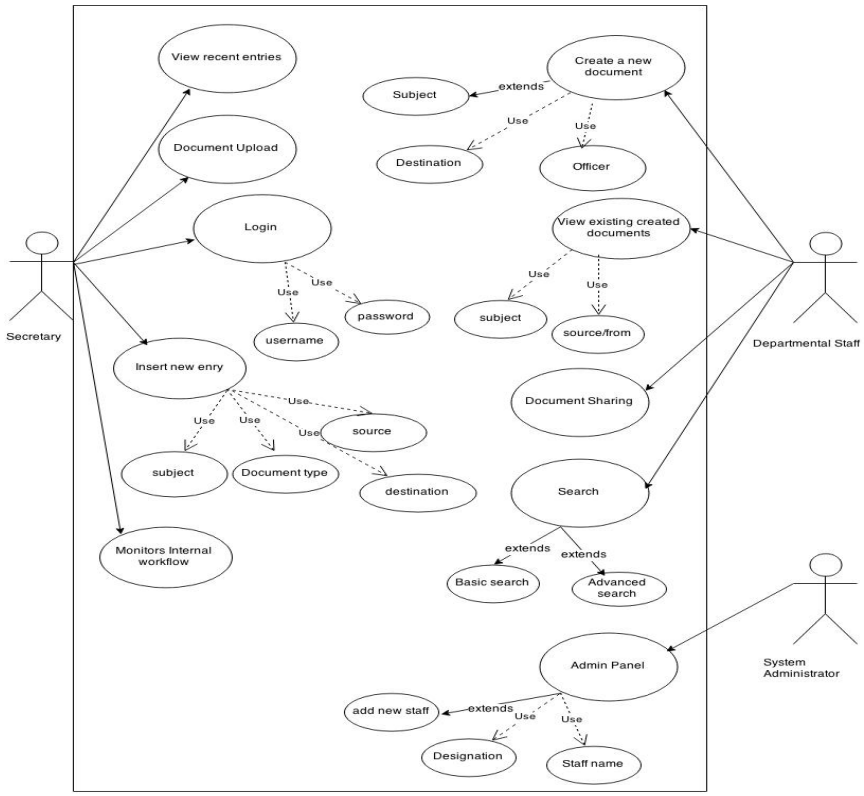

Fig.3. Use case diagram of the Proposed System.

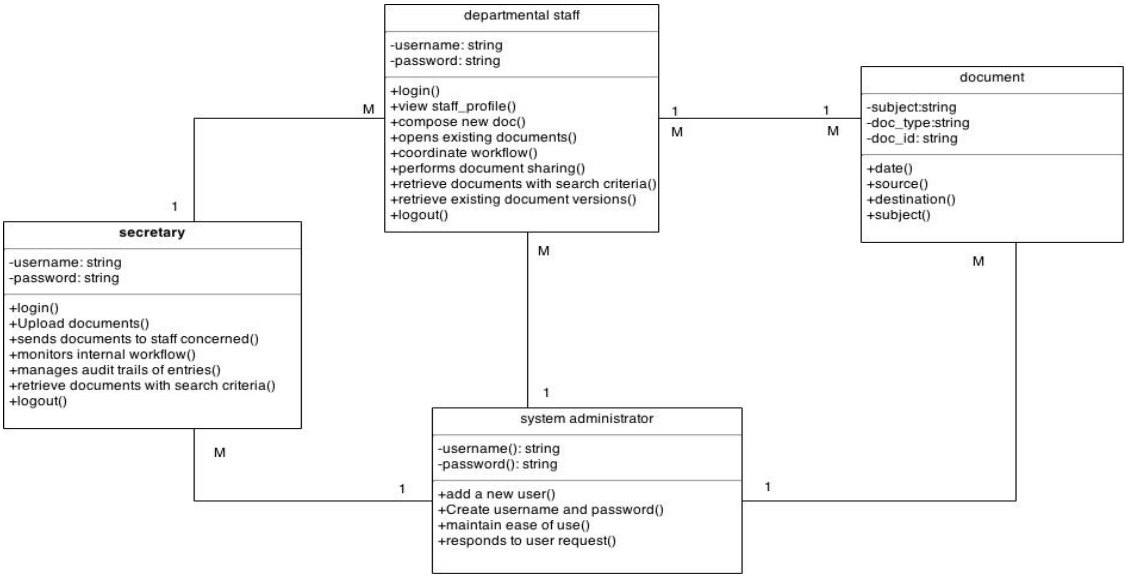

Fig.4. Class diagram of the proposed system.

