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DOI
10.5220/0004420602580266

Publication date
2013

Document Version
Final published version

Published in
ICEIS 2013: proceedings of the 15th International Conference on Enterprise Information Systems: Angers, France, 4-7 July, 2013

Business Process Modeling Languages Supporting Collaborative Networks

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Keywords: Business Processes, Collaborative Network, Business Process Modeling Languages, Virtual Organizations (VO), VO Breeding Environments, Service-Oriented Architecture.

Abstract: Formalizing the definition of Business Processes (BPs) performed within each enterprise is fundamental for effective deployment of their competencies and capabilities within Collaborative Networks (CN). In our approach, every enterprise in the CN is represented by its set of BPs, so that other enterprises can see and potentially share them when developing integrated BPs. Adoption of a suitable BP modeling language (BPML) is therefore critical for this purpose, while challenging due to the variety of existing tools and standards each with different levels of expressiveness and ambiguities. So far, surveys published on BP modeling approaches have compared several features of the main BP languages and standards. However, these surveys mostly focus on specific standards and tools and not on different categories of BPMLs. Moreover, there are no surveys addressing the need to fulfil CN's requirements. Therefore, aiming to select the most suitable BPML for the purpose of modelling and representing BPs in CNs, while overviewing the defined BPML categories, the paper introduces a new categorization of the main BPMLs. Furthermore, focusing on enterprise collaboration requirements, a specific set of criteria is introduced for comparing these categories. Finally, different categories of BPMLs are compared, when addressing their suitability to support CNs.

1 INTRODUCTION

Applying Business Process (BP) technologies, comprising the introduced standards, tools, and techniques, have greatly influenced enterprises toward reducing costs, increasing productivity, and achieving competitive advantage.

Formalizing BPs, performed at every enterprise, constitutes a fundamental element for effective cooperation among different enterprises within the Collaborative Network (CN). While the BP Management (BPM) systems can handle formally defined BPs, there are also emerging Service Oriented Architecture (SOA) approaches that can utilize formalized BP definitions, to facilitate service interoperation and enterprise collaboration (Papazoglou and Heuvel, 2006).

Many Business Process Modeling languages (BPMLs) and some standards are defined and being applied to the formalization of BPs in enterprises. A number of published surveys review the adoption and evaluation of BPMLs (e.g. Roser and Bauer, 2005); (Ko et al. ,2009) and have already addressed the comparison between some features of the main BPMLs and the standards.

The existing surveys however mostly, focus on pair-wise or group comparison of BP standards or tools (e.g. BPMN, BPEL, etc.), and do not emphasize different categories of BPML to which these standards or tools may belong. For example the distinct features aimed by their design, such as to evaluate and emphasize their graphical, ontological, executional, etc. aspects of the BP modeling, is not assessed for this purpose.

In this papers, besides introducing a set of categories for BPMLs, aimed to support their evaluation and selection of more suitable BPMLs in support of CNs, a novel analysis method is introduced to distinguish CN's peculiarities and to appraise different BPML categories against them.

Hence, we first briefly present the main concepts of CNs and BPs, and motivating the CNs, needs to work with include formalized BPs (in section2). Then, we review the existing categorizations of the main BPMLs, and introduce our categorization (in section3).

Soleimani Malekan H. and Afsarmanesh H..
Business Process Modeling Languages Supporting Collaborative Networks.
DOI: 10.5220/0004420602580266
In *Proceedings of the 15th International Conference on Enterprise Information Systems* (ICEIS-2013), pages 258-266
ISBN: 978-989-8565-61-7

In Section 4, we structurally focus on the collaboration purposes, distinguish a number of most relevant criteria for comparing the introduced BPML categories, and analyze them for the aim of supporting enterprise collaborations.

Finally, our evaluation approach is discussed (in section5), and our conclusions are presented (in section6).

