Development of Electronic Document Management System as an Economical, Practical and Dynamic System at SMKN 14 Jakarta

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Abstract. Most forms of documents in schools are in the form of physical documents, such as paper and various other physical forms. Physical documents will use a room that is quite spacious as a place to store it. This problem obstructs school performance and causes a decrease in the effectiveness and efficiency of the school. Related this problem, an alternative is needed in its settlement. Electronic document development is one of the technology-based, economical and practical archive management systems to support archiving activities in a school. This study uses research and development methods of Borg and Gall's research strategy. The purpose of this research is to implement and develop an electronic document management system as an economic system in SMKN 14 Jakarta. The results of this study indicate that the implementation at SMK 14 Jakarta shows positive results in improving document management. Digital document systems are integrated successfully within the organization and must be fostered by implementing a new culture that leads to electronic organizations (E-Organization).

1. Introduction

One of the key elements of business management is document management system. Document management becomes one of the aspects that supports the managerial process itself. Documents are recorded information, including data in the computer system, that is created or received by an organization/individual transaction activity or act as evidence of such activity. The information and data contained in a document, of course, is important and various, ranging from matters concerning routine operations until the important matters concerning the company. Therefore, we need a system that can be relied upon to organize and manage documents in order to function properly.

Most forms of documents at the company are in the form of physical documents, such as paper and a variety of other physical forms. The physical documents would use a fairly spacious room as a place to store them. This may not be a problem at first when a new organization still in operation. However, over time, accumulating documents would cause various problems such as termites, insufficient rooms, and the difficulty in indexation. The documents will be physically scattered, and it will be difficult to search if required later. This would hinder the performance of the organization, so the impact will eventually cause a decrease in the effectiveness and efficiency of the organization.

One form of document management in the developing world organizations is Electronic Document Management System (EDMS). EDMS is a digital-based document management system, where the system generally uses a digital document storage and use other support features such as a scanner and optical character recognition (OCR). EDMS is flourished with a variety of advantages over conventional document management systems, such as the flexibility to store documents in a storage memory with large enough space and cheap price. In addition, of course, speed and accuracy in finding and using documents will always be maintained by the database system developed. Companies that have implemented EDMS also show to have increased productivity by 30. The use and application of the EDMS is unavoidable, given the rapid development of technology and information that occur worldwide. To that end, each organization must be able to adapt to the changes that exist in order to maintain its existence.

2. Theoretical Review

Bocij, Greasley, and Hickie explains that system can be defined as a collection of interrelated components that work together towards a collective goal [1]. In line with the above definition, Mukhtar explains that the system is a collection of several components which consist of several elements, components and elements which can be tangible objects and methods that interconnect, interact and collaborate with each other on a regular basis to achieve the goal [2]. Dommasch and Laudeman in Adamsen describes that complete system is any complex of equipment, human being, and interrelating logic designed to perform a given task, regardless of how complex the task may be. Logically, very large or complicated systems are broken into subsystems, to be fitted together like blocks to form the entire or total system [3].

A system has at least three basic components that work together to achieve goals, namely: input, process and output. Component inputs are typically composed of data and the raw material which will then be processed to produce the desired output. Components processed the raw input in a system. While the component output is the result of input that has been processed. Additional component that generally also presents in the basic system is a component of the feedback, which serves to evaluate and analyze the system running. In addition, the components of the control (control mechanism) are also required to change, reduce, or add things which are needed in the system.

Development of the system can be defined as a process of defining, designing, testing, and implementing a new system. McLeod explains that one of the existing methods in the development of a system is the prototype method, and the stages in developing a system with the prototype model is as follows [4]:

1. Identifying the needs of the user. At this stage, the system designers make the process of data collection by observing and interviewing users to get an idea of what they want to the system, then do modeling of information systems that are running.
2. Developing Prototype. At this stage, the prototype design of information systems, such as database design, interface design, and construction of a prototype information system applications are created. The prototype is designed in such way from product development, manufacturing of usage tutorial modules, and prototype testing schedule.
3. Determining whether the prototype is acceptable. At this stage, the user provides input to the analyst whether the prototype is already as needed or not after experimenting with several stages. The results of this phase can include product enhancements in the form of various versions.

