

Basic Software Components for Economic Processes Modeling, Simulation, Analysis and Optimization

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Abstract: - The term business model became popular during the dot-com craze as entrepreneurs and venture capitalists tried to convince the world that they were doing something entirely new and different on the Internet. Despite this heritage, the idea of a business model is helpful in understanding a firma and what it does. One part of a business model is the firm's revenue model: how it plans to generate revenue to cover its costs and make a profit. During the heady days of the dot-com run-up, investors did not seem concerned at all that new enterprises were giving away services and seemingly had no concrete idea of where they would find revenue. A number of dot-com-s said that their funds would come from advertising because so many people would be visiting their sites. Technology makes it possible to develop new business models or to expand an existing model.

Key-Words: - Business process, business process modeling, tools for business process modeling

1 Introduction

A **business model** is a description of how an organization functions, a general template that describes its major activities. It identifies the firm's customers and the products and services it offers them. A model also provides information about how the firm is organized and how it generates revenues and profits. Business models combine with strategy to guide major decision at a firm. The business model describes products and services, customers markets, and business processes, while strategy is concerned with how to achieve the objectives of the business model.

The term **process model** is used in different contexts. For example, in Business Process Modeling, the enterprise process model is often referred to as the business process model. Process models are core concepts in the discipline of Process Engineering.

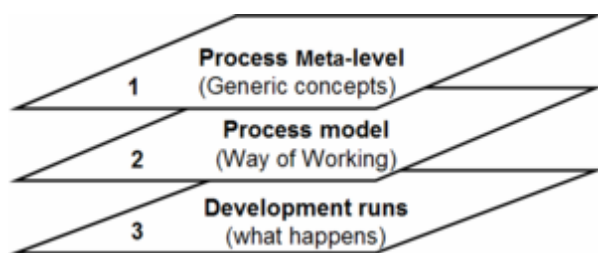


Fig.1: Abstraction level for processes

2 Business Process Modeling

2.1 Process models

A description of what **process models** are is provided by Colette Rolland: "Processes of the same nature are classified together into a **process model**. Thus, a **process model** is a description of a process at the type level. Since the process model is at the type level, a process is an instantiation of it. The same process model is used repeatedly for the development of many applications and thus, has many instantiations. One possible use of a process model is to prescribe "how things must/should/could be done" in contrast to the process itself, which is really what happens. A process model is more or less a rough anticipation of what the process will look like. What the process shall be will be determined during actual system development".

From a theoretical point of view, the **Process Meta-Model** explains which are the key concepts needed to describe what happens in the development process, on what, when it happens and why. From an operational point of view, the Process Meta-Model is aimed at providing guidance for method engineers and application developers.

2.2 Business process model

The activity of **modeling a business process** usually predicates a need to change processes or identify issues to be corrected. This transformation may or may not require IT involvement, although that is common driver for the need to model a business process. Change management programs are desired to put the processes into practice. With advances in technology from larger platform vendors, the vision of BPM models becoming fully executable (and capable of round-trip engineering) is coming closer to reality every day. Supporting technologies include Unified Modeling Language (UML), model-driven architecture, and service-oriented architecture.

A **business process model** facilitates the alignment of business specifications with the technical framework that IT development needs. A shared model can help to keep the business and IT views of the process synchronized.

The relationships of a business processes in the context of the rest of an enterprise systems, data, organizational structure, strategies etc. create greater capabilities in analyzing and planning a change.

Rolland lists different styles for representing processes: scripts, programs, and hypertext. "Process scripts are interactively used by humans as against process programs which are enacted by a machine. They support non determinism whereas process programs can, at best, support process deviation under pre-defined constraints. The hypertext style of process representation is a network of links between the different aspects of a process, such as product parts, decisions, arguments, issues, etc. Scripts and programs are two styles which may be applicable to prescriptive purposes whereas hypertext is well suited to descriptive and explanatory purposes. Strict enforcement of the prescriptive purpose can clearly be represented in process programs whereas flexible guidance requires the process model to be represented in process scripts. Descriptive and explanatory purposes require the establishment of relationships between different elements of a process trace. These relationships are well articulated as hypertext links."

Traditionally, informal notations such as natural languages or diagrams with informal semantics have been used as process models underlying information systems. In software engineering, more formal process models have been used.