2 FORMALIZED BPs IN CNs

By collaboration, enterprises gain opportunities to share their resources, including knowledge, and information. This can be best achieved, by means of formalized BPs. BP integration is aimed by enterprises and also other organizations that wish to compose value-added services, beyond the capabilities of their individual organizations (Camarinha-Matos and Afsarmanesh, 2008).

Below, after reviewing some principal background definitions for CNs and BPs, we present an analysis of the BPMLs from the CN requirements point of view.

2.1 Background Definitions

A common definition of Collaborative Network is presented in (Camarinha-Matos and Afsarmanesh, 2008) as: "*an alliance constituting a variety of entities that are autonomous, geographically distributed, and heterogeneous in terms of their operating environment, decision making, culture and social capital, that cooperate/collaborate to better achieve common/compatible goals, and their interactions are supported by the computer networks.*"

The two main categories of CNs are the: Virtual Organization (VO) and VO Breeding Environment (VBE). In a VO, partners share their BPs and other resources to accomplish their common goals.

VBEs, which establish long-term alliances of organizations, capture and save BPs of partners in their directories. The broker in the VBE context then considers selecting and integrating BPs of different organizations to form new VOs responding to emerged opportunities. (Afsarmanesh et al., 2011).

BP is defined as a series of one or more linked procedures or activities, which collectively realize a business objective or policy-related goal. BPM comprises concepts, methods, and techniques to support organizational aspect of processes, which are needed for the design, administration, configuration, enactment, and analysis of BPs.

BP modeling focuses on design and execution aspects of the BPs (Havey, 2009). BP Modeling aims at representing an abstract but meaningful demonstration of the real business domains.

2.2 BPMLs in Support of Collaboration

Beginning of 90s WFMS, which initially was designed for automatic transformation of electronic documents, introduced new tools to enable business analysts with design and define BPs between systems. For depicting information exchange among systems, the behavioural concepts (e.g. sequence and merge) were then applied in BP modelling.

Later in 90s, based on the Business Process Re-engineering (BPR) as well as embedding the best business practices, vendors were able to integrate separate software modules, under the so-called Enterprise Resource Planning (ERP) systems. To support ERPs, the BPMLs have focused on dynamic aspects of the BPs. Nevertheless the interactions between the designed modules were not so easy to achieve.

For the sake of integrating legacy systems into customized applications and ERP modules, the Enterprise Application Integration (EAI) (Lee and Siau, 2003) has tried to remedy the problem of inefficient BPs' integration. So, interaction-enabling entities (e.g. messages) gained significance. This level of collaboration provided an infrastructure for cooperation of enterprises through resource sharing, while preserving their heterogeneity.

During the late 90s, deployment of XML for integration, changed the co-working intensity of enterprises to a higher level, called business to business (B2B) (Havey, 2009).

The challenge of coordinating the BPs adopted by companies, yielded in integrating autonomous and independent applications, via loosely coupled mechanism of SOA (Papazoglou and Heuvel, 2006).

SOA is applied to support alignment and integration of web services, to achieve their successful cooperation. Furthermore, the alliance of standard bodies, e.g. BPMI and OMG, in introducing the BPMN, facilitated the cooperation among organizations.

At Present, the BP mining (van der Aalst and Dustar, 2012) and diagnosis approaches that address BP monitoring and their continuous improvement, are promising research lines in BP context.

3 CATEGORIZATION STRUCTURE FOR BPMLs

Targeting the variety of existing BP languages and standards, every BP modelling category introduced in the main related publications focuses on a set of attributes and specification of the BPMLs. The focus of our categories lies on identifying the capabilities as well as adaptability features in each category, in relation to the criteria of facilitating collaboration through formalized BPs. Therefore, we first study a large number of related scientific publications, in order to select the set of most recent and relevant BPML publications.

In this section, first we briefly address the most relevant categories that are defined for BPML in publications, and then introduce our categorization.

