

Design and Development of an Electronic Document Management System (EDMS) for ethio telecom

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Abstract

Electronic Document Management System (EDMS) is software that manages the creation, storage and control of documents electronically. Currently in most organizations, especially in the public sector, there is a heavy bureaucratic apparatus and there is a need of elasticity and ability to change working processes and habits in order to gradually switch to the digital environment. When implementing EDMS in public sector organizations, it often results in resistance of the staff and unwillingness to change the accustomed method of paper-based document circulation.

This paper analyses the current manual document management system that is used by ethio telecom and proposes an appropriate open source electronic document management software. We review literature to understand state-of-the-art. We made discussions with users, i.e., employees of the company to understand the current system and the requirements of the proposed system.

The proposed solution uses a web-based EDMS. This system will solve the current documentation problems and reduce the time on document flow, less paper document, and better security and retrieval of the document. From the top 5 open source software in EDMS, LogicalDoc 8.1 is selected based on user requirements.

Keywords: Electronic Document Management System; Public Sector; Document Management System

1. Introduction

Document Management System (DMS) is the use of a computer to store, manage and track electronic documents of paper-based information captured through the use of a document scanner. A DMS is a vital tool within any organization that is used to manage the organizational assets presented as documents generated within a business. According to ISO 12651-2, the definition of a document is "recorded information or object which can be treated as a unit". According to [1], a document means a container of information containing written or drawn information for a particular purpose in a structured way. It is commonly said that "a document can either be represented in electronic form (i.e., a Word document, a Spreadsheet file, Movie file, Sound clip, etc.) or as a traditional hardcopy consisting of one to thousands of pages". In this paper, a document is defined as any object which has the purpose or which is intended to be used for obtaining knowledge from the information it contains. A DMS is the continuous,

permanent, compulsory, and universal recording in accordance with the legal requirements in a company. For any company/organization, a document is an asset, road map, warranty, evidence and even more than that, and if this document is not managed properly it has a drawback on the whole business and operational process of the company.

Nowadays a document management system plays a major role in the realization of a company's short- and long-term objectives. Especially, for companies like ethio telecom, whose vision is being a world-class operator, having a well-structured, secure, centralized and easily manageable document management system is mandatory. The primary purpose of document management is to secure each document with recognition of the legal identity and protect from physical damage and loss. A secondary purpose is to create a data source for the compilation of statistics [2].

Physical hard copy documents are often the largest database within any organization and the most

difficult to access. An Electronic Document Management (EDM) solution needs the functionality required to manage and access information held in paper form. This means an EDM solution should be able to track hard copy documents and their filing, provide management tools and include the functionality required to convert paper to electronic format, i.e., images or text, as required [3].

Currently ethio telecom does not use any electronic document management tool. An employee uses his/her own way to manage documents. For some documents which are needed for personal consumption, an employee may use a scanner to scan the hard copy and save on a personal computer and also shelf the hard copy. However, the problem is more acute when an employee is transferred to another department or division.

Paper documents face the risk of having multiple versions at any given time and run a security risk when anyone has access to a confidential hardcopy. Paper documents also lack the ability to be linked to other information, making it difficult to track them. Most of the time, electronic version of a document is not stored properly because the individual stores the document as self-reference. For this reason it is not easily accessible whenever needed.

In general, the current traditional document management system has many problems in relation to cost and security. It is not cost effective for collaborative document authoring, editing and reviewing. In addition, the high volume of documents needs a big investment in buildings, shelves, folders and papers. Document security is not guaranteed; documents are vulnerable to fire and other natural disasters as well as other criminal cases. Since there are no backups, once a document is lost, it is less likely to be recovered.

These problems lead ethio telecom to give unsatisfactory service. That is why we need a system that finds a way to automate the system using the most recent EDMS. This makes the services of ethio telecom more efficient.

When implementing an EDMS:

- It increases document security and control mechanism. The difficult task of securing confidential information is simplified with a

digital document management system. Whereas paper files need to be stored in secure cabinets and controlled using manual access system, electronic documents are easily encrypted with access controls using passwords and an authentication system. Electronic files never go missing, nor do they easily fall into the wrong hands.

