Business Process Modeling and Standards Development

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Introduction

The emerging interest in the process approach is giving rise to numerous expectations and views. Whether it is Business Process Reengineering (BPR), Business Process Management (BPM), Activity Based Costing (ABC), Business Activity Monitoring (BAM) or Operational Risk Management (ORM), process is at the core of each of these approaches. The arrival of modeling standards is now resulting in the synthesis of process analysis methods and the creation of a knowledge base that can be shared by market participants.

Substantial progress has been made in business process standardization. However, it is clear that the wide range of domains covered by business process modeling requires more than a single standard. This white paper attempts to present the current status and explain the need to embrace the multiple dimensions of business process approaches. The perspectives given in this report are based on MEGA customer experiences and our many years of participation in standardization groups, as well as the emerging trends of the business process analysis market.
Business process: one concept, multiple arenas of application

Before creating a list of the modeling standards being developed, we will first address the following question: what business processes are we talking about? The term “business process” is often used in relation to very different types of projects. Of these, we are addressing the following three:

- The creation of a customer-oriented business management method. This means running the company via its business processes or **value chains**.
- The creation of procedures to oversee the organization’s operations: **organizational processes**.
- The integration of IT resources using a business process approach: **IT processes**.

In planning a company’s value chains, one important factor is the relationship between strategy and business processes. For example, a bank can decide to focus on the financial products market over the retail banking market. The business process “provide financial products” thus becomes the bank’s major value-added product line. Bank operations must be reorganized according to this business process so that each branch focuses on satisfying customers who buy financial products.

In the second example, a bank may be looking to improve its operational organization. This bank would want to ensure, through management procedures, that it had control over its customer debt levels. The goal is to determine what rules to apply and which organizational units are responsible for applying them. Here, task distribution and management of responsibilities for each task are at the forefront.

The third example involves a bank’s information systems. The issue here is coordination of software services and user tasks. In the case of this bank, a system process could be implemented to automate the gathering of past customer records for debt control purposes.
It is apparent that the areas described above cover topics as varied as strategic analysis, responsibility analysis, and information system architecture. This review of different instances involving business process modeling reveals that no single standard being proposed today can satisfy all these differing requirements. It is important to realize that for each approach, there must be a specific, adapted type of process modeling. Business analysts using the process approach will need to be informed as to the optimal standard to deploy.
The present-day challenges for Business Process Management

Companies that were once engaged only in producing goods have now become service providers. In the telecommunications sector for example, the trend is for the telephone as a product to be replaced by services delivered through the telephone, such as email access, online purchasing, and so on.

Companies have moved to offer services with products for three main reasons:

1. **To expand their market and their income**, using the same product to generate a number of services.

2. **To differentiate themselves from the competition** by providing a value added service that will distinguish them from others.

3. **To focus on their core business**: outsourcing, facilities management through consumption of services from other service providers to delegate peripheral activities.

Combining services with products goes hand in hand with combining processes. Each process is, in fact, a basic service generating operation. The need to combine processes and services is growing as we face the challenges posed by the globalization of business activities. New service and process combinations must now be added to take into account the company's various geographical sites, the different legal systems under which it operates, the branches or locations it has set up, etc.

A new need then arises in relation to modeling standards; namely that we are able to refer to the elements modeled (process, organization, business purpose, etc.) not in absolute terms, but in terms of a given context. For example, in the previous bank example, the choice could be made to set up the "provide financial products" process for some customer segments only, depending on their level of income and their location (e.g. city vs. rural). We will therefore refer to the "situation scenario" of this process in each different context. Process control will have to be specific to each situation scenario.
Criteria for a business process modeling standard

Aside from covering the different business process modeling requirements as described above, a standard for analyzing business processes must meet certain criteria that apply to any modeling standard:

- **An intuitive notation** that is easily adopted for use by those involved with business analysis: a good diagram is worth a thousand words.