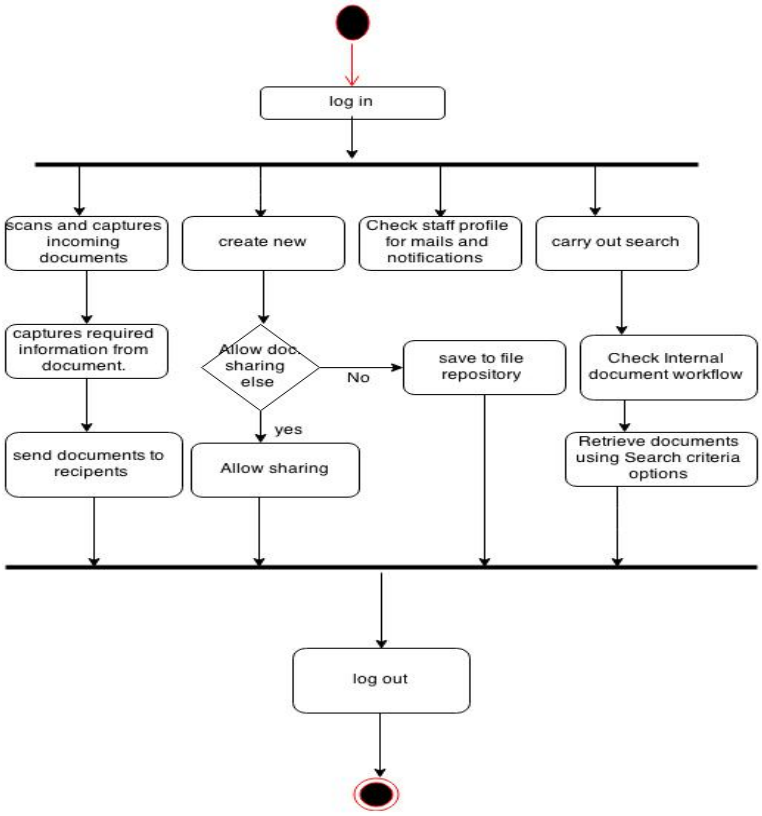

Fig.5. Activity diagram of the proposed system.

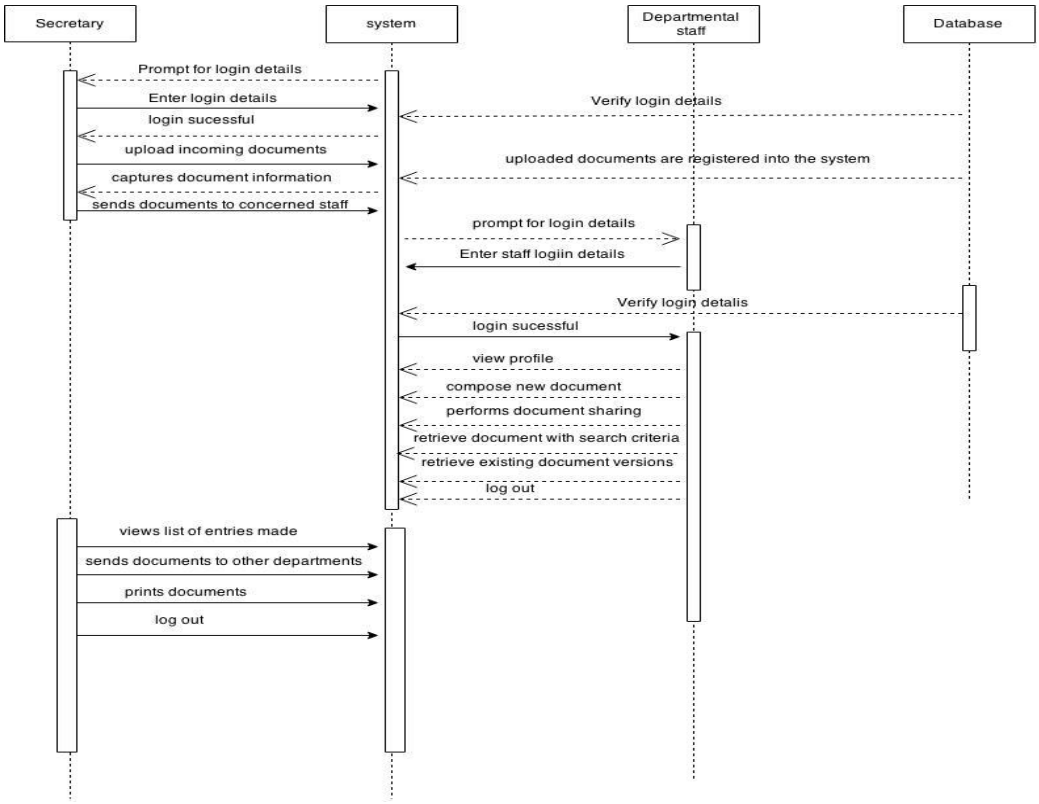

Fig.6. Sequence diagram of the proposed system.