According to Gulo, the document is a written record of events or occasions in the past [5]. Meanwhile, according to Moekijat, documents are all written records, either printed or not [6]. Azad Adam describes that document can be considered to be any file, whether it is text-based, picture based, or any other type of format, the which is under the control of an EDRM system [7]. According to Sukoco, the document is recorded information, including data in the computer system, which created or received by an organization/individual transaction activity or act as evidence of such activity [8]. Document means any object in the form of goods, pictures, or written as proof and can provide important and valid information. Documents must meet the requirements set, namely complete, adequate, meaningful, comprehensive, precise, and does not violate the law.

According to Tonfoni, Graziella and Jain, the document management is a process to help to accumulate and classifying documents and to make them available to others [9]. Document management is the process of achieving the goals of the document itself, as a source of information in decision making, in effective and efficient use of resources According to Awad and Ghaziri, document management system is a computer-based system which provides a web-based storage that can be accessed from anywhere [10]. The core of the document management system is a centralized storage area (centralized repository), a medium electronic storage (storage) with a primary storage location that can provide any authorized access to it. Document management system basically stores information and it incorporates a set of information relevant to one location through an interface.

According to the Association for Information and Image Management (AIIM), EDMS consists of a minimum of three components, which are; digitalization input, repositories, and document retrieval [11]. The system of digital document facilitating better access to documents saved digitally using a display or interface that is quite similar to the internet browser. According to the Journal issued by the U.S. Department of Health and Human Services document digitizing refers to creating a digital representation of a paper document through the use of an input device such as a scanner [12].

Liddy in her journal also explained that document retrieval is the computerized process of producing a list of documents that are relevant to an inquirer's request by comparing the user's request to an automatically produced index of the textual content of documents in the system [13]. As quoted by Bennett Klein EDMS solutions started out in the 1990's as document imaging where paper documents were scanned for electronic storage and retrieval [14]. Over time, these solutions evolved to include management of digitized information such as electronic forms and emails. EDMS solutions combine basic routing documents and workflows to help organizations automate business processes that are economical and practical in their application. An EDMS solution helps organization accelerate processes and task completion, eliminate time, risk and cost associated with storing and retrieving paper documents and forms, and address regulatory compliance around document retention, security and availability.

3. Research Methods

In this study, the authors used research and development (R & D) method. Sugiyono explained that the method of research and development is the research methods used to produce a particular product, and test the product effectiveness [15]. Such products are not only shaped in objects or hardware, such as books, stationery, and other learning tools but also in the form of software. Simply put, Nusa Putra explains that R & D can be defined as a method of research that deliberately, systematically, aim to find discover, formulate, refine, develop, produce, test the effectiveness of products, models, methods/strategies/ways, services, certain procedures that are superior, new, effective, efficient, productive, and meaningful [16]. The study was conducted at the office of SMKN 14 Jakarta. Data and research resources obtained by using observation and interview techniques at the office of SMKN 14 Jakarta and administrative staffs.

In the implementation of research and development, there are several methods used; descriptive, evaluative and experimental. Descriptive research method used in a preliminary study to collect data on existing conditions. Evaluative methods used to evaluate the system being implemented so as to find weaknesses that exist and to analyze how to develop a more effective system. Experimental method used to test the efficacy of the resulting product. Experiments were performed as a direct application of products on the conditions and circumstances directly where the product will be implemented. This study used a linear process, where the testing and revision process were carried out three times in one cycle by performing the stages of system engineering, analysis, design, code, testing and maintenance.