3.1 Classification Approaches

Current reviews of BPMLs can be divided into two main classes of "*General Reviews*" and "*Particular Evaluation*". Publications that can be classified as "General Review" are mostly focused on general uses, and on encompassing the main specifications of the BPML categories. For example, (Ko et al., 2009) is a survey focusing on *Business Process Management standards*, and (Havey, 2009) focuses on "good" BP modeling architecture.

Another example is (Mili et al., 2010) that focuses on *overview of BP Modeling*, where it first addresses business goals and aspects (i.e. functional, informational, etc.), and then introduces the four categories of BPMLs, including: *Traditional* BPML (e.g. IDEF), *Object-Oriented* BPML (e.g. UML), *Dynamic* BPML (e.g. WS-BPEL), and *Process Integration* BPML (e.g. WS-CDL).

On the other hand, publications in the "Particular Evaluations" class focus on BPML categorization for specific purposes (Roser and Bauer, 2005); (Lu and Sadiq, 2007); (and De Nicola et al., 2007). For example, in (De Nicola et al., 2007) the categories are introduced around the subject of "introducing an ontological approach for BP Modeling", including Descriptive (e.g. BPMN), Procedural (e.g. XPDL), Formal (e.g. PSL), and Ontology-based (e.g. OWL-s).

3.2 Proposed BPML Categories

Considering the general purpose of our research, and comparing to the above-mentioned different classifications, we have first design a more comprehensive framework with six classes of: "graphical", "formal", "executional, "ontological", "interoperational", and "monitorial" to capture all kinds of BPMLs, as addressed in table 1.

Due to space limitation, the main characteristics of each of these six categories, and their main representative example BPMLs are only briefly described in the following subsections, while the main examples are also represented in table 1. Please note that in principle, it is possible for a BPML to be represented as an example of more than one category. However, here we have placed each BPML only in its most representative category.

Table 1: Our introduced categorisations.

BPML Categories	Categories' Members Examples
Graphical	IDEF, EPC, UML, BPMN
Formal	Petri-Net, Pi-Calculus, PSL, Reo
Executional	BPEL, WS-CDL, XPDL, YAWL
Ontological	OWL-s, WSMO, BPDM
Interoperational	RosettaNet, ebXML (BPSS)
Monitorial	BPRI, BPQL

The reasoning behind our categorization and how we outline the six specific classes is depicted in the graph of figure1.

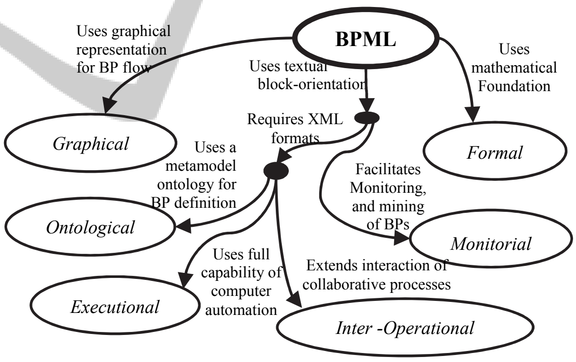

Figure 1: A tree graph of our categorization method.

Graphical BPMLs: The classical generation of these categories of modeling languages mostly emphasizes on illustrating the system behaviour and its abstraction in graphical picturesque format. They are not typically formal.

Formal BPMLs: Founded upon mathematical principles, these languages have emerged. Although, adoption graphical symbols has happened in some of these languages, but difficulties in user's understanding and interaction hold them mostly at theoretical and mainly academic utilizations.

Executional BPMLs: Computer executable languages let BPs to be deployed by software engines. They are developed based on XML structure, and clarify BPs by their computerized semantics, and mostly industries use them for BP modelling and service invocation.

Ontological BP Languages: As anticipated, this category focuses on modeling semantic capture. Also, try to constitute the base for an increasing number of BP modelling languages, each proposing different metamodels. The ontological layer in these languages clarifies the roles, entities, and interactions. This category has also the advantages of using XML formats.