Like the sequence diagrams, collaboration diagrams are interaction diagrams. The information is conveyed similarly to sequence diagrams. Instead, they emphasize the functional role of objects. Fig. 8 shows a schematic with actors, objects, and arrowheads that represents navigation according to the methods used. The diagram in the figure shows the many collaboration structures that are used to characterize each system activity. It displays the actions taken

to add a new item, create a new document, see recently added documents, conduct a search, and manage internal workflow.

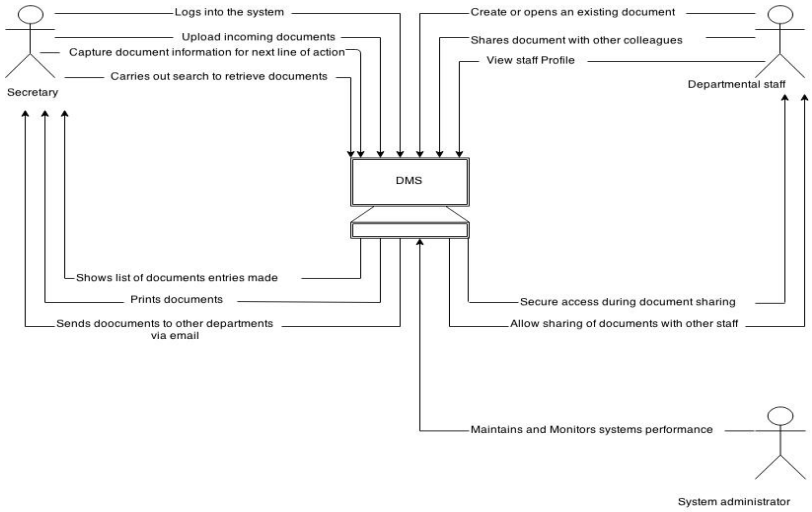

Fig.7. Context model diagram of the proposed web-based document Management system.

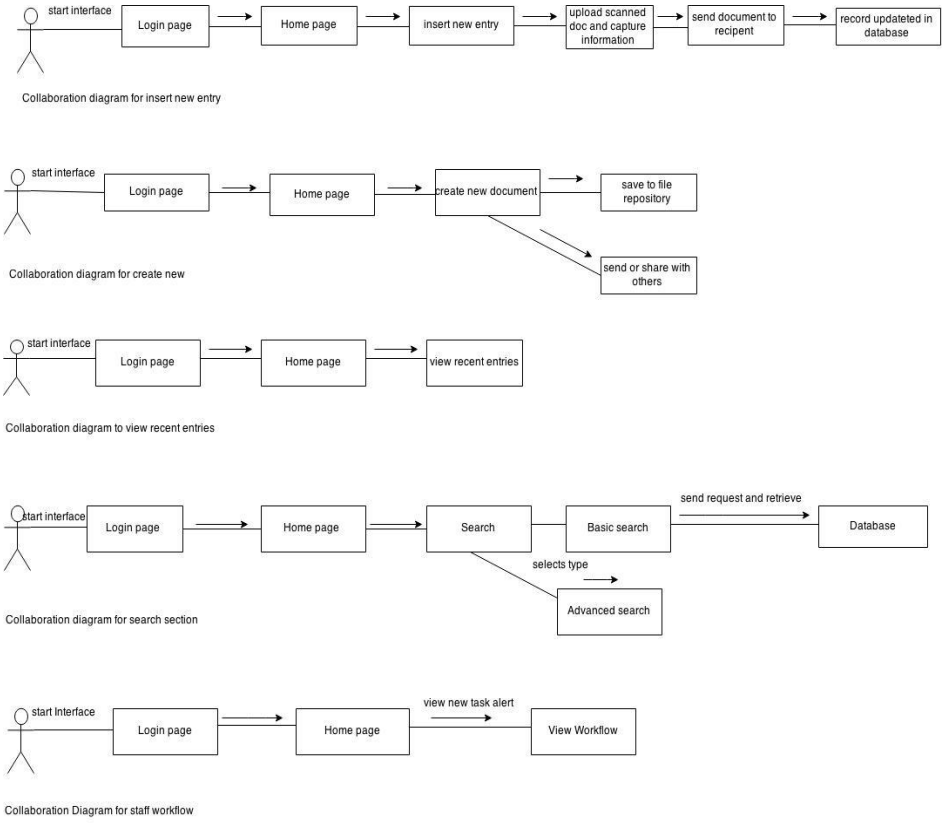

Fig.8. Collaboration diagram of the proposed web-based document Management system.