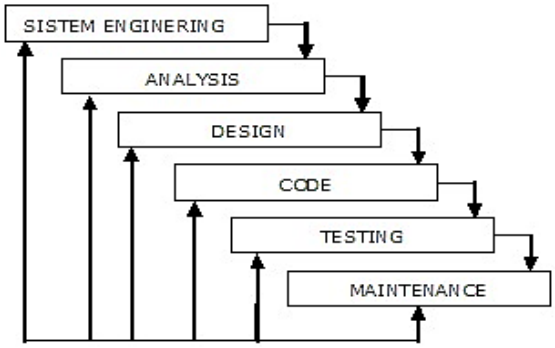

Figure 1. Research Scheme

4. Result and Discussion

Needs analysis conducted to administrative staff at SMK 14 Jakarta shows that the document management system used is a traditional document management system that only applies to document management in the physical form. When the administration receives a letter or document from an outside source, the staff will immediately record it in the incoming mail log manually. After that, the letter will be placed into the document folders. Obstacles experienced by manual document management system is the process that tends to be troublesome. Document build up is slowly occurring, resulting in difficulty in finding documents if it is later required. The risk of damage and loss of documents also tend to be high, resulting in various ineffectiveness in document management.

In the development of EDMS at SMKN 14 Jakarta, researchers used open source software that are available as options for non-profit use, namely Open Knowledge Management (OpenKM), Java Development Kit (JDK) from Oracle, and Apache Tomcat. EDMS was installed inside a Local Area Network (LAN) network that includes an internal network in SMKN 14 Jakarta. This network was covered by a router that functions to connect both internal and external networks. Researcher used localhost server that was installed on the staff computer, which will become the main storage of EDMS. Researcher completed the product package with a video tutorial on the use of product procedures created using Camtasia Video Studio application.

Initial installation of the product was on Wednesday, December 30, 2015 located at SMKN 14 Jakarta, precisely in the administrative staff computer. The computer had a medium specification, based on the Windows XP operating system. The first installation installed OpenKM community version 6.3, Java Development Kit 7.9, and Apache Tomcat. Furthermore, researchers also installed the Canon Pixma 6170 printer that also has a scanner as one of the main data input in EDMS.

The product installation process was continued on Thursday, December 31, 2015 where the installation focused more on the completion of the previous day's process. This included product improvements in the form of replacing the main page logo, creating usernames for users, and configuration of the LAN network that will be utilized during initial field trial.

Initial field testing of EDMS was conducted on January 4, 2016 at the office of SMKN 14 Jakarta. The trial took place with the presence of administrative staff at SMKN 14 Jakarta. The first step was to provide instructions and tutorials, and show video tutorials that have been made to explain the details of SOP usage of EDMS. In this early-stage trial, some constraints were still visible on the product. Product revisions were processed based on data collected during initial field trials and processed to become information related to EDMS constraints and shortcomings:

1. Plug in Java that had experienced unresponsive constraints. Researcher diagnosed existing problems may be sourced from the Java version installed in the administrative computer of Prodi Management Education. The installed version was Java version 7.9, which is the latest update issued by Oracle. While the operating system used was Windows XP, which is an operating system that is quite old. Researchers decided to reinstall Java with an older version, version 6.5.
2. A summary feature of an inactive EDMS report was not known yet. Researcher suspected that this was caused by networks which were sometimes unstable that disrupted the database synchronization process that exists on the local server.
3. Logo replacement was a configuration owned by OpenKM that can be accessed by an account that has privileges as administrator. The logo on the OpenKM system will be automatically adjusted to the correct size, using an integrated application called Image Magick. Researchers suspected that this was the source of the problem in logo replacement, so it was decided to reinstall the Image Magick in a newer version.

The final field trial was conducted on Wednesday, January 6, 2015 located in the administrative office of SMKN 14 Jakarta. Field test was done by trying to input data and employee documents of Prodi Management Education. Documents were included in the form of documents needed for data collection of Civil Servants. Before performing the input process, Emma first created a folder classification system in the system to maintain EDMS tidiness. Folders were created according to user

categories and needs, making it easier for users to search later. This folder system was flexible, tailored to future needs.

