DEVELOPMENT OF A WORKFLOW APPLICATION FOR VEHICLE FLEET MANAGEMENT: A CASE STUDY OF GUINNESS NIGERIA PLC

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ABSTRACT

Transfer of documents and information in various establishments are usually characterized with various problems such as loss of documents, delay of documents delivery and some bureaucratic problems that are non-productive to the establishment. Overcoming these problems calls for an automated software known as workflow application software that promises reliability, timeliness and precision in the treatment of documents in any establishment. In this work, a workflow engine for acquisition and management of vehicle fleet of Guinness Nigeria PLC was design to overcome the bottleneck associated with this process. The workflow engine is C# based with ASP.NET. C# is the host application which is time efficient and web enabling. The workflow engine design is capable of handling car requisition and allocation to various cadres of employee in the establishment through document transfer. The advantage of this work is in its reliability, efficiency and flexibility of document management. We also propose this work as open source workflow application with customization to any organization needing it.

Keywords: ASP.NET, C#, Open Source Software, Vehicle Fleet Management, Workflow

1. INTRODUCTION

Today, virtually all organizations regardless of size possess a legacy of paper documents, accumulate a rapidly growing store of electronic documents, and anticipate a future that is mostly but not entirely electronic. The documents that organizations produce from spreadsheets, databases and so on contain structured information much of which is numerical. But organizations also produce a vast range of important documents such as letters, reports, emails, marketing materials, studies, engineering drawings, handwritten consultation notes, and committee minutes all of which contain unstructured information. Structured and unstructured information comprise information assets critically important for any organization [1,2,7,8]. Modern computer applications have enabled organizations of all sizes increasingly adept at handling structured information. Even the largest organizations continue to be challenged by the need to manage their voluminous unstructured information. Unstructured information and the documents that contain it constitute an organization’s memory of its process and procedures, and its knowledge base of its expertise, experience and specializations. Hence there arise the needs for workflow management software that will automate the process of the company [1,2,3,5].

Our purpose in this work is to automate transfer of documents from one office to another which will ensure quick and safe delivery of documents, reduce the physical document transfer and dependence on paper and prevent loss of documents in transit. The package developed is proposed as open source workflow software for any organization with some customization.

2. REVIEW OF WORKFLOW

There are different ways of defining workflow depending on the perspective one looks at it. Various authors have presented different definitions of workflow. Workflow is defined as a series of tasks within an organization to produce a final outcome [2]. It is also regarded as part of a business process in the real world which is automated by Computers [3]. A workflow is considered interplay of policy, process and practice. This process adheres to certain policies and employs certain practices. The level of applicability of the policies and practices essentially determines the scope of the workflow. That is, a workflow may satisfy a given purpose for an office, several offices within an organization, the entire organization, or several collaborating organization [8].

From the foregoing, Workflow can be defined as “any task performed in series or in parallel by two or more members of a workgroup to reach a common goal.” The following words need emphasis:
Any Task: Which implies that workflow refers to a very wide range of business related activities.
Series or in Parallel: Which implies that steps in the task may be performed one after the other, or simultaneously by different individuals, or a combination of the two.
Two or More Members: Which implies that if only one person performs a task it is not workflow. As the workflow name suggests, a task is workflow if it "flows" from one individual to another.
Common Goal: Individuals participating in workflow must be working towards a common goal. If they are working on independent projects, that does not constitute workflow.

A. Examples of Workflow
Given the definition of workflow there is a very large number of business activities in an organization which fall in the workflow category. These include: Purchase Orders, Employee Performance Reviews, Weekly Time Sheets, and Loan Approvals[8].

B. Benefits of Automated Workflow
Automated workflow is important in an organization for the following reasons: It ensures maximum throughput and accuracy when distributing work or tasks. It improves the control of a process with less manual intervention. It helps to eliminate misplacement of work. It reduces delays. It ensures that tasks are performed according to company’s policies and procedures [4,8].