4. Implementation

The proposed system was implemented using a NetBeans tool, which is open-source software with an integrated development environment (IDE). The NetBeans software provides the coding environment for writing HTML, PHP, CSS and JavaScript and Java programs. The graphical user interface was designed using HTML, CSS and JavaScript, while the middleware was designed using Xampp (Apache HTTP server, PHP, MySQL and PHPMyAdmin), which provides scalability, load balancing, transactional processing. The back-end was designed using the SQLite database tool. The database design tool was used because of its robustness to save large data and its compatibility with many programming languages like PHP, JAVA, and Python**.** The website, which serves as the middleware and data access

layer's interface, is displayed and processed by web browsers. The program was implemented on a machine with the following specifications: 6GB RAM, Intel Core (TM) i5-2450M processor running at 2.5GHz, 64-bit Operating system and a 100GB Hard disk. For the distribution and processing of different document types within an organization, the proposed web-based document management system is platform-independent.

The WBDMS system is a web-based electronic program that can be accessible by a local host web server or remotely hosted in the cloud, as shown in Fig. 9.

4.1. Login page for Document System

The main login page shown in Fig. 9 displays the page that only the authenticated users (the secretary, departmental staff and administrative officers). can access. The authenticated user can only gain access in to the system with the username and Password given to them by the Administrator. The username and Password enable them to have access to the dashboard. When users enter correct login information, the system recognizes their role (assigned when they were added to the system) and redirects their dashboard accordingly.

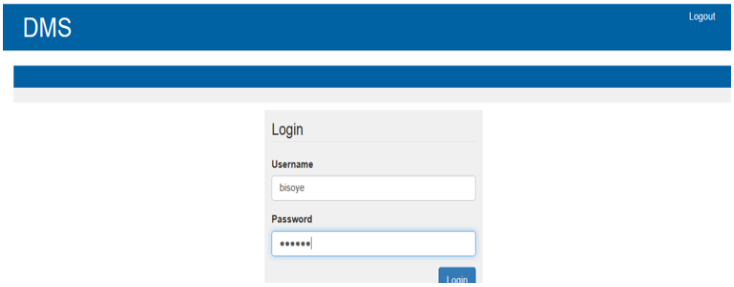

Fig.9. Screenshot showing the login page of the Web-based Document Management System.

4.2. Home Page

The home page as shown in Fig. 10 is the first page that a user sees after logging in to the system. It serves as the main page that directs users to other pages in the system. According to the dashboard displayed on the page, there are four sections on the form: insert new entry, create a new document, view recent document and search for document. Fig. 11 shows that the user can import documents that are arriving at the department by using the insert new entry page. The user records all pertinent data about the document, including its type, its subject or title, its author, its date, etc. The user uploads the document and stores it in the system after collecting all the necessary data. Additionally, the build new Document page shown in Fig. 12 offers a dynamic content platform where a user can add text to pre-designed documents as needed. In this area, users can generate papers and instantly send them to other employees within the organization company. The user saves and transmits the document to the recipient after creating the content.

The View recent documents page as depicted in Fig. 13 displays all of the user's submitted document entries, allowing the user to send them to the specified recipients. While the user can search and get system-stored documents using the Search for Document screen shown in Fig. 14. There are two kinds of search categories offered by this system, namely basic and advanced search. The text field for the user to enter the document's subject for a search is shown in the basic search. The user can then enter different text fields in the advanced search to limit the number of results that are returned after the search. Similar to the External Process page, the Internal Workflow page, as depicted in Fig.16, shows the document workflow and movement for each document transmitted both inside and outside the department. When a user uses an arrow to transmit a document to another staff, the workflow displays the document's current location., and it also does so when another user transmits the same document to another member of staff.

