TOWARDS PAPERLESS OFFICE

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Abstract: During everyday working activities workers retrieve information, act on it and archive it. This process, with manual searching, faxing, photocopying and hand distribution, is costly and time consuming. The inefficiencies of the process divert staff from the important part of their jobs–making productive use of the information. Information technology could be used to reengineer traditional processes in order to achieve cost savings, improve customer service, and bring about needed flexibility to all aspects of business operations in today's highly competitive global market place.

In this paper we introduce new web based application designed to achieve maximum efficiency in management of company business processes. We have combined information and communication capabilities of the Internet and local Intranet to achieve better process automation and to improve the capabilities of the workflow. With this application we have automated the process of planning, tracking and performance of various tasks in the organization. As a result, we get productivity improvement in users' information – related activity.

Keywords: paperless office, workflow management, document management, eWorkflow

1. Introduction

The changes in society where we live, affected the way organisations operate in commerce, public administration, education, and in science and engineering. In today’s competitive business environment, companies are forced to expand their services on foreign markets where they are faced with bigger competition. These companies must have the ability to recognize, understand and use very fast everyday opportunities in order to streamline operations, reduce costs, and improve customer service. “Do more work in less time for less money” seems to be the way companies are trying to work today.

During everyday working activities workers retrieve information, act on it and archive it every day. This process, with the manual searching, faxing, copying and hand distribution, is costly and time consuming. The inefficiencies of the process divert staff from the important part of their jobs–making productive use of the information. Researches in industry show that:

- an average worker spends 40% of its working time looking for some kind of information;
- documents in the companies are copied or reproduced in different forms 11 times;
- the expenses for one document on paper as long as it is needed are $20;
- when average worker leave the company 70% of its knowledge goes with him;
- only 10%-20% of the critical company information is structured in databases.

On an annual basis a typical company of 1000 people prints more than 9 million pages, copies 4 million pages, sends and receives 1 million faxes, and spends 81700 hours each year moving paper documents [2].

In order to survive in today's highly competitive global market place, companies must formalize, control and scale its business processes, as key factors for its productivity, its strength versus competition, and its ability to gain loyal customers. A major goal of information technology is the effective support of a company’s business processes [3], and can be used to reengineer traditional processes, and achieve cost savings, improve customer service, and bring needed flexibility to all aspects of business operations. That is why many companies in both public and private sectors - are gradually moving toward "paperless" methods of conducting business.
2. The concepts of paperless office

Since ancient times, paper has been the most common method of documenting information. Paper has a familiar touch and feel, and is a natural element of the modern bureaucratic landscape. People got used to this method of transmitting information so much, that they are oblivious to the burden that it causes, physically, economically, and environmentally, and it is the first thing that comes to their minds when they think about communication. Changing their conception by introducing new way of communication requires lots of efforts and time.

With the growth of information and communication technology, lots of companies tried to find better and faster way to transfer the information, in order to increase its revenue, reduce its staff and storage costs, access its documents in a timely manner, reduce errors, and improve goods or services. Some of the most common problems with paper which motivated them to search for alternative ways of communication are [4] [5]: paper is expensive, its inconvenient for use (paper must be used locally, can’t be remotely accessed; paper occupies physical space, it must be stored; paper requires physical delivery; one person to one paper document etc), its not eco-friendly, and its uncool (paper is seen as old-fashioned).

In late seventies, the phase “paperless office” was mentioned for the first time. There are various definitions about that phase, but basically it was describing the idea that soon paper will be thing of the past, and that all business will be conducted electronically. An interesting example of a world without paper is described in Roddenberry's Star Trek movie.

Besides the fact that the companies for more that 30 years are trying to create paperless environment, still they have not achieved their goal completely. The reasons for that are analysed in [5]. As “three kinds of reasons that people stick with paper” are mentioned:

- Reorganization of the work practice. “Real paperless environment must begin at the cultural level” [6];
- Digital alternatives to paper must be better designed. Studies have shown that people retain 30% more information if it is shown to them on paper than if they see it on a computer screen [7];
- In some occasions paper just works better that any digital device that can be designed.

Most of the researchers agree that “going paperless” does not mean introducing 100% paperless environment, but creating “less paper environment” [8]. In [9] it is mentioned that “the goal of a paperless office should be to use paper more efficiently, not eliminate it altogether”. For our purposes, we can say that an office is having a paperless environment if its work processes are essentially electronic, with minimal use of paper documents and reduced need for human handling of routine tasks.

When implementing paperless solution, work processes and electronic systems should operate seamlessly by integrating databases, hardware, and software. Usually two systems are essential in this implementation: workflow management system (which focuses on support and automation of office processes), and document management systems (which focuses on support for office data).