Modeling a process presents significant challenges. Modeling should ensure consistency and thoroughness in capturing relevant information so

that both business analysts and the developers can understand the business requirements that are captured in the model. During modeling, alternatives and exceptions to standard procedures must be captured, in addition to normal operations. Professionals with different scopes of interest and expertise can build process models to meet a wide range of business objectives. For example, an analyst requires a high-level view of a process to drive strategic decisions and to do process analysis such as simulation. A developer uses a process model as the input to implement a solution.

Michael Havey, author of *Essential Business Process Modeling*, stays that: "the boxes and arrows of outrageous fortune". When a business analyst stands at a whiteboard, sketches the flowchart of a business process as a cluster of boxes linked by arrows and asks the software team to make it run, Business Process Modeling (BPM) – sometimes known as Business Process Management – comes to the rescue. BPM is a set of technologies and standards for the design, execution, administration, and monitoring of business processes. A business process is the flow or progression of activities (the "boxes") – each of which represents the work of a person, an internal system, or the process of a partner company – toward some business goal.

Over the years, the scope of business processes and BPM has broadened. Less than a decade ago, BPM, known then as "workflow," was a groupware technology that helped manage and drive largely human-based, paper-driven processes within a corporate department. For example, to handle a claim, an insurance claims process, taking as input a scanned image of a paper claims form, would pass the form electronically from the mailbox (or work list) of one claims specialist to that of another, mimicking the traditional movement of interoffice mail from desk to desk. BPM today is an enterprise integration technology complementing Service-Oriented Architecture (SOA), Enterprise Application Integration (EAI), and Enterprise Service Bus (ESB). The contemporary process orchestrates complex system interactions, and is itself a service capable of communicating and conversing with the processes of other companies according to well-defined technical contracts. A retailer's process to handle a purchase order, for example, is a service that uses XML messages to converse with the service-based processes of consumers and warehouses.

3 Tools for BP modeling

3.1 Business Integration Modeler

Web Sphere Business Integration Modeler is an easy-to-use tool designed specifically for business users to capture and document the specific steps of a business process. Included as core features are the following:

User Profiles: Business Integration Modeler provides three different user profiles which allow different views of the same process model with different details. The three profiles are: basic, intermediate, and advanced. These profiles are associated with the roles of the different users. A business domain expert or analyst uses the basic profile which illustrates the business tasks as sequences of activities, while the rest of the model information is captured as documentation. The intermediate profile is more technically oriented with details on data models, expressions, and cardinality information and is more suited for business architects. The advanced profile provides the comprehensive details on the process and data models. This profile is well-suited for solution or IT architects. It should be noted that switching the profile does not change the underlying data model.

Technology Modes: There are three technology modes: operational, BPEL, and MQ Workflow FDL. Based on the technical expertise and the view on the required details, one could switch between the modes. Some options and notational elements can be disabled in some modes, and selecting the appropriate model helps define appropriate artifacts for the target workflow execution environment. Note that switching the modes does not change the underlying data model.

Catalogs: These are a logical grouping of similar modeling entities. These catalogs include the following:

- Data (business items such as order, product)
- Processes (main process, sub process, services, tasks)
- Resources (roles such as customer service representative, sales manager, or resources such as Web server, app server)
- Organization (organization hierarchy, location)
- Report (summary, comparison, documentation)

These groupings increase the reusability of the modeling entities.

Processes: Processes are a sequence of activities, conditions that dictate when these activities will be performed, resources required to perform activities, and the data flows between activities and interaction with services. These

processes are modeled using the diagramming notations provided by the tool.

Simulation: Process model simulation helps the organization to observe how a process will perform under the variations of input. This feature provides capabilities for varying the input, associating cost factors, and adjusting the resources/current allocations to simulate a real business scenario. These simulations could enhance the analysis on the critical path, shortest path, cycle time, and cost/time measures about the process model.

Reporting: This feature provides a valuable guidance in process analysis and redesign. There are various reporting features available, including process summary, comparison reports on two process models, comparison on as-Is versus To-Be on ROI measurements, documentations, and procedure (rules, policies and procedures) report.

Analysis: There are two types of analysis that could be performed on a process model: static analysis and dynamic analysis. In the case of static analysis, most of the information is extracted from the model and used to analyze cost, time management, performance, process flow validity, and resource leveling. The dynamic analysis is done on the output from the simulation process based on the output logs or the events. There are two kinds of dynamic analysis: aggregated analysis (based on the form multiple executions of the process model elements) and case analysis (using one instance of execution of a specific sequence of process elements).