Interoperational BPMLs: Modeling public sharable processes of partners, especially in E-Business interactions, among all business partners, is the key concern in this category. XML standard series are the main players in collaborative business processes.

Monitorial BPMLs: Contemporary BP modeling trends focus on diagnosis iteration of the BPM Lifecycle. The diagnosis consists of monitoring and resolving the deadlocks or problems in BP's flow. Furthermore, extract and unambiguous approach for recognizing BPs based on a dynamic logging of process behaviour, the so-called process mining (van der Aalst and Dustar, 2012).

4 BPML EVALUATION FOR CN CRITERIA SUPPORT

Putting emphasis on categories and not every BPML, multi-aspect evaluation of a phenomenon requires a methodology, to support maximal coverage of the target area. For the purpose of appraising BPMLs in supporting CNs requirements, we should consider both the BPs and the CNs aspects simultaneously. So, our designed evaluation methods as well as our evaluation process are discussed in following sub-sections, respectively.

4.1 Evaluation Method

For our evaluation, we are following a goal-based approach, described in (Goldkuhl and Lagsten, 2012). Several goal-settings have been introduced by different approaches. For instance a set of generic software process modeling objectives have been specified in (Curtis et al., 1992). Non-functional requirment's objectives are presented in (Chung and do Prado, 2009) supporting process dependency discovery, needed for change management. These context-aware objectives still hold today. But for our purposes, to support more effective BP collaboration in a CN, we further add the criteria "*to support enterprise collaboration*" into this context.

Extending the epistemological-view framework for BPMLs evaluation, introduced by (Frank, 1998); in our goal-oriented approach consist of the following steps: "Focus" on language categories, design the "contextual model" for evaluation", "review" the context and then distinguish the "primary" and "complementary guidelines" to evaluate our findings through "context analysis".

Based on the debate in section 2, our primary aim is to focus on supporting collaboration through formalized BPs and evaluating BPML categories for this purpose extract the collaborative intention aspects within the CNs.

This goal-based approach has focused on qualitative criteria and indicators, related to setting goals systematically. As the evaluation method, we adopt *Critical Success Factors* (CSFs) method, and follow the requirements of achieving established objectives, by running a *Critical Success Factors Analysis* (CFA) explained in (OASIS, 2008)

CNs have their particularity, and the formalized BPMLs should support achieving CNs' goals. To better characterize the particularities of the CNs, and especially VOs and VBEs, we apply the "Reference model for Collaborative Networks (ARCON)" (Camarinha-Matos and Afsarmanesh, 2008).

We have performed a CFA study to find out the CN-compliant CSFs and the vital requirement indicators for achieving our goal. This study is based on technical reviews and experts opinions. We then discuss the BPML categories versus the identified and recognized CN requirement indicators.

4.2 Evaluation Process

According to the (ARCON) model (Camarinha-Matos and Afsarmanesh, 2008), and our discussion and CN's definition in section 2.1, the following aspects indicate the main constitutional objective themes in the CN discipline, extracted from its standard definition:

- **Goal-orientation** [focusing on goals through business interactions]
- **Infrastructure for Commonality** [support the co-working and coordination toward goals]
- **Managing Node Heterogeneity** [support non-uniform properties, e.g. operational processes]
- **Network enabled** [supported by the computer networks]

As the first CSF, to enable successful collaboration, BP modeling tool should provide enough "comprehensibility" for partners (e.g. BP Analysts). The "ease of use" is another issue, which supports convenient interoperation through CNs. “expressiveness for behaviour”, is the next challenging issue for enactment of BPs in CNs. Also, for cost-effective achievement of goal in CNs, “accessibility” of BP documents and standards has to be considered. The coverage of CN’s objective and the introduced CSFs are illustrated in table 2. The asterisk represents the minimal coverage between our CSF and CN’s objective elements.

Table 2: Coverage of CN’s objectives and CSFs.