C. Structuring a Workflow Process
A workflow process is created as follows:
1. Define an activity, or task, which a workgroup needs to perform and the business rules governing the activity.
2. Break the task down into "sub-tasks," also called "steps." Each step represents a well-defined list of things which are to be performed by one individual and which are logically done together. A task may be broken into steps in many different ways. This is where business judgment is required to decide where to split a task into its component steps.
3. Decide the skill sets required to perform each step. This will specify the job function(s) or individual(s) who may be called upon to perform the step.
4. Identify all external applications used to complete the task and determine if there are manual steps that can be automated as part of the workflow.
5. Decide the sequence in which the steps have to be performed.
6. If some of the steps are performed on a conditional basis, identify these steps and define the conditions.
7. Lay out a "map" of the workflow which identifies the steps and the sequence, or "flow" in which the steps are to be performed. Associate job functions or individuals with each step.
8. Create the forms, documents and instructions which will be used by the individuals at each step to perform the sub-task. As you will notice, workflow involves a sequence of steps or a "process." The task "flows" from one step to another based upon pre-defined rules and conditions. That is why the term business workflow is often interchanged with the term "business process," or simply a "process" [7,8].

D. Workflow Management System
A workflow management system (WFMS) is, in the largest sense, the co-ordination of work processes through software. A workflow management routes pending activities to process participants according to a model of the process. Workflow management systems have been around since the late 1970 but every now and then they are rediscovered in a marketing way such as office automation, business process re-engineering or web services choreography[1,2,3].
The benefits of using a workflow Management system include the following:

• Improved efficiency: by automating the business process many unnecessary steps can be eliminated.
• Better process Control: through the process modeling and standardization of the business processes better management of the processes is achieved.
• Flexibility: because the processes are controlled by software, they can be adapted proactively with the changing business needs.
• Business process improvement: with the use of the process models much information about the process’s performance can be found and the process can be improved.

E. Why are workflow standards so important
Organizations making an investment in workflow software want to be sure that their investment is going to be protected. With standards users can have confidence that essential criteria will be met, hence reducing
the risk involved. This clearly becomes of paramount importance when workflow systems are required to interoperate with those of other organizations whenever business processes are conducted across organizational boundaries[4,7,8].

F. Workflow Standards Framework  
The Workflow Management Coalition has developed a framework for the establishment of workflow standards. This framework includes five categories of interoperability and communication standards that will allow multiple workflow products to coexist and interoperate within a user's environment. More technical details are available in the WiMC document Workflow Reference Model[7].

Fig. 1: Workflow Reference Model Diagram[7]

3. SET OF RULES AND PROCEDURE FOR VEHICLE ACQUISITION AT GUINNESS NIGERIA PLC

The business rules and process were well understood so as to separate the process that can be automated and the ones that cannot be. That is, there are some processes that are better off manually executed rather than automated. The fleet manager was interviewed and adequate information was collected in order to build the workflow processes. Below is a list of basic rules and procedures in the acquisition of Vehicle:

1) Director of human resources advises head human resources and fleet manager employee.
2) Fleet manager then check the car pool for availability of car.
3) If car is available, fleet manager notify the head human resources and he then allocate the car to the user and if not available Fleet manager notify the purchase manager.
4) The purchase manager obtains for vehicle type and starts the Asset purchase process which is manually executed.

5) On completion of the asset purchase process, the stores controller accepts the delivery of vehicle and notifies the fleet manager and representative inventory accounts.
6) If fleet manager and representative inventory accounts approves the car, the fleet manager raises requisition and sends a letter of allocation for approval by the head of human resources.
7) If letter of allocation is approved by head of human resources, he allocates the vehicle to the new employee.
8) The user then notifies the director of human resources of the acquisition of a new vehicle.
Flow Chart Diagram of Business Rules

4. CHOICE OF DEPLOYMENT TOOL

In the design and of this workflow software, the following tools were considered among the various available workflow development tools: ASP.NET with C#, Microsoft Office Visio 2003, Windows Workflow Foundation (windows based workflow engine).

A. ASP.NET with C#

ASP.NET Web pages allow you to create dynamic content for your Web site. With a static HTML page (.htm or .html file), the server fulfills a Web request by reading the file and sending it as-is to the browser. In contrast, when someone requests an ASP.NET Web page (.aspx file), the page runs as a program on the Web server. While the page is running, it can perform any task that your Web site requires, including calculating values, reading or writing database information, or calling other programs. As its output, the page dynamically produces markup (elements in HTML or another markup language) and sends this dynamic output to the browser.