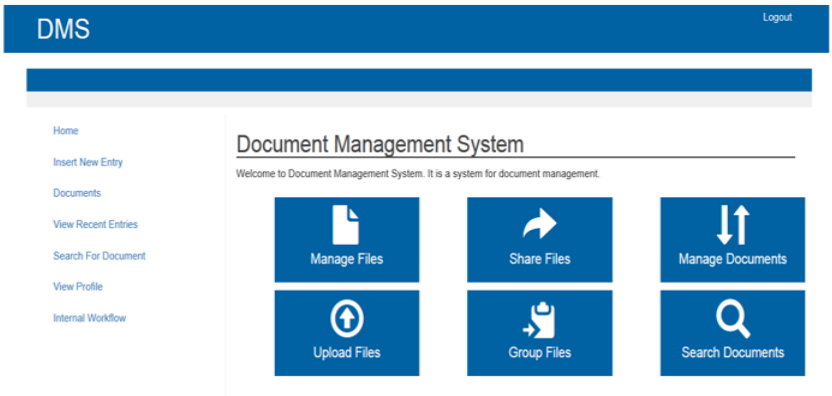

Fig.10. A Screenshot showing Homepage of the Document system.

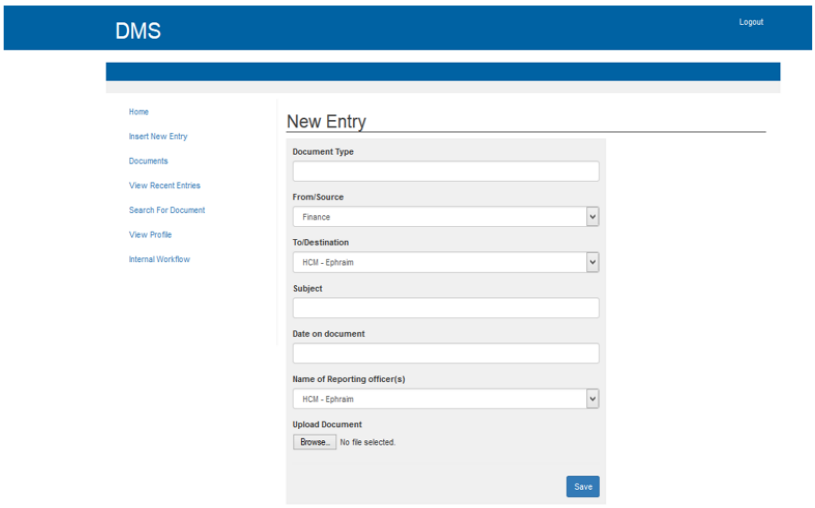

Fig.11. A Screenshot showing the New Entry page of the Document system.

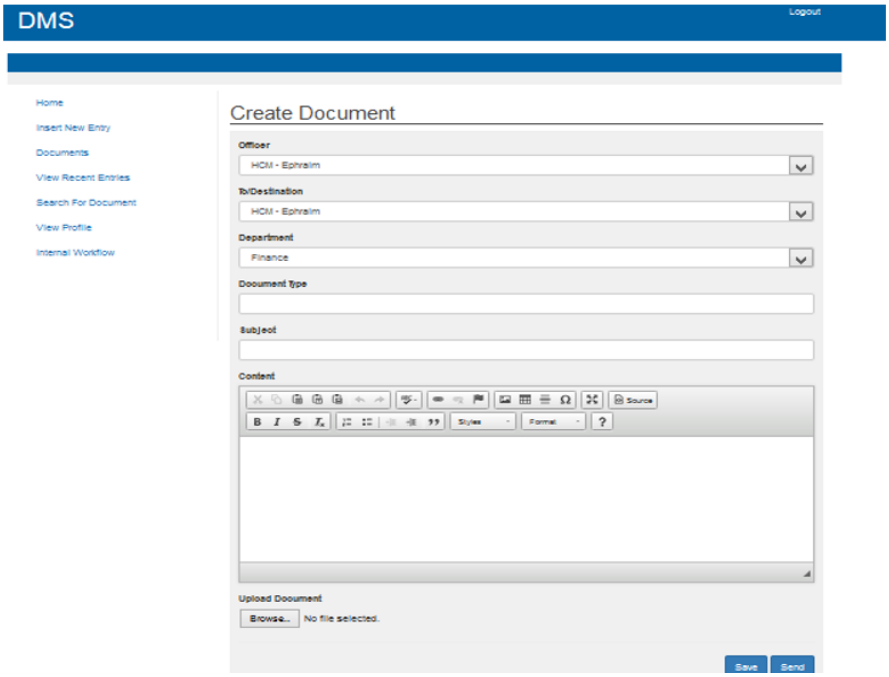

Fig.12. A Screenshot showing the Create New Document page of the Document system.