CSFs / CN’s Objectives	Comprehen-sibility	Ease of Use	Expressiveness for behaviour	Accessibility
Goal-Orientation				*
Commonality	*	*		
Heterogeneity	*	*	*	
Network enabled			*	

Finally, we introduce a series of generic required indicators from BP modeling context to appraise the suitability of our categories for CNs.

Understandability: Ease of interpretation and capture by which under specified circumstances, the user can interpret an instance, model, analyse, and develop the BP model (Mendling et al., 2007)

Expressability: Capability to represent the process model’s attributes like: control, resources, flow structures, data, and etc.(Kiepuszewski, 2002)

Flexibility: The ease with which in BP modeling the modifications are possible in types and instances, based on incomplete bstraction (Lu and Sadiq, 2007).

Availability: The amount and degree to which business process modeling documents in specific formats, and standards are accessible and adoptable. They are ready-to-use for desired collaboration by the organizations (Milanivic, 2008).

Enactability: The ambition of acquiring capability to completely execute of the BP model directly and without exploiting extra tools and information (Russell, 2006).

Figure 2 represents the CFA analysis diagram.

The figure depicts our evaluation method.

5 DISCUSSION

We are following a two-dimensional descriptive evaluation. The first dimension consists of BP modeling languages categories. Six comprehensive categories are introduced and defined. Please note that we focus here on BPML categories instead of the languages, so there are a number of choices of BPMLs in each category for CNs to select. Due to their importance in our evaluation model, the analysis of six categories versus requirements indicators are further defined and exemplified.

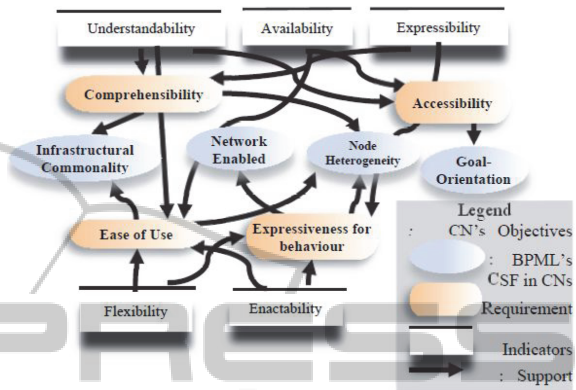

Figure 2: Interconnections in CFA Diagram.

5.1 Availability

The notion of availability has its roots in reliability idea, which implies, ratio of the time that users have received the service according to prior level of agreements. Unavailability of a modeling BP language happens when we don’t have “steady-state”, “intervals”, and “user-perceived” availability (Milanivic et al., 2008). For our evaluation, we assume availability as the existence of BPML documents within the context of CNs.

The annual research of BPM Market (Wolf and Harmon, 2012), since 2005, thoroughly has surveyed the BPM trends in different aspects. In its 2012 report, the survey runs around evaluation of BPM is addressed in that report.

It can be noticed that the availability of graphical BPMLs is at the highest level. For example BPMN’s usage is within 60% of all organizations. Meanwhile, there is less availability for ontological BPMLs (e.g. BPDM). Although, the debate on the timely development of trends is not the focus of this paper, but decrease in attraction level of BPEL during recent years is noticeable. Even interest and availability of UML and EPC slightly decrease. Also according to that survey the pervasiveness of the rest of BPML categories (e.g. interoperational, formal) are the lowest in usage ranking. So, it is expected that organizations initiate collaboration in CNs applying graphical BPMLs, and especially BPMN.

5.2 Enactability

As it is discussed in (van der Aalst et al., 2003) that after accomplishing "process design" and "system configuration" at the third step of the BPM's lifecycle "process enactment" is located right before the "diagnosis" step. Which make it challenging. The more independent is the BPML from the technology and vendor executable environments, the better its enactability in CNs.

Adopting formal semantics for better enactment (ter Hofstede et al., 2010) supports – and does not contradict the increase in understandability (van der Aalst et al. 2003) – in support of the requirements in CNs.