- **A meta-model and vocabulary**, a group of concepts and relationships that are strictly and consistently defined to provide a solid foundation for the various business process approaches. Two types of meta-models will be singled out here:

  - *Flat meta-models*: a type of formalization used to represent an entire process, but in only one dimension. They are often based on rigid hierarchical breakdowns (of the process/sub-process kind) which do not allow the same process to be set in a number of contexts. When more than one "situation scenario" is needed, some copy-and-paste operations of portions of process models have to be performed, which quickly makes the dependency graph between processes inextricable.

    *Most of the old process standards are flat meta-models (EPC, IDEF, etc.)*.

  - *Structured meta-models*: a type of formalization that sets out to integrate in a consistent way the two notions of process definition and process use. From the very first system examples, these meta-models reveal their full power and their capacity to address the issues in today’s BPM. Only these meta-models permit the differentiation between the capabilities offered by a process (ability to ship a product in five days) and the specific requirements imposed on the various usages of the process in different contexts (in context ‘International’ the requirement is to deliver in six days; in context ‘Local’, the requirement is to deliver in two days).
Any structured meta-model can be folded up into a flat meta-model. However, flat meta-models cannot be expanded into a structured meta-model. Most of the new process standards are based on structured meta-models (BPEL2, UML2, BPDM, BPMN2, etc.). These standards require a new generation of tools that combine ease of use with power of analysis.

- **A unified model of interaction** included in the meta-model. The interaction model must allow both intra-process exchanges and inter-process exchanges to be defined.

- **A breakdown of the meta-model and notation for each level of analysis of business processes**: value chain, organization, IT system, etc. This breakdown must be accompanied by a mechanism for navigating between the different levels of process analysis.

- **An exchange format** for both the process models and their diagrams.
State of the Industry

A double analysis grid depicting the field of application for the process modeling and the characteristics of a modeling standard enable us to classify the main standards that already exist and those currently being created.

**Figure 1 – Grid Analysis for a Business Process Modeling Standard**

<table>
<thead>
<tr>
<th>Fields of Application</th>
<th>Value Chain Analysis</th>
<th>Organization Analysis</th>
<th>System Process Analysis</th>
<th>Execution language for automated processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Characteristics of a modeling standard</td>
<td>Has a flat meta-model</td>
<td>Has a structured meta-model</td>
<td>Has an integrated interaction model</td>
<td>Has a notation</td>
</tr>
</tbody>
</table>

The following table gives us an overview of existing and proposed standards:

**Figure 2 – Major Business Process Modeling Standards**

<table>
<thead>
<tr>
<th>Name</th>
<th>Standard Organization</th>
<th>Status</th>
<th>Field of Application</th>
<th>Flat Metamodel</th>
<th>Structured Meta-model</th>
<th>Integrated Interaction Model</th>
<th>Notation</th>
<th>Exchange Format</th>
</tr>
</thead>
<tbody>
<tr>
<td>XPDL 2.0</td>
<td>WFMC</td>
<td>Finalized</td>
<td>Execution Language</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Use BPMN</td>
<td>Yes</td>
</tr>
<tr>
<td>BPEL 2.0</td>
<td>OASIS</td>
<td>Finalized</td>
<td>Execution Language</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>ISO 9000x</td>
<td>ISO</td>
<td>Finalized</td>
<td>Value Chain Analysis Organizational Process Analysis</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>EPC</td>
<td>Universität des Saarlandes</td>
<td>Finalized</td>
<td>Value Chain Analysis Organizational Process Analysis</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>UML 2.0</td>
<td>OMG</td>
<td>Finalized</td>
<td>System Process Analysis</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>BPMN 1.1</td>
<td>OMG</td>
<td>Finalized</td>
<td>Notation for business process diagrams</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>BPDM 1.0</td>
<td>OMG</td>
<td>Finalized</td>
<td>Delivered Service Analysis Value Chain Analysis Organizational Process Analysis System Process Analysis</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>BPMN 2.0</td>
<td>OMG</td>
<td>Under Development</td>
<td>Delivered Service Analysis Value Chain Analysis Organizational Process Analysis System Process Analysis</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
XPDL, BPML, BPEL

These process modeling languages are dedicated to process execution. They are generally not used directly in analysis and design phases. Being expressed in XML syntax, they have a native exchange format. None of these languages offers a standardized graphic notation. By definition, they are not designed to cover the levels of value chain and organization analysis.