B. Using Workflows with ASP.NET

Windows Workflow Foundation was created to run in varying host application environments. ASP.NET Web Form is one such supported environment. However, when you are creating a Web-based hosting application for Windows Workflow Foundation, you must design your hosting infrastructure to account for key architectural differences between an ASP.NET application and a traditional Windows Form application. For example, ASP.NET applications may serve several synchronous users at one time. In a
server environment such as this, your application must be designed in a way that uses the available system memory efficiently. Windows Workflow Foundation provides the Sql Workflow Persistence Service to unload workflow instances in these cases. Additionally, ASP.NET sends a response when it receives a request. By default, workflows are executed by the workflow runtime in an asynchronous manner. Because of this, a page may render and a response may be sent before a workflow has completed. To circumvent this, Windows Workflow Foundation provides the Manual Workflow Scheduler Service in order to run workflows synchronously. This enables your Web Form to return workflow state information back to the user.

C. Microsoft Office Visio 2003

Visio 2003 is the simple & flexible tool that documents and organizes complex ideas, processes, and systems -- and illustrates them for others! Import into. NET connected software to address specific business needs.

Product Features

- It's never been easier to assemble diagrams -- just drag the pre-defined Microsoft Smart Shapes symbols into the desired location.
- Generate common diagram types from all sorts of existing data, to put complex concepts, processes, and relationships into their proper context.
- Create visually rich diagrams that give your ideas maximum impact -- then share them in workspace files on your team's SharePoint site.
- Integrate with other business systems by extracting data from Visio diagrams and importing it to Excel, Word, Access, SQL Server, XML and other formats

D. Windows Workflow Foundation (windows based workflow engine)

Windows workflow foundation is the programming model, engine and tools for quickly building workflow-enable applications on windows. It consists of a Microsoft WINFX namespace (system workflow), and in-process workflow engine, and designers for Microsoft Visual studio 2005. Windows workflow foundation is available (currently as Beta) for both client and server versions of windows. Windows workflow foundation supports a wide range Scenarios including workflow within line-of-business applications, user interface page flow, document-centric workflow, human workflow, composite workflow for service-oriented applications, business rule-driven workflow and workflow for systems management.

E. System Requirements

- Supported operating systems: Longhorn (Windows code Name); windows server 2003 service Pack 1; windows XP Home Edition; windows XP Media center edition; windows service pack 2.

- Required Visual studio Versions: The released version of visual studio 2005 is not required for installation of the runtime components but it is required to utilize the windows workflow foundation Visual Studio.NET designer elements.

5. RESULTS

A. Starting the Application

Each user login into the application with their privileges i.e. password. The fleet manager log in using his username and password and vice versa.
On start up of workflow process each user login into his/her page as provided.

B. New Employee Page
On employment of new employee, the update new employee button is clicked and a window page pops up that look like the following one:

On click of submit button automatically updates the employee record in the database. The Workflow engine then automatically routes a mail to the fleet manager notifying him of a new employment.
A. Assigning Vehicle

On availability of vehicle, the fleet manager clicks on the notify HR manager button and via the workflow engine a mail is sent to the human resources manager. The user gets notified by clicking the assign button on the human resources page. The assign looks thus:

![Assigning vehicle to User](image)

Fig. 7: Assigning vehicle to User

On click of the assign button an internal memo is routed to the user. Below is the internal memo page.

![Vehicle Allocation Form Page](image)

Fig. 8: Vehicle Allocation Form Page

In case of non-availability of vehicle an asset purchase process is initiated this is external to the workflow process. On completion of this process, the fleet manager notifies the human resources manager and vice versa.

D. Workflow Engine Design
6. CONCLUSION

This work automated vehicle acquisition which allows easy transfer of document from human resources manager to fleet manager, eliminate the work of messenger who carries the letter of allocation form to the user and prevent loss of document in transit. We propose our work as an open source application to be customized for the organization to use it. Much of the further work will be concentrated on customization of the application and making the application available on the internet as open source application.

REFERENCES


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