One document input process through scanning process took about 3 minutes. In addition, trials were also conducted to access the system through a computer in the network. Document sharing feature is one of the main features in electronic document management system, where multi-users can use and access the system simultaneously. EDMS can be accessed well through various computers connected to the Local Area Network (LAN) at SMKN 14 Jakarta. In this final-stage trial, some constraints were still visible on the product. Obvious obstacles were:

1. Logo replacement problem still occurs, even though the Image Magick application has been re-installed. After going through several analyzes and studies from the OpenKM forum, the researchers found the problem lies in the configuration of OpenKM accessed through the Administrator panel inside the application. The problematic configuration is the configuration of the Image Magick application usage as the default application used to manage an image used, including the logo on the front page. After doing the configuration, the logo can eventually be converted into a logo that has been created.
2. Scanner size which was limited to the size of A4 paper was a constraint in the process of inputting a legal-sized document. But taking into account the various conditions that exist, researcher decided to keep using existing devices. Most legal-sized documents do not use the full paper area, so the input process by folding a small piece of paper will not remove the information contained in it.
3. The use of Java in product development does have weaknesses. Java as one of the tools to develop an application product is famous to use lot of memory, so that impact on "heavy" its process run. But the weakness is because Java has a language that is close enough to human language. The principle in the programming language is, the closer a programming language to the human language, the more difficult the process would be by the machine/computer. Conversely, the closer the programming language to the machine language, it will be more difficult to understand humans, but it will be easier to be processed by the machine / computer. The decision was that researchers persisted in the use of Java as a programming language to develop EDMS in SMKN 14 Jakarta.

EDMS was implemented at SMKN 14 Jakarta as integrated digital systems that organize and manage documents. Implementation was done with the approval of Principal and administrative staff. Implementation of EDMS was conducted since December 30, 2015, starting with the installation phase of hardware and software at SMKN 14 Jakarta. Installation hardware included the preparation of the local server computer with the following specifications:

1. Processor Intel Core i3 second generation with a clockspeed of 2.9 GHz and a cache of 1.5 Megabytes.
2. Random Access Memory (RAM) DDR3 dual-channel mode installation of 4 Gigabyte, with a clock speed of 1300 MHz and a voltage of 1.35 volts.
3. Hard Drive with three virtual partitions with a total of 500 Gigabyte Partition.
4. LCD Monitor.
5. Keyboard, Mouse, and Speakers.
6. Printer HP P1102w.
7. Canon Pixma Printer and Scanner 6170.

Furthermore, some software installations were done on the computer to run the EDMS, including:

1. Windows XP Service Pack 3.
2. Mozilla Firefox Browser.
3. Java Plug-in Environment.
4. Java Development Kit 1.6u45.
5. Apache Tomcat.
6. OpenKM community version 6.3.
7. Drivers Printer and Scanner Canon Pixma 6170.

Implementation was done within 3 weeks, starting on December 30, 2015 until January 18, 2016 with a summary of the report as follows:

1. There were a total of 2 users who have registered with EDMS, Principals and Administrative Staff. These two users have permission as administrators and can make full changes to the system.
2. It has been digitizing official documents related to the data collection of civil servants (PUPNS) three teachers.
3. The logo has been changed successfully so that the display will show the front page logo of SMKN 14 Jakart
4. EDMS already contained 58 documents in it, which consists in the form of text documents, videos, images and other file types.
5. The total size of the document that has been inputted into the system was 93.5 Megabytes
6. 21 directories or folders in the EDMS have been made in order to categorize the various documents that have been inputted into it.
7. A number of features and software required to develop and improve EDMS functionality has been activated and installed including search features, summary reports, share documents, Uni PDF, and Sygate Personal Firewall.