The first execution standard was developed by the Workflow Management Coalition (WFMC). A new XML version of the WFMC language was released in 2002 under the name XPDL.

The Business Process Management Initiative group (BPMI) released a competing language in 2001 called the Business Process Modeling Language (BPML). This initiative restarted the work on process execution languages and made many contributions to its successor, Business Process Execution Language (BPEL).

BPEL was initiated by Microsoft and IBM in response to the BPMI initiative. Since that time, this language has received the support of most market players, including BPMI. BPEL has become the de facto standard for business process execution. It lies on top of the Web service specification stack. Since 2003, the standardization group Organization for the Advancement of Structured Information Standards (OASIS) has been in charge of the evolution of the BPEL language.

Version 2.0, published in April 2007, added a new dimension to BPEL, namely "human tasks". This addition was in response to a criticism leveled at version 1.0 of BPEL that it only took account of processes between systems, and ignored the "human factor". Taking account of user interfaces is indeed an essential element in process automation, so who could afford not to be concerned about it? There is, however, a misunderstanding about the expression "human factor". It is implicit in setting the concept of manual task against that of an automated task, as if you could switch from one to the other by simple substitution. The process execution languages describe the orchestration of IT resources by means of processing strings and calls on components. Unless man is treated as bionic, a program can make no "calls on people". It can, on the other hand, offer a user interface.
This allows us to form a conclusion as to the limitations of process execution languages as analysis tools for the business, namely that this is quite simply not their prime objective. XPDL and BPEL will fall far short of having enough elements to form the operational specifications of a new system and specify the different requirements associated with it, the different use cases arising from it, and the "logical" system processes that describe said use cases.

The opposite is just as true: it will be quite difficult to take a system process defining a use case of the system as the automated process running in this system. This would be to confuse the specification with the program running it.

**ISO 9000/2000**

The International Organization for Standardization (ISO) was one of the first organizations to be interested in business processes with the ISO 9000 standards. The ISO provided many relevant definitions for levels of analysis related to organization and value chains. Unfortunately, ISO never provided a formal expression of the quality processes or an accompanying graphical notation. As a result, ISO 9000 standards never led to a process modeling standard. They remain a reference source for analysis of quality processes.

**IDEF3**

IDEF3 is one of the families of specifications created by Integrated Computer-Aided Manufacturing (ICAM), a US Air Force initiative. The IDEF3 standard was finalized and made public in the 1980’s and has been widely used in the US and integrated with the Structured Analysis & Design Techniques (SADT) system design method.

IDEF3 has a notation and a flat meta-model, but no real exchange format. The notions of process and process contextualization are represented therein by a common Unit of Behavior (UOB) concept. IDEF3 includes the essential elements required for process rollout to be expressed but has no real interaction model.
The use of IDEF is currently in decline and new standards like BPMN and UML2 are tending to replace it.

**EPC**

The Event Process Chain (EPC) originally associated with SAP R/3 was developed by Professor Wilhelm-August Scheer at the Institut für Wirtschaftsinformatik at the Universität des Saarlandes in the early 1990s. It is used by many companies such as IDS-Scheer for modeling and analyzing business processes.

The EPC model is based on two main concepts, Event and Function, complemented with a set of sequencing elements such as OR, AND, and XOR. Presented as an easy-to-understand model and notation, EPC belongs to the category of flat meta-models where the meaning of any portion of the diagram may depend on other portions arbitrarily far away. The reason, of course, is that EPC doesn’t have any notion of process involvement that enables it to handle multiple contexts for process analysis.

The major developers and users of EPC have recognized the need for a new generation of standard for process modeling. Many of them are now part of the BPMN2 initiative at the Object Management Group (OMG).

