

Adopting the Object-Oriented Paradigm in Document Management

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Abstract— The introduction of the object-oriented paradigm in programming has marked an upsurge in the development of object-based applications to replace the age-long relational database paradigm. The object-oriented programming (OOP) concept gives a new dimension which has perfectly been employed in complex programs. In this paper, OOP is employed in the design of a document management system suitable for large organizations which hitherto have been using the traditional manual document management system through the file cabinets. It is obvious that a paperless office concept is gradually replacing the manual concept; however, the method of documentation is still very clumsy from organization to organization. This paper attempts to remove the bottleneck involved in such systems.

Index Terms— Administration, Design methodology, Document management, Object-orientation, Paperless Office, Recovery, Storage

1 INTRODUCTION

The storage and retrieval of data offers challenges that even data curators sometimes are at sea to bringing solutions.

Challenges abound with the choice between various storage and retrieval methods/techniques. Using the appropriate storage technique makes programs simpler and data easier to manipulate. Information storage is necessary to enable processing. Traditionally, paper is used to create documents. In today's world, electronic documents are created and distributed via computer network. In paper-based systems man-hours are spent filing, retrieval, searching, and editing documents. In business environments with sole aim of cutting costs and increase productivity, manual document storage and retrieval should be replaced with a document management system (DMS). Document is commonly used to mean an information carrier, in the form of paper, presented as written or drawn information to achieve and satisfy a determined intention [1], [2]. Through the use of information technology, document and documentation are now redefined. In today's business, individual computer files contain a large part of the documents handled and stored in computer systems. These files are treated as units by various systems that use them. Electronic documents are today created with the aid of information technology. These documents are in the form of text, graphics, and multimedia objects (audio or video clips). An electronic document contains information from variety of sources on specific topics to meet the needs of particular individuals, and preserves the information in electronic form and a suitable format. [3].

The current situation is such that a mixture of variety of methods are employed to manage documents in many organizations and institutions. It is rare today to find documents

produced by hand. However, a lot of documents are still transferred by producing hard-copies and are sent by the use of the surface mail. Sophisticated methods exist where the digital production of documents are done and transferred digitally as attachments in electronic mail. The application of digital machine assists to speed up the process of document transfer. In the case of document management, application of digital machines hardly offers a significant improvement over the current situation since finding a document in another person's personal computer may be a nightmare compared to doing so on the shelves if prior knowledge of the location is unknown. The use of DMS is the most sophisticated method that can solve the current quagmire. In a DMS, the server is used to centrally store documents thereby enabling users to interact with the central repository through interfaces implemented using standard web browsers.

A DMS is a computer system used to store and track documents electronically. The documents could be images, as in biologically scanned images, or normal day-to-day office documents generated from sales or through the accounting departments. The system keeps track of the different versions of documents created by different users. Organizations are able to exert greater control over the production, storage and distribution of documents through the use of DMS. This will result in greater efficiencies to reuse information, control documents through a work-flow process and reduce product cycle times. The full range of functions that a DMS may perform includes storage and retrieval, document identification, version control, tracking, work-flow management and presentation [4]. DMS has various components, namely usability, capture, indexing and retrieval, storage, distribution, work-flow, security, and disaster recovery.

2 DOCUMENT MANAGEMENT SYSTEM OVERVIEW

While it is expected that the benefits that computer networks offer should have been harnessed by many organizations, about 85% of corporate information is still inaccessible owing to the fact that the information still resides in paper document

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[5]. Inherent in such paper-based document system (PDMS) are wasted man-hours spent searching, filling, retrieving, and editing documents. So much is said about paperless office, but there still exists a big gap between the dream and its realization. In a business-oriented environment, antiquated paper filling systems need to be replaced with an electronic document management system (EDMS) to cut down cost and increase productivity. EDMS is the central proposal in this paper and will also be interchangeably referred to as DMS in the remaining sections of this paper. The removal of paper-based limitations on information through its conversion into an electronic document makes it a strategic resource. Enormous time is saved and invested into other business through the electronic retrieval of documents. Ignoring the need to transform into paperless office costs millions, through wastage of material and human resources, that could otherwise be used for the development of the institutions' bottom line.