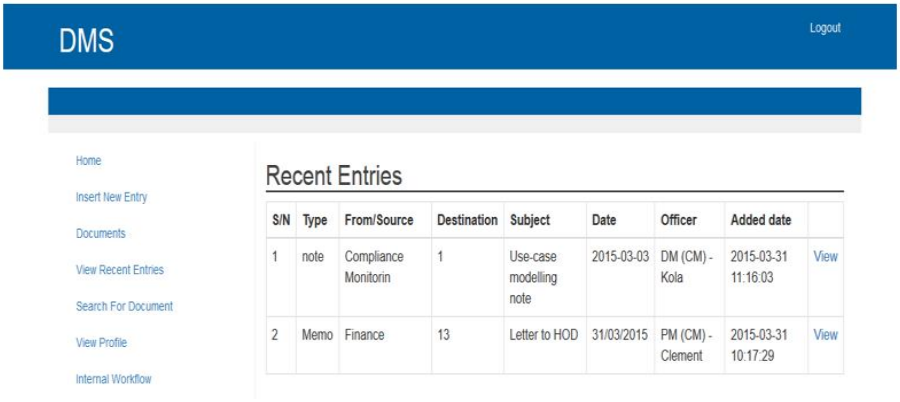

Fig.13. A Screenshot showing the View Recent Entry page of the Document system.

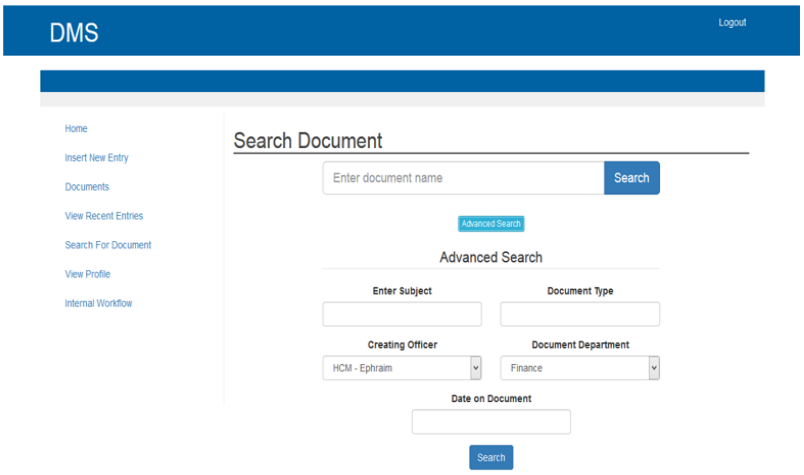

Fig.14. A Screenshot showing the Search Document page of the Document system.

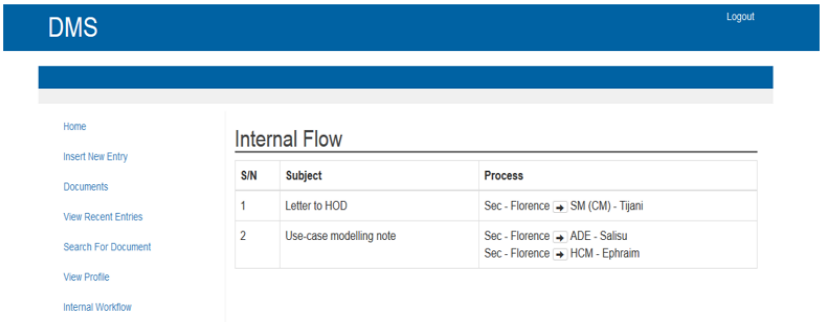

Fig.15. A Screenshot showing the Internal flow of the Document system.

4.3. System Evaluation

The new system developed was tested and and its performance assessed based on the modified DeLeon and McLean information system theory model. and its performance assessed. Utilizing measures including information quality, service quality, user satisfaction, and net profit from use, the system assesses performance accuracy and effectiveness using a modified Likert scale questionnaire tool. The Likert scale is a subjective evaluation analysis tool, which is similar to decision analysis system tool (DAS), that measures the attitude of respondents towards a certain subject or rate of the several subcategories of a parameter that are used to evaluate the system that has been designed. A modified 5-point Likert scale is used in this situation. A single number, ranging from 1 to 5, where 1 represents the lowest perceived quality and 5 the highest, as indicated in Table 2. The responses received from respondents are presented in Table 3.

Table 2. Table of Rating Scheme.

No.	Weight	Quality
1.	5	Excellent
2.	4	Good
3.	3	Average
4.	2	Poor
5.	1	Very poor

Nevertheless, depending on the specific needs of the organization, different expectations might be placed on the newly established DMS, which may be thought of as necessary and beneficial to have. This is because different platforms have various characteristics. Ease of use, convenient and advanced search and retrieval, version control, improved workflow, document compliance, cost reduction, indexing, support for various formats, organization, good organization, collaboration, and annotation are among the features anticipated for or included in this current DMS. However, the new system's procedures for processing documents require that users (Admin, staff, and secretaries) check in using usernames and passwords to access the system's home page, which facilitates access to other pages within the system as seen on the dashboard in Fig. 10.