3. Automation of business processes

Each company has its own structure, in which some functional responsibility has been assigned to certain persons. These responsibilities are usually connected to some tasks which are described explicitly in a person’s job description. The implementation of a task exists from exercising a number of activities. An activity can be defined as follows [10]: "an activity is a collection of events which come about under responsibility of an actor." This chain of mutually related functions with their inherent activities makes together a process.

According to The Workflow Management Coalition (WfMC), an international body based in Belgium, the term business process is defined as: “A set of one or more linked procedures or activities which collectively realize a business objective or policy goal, normally within the context of an organizational structure defining functional roles and relationships.” This definition of business process is published in their standard glossary of workflow terminology [11].
One example of a business process is opening bank account. This process can be split into activities such as: filling the form by the applicant, reviewing the form for completeness by the bank employee, creating a new contract, sending the contract to the client for signing, opening the account, and issuing some form of identification for that account. An activity is a single logical step in the process.

Over the years, various definitions have been proposed for concepts relating to workflows. For example, Giga Group has given the following definition: “we call the operational aspects of a business process — the sequence of tasks and who performs them, the information flow to support the tasks, and the tracking and reporting mechanisms that measure and control them — the workflow”. The Workflow Management Coalition (WFMC), having the definition of business process, has defined workflow as “The automation of a business process, in whole or part, during which documents, information or tasks are passed from one participant to another for action, according to a set of procedural rules.” [11].

A system that defines, creates and manages the execution of workflows through the use of software, running on one or more workflow engines, which is able to interpret the process definition, interact with workflow participants and, where required, invoke appropriate IT tools and applications is called workflow management system.

Workflow technology is currently in use in various domains: healthcare, education, telecommunications, manufacturing, finance and banking and office automation. WfMSs are being used today to reengineer, streamline, automate and track organizational processes involving human and automated information systems [12].

4. Motivation

The continuing process of reorganization of business processes can lead to complex structures of business information, which will be very hard to search, and company structure which will be very hard to understand. The motivation for development of a system for workflow and document management was based on everyday problems with which employees in USAID executive office in Macedonia were facing with. The ideas which came from this motivation can be represented in these categories: request submission and information tracking, employee notification and management of common documents.

4.1 Request submission and information tracking

The main reason for implementing a system like this was the request submission procedure. Usually this procedure was taking long time to finish because of subjective purposes, information was lost, and the requester could not find the status of its request. Trying to overcome these problems we have designed an engine which will keep track of every step in the process, including the routing of the appropriate information to the appropriate person at appropriate time. Using this engine the requester can see the status of its request, and see the next responsible person for that request. Unifying the submission of the requests, the process must be executed just as it is supposed to, not allowing any other ways of its execution.

4.2 Employee notification

Getting the right information at right time is the main function which this system should provide to the employees in the company. This way the users will not forget their responsibilities, because the system will notify them, reminding them about the things they will need to do. The system should be also able to inform the supervisors about any deviation which is happening in the business process, about any not finished task, and in ideal case propose solution for exceptions which can happen during the execution.

4.3 Management of common documents

During their everyday working activities, employees are working with lots of information which is usually kept in documents. Searching this documentation takes time. In order make the information retrieval faster, we have proposed a system which will organize the information for the employees and will present them in a proper and easy understandable unified way. That system was supposed to be used by non technical persons which knowledge to the computers is limited to text processing capabilities and the use of Internet. The system was supposed to notify the employees for their responsibilities and provide very transparent way for the status of the documents and information connected to it.
5. Practical implementation

Before designing the solution we were supposed to decide whether we are going to use web based solution, or implement desktop based solution. Analysing the both concepts we concluded that web based solutions have lots of advantages over desktop based one, especially in application for workflow management. The main advantage is installation on only one computer in the company network, which saves lots of time, but at the same time, makes the application easy for upgrading and maintenance. According to the concepts of web based applications, in order to get access to the resources the application offer, the user should only have web browser installed on the client side.

5.1 System architecture

The system was realized using three-tier architecture in which application logic is separated from data. This type of architecture offer easy upgrade in the future. The system architecture is shown on Figure 1.

![Three-tier architecture of the system for workflow management](image)

User interface layer is connected with the application logic layer and is used by the users which submit requests. Any device on which web browser is installed can be used as a client, including wireless devices.

The application logic layer consists of web server, on which files coded in ASP (Active Server Pages) scripting language are stored. The operating system is Windows 2000 server, with Internet Information Server installed. Other Microsoft operating systems can be used also. The function of this layer is to accept the requests from the user interface layer generate answer to those requests and send them to the users. This layer can communicate with data layer in order to produce the answer.