Although EDMS is much publicized, some setbacks could be manifested in its usage. These are non-traceability, possible loss and fragmentation of information, and non-accessibility of the information. These problems will be noticed if the developers and administrators don't put structures in place for backups and recovery. However, there are remarkable advantages in the use of DMS. These are the provision of data security, data reliability, and work process management within an organization. DMS enhances efficient location and delivery of documentation. It also enables the management of data and documents regardless of its origin or format. It has the ability to integrate computerized and paper-based systems with established control of access, modification of stored documents and distribution of same. A fully implemented DMS simplifies work, saves time, enforces quality standards, audit and accountability, and protects investment on the documents. The above listed advantage necessitates the application proposed in this paper.

3 DESIGN METHODOLOGY

Structured system and analysis and design methodology (SSADM) and Object-oriented analysis and design methodology (OOADM) were used. SSADM is a widely used computer application development model. SSADM is formally specified in British Standard BS7738. Under SSADM, application development projects are divided into steps, tasks, and modules. It also provides a framework for describing projects as it's suitable to managing the project. It includes aspects of the lifecycle of a system from the feasibility study to the production of a physical design stage. In detail, SSADM sets out a cascade view of systems development with series of steps, one leading to the next step. Seven stages are identified in SSADM namely: feasibility, investigation of the current environment, business systems options, definition of requirements, technical system options, logical design, and physical design [6]. For each stage in SSADM, a series of techniques and procedures are set out, with conventions for recording and communicating information in textual and diagrammatic form. SSADM is a comprehensive model that uses only those elements of SSADM that are appropriate and necessary to the project.

On the other hand, OOADM is used to implement/translate the various constructs into functional systems. OOADM is the principal industry proven methodology for developing high quality object-oriented systems. OOADM comprises of three major aspects: analysis, design and programming. The analysis component, referred to as object-oriented analysis (OOA), handles the design requirements and the entire architecture of the system. OOA focuses on describing the specification of the system and what it should do in terms of key objects in the problem domain. The design aspect (object-oriented design - OOD) translates system architecture into programming constructs such as interfaces, method descriptions, and classes. The programming aspect (object-oriented programming - OOP) deals with the implementation of the programming constructs.

Object-oriented languages are mainly concerned with object decomposition, that is, splitting of complex software systems into various objects, and then combine the data and the functions that operate on the data into a single unit - the object. Objects are constructed by modelling real world instances. An object-oriented system consists of a number of mutual objects, with basic identical characteristics, each of which may or may not collaborate with other objects in order to achieve some tasks intended by the user. Software objects model real world objects. Real world objects display the characteristics of high cohesion. The objects maintain a single theme or focus. This form of object decomposition provides a natural way of breaking the problem down into simple isolated, manageable parts. In most cases, the development effort shifts from writing a new code to assembling existing objects in new and innovative ways to solve a problem. OOADM is used in the proposed method to cut down on development time and costs, and to produce a flexible, modifiable and maintainable system. Figure 1 shows a pictorial view of an automated document manager.