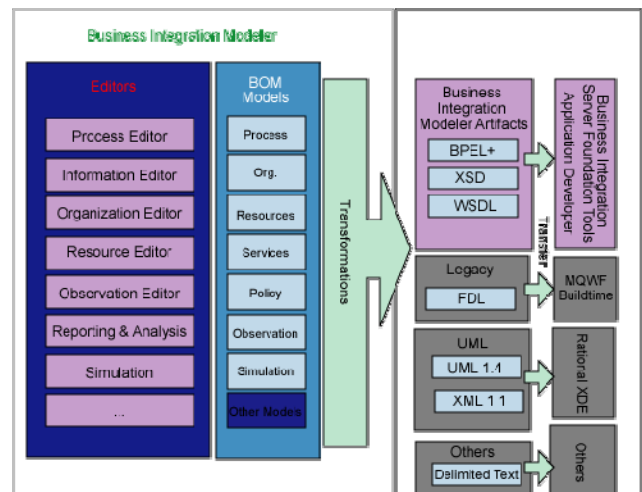


Fig.2: Business Integration Modeler editors, models, and transformations

As Fig. 2 shows, an analyst creates various process elements in the appropriate editor (for example, a use process editor for the graphical

representation of a BP flow, consisting of activities and the connections between them). These process elements are stored as BOM-s in disk files. Business Integration Modeler automatically applies the corresponding validations on the BOM. At a later stage during the model export time, the analyst will apply the correct transforms to convert the BOM-s to corresponding target artifacts.

3.2 ARIS

Development of ARIS Platform was informed by the experience gained in more than 6,000 business process management (BPM) projects. Research done by leading technology analysts shows that ARIS Platform continues to enjoy good position due to this combination of project insights and innovative software development. With its intuitive user interface, smart Web technologies, and high level of scalability, ARIS is the benchmark for enterprise-wide business process management. Integration of a range of different modeling methods and frameworks, such as Event-driven process chain (EPC), UML, BPEL, BPMN, ITIL, enables deployment of ARIS in many different business areas. All these methods are brought together in the central ARIS repository.

3.2.1 Modeling, Analysis and Optimization

Within a BPM cycle, Business Process Design is of particular significance. Companies are enabled to create transparency regarding the current process quality. Using the integrated methods in ARIS, it is possible to ensure a consistent procedure as well as a uniform language for process description. In the design phase, the first step is to make an inventory of the current status. The workflow sequence, the departments involved and the IT systems employed are all documented. The knowledge on business processes or structures is stored via graphic modeling in the central ARIS database. This ensures that data and models are re-used throughout the company and enables a uniform view of the organization – covering all processes, organizational units and operational areas.

One of the most significant model types of ARIS is the event-driven process chain (EPC). Using the method of the EPC, the events in a company which lead to the initiation of certain functions, which in turn set off other events, can be visualized. The individual function can be related to the operational organizational units. Fig. 3 shows an EPC model designed in ARIS Business Architect, which documents the workflow for a customer proposal at a car manufacturing company. Several elements and relationships of this method visualized

in this model are stored in the central ARIS repository. Although the order processing clerk is assigned twice to a function as the performing organizational unit, both elements refer to one single object in the database.

Moreover, the order processing clerk can be displayed in the organization chart.

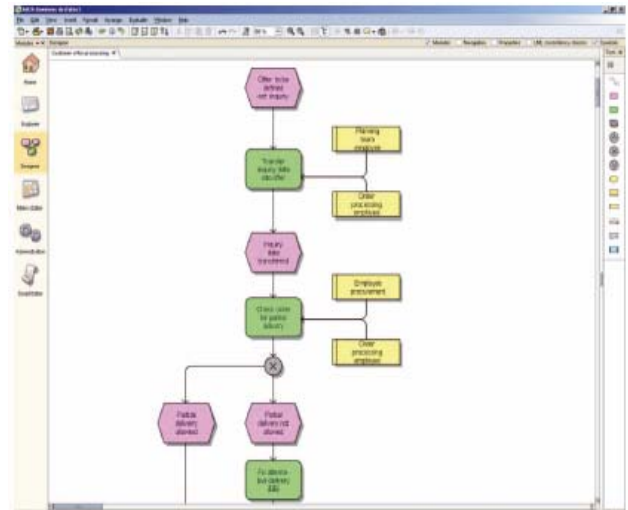


Fig.3: EPC Modeling Method in ARIS Business Architect

The re-use of object types ensures the integration of methods within various application scenarios. This allows a number of evaluations, such as: “Which functions are being performed by a company’s organizational unit?” By applying this method of process design, it is possible to gather critical information on the actual efficiency of business processes.

