Roles of Flexibility in Workflow Engineering

Shweta M. Tayade and Vinay Chavan

***Abstract*—No matter what type of area, application, operating system or programs is used workflow technology is used to enhance it to make work user friendly & simple. In order to adequately support the execution of business processes in an increasingly turbulent world with shorter cycle times, workflow management systems must provide higher support for flexibility by easy & simple ways. When applying business process reengineering the significance of workflow technology has been now observed to a great extent. Workflow technology is currently being deployed in quite diverse domains. However, the element of change is present in some degree and form in almost all domains. A workflow implementation that does not support the process of change will not benefit the organization in the long run. Change can be manifested in different forms in workflow processes. In this paper, we first study workflow in its dynamic, adaptive & flexible kinds of processes. Here, we can say that flexibility is the ability of the workflow process to run on the basis of a loosely, or partially coupled model, where the full definition of the model is made at runtime, and may be unique to each instance of execution.**

***Index Terms*—Business process, business, workflow, flexible.**

I. Introduction

A workflow management system is all about atomizing process thinking [1]. Workflow management systems (WFMSs) provide useful mechanisms to support users in their enactment of daily business processes. In today's ever changing turbulent business reality BPS systems must provide a high degree of flexibility [2]. Lock in to yesterday's process definitions must be avoided to exhibit continuous improvement and optimization.

The main implementation area has been recognized by the Microsoft as Sequential, State-machine & Flowchart workflow. All the categories of the workflow in different literature [3] such as production, collaborative, ad-hoc etc can be broadly automated. The degree of usability of workflow technology can be found out by the process characteristics such as performance, functional complexity, predictability and repetitiveness are often considered, especially in the general class of pre-defined workflows.

The necessity for the support of change or flexibility in workflow systems is well recognized. Providing support for changing processes in workflow systems is, and has been for a few years, an active area of research [4]-[7]. In the following sections, a categorization of change characteristics in workflow processes, dividing them into three broad areas as static, dynamic, adaptive and flexible workflows.

This paper primarily deals with the flexible type of workflow and its need in different sectors. In the subsequent sections, we will present a unique, generic and conceptual framework for the handling of flexible workflows. We have taken up approach contemporarily based on the principle of identifying change as an ongoing process, and integrating the process of change into the workflow process itself which is predefined and can be said to be fixed. The framework presented in this paper introduces the concept of a flexible workflow comprising of a core process and one or more types or roles of flexibility within the core or main process.

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F. A. is with the Department of MCA, G. H. Raisoni College of Engineering, Nagpur. India (e-mail: shwetasoni0@gmail.com).

S. B. is with Department of Computer Science, Porwal College, Kamptee. India. (e-mail: drvinaychavan@yahoo.co.in).

II. Different Elements of Change in Workflows System

The terms and definitions are first introduced for more understanding. By a workflow management model we mean a definition of the rules, tasks, ordering, data, resources, and other aspects of the process. Almost all workflow management models are governed by *rules* and are represented as graphs which depict the flow of the process tasks, together with a description of other task properties. A *Rule Engine* stores rules used to process and verify the workflow. A *workflow Instance* is a particular occurrence of the process. An *Instance Type* is a set of instances that follow the same execution path within a given process model.

A. Static

The first element of change is static. The static workflow starts with static documents typically forms and applications such as new accounts applications, forms and customer service requests). Data from static documents usually end up in databases while the documents themselves become part of a file or archive [8]. Static changes refer to those changes made to the workflow while it is not being executed. Modification can be made to various elements of workflow, such as the process, the available resources, as well as the changes that can be made to the resource allocation mechanism.

B. Dynamism

The next element represents dynamism - which is the ability of the workflow process to change when the business process evolves. This evolution may be slight as for process improvements or drastic as for process innovation or process reengineering. In any case, the assumption is that the workflow processes have predefined or fixed models, and business process change, causes these models to be changed or distorted.