Data layer consists of SQL Server 2000 database. This database is in communication with the web server on which dynamic web pages are executed, and where answers to user requests are generated. The communication between web server and the database is using SQL statements.

The main functions every workflow management system should offer are: procedure representation and interpretation, dispatching work to the right participant at the right time, assistance with user activity execution, monitoring and alerting, and statistics.

5.2 Procedure representation and interpretation

Adequate translation of the business process from the real world into a formal, computer processable definition is one of the main functions every workflow management system should provide. This is usually done by the use of one or more analysis, modelling and system definition techniques. The resulting definition is sometimes called a process model, a process template, process metadata, or a process definition.

A process definition normally comprises a number of discrete activity steps, with associated computer and/or human operations and rules governing the progression of the process through the various activity steps. The process definition may be expressed in textual or graphical form or in a formal language notation. Some workflow systems may allow dynamic alterations to process definitions from the runtime operational environment, as indicated by the feedback arrow in the above diagram.
According to the WfMC, this is considered to be a major distinguishing area between products in the marketplace. Implementation of this functionality in the system we have designed, took a lot of time, during which we were supposed to analyze all business processes in the organisation and find some unified way for their representation. From the analyses we have done, we identified 5 activities which are common for most of the processes this company have. These activities are shown on the Figure 2.

Every business process which exists in the organization can be composed of these 5 activities, but there are processes which only have few of the presented activities. According to that, we have implemented a dynamic configurable system in which every process can be configured separately. According to that configuration, that process can consist of one, two or more activities.

5.3 Dispatching work to the right participant at the right time

Workflow management systems are responsible for creating and controlling operational instances of the process, scheduling the various activities steps within the process and invoking the appropriate human and IT application resources, etc. Involving the appropriate human and IT resources at right time makes the processes faster and easier for people to follow. Every person has access to his responsibilities and is informed on time that some kind of action is required.

The systems we have implemented have a standardised framework for supporting interaction between the system and its users, through which the users have detailed information about the activities that are waiting for their action.

5.4 Assistance with user activity execution

Tightly connected with the previous functionality, the system we have developed provide very easy accessible list of activities which are waiting for user action. Every logged user can easy access that list and prioritize the actions that need to be taken. For every task in the list there are some information’s which are helping the user deciding which of the actions needs to be taken before the others.

5.5 Monitoring and alerting

Workflow engines are able to define deadlines for each process and monitor them. They are able to deal with missed deadlines by a variety of actions such as alerting a supervisor, changing priorities, or even changing the path to be followed inside the procedure.

![Figure 2. Common activities for every company business process](image)

![Figure 3. Monitoring specific values and alerting the appropriate person](image)

We have implemented two ways for alerting the responsible persons: web based alerting and alerts which are send via email. Using the email module which is part of the system, for every action which needs to be taken, the appropriate person is alerted. Also the system monitors specific values in the system, and informs the appropriate persons if any activity is needed.
5.6 Statistics

Having automated business processes managed by computers gives lots of opportunities for generation of various statistics which can be very useful in process analyses or analyses of person’s activity. The system we have created has few types of statistics which are mostly related to the quality of the service the executive office gives. The supervisors can see what are the past and current activities of specific users, that way evaluating its productivity, and also analyse the quality that person provide in its work.

All statistics are complementary with other software for statistical analyze, and can be easily transferred to the required formats.

6. Results

Using the possibilities of information technology we have tried to design and implement a system for workflow and document management in order to improve company services and decrease its costs. The system described, was implemented in USAID Macedonia office at the end of 2001 and it is still in use. In the meantime it was implemented in 20 other USAID offices around the world. The user interface is very easy to use and it is section 508 compliant, which means that can be used by handicap users in combination with specific software. Training was not required, because the system is web based and most of the users were already familiar with browsers and basic Internet usage. Training was only needed for the administrator of the system, which was supposed to configure the system, and appropriately represent the real processes using the tool for process definition. Also the administrator is supposed to set the employee structure in the organization and assign specific privileges to specific users.

Using this system we have successfully improved everyday company work from various perspectives:

- By defining the employee’s roles in every process on the system, their access is controlled and they are only capable to see only that information which is assigned to them. They will be not able to see other employee information with which the security in the organization will be increased.
- Eliminating the manual actions between the activities, the workflow system is reducing the time between the start of a business process and its successful completion.
- Workflow applications provide detailed progress reports, including activities in progress, their status and the person responsible, a view of the remaining activities to be carried out, all in a matter of seconds. Employees and clients can get exact information on the status of a business process and a list of activities waiting to be completed.

This application maintains a diary of all the events it controls, including date and time, the tasks concerned and the name of the participant. Information from the diary provides reports on costs and progress of each activity, and performance of the procedures themselves.

7. References

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