The main objective of EDMS creation and management is to provide evidence for the implementation of the main tasks and functions of the organization or for the accountability of organizations or individuals. The archive has several characters to support basic and multifunctional tasks that provide evidence:

1. Authenticity, which is the original character of the archive that relates to context, structure, and content. This means that the archive is intended to have the subject matter.
2. Reliability, namely the ability of archives to provide reliable evidence. The archive has reliable content because it completely and accurately describes transactions, activities, and facts.
3. Integrity, which is related to complete and irreversible archives.
4. Usefulness, namely membership of the archive to place, rediscover, present, and interpret activities and transactions of organizational activities.

Rapid evolution in computer technology and also in information systems has given rise to the issue of electronic archive management relating to availability, authenticity, completeness, and value of a use. In an electronic-based work environment, there is a need to change in the field of archives starting from the provision, use, and maintenance.

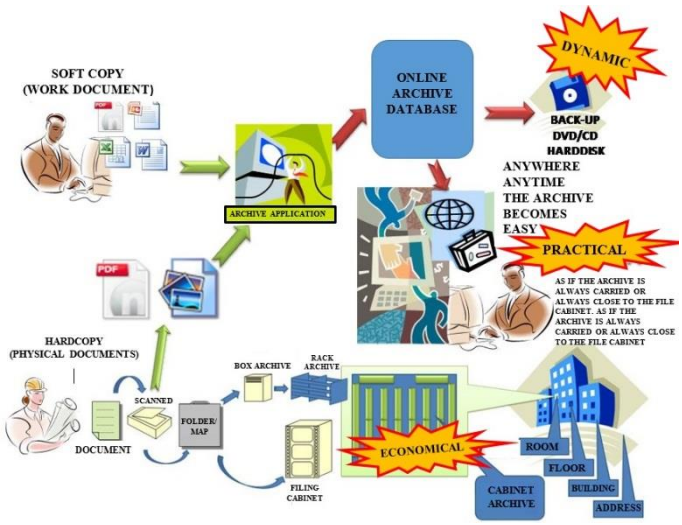

Figure 2. The Flow of Developing an Electronic Document Management System as an Economical, Practical and Dynamic

Benefits of Developing an Electronic Document Management System as an Economical, Practical and Dynamic:

1. Quickly find and allow the use of archives or documents without leaving the work desk.
2. Indexing that is flexible and easily modified based on the procedures that have been developed will save energy, time and cost.
3. Search in full text, by searching for files based on keywords and names and finding them in full-text documents.
4. Minimize the possibility of losing files, this is because we will only see on the monitor screen or print it without being able to change it. We can look for it by sleeping word or file name if it is accidentally moved. Of course, there are procedures for backing up into other media, such as CDs or external hard disks.
5. Save storage space.
6. Archive digitally, so the risk of damage to paper documents or opaque because age can be minimized because it is stored digitally. Also at risk of moving documents to folders that are not supposed to know or even disappear will be safe because they are stored digitally.
7. Share archives easily, because sharing documents with colleagues and clients will be easy to do via the internet.
8. Improving security, because mechanized control is clearly stated in the electronic filing manual, people who do not have an authorization are relatively difficult to access.
9. Easy to do data recovery, by backing up data into compatible storage media. Compared with recovering paper documents that are partially burned or affected by floods or theft, the back-up will be difficult again.

5. Conclusion

The application of electronic document management system can overcome the shortcomings of traditional document management system previously applied at SMKN 14 Jakarta, namely:

1. Storage of digital document management system is fairly inefficient because it is in the hard disk in the computer operating system, so it does not cause a buildup of documents taking up work in school
2. The process of finding the document or the information contained in a document goes much faster with a search feature that belongs to the electronic document management system. This greatly assists in decision-making processes that require fast and accurate information.
3. Storage of documents in digital form can be a back-up or backup physical documents that are vulnerable to loss and damage, so the school has a copy of the original document for all activities undertaken.

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