- It will help to have more reliable backup. Traditional document management practices encourage the saving of documents on local computers and non-controlled file shares. This means that quite often, content may not be properly backed up. It is a regulatory requirement to be able to produce original and legible copies of records and having a strong backup solution in place for the new system. EDMS centralizes all documents and records and encourages the creation and management of these records in one location. This in turn significantly improves our ability to backup all content and ensures we can readily retrieve them.
- Using advanced search tools available in EDMS, it is easy to find information and knowledge from indexing content. Compare this immediate access to a traditional paper file, which has to be housed in a file cabinet or room and then must be requested, retrieved and delivered to an employee. During its use that paper file cannot be accessed by another employee, nor it is easily tracked during its journey. Electronic documents can be retrieved immediately, shared and routed to any employee who needs it. So it allows us to improve decision making and reduce the amount of time lost looking for information.
- It will also help to get a better version control. EDMS has built-in version control which allows to automatically version documents and ensure that full document history is available. As everyone is working on the same single document within the EDMS, problems associated with multiple copies of documents dissipate, as does the need to distribute copies via email.

In general the benefits of EDMS include work process and forms publication, easier search of organizational records, and cost saving from low use of materials such as paper and also faster and easier information accessibility, enhanced information currency and accuracy, higher employee productivity and improved customer satisfaction and relations management.

The main purpose of this paper is to design and implement an EDMS to automate the document management system of ethio telecom and avoid unwanted rushing/panicking when searching manual documents whenever different departments or regulatory bodies need them. Additionally, it also creates smooth working schedules at different branches.

2. Related Work

As indicated in [4], EDMS is defined as a collection of technologies that are used to create, capture, index, distribute, review, maintain, store, retrieve and dispose of information assets. Major components of EDMS include imaging, document management and workflow processing. According to [5], EDMSs have been used in public organizations. EDMS implementation studies in the public sector began to grow in the early 2000s. For the purpose of providing productivity, space savings and a general improvement in business processes, public organizations are increasingly implementing EDMS in order to transform service delivery to citizens. In addition, applying EDMS can be used to reduce operating costs and minimize office space for filing and reducing the cost of labor.

The study in [6] aimed at investigating the implementation of an Electronic Document and Records Management System. The author used a case study research method to ensure greater reliability of data. Both qualitative and quantitative approaches were used to analyze, present and interpret data. Data were collected using observation, questionnaires, documentary reviews, and interview methods. The author concluded that the success of implementing an EDMS is directly related to the amount of effort and collaboration that goes into planning a project. Also top management support and

training of system users are critical towards accomplishing goals and objectives.

As indicated in [7], the authors investigate the technological and human challenges that hinder the implementation of electronic document systems in Iraq E-Government. The methodology utilized a quantitative approach via survey questionnaires from various public and private sectors. For the data analysis, it used descriptive methods. The paper concluded that all the difficulties can be overcome by taking serious and effective steps by the government.

3. The Proposed Solution

In this section, overview of the proposed system with its functional and non-functional requirements, analysis model using use case diagram and use case descriptions are presented. In order to achieve our objectives, we reviewed literature related to electronic document management and collected the necessary data. Open source software and appropriate programming tools and techniques were used. For the purpose of requirement gathering and determination of the system, both primary and secondary sources of data are used. Primary data sources include interviewing employees of the information system division and related divisions and observation of the current work process. Interviews were conducted with 15 senior managers and 20 staff within the target division from all departments. The purposes of the interviews were to understand the challenges that the division faces in managing its documents and to collect the basic requirements of the system that the department needs.

The semi-structured interviews started by asking subjects how they organized their documents and whether they followed a specific pattern of structuring files and folders or used special document management tools. We asked questions about their file hierarchies and desktop arrangement to understand how users keep documents. All of the interviewees reply that they kept documents in their own style and do not follow one standard filing system.

In addition, we asked participants about the organization of their workspace. It has been observed that the participants find the digital version of a paper

lying on the hard copy document in their desk and vice-versa to understand the truck of the information that keep and how they relate the two document types. In the interview question, the company's current document management system problem and how and which feature included in the proposed system and give a weight to each required parameter. As a result of the interview and observation, most of the interviewees agreed on the following problems that are faced by the company.

- *Difficulty to search information:* the way records are stored and the lack of proper reference methods make finding of a particular information or record a very difficult and time-consuming task.
- *Weak communication:* Due to poor communication system, information is often received lately from one division to another or within a division.
- *Cost:* Exchanging documents using the existing method is very expensive. In addition to managing the ever-increasing volume of paper-based documents, additional personnel as well as investments on rooms, shelves and folders are required.
- *Documents are unsecured:* Manual method of document management is vulnerable to natural disasters and other criminal activities. Since there are no backups, if a document is lost, it will not be restored.

Generally, the existing method of document management and exchange is cost ineffective, time consuming and unsecured.

