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The Agility Challenge in Business Process Management

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A Case Study

The Agility Challenge in Business Process Management

Martin Kernland, Oliver Hoeffleur, Michael Felber, Zürich, Switzerland

Ever more dynamic enterprise environments present strong requirements that business processes must be more flexible and automated in both their design and behavior. The example of an Engineering Change Management system at Daimler AG shows how a novel approach can lead to significant benefits in both areas.

Background

Business Process Management (BPM) software is becoming an increasingly relevant option for the day-to-day management of business processes. BPM controls process lifecycles with support for process modeling, execution, monitoring and optimization. As a case in point, Daimler AG requires a BPM system to manage change request processes associated with Engineering Change Management (ECM), among other domains. ECM is of particular relevance as it spans the entire documentation and execution of processes associated with the description, analysis, decision and implementation of product changes.

Rising requirements from the ECM business process made apparent to Daimler that it would need to modernize the existing software solution in order to satisfy the complex demands of a more flexible and situation-specific mode of operation. Specifically:

The ECM process had become increasingly significant to the management of change events calling for more flexible process development. The conventional system design processes of the existing solution, however, did not allow rapid and optimal adaptation of the processes to changing priorities.

The conventional system's process control was not capable of governing highly variable change requests in a situation-specific and purposeful manner, that is, adapted to change request content and project context. For example, both minor and drastic changes followed the same process steps, which placed unnecessary strain on the organization and reduced overall process efficiency.

A thorough examination of improvements based on conventional BPM solutions demonstrated that these limitations could be only partially reduced, and only in the short term. Such means would essentially have been limited to adding new variants to the rigid basic process scheme, an approach that would result in extra complexity and thus come at a high price.

The realization of these limitations and the lack of suitable means to tune their existing systems were at the root of Daimler's vision and commitment to seek a novel approach that would not rely on procedures and schemes, but enable agile process design and execution.

The Agility Challenge

In this context agility was defined as a blend of goal-orientation coupled with the ability to adapt in real-time. The former concept is the key concept that sets this definition of agility apart from pure reactivity and flexibility.

An evaluation of conventional BPM systems from major industry vendors demonstrated that they uniformly lacked the goal-orientation dimension in their process models. It was also apparent that none were capable of real-time adaptation of process paths in response to changing influences and targets.

The agile BPM application desired by Daimler should however be capable of capturing business-level goals at model level; not merely document and execute procedures. Goals should be dynamically combined with plans of action to form optimized process instances.

Two key requirements for such an agile BPM application were thus defined as follows:

Requirement A: Agile adaptation of the system to changing conditions
Process owners should be allowed to promptly configure and deploy process changes in an agile system. Business processes should therefore not be hard-coded into the system. Rather, an

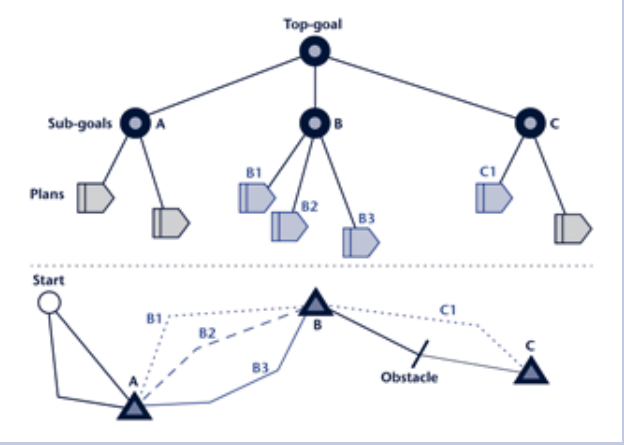

Figure 1: *Goal-oriented process models connect goals and plans to a network of potential process paths that enable agile system adaptation and agile process behavior. The route to the top-goal should lead through A, B and C. The most suitable path is chosen in real-time depending on environment conditions – much like it would be in a car navigation system*

executable process model should allow the direct implementation of new functionalities, which would then be integrated in real-time into a running process.

Requirement B: Agile process behavior
Dynamic conditions require ECM processes to display agile behavior in accordance with their contents, goals, and priorities and in critical situations (e.g., when cost, time or quality targets are jeopardized or resources/roles are overstretched).

Project vision "Goal-Oriented Process Modeling and Execution"

Conventional business process modeling creates a sequential process flow. Demands for flexibility are typically met by modeling additional process variants.

The innovative concept of goal-oriented process modeling is that processes are modeled as hierarchies of goals. Each terminal goal is then associated with one or several plan alternatives that are able to satisfy the goal. The network of connections between goals and plans within the hierarchy layers is flexible (see Figure 1) with the potential process paths described by rules that govern the behavior of goals and the application of plans.

Goal-oriented modeling of business processes first breaks a process down into individual goals ("what?") and plans ("how?"). Depending on the context, the execution path variants are then determined at run-time based on the plans attached to goals. Changes to the goal-plan-context model are thus effective immediately. This allows the process owner to promptly adapt the system or a process to dynamic conditions, as described in requirement A.

The BPM run-time component then activates goals and executes plans in accordance with the current process context. After every processing step, and before every execution of a plan or activation of a goal, the run-time engine refreshes the dynamic context variables and selects the correct subsequent goals and plans. In this manner the second requirement – that of agile process behavior – is also fulfilled.

