

WEB BASED WORKFLOW AND DOCUMENT MANAGEMENT SYSTEM

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Abstract: Electronic workflow is automation of a business process during which documents, informations or tasks are passed from one participant to another for action, according to a set of rules [1]. Successful workflow solution is also able to handle exceptions to those roles. In this paper we introduce new web based application designed to achieve maximum efficiency in management of these business processes. We have combined information communication capabilities of the Internet and local Intranet to achieve better process automation and to improve the capabilities of the workflow, with which we easily reached every desktop in the organization. With this application we have automated the process of planning, tracking and performance of various tasks in the organization, at the same time providing automated notifications on pre-defined tasks and significant events which are pending for user action. As a result we get productivity improvement in users' information – related activity.

Keywords: workflow management, document management, e-Workflow

1. Introduction

In the past two decades lots of changes happened in the society in which we live. Those changes also affected the way how organizations operate in commerce, public administration, education, and in science and engineering. Many of these new developments are fuelled by: market globalization, enhanced meaning of knowledge, and information and communication revolution. Today's companies are not only competing with their local concurrents, but they are forced to expand their services on foreign markets where they are facing with bigger competition. These companies must have the ability to recognize,

understand and use very fast everyday opportunities in order to survive in this very competitive marketplace.

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 shows that only 10%-20% of the critical company information is structured in databases. The rest is on paper. Keeping lots of information on paper, is requiring big storage place, and makes the information retrieval almost impossible.

In order to survive in today's highly competitive global market place, companies must formalize, control and scale its business processes, as many 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 [2], 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.

2. Workflow Management Systems

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 [3]: "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 [1].

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. For example, making a payment or not making a payment is activ-

ity. Sometimes it is not required to automate all activities from which every process is composed of. For example if it is required for a client to sign the contract personally, that will be one manual activity, which must be taken during the business process.

Over the years, various definitions have been proposed for concepts relating to workflows. For example, Giga Group [4] 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.”

A workflow schema is the actual topology of a workflow, that is, the sequence of tasks, which must be performed in order to complete a job. Such schemata can specify the workers, which must process a job using well-known identifiers, or using roles, attributes indicating the parts played by workers in the workflow. The use of roles allows a workflow specification to be more general.

A workflow schema does not need to be a linear sequence. It can have decision points at which a job takes one of a number of possible paths. More interestingly, it can have points at which a job can split into multiple concurrent sub-jobs, and other points at which multiple sub-jobs can join to reconstitute a job.

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 management of processes requires a process definition tool, a process execution engine, user and application interfaces to access and action work requests, monitoring and management tools, and reporting capabilities.

Process modelling tools allow business users to coordinate business activities, people and applications, and to model routing of work requests within a process and across processes. The model can depict various aspects of a process, including automated and manual process activities, decision points and busi-

ness rules, parallel and sequential work routes, and how to manage exceptions to the normal business process.

A major advantage of electronic management of business processes is the degree of monitoring available in the process. At the micro level, it provides the ability to track and monitor individual work requests and at the macro level, review resource productivity and work volume analysis. The ability to quickly search for and identify a work request within the process allows a business user to quickly respond to customer enquiries, and to possibly extend this functionality to customers for online status query. Workflow management and reporting tools utilise the audit history tracked by workflow engines to provide feedback on performance issues. Analysis of this information can indicate bottlenecks in the process. Bottlenecks, or performance issues, can be due to any number of reasons such as an ineffective design, a technical architecture issue, perhaps a lack of resources or staff education issues. Analysis of the problem can then be used to implement changes to the workflow process itself or external initiatives, such as training programs or allocation of additional staff to action certain activities.

Application domains where workflow technology is currently in use include healthcare, education, telecommunications, manufacturing, finance, banking, and office automation. WfMSs are being used today to reengineer, streamline, automate and track organizational processes involving human and automated information systems [5] [6] [7]. The success of WfMSs has been driven by the need for businesses to stay technologically ahead of the ever-increasing competition in typically global markets.

3. 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. 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. Functionalities

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 at any time can see the status of its request, and see which the next responsible person for that request is. Also unifying the submission of the requests, the process must be executed just as it is supposed to be, 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 finish. 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 Document management

During their everyday working activities, employees are working with lots of information, which is usually kept in documents. Searching this documentation takes time and is taking away the employees from doing their actual responsibilities. In order make the information retrieval faster, we have proposed a system, which will organise 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 many ad-

vantages 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 site. Usually all existing operating systems include web browser in their installation, so there was no need to work on any client machine in the company, and the whole work was done on one computer, called web server.