In addition, the user can import any new departmental papers using the first menu item: Insert New Entry. The

user records the relevant details about the document, such as the document's type or format, its subject, its source, and its creation date. Once the document has been photographed, it can also be scanned and turned into a viewing format that can be altered and rendered with regard to binding. After that, the scanned papers are properly rearranged and stored in repositories. It is now possible to upload the scanned papers for viewing and other purposes. Similar to that, a Create New Document page offers a platform where a user can add text using a text editor that has already been created.

5. Result and Discussion

The respondents evaluated the parameters in the order according to how they scored on the document management system. As shown in Table 3, this is intended to support each respondent's judgment and attitude towards the caliber of the developed system. The frequency of the metrics shows how well the system is functioning, according to the respondents. Twenty-one (21) respondents, or approximately 87.50% of the sample, used the system excellently, while another 20% made good use of it and 4.17% received an average score. No respondents, however, provided scores based on the other ranking. However, 98.20% of the respondents as a whole had good intentions to use the document management system. 94.20% of the respondents used the system and provided feedback on its reliability, which consistently generates reliable results. The system designed is always usable, as evidenced by the assessment's 100% availability rate. When the system was put to use, 96.60% of the respondents responded. This shows that the document system was regarded as suitable and sufficient by users (secretaries and departmental personnel) to fulfill the given criteria.

Table 3. System Evaluation Rating of the System Quality.

Parameter	Excellent 5	Good 4	Average 3	Poor 2	Ver poor 1	SoR	SoP	Avg	CWP
Usability	21	2	1	_	_	24	118	4.91	98.20%
Reliability	20	1	3	_	_	24	113	4.71	94.20%
Availability	24	_	_	_	_	24	120	5.00	100.00%
Response Time	21	2	1	_	_	24	118	4.91	98.20%
Adaptability	18	5	1	_	_	24	113	4.71	94.20%
Satisfaction	20	4	_	_	_	24	116	4.83	96.60%
Avg	20.67	2.33	1			24	116.33	4.85	97.00%

Where; SoR, SoP, Avg and CWP refers to Sum of response, Sum of Parameters, Average and Cumulative Weighted percentage respectively.

Fig.16. Graph showing the System Quality Rating.

Furthermore, a 98.20% response rate from the system's use showed that the document management process and distribution are better than when manual or traditional methods are used. In conclusion, 97% of respondents, on average, gave the web-based document management system a positive rating for quality. This demonstrates that the system created was able to satisfy typical conditions and demands. In the same vein, Fig. 16 displays the graph of the Cumulative Weighted Percentage (CWP) against the rating criteria. The frequency of the metrics shows how well the system is functioning, according to the respondents.

The information quality measures the content issue to ensure that the generated web-based document system is customized, thorough, pertinent, understandable, correct, and safe. The results of the evaluation of the developed system in terms of information quality are displayed in Table 4. The accuracy of the content (i.e., the capacity to provide a precise outcome) produced 95%, while the rate of completeness yielded 96.60% and the ease of understanding the processes and procedures of use gave 91.60%. The developed web document management system's quality rating is shown graphically in Fig. 17.

Table 4. System Evaluation Rating of the Information Quality.

Parameter	Excellent 5	Good 4	Average 3	Poor 2	V.Poor 1	SoR	SoP	Avg	CWP
Accuracy	20	2	1	_	_	24	114	4.75	95.00%
Timeliness	21	2	_	_	_	24	95	3.96	79.20%
Trustworthiness	5	17	2	_	_	24	99	4.13	82.60%
Completeness	20	4	_-	_	_	24	116	4.83	96.60%
Easy to Understand	16	6	2	_	_	24	110	4.58	91.60%
Relevance	1	22	1	_	_	24	117	4.88	97.60%
Avg	13.83	8.83	1.33	_	_	24	108.50	4.52	90.40%

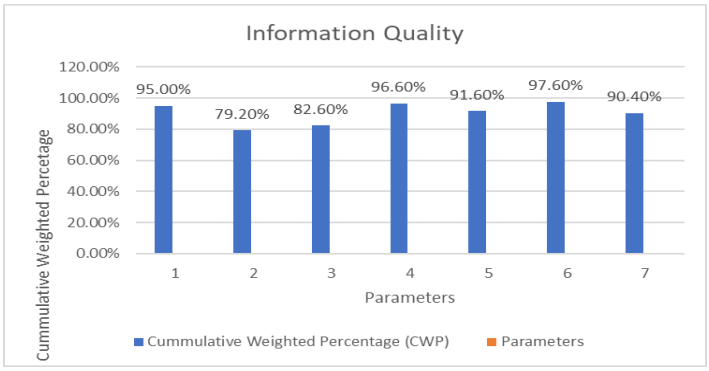

Fig.17. Graph showing the Information Quality Rating.