The utilization of cost centers and resources, as well as the deceleration of processes caused by media and system fractures, are made just as visible as the establishment of “Best Practices“, i.e. process variants, which, based on a time and cost comparison, emerge as best of kind. This enables the detection of organizational, structural and technical weaknesses within processes, and, based thereupon, optimization potential can be determined. The analysis results, in combination with corporate objectives, are the basis from which target processes are derived. These are processes, which – implemented in IT – are designed to support the company in generating value.

ARIS Design Platform enables Business Process Design for a large variety of application scenarios – from quality management to process cost accounting and the implementation of commercial software. Due to the high flexibility of the methods in ARIS, the scope of the supported areas can be

enhanced swiftly. The following will show the application of the described ARIS method to the new business topics Compliance Management, Enterprise Architecture and Business Rules.

3.3 ADONIS

Successful and dynamic enterprises can realize decisive competitive advantage through the ability to adapt their business processes quickly to the quickly changing market conditions and through the active arrangement of their core competencies. The increasing dynamic, globalization and increasing competition makes efficient Business Process Management an essential goal.

To enable this, the procedural modeling, analysis, simulation and evaluation of business processes is an authoritative success factor. The goals of Business Process Management are the optimization of both the processes of an enterprise as well as the resources and technology which execute those processes.

The ADONIS Business Process Management toolkit offers essential toolkit support for Re-engineering and Reorganization projects.

The "Meta-concept" of ADONIS means that through its customizing, the tool can be configured to optimally suit the particular requirements of any user. The ADONIS user can decide how he should build the processes and how he can best use the ADONIS mechanisms. Because ADONIS is method independent, the management of business processes on varying levels is guaranteed.

The BPM toolkit provides a large number of components and modules with which user can enrich, analyze, simulate and evaluate his models.

The ADONIS Business process management toolkit consists of the following components:

Acquisition: Information Acquisition supports the user in gathering information which is important (or necessary) to successfully model the business processes and Working environments. One of the methods provided is the use of the Acquisition tables or HOMER component which runs through a link to Microsoft Excel. Data can be entered in these tables (excel sheets) and this data can then be exported to an ADL file and imported into the ADONIS Business process management toolkit.

Modeling: The Modeling component is the heart of the ADONIS Business process management toolkit. The modeling component allows to build the models required (e.g. Business Process or Working environments). The user can create and amend his own models (and the attribute values of the objects used) using the graphical editor (Model editor)

provided. Additionally, it is also possible to input attribute values through a tabular view of the model.

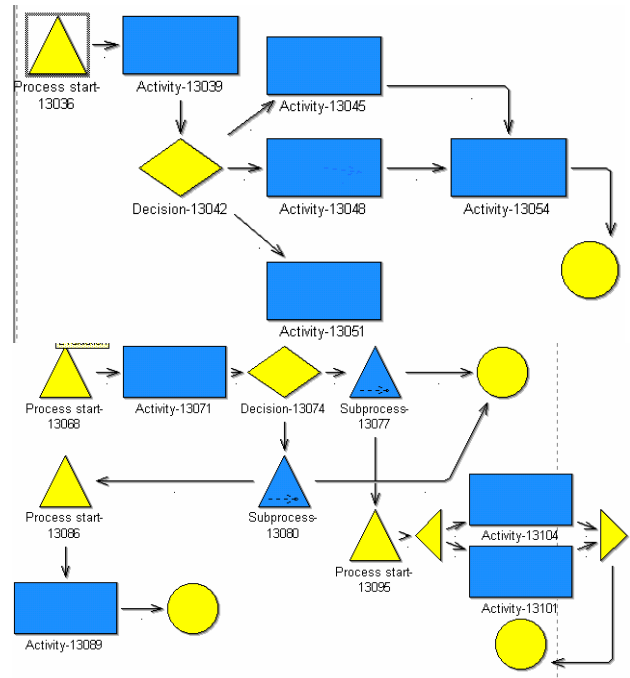


Fig.4: Modeling with ADONIS

Analysis: Within the Analysis component, queries on ADONIS models can be run and Relation tables or predefined charts can be produced. Both predefined and user-definable queries are provided in ADONIS. The query language in ADONIS is AQL (AQL = ADONIS Query Language). However support dialogs are provided within the toolkit to assist in the creation of queries so no knowledge of this syntax is actually required). The results of a query can be displayed either as a table or graphically. The results can also be exported to an ASCII file. In this way one can process the results further in another application (e.g. spreadsheet, word processor etc.).