The solution: Goal-oriented Autonomic BPM

The feasibility of modeling and implementing goal-oriented business processes was confirmed by Daimler's corporate research during an internal innovation project. With the world-premiere of a goal-oriented autonomic Business Process Management Suite (BPMS), software vendor Whitestein Technologies is now capable of achieving project the vision as a scaleable enterprise application.

Whitestein's product Living Systems® Autonomic BPM (LS/ABPM) is a comprehensive BPMS for the development and operation of goal-oriented business process systems that fulfill the requirements described above.

Goal-oriented process modeling

Process analysts working on ECM at Daimler use the LS/ABPM Process Modeler to graphically design goal-oriented process models with GO-BPMN, a goal-oriented extension of BPMN, the international standard notation for business process models.

Traditional modeling tools command a very sequential mindset. Goal-oriented modeling, on the other hand, is much closer to the established approach in managing workflows that first defines goals and then identifies possible plans of action.

Goal-oriented process models are directly executable in the LS/ABPM Process Navigation Engine run-time component. This allows process designers with limited IT skills to directly edit and test process models on their PCs and then directly deploy them subsequent to approval.

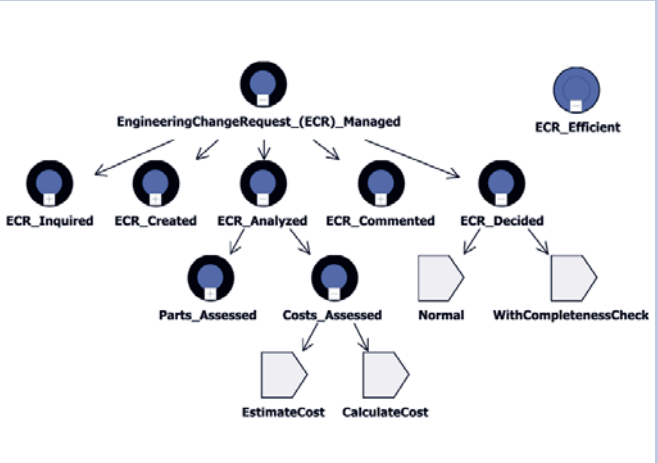

Figure 2: *Goal-oriented process model of a VDA recommendation-compliant Engineering Change Management process*

A directly executable GO-BPMN process model also eliminates the need to translate the model into an intermediary execution language such as BPEL. This eliminates the potential of inconsistencies arising between the process model and the process instance.

Finally, the modular setup of goal-oriented process models benefits distributed organizations such as Daimler, as individual process elements can be modeled independently.

Goal-oriented, autonomic process navigation

The other LS/ABPM innovation of relevance to Daimler's ECM system is the capability of the Process Navigation Engine to autonomically pursue process goals and dynamically select and execute optimal plans. This results in highly agile, situation-specific process navigation in lieu of conventional "hard-wired" process execution.

LS/ABPM's ability to be autonomic while ensuring that processes remain consistent and safe is powered by the application of innovative software technologies and methodologies developed in the areas of agent technologies and autonomic computing.

Example: Engineering Change Management

Figure 2 contains a goal-oriented ECM process model compliant with recommendation 4965 of the German Association of the Automotive Industry (VDA). The top-goal relates to the overall management of an engineering change request (ECR). Several sub-goals must be completed in order to achieve this top-goal: "ECR_Inquired," "ECR_Created," "ECR_Analyzed," "ECR_Commented," and "ECR_Decided." Further sub-goals beneath this second layer may be added as required. Figure 2 also displays four examples of plans that represent different ways of achieving the goals "Costs_Assessed" and "ECR_Decided," respectively.

In addition to the *achieve goals* illustrated in Figure 2 which become inactive when completed once, goal-oriented process modeling also supports *maintain goals* that describe states to be upheld. The above example contains a second top-goal "ECR_Efficient." The LS/ABPM run-time component ensures that this goal is continuously re-activated once its plans are completed, and autonomously (i.e., without human intervention) resolves conflicts with competing processes.

Context rules that are defined statically (e.g., product line = "cars") or dynamically (e.g., "time remaining until deadline") guide the application of goals and plans. Changes to plans, goals and context rules are possible at any time – even at run-time.

Benefits of the solution

The key advantages of the LS/ABPM solution for Daimler's ECM can be summarized as follows:

- Goal-oriented processes with autonomic execution control accounting for the content and priorities of change requests, including critical threshold and exception conditions.
- Reduced complexity at the process model and instance level due to the separation of goals and plans.
- Process analysts with basic IT skills can model executable processes and intuitively comprehend the goal-plan methodology due to its direct association with day-to-day management routines.
- Directly executable process models promote the timely evolution of process models and eliminate the need for a separate intermediary execution language such as BPEL (and thus the additional complexities of round-trip engineering).
- Process-to-process communication enables the parallel execution of competing goals without risk of deadlocks.

Contact

Whitestein Technologies AG
Oliver C. Hoeffleur
Pestalozzistr. 24
8032 Zürich
Switzerland
Phone: +41 44 256-5020
E-mail: och@whitestein.com
Internet: www.whitestein.com