**UML 2.0**

The OMG’s UML 2.0 specification was completed at the end of 2004, the product of a lengthy development period. UML 2.0 has a very large scope, so this report will address only a few aspects of the new “activity model”. Activity models in UML 2.0 have been completely reworked from the 1.X versions. The main errors in the 1.X specifications were corrected, and the new model offers a robust base for process analysis. However, its technical nature makes it still primarily suited for business process automation. In its current state, UML 2.0 activity models cannot provide comprehensive support for dedicated business process analysis.

The UML 2.0 activity model has most of the characteristics of a structured meta-model and, in particular, distinguishes between the concept of activity (process equivalent) and
the concept of action (process step equivalent), thereby supporting the notion of process involvement in other processes.

However, the UML 2.0 activity model by its technical nature is still essentially aimed at system process designers. The information exchange notion is represented therein using concepts of parameters and "pins" specific to the programming world. This concern is totally legitimate and justified in relation to computer program design, but it is unsuitable for business process design.

Another criticism that can be leveled at the UML 2.0 activity model relates to the terminology used. The term activity is used to denote what the whole BPM community calls process. This same community uses the term activity for a process step. This causes terrible confusion among users. Understanding of UML 2.0 is often marred by errors in this respect.

It is, therefore, hard to see how the UML 2.0 activity model could serve as an analysis and communication support for business processes. The OMG is aware of these limitations and a few years ago it launched a complementary initiative, BPDM, specifically covering business processes. OMG also integrated BPMN notation following the merger with BPMI. Since these two initiatives – BPDM and BPMN notations – were launched separately, the two projects were integrated in two stages (see paragraph below on BPDM and BPMN2).

**BPMN – Business Process Modeling Notation**

After the BPML execution language was developed, BPMI launched a new initiative on graphic process notation, the BPMN 1.0 specification, which was released in 2004. BPMN is an undeniable step forward for a graphical representation of business processes. It specifically introduces the notions of messages and information flows that were lacking in most traditional process representations (IDEF, SAP EPC, UML 2.0).

BPMN 1.0’s primary scope was to represent executable business processes. This is why many artifacts such as exception handling, compensation handling, and error handling were incorporated. At its initial release in 2004, the notation appeared complex and not really appropriate to business users. But, as a matter of fact, it has become a de facto
standard for all kinds of process analysis, including business analysis. BPMN now appears to be the future of process modeling notations.

Another important point regarding BPMN is that the specification addresses only the issue of notation. BPMN includes neither a meta-model nor an exchange format. It would thus be difficult to discuss exchanging BPMN models.

Collaboration in this area led to the merger of BPMI with the OMG, which resulted in BPMN becoming an OMG standard. Version 1.1 of BPMN was published at the start of 2008 and comprises some clarifications and upgrades compared with Version 1.0.

Following its integration with the OMG, BPMN came up against the other business process standard being developed by the OMG: BPDM (Business Process Definition Meta-model). It is in the merger of these two standards that the future of process modeling lies.

**BPDM – Business Process Definition Meta-model**

The OMG includes a task force responsible for company business modeling specifications known as the "Business Modeling Integration Domain Task Force" or BMI DTF. This task force has established a development plan for business specifications, some of which have already been published, such as the Business Motivation Model (BMM) for strategy analysis or Semantic for Business Vocabulary and Rules (SBVR) for business rules. The table below gives a summary of BMI task force specifications and projects.
BPDM and BPMN have been jointly developed in the context of BMI. BPDM and BPMN are the principal line of development as far as process modeling is concerned. This thrust is part of the general modeling architecture promoted by the OMG under the name Model Driven Architecture (MDA). MDA is a framework for defining meta-models, converting them, defining the related notations and exchanging models and their diagrams in a standardized exchange format (XMI). The MDA framework therefore automatically provides the essential elements for any modeling standard.

