CMMN Implementation in Executable Model of Business Process at Order-Based Manufacturing Enterprise

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Abstract. Agility - capability of an enterprise to function in the highly competitive and dynamic business environment. To survive and successfully develop companies should have flexible, adaptive business processes and management system that enforces the strategy and ensures achievement of target (commercial) goals. Case management is a paradigm for supporting flexible and knowledge intensive business processes. It is strongly based on data as the typical product of these processes. This paper presents implementation of this paradigm at the manufacturing enterprise based upon principles of CMMN emerging standard, declarative approach to business process modeling and the systems theory. The implementation uses first order logic (Prolog) and elements of lambda calculus. It has been in operation for more than 3 years.

1 Introduction

Modern business environment is highly competitive and dynamic. To survive and successfully develop companies should be not only agility – focused and have flexible, adaptive business processes but also the business management system that enforces implementation of the business strategy and ensures achievement of target (commercial) goals. The operation of business management system includes the online monitoring current state of the business, comparing it to the planned one, analyzing causes of deviation and generating the corrective responses by updating the plan, launching, pausing/stopping the relevant business processes. Therefore for businessmen to have the tool ensuring the achievement of business goals by managing business processes these processes should be closely linked to the state of the business and its management system.

This paper presents the experience obtained in development and operation of flexible and adaptive business process management system at ZAO “Mosflowline” (www.mosflowline.ru) - the manufacturing enterprise with order-based engineering and production processes. It produces polyurethane-insulated components for oil and district heating pipelines. The enterprise operates in highly competitive environment imposing strict requirements on prices, delivery times, payment adjourning periods. The business processes in the enterprise of this type have the following distinctive features: (a) a customer can make changes to the list of the ordered products, their
configurations, scope and time of delivery “on the run” while the order is being executed; (b) a contract manager can pick different ways to execute the contract: production, resale, outsourcing of certain operations depending on the book of orders, availability of production capacity and other factors determining the state of the company; (c) large number of customers resulting in large number of simultaneously executed orders; (d) the size of nomenclature is more than several thousand items due to various combinations of product parameters affecting manufacturing processes. Features (a) and (b) indicate the high level of agility of these processes: they can be implemented in a number of ways depending on specific case and personal preferences of the client and the contract manager while each of the ways is limited to a set of template implementations. The order size can vary from several to several hundred different items. The number of orders in work varies from several dozens to several hundreds. Product data is also continuously changed (both in terms of structure and content) due to requests from the customers and R&D efforts aimed at improving quality and characteristics of the product line.

The main goal of the project was development and introduction of the adaptive and flexible business process management system that should ensure achievement of the enterprise commercial goals. The project required resolving two large problems. The first one – development of the agile enterprise model that in addition to business process definitions should include the definitions of:

- goals represented as integrated metrics identifying the planned state of the business at different levels of management;
- management system ensuring the monitoring of business process execution and achievement of the identified goals;
- resources (material, human, information) used in business processes;
- organization structure identifying subordination of business process participant and responsibility for goal achievement.

The enterprise model should allow for computer-aided verification at the stage of initial development as well as at the stage of modification due to process improvement or adaptation.

The second problem – is development of the system supporting the execution of flexible and adaptive business processes. The system should:

- ensure integration of definitions of goals, resources, organization structure, planned and actual business states into the single information model of the business;
- provide selection of the specific business process implementation depending on the current state of the business and user preferences;
- enable modification of business processes in the course of their execution;
- enable direct execution of declarative definitions of the business processes without the need to translate them into software code.

Solution to the first problem rests upon the mathematical systems theory that deals with the dynamical systems/processes in the physical world [1]. The advanced approach to development of the agile enterprise model and non-workflow theory of business processes based upon the systems theory is described in [2, 3, 4]. According to this approach an enterprise is represented as three-layered model consisting of