Table 5. System Evaluation Rating of the System Use.

Parameter	Excellent 5	Good 4	Average 3	Poor 2	V.Poor 1	SoR	SoP	Avg	CWP
Ease of Retrieval	23	1	1	_	_	24	119	4.96	99.20%
Ease of Navigate	23	1	_	_	_	24	119	4.96	99.20%
Nature of Use	23	1	_	_	_	24	119	4.96	99.20%
Graphics	22	1	1	_	_	24	117	4.88	97.60%
Responsive	22	1	_	_	_	24	117	4.88	97.60%
Efficiency	1	22	1	-	-	24	96	4.00	80.00%
Avg	19.00	4.5	0.50	_	_	24	114.50	4.77	95.47%

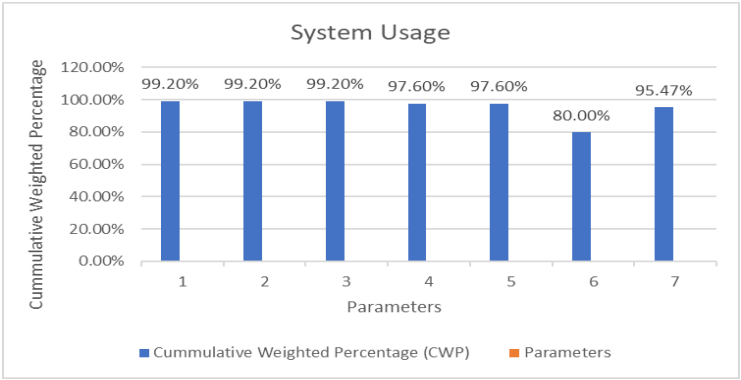

Fig.18. Graph showing the System Usage.

The quality of the system and information metrics alone or collectively impact the System Usage and User Satisfaction. The use of the developed system is 99.20%, as indicated in Table 5, which is a great indicator of how well the organization in need has adapted the new WBEDMS. However, the respondent's utilization of the system results in a significant system rating of 90.40%. This demonstrates how the effectiveness of the system affects utilization. As a result, as can be seen in Fig. 18, the prolonged usage of the WBEDMS is highly related to user satisfaction. Additionally, the conclusion produced by the system showed a pleasant experience of 99.20%. The user is proficient with the system's

functionalities and operations as evidenced by the high evaluation rate of significant impact on user satisfaction. This is similar to how the use and user satisfaction affect the net benefit, a system that is cost-effective as compared to a paper-based document filing system would take less time to process records and document applications.

6. Conclusions

The present study used web technologies and object-oriented hypermedia design methodology (OOHDM) to develop and implement a web-based electronic document management system. The proposed system was created with the help of the unified modeling language (UML), and it was then implemented using the NetBeans software programming tool, which has an integrated development environment (IDE) that offers the coding environment for creating the HTML, PHP, CSS, JavaScript, and other programs needed for the work. While the middleware was created using Xampp (Apache HTTP server, PHP, MySQL, and PHPMyAdmin), which offers scalability, load balancing, and transactional processing, the graphical user interface was created using HTML, CSS, and JavaScript. The SQLite database tool was used to design the back-end. Based on a modified version of DeLeon and McLean's information system theory model, the newly built system was tested and its performance assessed. The system's development yielded an accuracy of 95% and usefulness of 99.20%, according to the results. Based on the new system's correctness, usability, and dependability, it increases user satisfaction, boosts productivity, and ensures time and data efficiency in office administration. The goal of future work on the electronic document management system is to conduct an in-depth analysis of the system and incorporate elements like intelligence, platform-centric content strategies, and cloud awareness. In order to improve employee productivity, the use of information systems for document management systems provides a simple, rapid, and secure means to create, transfer, and store documents in an electronic format.

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How to cite this paper: Samuel M. Alade, "Design and Implementation of a Web-based Document Management System", International Journal of Information Technology and Computer Science(IJITCS), Vol.15, No.2, pp.35-53, 2023. DOI:10.5815/ijitcs.2023.02.04