The workflow model consists of processes which define a set of tasks or jobs. The workflow instances with active status which are developed in the old model are very difficult to adjust with the new specification. With a slight change in

one process all the other processes in the model may get potentially affected. Eventually, this may affect in disturbance in the flow of model, loss of work, delay in execution timeline so should be planned state fully [9].

Explaining the need of dynamism handling method in workflow some standard examples are stated in the following sections.

The recruitment process of Project manager of any organization can be one of examples. The procedure for application, review and acceptance is usually well defined. This procedure is published well in advanced. But depending upon the client's requirement suddenly one more condition of requiring all the applicants to mention the notice period. The implementations of this change can be done in two ways; first is to leave all the existing application and apply change only to the new applications. So, the old application will continue to be processed according to the old defined process model. The next option which can be exercised can be to fully migrate to the newly defined process. In this case both existing and new applicants will get affected by the change. Thus, all existing applications which are initiated according to old rule now will have to migrate to new process. This will involve add some transition workflow activities as well as some rollback and also some optimizing activities to the model. The setup of the migration strategy is a difficult problem and has been an interesting research topic in this area. [10]-[13]

C. Adaptability

The element of adaptability involved a number of different aspects as adaptability which a can be discussed on a set of breakdowns of technological failures upto changing organizational needs. So, it is difficult to deal with adaptability of workflow in a simple pre-defined way. The workflow adaptations are classifications according to four levels of abstractions: Infrastructure, Resource, process and domain [14].Handling of exceptions, which cannot be anticipated, is more complex. However, many of exceptions can be anticipated [15], [16], and by capturing these exceptions, the adaptability of the workflow is enhanced. In fact, unless these exceptions are captured within the workflow model, their handling will continue to be done outside of the system, in the form of "system workarounds", the on sequences of which may come in conflict with process goals. However the complete set of exceptions for a given process can never be captured, thus dealing with unanticipated (true) exceptions will always is an issue [17], [18].

Adaptability can be explained by taking up the same example of recruitment of Project manager in an Mexican company where Degree in French is required. The applications will need services of special person who may be outside the company taking up the recruitment. Though rare, exceptional conditions like these if handled in the workflow model will improve the adaptability factor to greater extend.

D. Flexibility

The important element flexibility – can be optimally explained as an capability of the workflow to handle a process on the basis of unstructured model, ability of the workflow process to execute on the basis of a loosely, or partially specified model. This model can change at execution time.

Presence of flexibility can be seen in many applications of varied areas:

-Patient admission in Hospital management can serve to be a good example of flexibility. The procedures are structured, pre-defined, predictable and repetitive, but the method of treatments is defined uniquely for each case. To a very good extent this can be managed.

-Academic sector where students with diverse learning needs and styles are working towards a common goal or task or study. The flow taken u by each student needs to be flexible depending upon the background and need of hour. Also, a background process should always exist of fixed type wherein study guidelines and compulsion of course level constraints is taken care of to maintain the quality of learning.

- Microsoft has evolved a very interesting management in area of Customer Relationship Management (CRM), wherein the need to provide a flexible means of management of call center activities according to the available resources and data, by integrating CRM systems with core organizational workflow processes and underlying applications.

The key issue in flexible workflows is the modeling of the unstructured workflow. Thus rather than enforcing control through a rigid, or highly prescriptive model that attempts to capture every step and every option within the process, the model is defined in a more relaxed or "flexible" manner, that allows individual instances to determine their own (unique) processes. How to achieve such an approach to modeling is the main focus of this paper.

III. Conceptual Framework for Flexible Workflows

The market is overloaded with different kinds of workflow products. Many of them though not all, provide process modeling tools that follow some variation of the workflow modeling language introduced by the workflow coalition [19]. In Figure A, we briefly introduce the basic structures of a generic workflow modeling language [20], also based on the coalition standards to a large extent. This language will be used in later sections to illustrate various examples.