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.

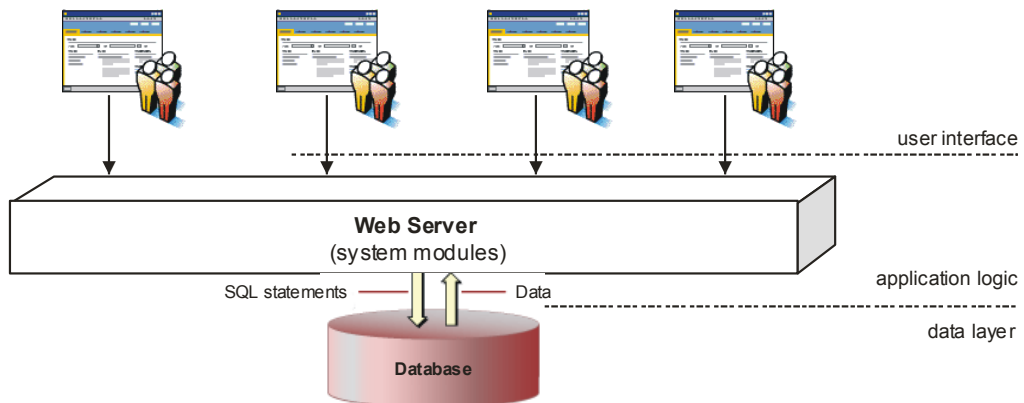


Figure 1: Three-tier architecture of the system for workflow management

User interface layer is connected with the application logic layer and is used by the users which submit requests. Any computer on which web browser is installed can be used as a client, and it is not depended on the company which produced the browser. Also any wireless device can be used which has integrated web browser in it.

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 the 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

The main function every workflow management system should provide is adequate translation of the business process from the real world into a formal, computer processable definition. 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 Workflow Management Coalition, 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 analyze we done, we identified 5 activities which are common for most of the processes this company have. These activities are shown on the Figure 2.

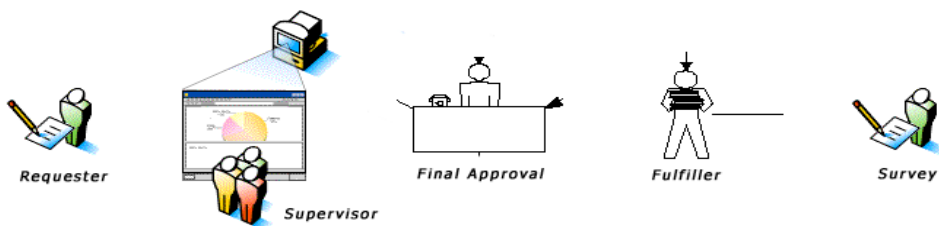


Figure 2: Common activities for every company business process

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 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 is some information 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.

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. In addition, 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 pro-

cess analyse or analyse of persons activity. The systems we have created have 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 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 format.

GOV Tracking System							
Year ▾	Make ▾	Model ▾	Plate #				
➔ 1998	Opel	Vectra	SK-202-GG	MR	FUEL		EDIT
➔ 2000	Peugeot	206	SK-323-IJ	MR	FUEL		EDIT
	Renault	Megane	SK-863-LJ	MR	FUEL		EDIT
➔ 2001	Citroen	Berlingo	SK-625-A5	MR	FUEL		EDIT

[VIEW ARCHIVE >>](#)
[E-MAIL ALERTS >>](#)
[REPLACEMENT GUIDELINES >>](#)
[ADD NEW GOV >>](#)

Figure 3: Monitoring specific values and alerting the appopriate person

6. Results

Described system 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. Because of its web based orientation there was no need for user training, because most of the users were familiar with browsers and basic Internet usage. The only training was needed for the administrator of the system, which is supposed to configure the system at the beginning, and appropriately represent the real processes using the tool for process definition. Also the administrator must set the employee structure in the organiza-tion and assign specific privileges to specific users.

Using this system we have successfully improved everyday's 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. Clients as well as members of the organization can be given exact information on the status of a business process

With Workflow the user sees a list of activities to be completed. Once he or she chooses an activity, all the documents and forms attached to that activity appear at the workstation automatically. When it is completed, the information created during its execution is automatically filed in its proper place

A Workflow 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

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