Based on the result of the interview and the parameter/criteria that are shown in Table 1, from 5 open source EDMS software candidates, LogicalDoc 8.1 is selected as a solution for EDMS for the company. The proposed system has the following functional requirements:

- The system must be able to record information about the community of ethio telecom.
- The system must be able to record and update events.
- Head administrator must be able to add/create/remove Branch administrators.

- The system provides an environment for creating and modifying user accounts.
- The system must be able to search information using title or using words.
- Full text search: this lets a user to find documents by their content, i.e., words or phrases in the document.
- Generating multiple search indices for different languages.
- Search document types like PDF, MS Word or Excel, HTML, XML, PowerPoint, JPEG, audio, video and other electronic documents. This means having instant access to information, regardless of the format of the information.
- Finding documents by index fields such as date, file name, file type, and size.
- The system must be able to report the information recorded before.
- The system must be able to control different version of the documents.

The non-functional requirements of the system will have scheduled backup plan from the central EDMS database and sufficient secrecy of the organization's information that is stored in the central EDMS database from illegal access. Also it handles multiple user requests and processes them efficiently and is robust enough to manage any valid input from the users and perform any EDMS database operations with no errors. Finally the system will have simple, understandable and user friendly graphical user interface which has appropriate and descriptive names.

Figure 1 shows the essential use case of ethio telecom Electronic Document Management System. There are four actors that interact with ethio telecom Electronic Document Management System. Table 1 shows the actors of the proposed system with their description.

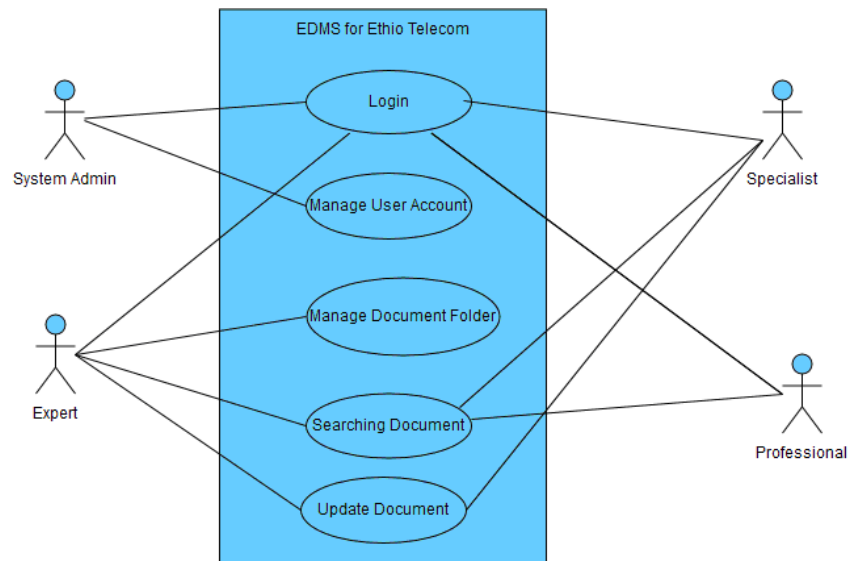


Figure 1: Use Case Diagram

Table 1: System Actors with their Identifiers

Actor	Description
System Administrator	A System Administrator is a person who is responsible for administering the whole system, including adding new users and removing existing users.
Expert	An Expert is a person who can manage all documents in the system such as add, delete and move folders or subfolders within the system.
Specialist	A Specialist is a person who is responsible for document preparation and updating the document from the system database.
Professional	A Professional is any staff member who has an access feature of the web application of the system.

The proposed system is a web based application in which all records of the districts of ethio telecom are stored in a central database at the Head office. Then all branches of the organization will have

access to this central database to record, update, and retrieve required data and information. The proposed software architecture is shown in Figure 2.