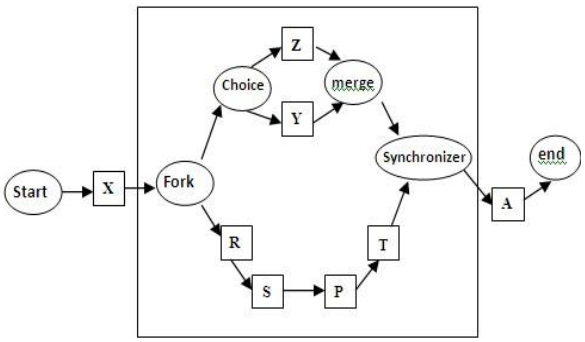

Fig. 1. Conceptual framework of workflow system based on generic workflow language

Using the predefined language as above, this can derived that the measurement of degree of flexibility can depend upon the count of the instance types that can be generated

from the process model and also which follow the rule defined in the rules engine. The relation between the choice constructs and number of instance types can be said to be direct[21]. To justify observe the above figure, a choice-merge construct encapsulates two activities, Y and Z. For any kind of execution of this process, only one of Y or Z will be executed. Thus the process has two instance types which have followed the rules correctly.

Next, when we consider a case where a process generates a many instance types, it then directly demands a high degree of flexibility. Imagine that a large number, say n number of paths are present within a choice-merge construct. Every path potentially represents a complex sub-process which has to pass through the rules too. Many constructs can exist of this type which can include complex nesting and inter transitions too. Thus if a typical workflow language is used then it may not satisfy the above conditions for the process. As limitations exist in flexibility as by definition which on built on only merge-choice construct. So, an alternative approach of modeling should be used, wherein a model following the following factors of flexibility should be used to get the maximum degree of unprecedented flexibility:

- Optimization: *Flexibility can be increased by when samples are loaded continuously which can be prioritized as well and also which can be run in parallel as well;*
- Rules: *The suggested solution is based on separating activities from execution rules. Activities are implemented as a set of loosely coupled services. Services can be replaced when necessary. The execution sequence may be changed without the need to rewrite or reconstruct a given workflow.* [22]
- Granularity: *Encapsulation of activity details within workflow tasks, and keeping sub-activities 'internal' (and flexible), or outside the direct control of the workflow [23] will also gain good level of flexibility. Though this can be applied to a limited extent, but it cannot be used at a standard level, namely to coordinate and control the flow of process activities.*

All the factors mentioned above must be used to build a flexible process managing model and not a prescriptive model as not all the factors can be added up to the model to gain the benefits of flexibility.

Flexibility as we defined it earlier, is the ability of the workflow process to execute on the basis of a partial model, where the full specification is made at actual execution time or runtime. Hence, for modeling framework that offers true unprecedented flexibility, we need to consider the factors, which influence the paths of (unique) instances together with the process definition.

IV. Conclusions

Difficulties in dealing with change in workflow systems have been one of the major factors limiting the deployment of workflow technology. At the same time, it is apparent that change is an inherent characteristic of today's business processes. This paper provides a comprehensive categorization of change characteristics in workflow processes, based on which we present an approach that recognizes the presence of change, and attempts to integrate the process of defining a change into the workflow process itself. Our basic idea is to provide a powerful means of capturing the logic of highly flexible processes without compromising the simplicity and generosity of the workflow specification language. This we accomplish through pockets of flexibility in workflow specifications, which allow workflow processes to be tailored to individual instances at runtime.

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Shweta Tayade was born in Ngapur on 19/04/80. She has completed Master of Computer Applications from R.T.M. Nagpur University Maharashtra in 2004. She has 2 years of IT Industrial Experience as Team Leader. Currently, working as RESEARCH SCHOLAR and ASSISTANT PROFESSOR at G. H. Raisoni College of Engineering, Nagpur for last 3 years. She has published paper in ICETET'11 and 3 other international Conferences.

Asst.Professor Tayade is a member of IEEE. She has awarded "Outstanding Contribution Award 2011" at G.H.Raisoni College of Engineering.