An Analytical evaluation of Business process models can also be carried out.

Simulation: The simulation of business process and Working environments is executed in the Simulation component. Four simulation algorithms are available in ADONIS: Path analysis simulates the business process models only, while the Capacity Analysis, Workload Analysis (steady state), and Workload Analysis (fixed time period) simulate the Business process models AND the corresponding Working environment models.

With the help of ADONIS Agents it is possible to calculate non-standard results during the simulations.

Evaluation: The evaluation component offers mechanisms for the evaluation of "should-be"

models as real running processes. The BPMS Paradigm shows that "Evaluation" is a core activity of the Re-Engineering Process and the Performance Evaluation Process.

The evaluation component provides the following areas of functionality Comparative representation of results, Evaluation of real-time audit trails of the Workflow management system MQSeries Workflow (IBM) and pre-defined evaluation queries.

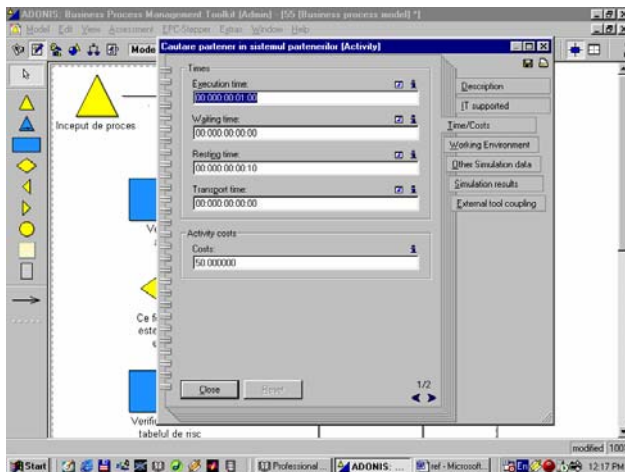


Fig.5: Evaluation with ADONIS

As an additional component the ADONIS Process Costing component can be integrated with the toolkit. The ADONIS Process Costing component supports the optimization of costs, especially overhead costs and supports the identification and evaluation of possibilities for savings.

Import / Export: The Import / Export component provides the possibility of exporting ADONIS models, model groups and application models into ADL files as well as importing them into an ADONIS database from ADL files. ADL stands for ADONIS Definition Language. With the help of ADL-import and ADL-export, the user can transfer ADONIS models, model groups and application models into a different ADONIS database. Additionally, ADL-Export can serve as a back-up mechanism for the models, model groups and application models.

As well as the above functionality, within the import/export component, it is possible to export ADONIS models to FDL files which can then be transformed into the Workflow Management system MQSeries Workflow.

The ADONIS Documentation component can be integrated into the Import/Export component as an additional component. With the help of the Documentation, it is possible to generate HTML and

RTF documents from ADONIS models. In this way it is possible to distribute the contents of the models either in document format (through a word processing program) or over an Intranet.

4 Conclusion

Business Process Management has become an important tool for taking companies forward. It becomes increasingly difficult to identify business-critical systems, and cost-cutting targets prove elusive. Creating enterprise architecture provides the opportunity for progress by systematically documenting all the systems used by the organization. Aligning IT structures with an organization's objectives and business processes is the only way to achieve sustained improvements and a significant reduction in the cost of developing, maintaining, and upgrading IT systems.

BPM therefore covers the recording of processes (including analysis and optimization), process implementation in the IT infrastructure, and the automatic monitoring and measurement of processes and their key performance indicator, thus enabling a company to adjust to changing internal and external demands. As this description shows, Business Process Management is a continuous loop, rather than a one-time exercise.

What this paper intended to present, besides the importance of business processes modeling in nowadays enterprises, was a comparison between some different modeling tools, as instruments in the area of BPM, with different components, according to users requests.

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