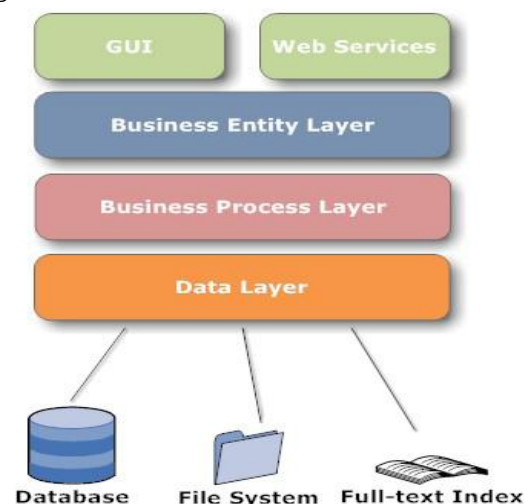


Figure 2: LogicalDoc Application Layers

The architecture has 3 application layers and they communicate with each other through the spring application contexts. Those are the Data Layer, which is responsible for resource management and stores the information into three main stores: Relational DB, File System, Full-text Index; business process layer that aims to make a reliable and helpful Application Programming Interface (API) to the upper layers, and business Entity layer, that allows the GUI components to interact with the DMS engine. It is developed using Java web technology. This technology choice has enabled the work to have portability, extendibility and security. The portability enables the work to be deployed on a given platform and work with the currently existing web servers with or without plug-ins. The extendibility can be expressed as features for the work to tolerate future expansions. The security features of the Java language can be incorporated to the level of requirement in need.

4. Discussion

Searching for information in a manual system does not only consume time but it is also tiring and cumbersome whereas in EDMS it eases the retrieval process as long as the manual system has been streamlined. Understanding the importance of the system motivates users in taking advantages of the opportunities accrued by using it. Respondents were

asked whether they understand the importance of the EDMS. 80% of the respondents revealed that they understand it to a large extent, 14% of the respondents indicated that they understand it to a small extent, whereas only 6% indicated that they know it to a very small extent. This reveals that a majority of the users understand the EDMS highly followed by a few who know its importance. Respondents were asked whether they would prefer to use an EDMS. A majority of them (80%) said to a large extent, whereas 20% indicated that they would prefer using it to a very small extent. Based on the respondents' feedback, it clearly indicates that there is a confidence level in using EDMS.

We used some parameters to analyze and compare the possible functionality of open source electronic document management system. Table 1 shows the comparison functionality.

Based on Table 2, LogicalDoc EDMS is selected as the proposed tool for an EDMS. However, there is a gap on user functionality requirements, i.e., integration with Microsoft Outlook since the company uses a formal email account.

Table 2: EDMS Open Source Tool Comparison

Criterion/Parameter	Weight Factor	OSS Tool Available				
		Leto DMS	Krystal DMS	KnowledgeTree DMS (Kimios)	OpenDocMan	LogicalDoc
Web based Architecture	3	3	0	0	3	3
Document management	11	10	7	8	9	11
Multi-language	4	4	0	0	4	4
Data Security	5	1	2	2	4	5
Searching	2	1	1	2	1	2
Version Control	4	4	4	2	4	4
Online view	6	6	4	0	2	3
Notification	5	2	2	1	4	5
Easy of use	3	2	1	1	3	3
Stability	5	3	2	5	4	5
Platform Independent	2	2	2	2	0	2
Customization	2	1	1	0	2	2
Total	52	39	26	23	40	49

In general, the following are limitations of using open source EDMS software.

- *Fewer features:* it is only logical that free software should come with fewer features than the commercial versions. While some of the open source EDMSs provide commercial versions, they are still of poor quality than the paid versions of regular document management tools.
- *Lack of technical support:* Since these are open source tools, usually one has to ask the user community for an issue with the software.
- These programs rarely meet the compliance standards of government agencies or business industries.

The selected open source software, LogicalDoc 8.1, was deployed to gather feedback from users. All of the users were excited automatically documenting their documents and also ensuring higher security of their documents. The system made it easier for them to find documents, securely store them, and share them with less stress. Also users were able to add comments on any document in case of any important note that need to be added for the intended user to note before s/he uses the document. Finally users stressed the advantage of having the system embedded into daily operation as participants realized the benefits of this system in keeping track of their documents and ensuring the document is securely safe from unauthorized personnel.

5. Conclusion and Future Works

This paper focuses on the design and implementation of EDMS for ethio telecom. It does not use only technical ability in programming, but also ideas of management information system. The research uses an open source system, which is easy to develop and use the idea of object oriented programming to implement. In addition, this version of EDMS meets most of the user requirements and it will help the Information Services Division to reduce its paper documents and help employees to do more work than waste their time to find a document.

It is recommended that by implementing EDMS will improve the productivity of the organization, and will assure proper document control. Referring to

time, the proposed EDMS will reduce the time needed to find documents and improve the document workflow. In terms of cost, an EDMS can reduce cost by reducing the need of printed papers and document administration. The quality will also be improved because the latest information will be available and published, so there will be a minimal risk of working on old documents.

However, there are also some works remaining to be considered in the future.

- This paper considered only free trial of community based OSS of EDMS without customizing the source code that is missing valuable function in the free trial. So in the future, we will incorporate the missing functionality by using customization.
- Since the searching efficiency of the system has not been taken into consideration in this work, we will extend it by adding this feature.

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