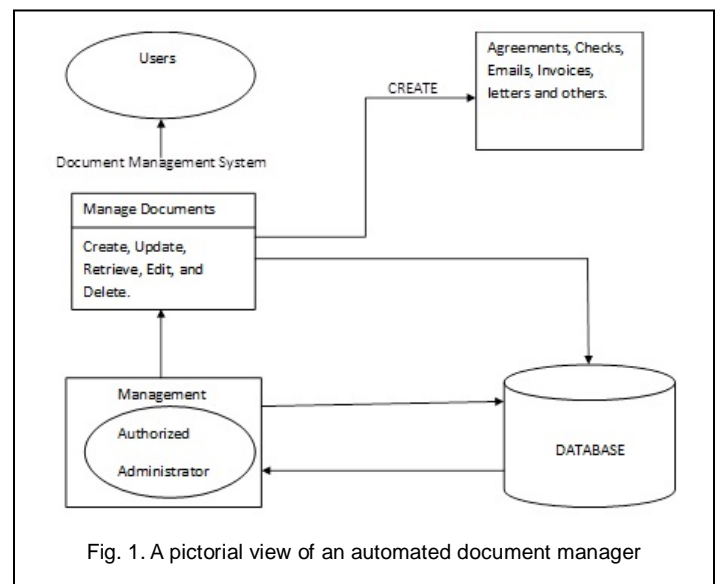


Fig. 1. A pictorial view of an automated document manager

4 THE PROPOSED SYSTEM

The proposed system uses six objects as follows: Agreement Manager [Subject, Author, Date, Place, Signed by, Status, Version], email manager [Subject, From, Copy cc, Date, Has_attachment, Status, Version], invoice manager [Invoice number, Company, Date, Amount, Direction, Paid, Payment Method, Paid on], checks manager [Subject, Check number, Date, Author, Account_number, Direction, Status, Version], letters_manager [Subject To, From, Received_via, Direction, Version, Status], and registration manager objects (see Figure 2).

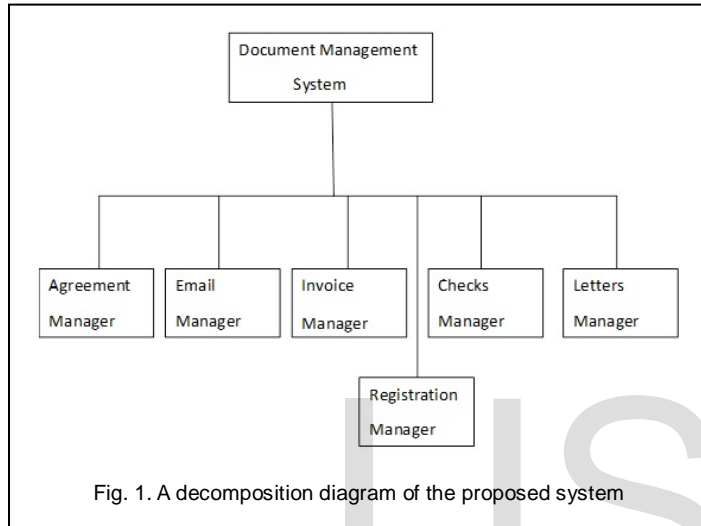


Fig. 1. A decomposition diagram of the proposed system

Access to the system is enabled by the administrator through a login page. To establish coordination, the administrator supervises all the modules represented by the various objects. Users are granted permission depending on the activity they need to carry-out. Access to any module is permitted after an application has been certified by the IT manager and the unit head of the department (HOD) from which the request emanates. A copy of such certification is sent to the administrator who in turn grants permission. All these are done online in minutes. A

and Administrator immediately a request is made. At the creation of documents, the system requests if the document is needed for permanent storage in the DMS server. Answers in affirmation compel the system to automatically save a copy on the server after authorization by the administrator. Documents must pass a simple test to proceed for the administrator's authorization. The proposed system is fully automated.

5 CONCLUSION

A Document Management System is proposed in this paper to provide proper organization, efficient storage and easy access to documents. This should help the user in removing the bottleneck of keeping paper documents, slow distribution of documents, misplacement of documents and the inconvenience of retrieving files from remote locations. The proposed system is designed employing the object-oriented paradigm with the capability to store information, and provide retrieval and security of the documents. The proposed Document Management System was developed with a generic nature. Further work will involve a Multimedia Document Management System (MDMS). This will be a system that has a combination of moving pictures, sound and some other information along with text messages.

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