BPDM is the first specification to cover all process analysis dimensions and to offer:

- **A formal meta-model for BPMN 1.1 notation.** This is a structured meta-model allowing processes, the people involved in them, and the resources involved to be contextualized. BPDM clarifies many ambiguous aspects of BPMN notation and offers a solid foundation for process definition, from business analysis to execution.

- **A unified interaction model** that takes into account not only interactions between processes, but also inter-process interactions; this is what we know as
process choreography (inter-process communications) and process orchestration (intra-process communication) respectively.

- **An event model**, making it possible to:
  - Describe situations arising from process roll-out;
  - Ensure synchronization between processes following detection of events arising from process roll-out;
  - Describe situations the processes are designed to control, otherwise known as "case handling".

- **A process delegation model** allowing stratification of the process approach by showing, for example, how organizational processes delegate some of their operations to system processes.

- **An exchange format** based on the OMG’s XMI standard.

The BPDM specification can be accessed at the following url: [http://www.omg.org/spec/BPDM/Current](http://www.omg.org/spec/BPDM/Current)

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**BPMN 2.0**

Since the BPMN and BPDM projects were launched in different contexts (BPMI for BPMN and the OMG for BPDM), it was necessary to complete the merger started under the BPDM project in a unified version.

On this occasion, the meaning of the acronym "BPMN" has been altered. It was changed from "Business Process Modeling Notation" to "Business Process Model and Notation", signifying that the standard includes both a process meta-model and its notation. The BPMN 2.0 project has the following objectives:

- To clarify some aspects of BPDM terminology not yet aligned with the BPMN 1.1 notation;
- To clarify some aspects of the BPMN 1.1 notation for which the meaning in terms of process logic was provided by the BPDM project;
- To provide a notation for process choreography (inter-process communication);
To provide an exchange format for process diagrams. (BPDM, in fact, currently only offers an exchange format for process models and not for their diagrams.)

The BPMN 2.0 specification is scheduled to be approved in 2010.

**Summary**

Standardization for business processes is currently in full swing, and significant progress has been made. The execution part, developed by OASIS with BPEL, continues its merger with Web services; the analysis and design part is shifting its emphasis from execution to business centric analysis.

The initial BPDM specification was a first essential step, which will be further completed in the BPMN 2.0 project. A little more time will be needed for this new process model generation to be adopted by all market players. The limitations of conventional approaches for solving present-day process analysis challenges, as mentioned at the start of this document, can now be seen, in terms of combining the notions of services and processes, taking process involvement contexts into account, controlling at-risk situations, delegating processes, etc.

Today, process modeling instances are changing, as is the formal and theoretical bedrock on which modeling stands, with concepts like the new structured meta-models. The pieces of the puzzle are coming together and the players in this market are re-positioning themselves to adopt the latest standards. Standardization of business processes is reaching a state of maturity.
MEGA’s Approach

Standards are a major factor for the adoption of a common vocabulary and common descriptions for business processes. MEGA was one of the first companies to join forces with BPMI, and has actively participated in the development of BPMN and contributed to the merger of BMI with the OMG. The OMG has a robust open modeling architecture to support process approaches covering both the IT side and the business side. Several MEGA employees hold positions on standardization working groups, allowing the company to actively participate in the latest developments underway at the OMG. MEGA is participating in the BMM (strategy analysis), SVBR (vocabulary and business rules), BPDM, and BPMN2 (business processes) initiatives, which now involve players from the world of business at the OMG and no longer just IT specialists.

With the growing success of The Open Group Architecture Framework (TOGAF), The Open Group has become more dynamic in capturing company architecture design and management methods. Large groups like Capgemini and SAP are now stakeholders and MEGA is following the work in progress with close interest. The collaboration between The Open Group and the OMG will bring together theory and practice for the greater benefit of users.
About MEGA

MEGA is a pioneer in enterprise architecture and business performance solutions, offering the MEGA Modeling Suite for business process analysis and enterprise architecture, and the MEGA GRC Suite for governance, risk, and compliance.

The company helps organizations understand, align, and control information at the enterprise level, anticipate trends and manage market changes, and reduce unknowns, delays, and costs.


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