Executional BPMLs enable the enactments of BPs, for sharing BPs and automatically executing them through machine understandable structures. But, despite their common executional capabilities, they have their particularities.

BPEL describes behaviour of BPs within interaction between process and its partner, and efficiently supports orchestration. WS-CDL executional aspect consists of choreography. Within the executional BPML category, some of the languages such as BPEL have restrictive syntax, and some (e.g. YAWL) have exact executional syntax (ter Hoftstede 2010).

Some formal languages - except embedded notions like (pi-calculus in WSCDL) provide graphical enactability interface, e.g. in reo and Petri net. Ontological BPMLs, because of their XML supporting structures have convenient level of enactability

In interoperational BPML category, XML enactability is embedded, but with some difficulties e.g. naming and XML reusability in RosettaNet (Damodaran, 2004) or deficiencies in event handling during interactions (Green et al., 2007). Ontological BPML category focuses on semantic aspects (e.g. OWL-s), and runs enactment in an abstract level.

5.3 Expressability

To express different kinds of BPs (e.g. private, public, or collaborative) in the CN environment, the expressability power of BPML is important. The expressive power of modeling language represents the possibility of expressing constructs in direct or indirect manner (Kiepuszewski et al., 2002). These constructs comprise: control, resources, data, organization, execution, and behaviour of a business models. Expressability encompasses the notion of suitability, which focuses on modeling and implies conformance of the BPML with for instance 43 workflow patterns introduced in (Russell et al., 2006). Although, the evaluated domain in that paper does not focus on BPML categories, but provides a general inception for comparison of BPML categories.

While we map BPMLs' evaluation in (Russell et al., 2006) to our proposed categories, a number of these patterns e.g. "discrimination", "milestone", "partially join", etc. are the kind of patterns which languages and standards have difficulties in expressing them.

Nevertheless generally, the graphical BPML category has better compatibility, while in executional category- except for YAWL- languages have some deficiencies, for example for supporting "Arbitrary Cycle", because of their rigidity in capturing real-world abstraction.

Formal languages category members have good capability of expressiveness, because of their mathematical foundation, e.g. Petri-Net; expressive power (van der Aalst et al., 2003) used in workflow pattern design, or constraint automata is used in the Reo. Ontological languages use logical basis for instance in OWL-s for representing better expressiveness.

5.4 Flexibility

Due to inherit dynamicity of CNs, the flexibility of the applied BPML for representing their BPs is fundamental for representation. BPMLs try to sustain their dynamicity in coping with expected and unexpected changes, through adopting flexibility. In (Schonenberg, 2008) four types of flexibility are mentioned as follows: *"design", "deviation", "underspecification"* and *"change"*.

For flexibility support, mostly in two first above-types, BPMLs rely on their pre-design notations and are abstract from flexibility concerns. On the other hands, the block-based (rule-based) BPMLs could manage the flexibility in higher level (e.g. deviation or underspesification) (Lu and Sadiq, 2007).

In the graphical BPML category, flexibility within different languages and standards is considered in different ways. In BPMN, by predicting three types of diagram for collaboration, and for the concepts of *pool* and *lane*, the decomposition for changes is possible. The *frame* and *frame heading* techniques in UML 2.0 Activity Diagram let the elements of the languages to be defined and described in a modular and flexible structure. So, "design and deviation" are supported.

In formal category, mathematical concepts help to retain model identity, for instance the structure of *Atomic* and *Complex* activities in PSL. Besides, graphical representation in Petri-Net and Reo simplifies the modification flexibilities. So, “design and deviation” are supported.

The XML-based structures usually support flexibility in design and changes, and even underspesification, to certain extent (Schonenberg, 2008). YAWL, BEPL (inter-relations), and WSCDL (choreography) support various types of flexibility. Even RosettaNet PIP techniques, channelizes the modifications. This benefit supports within block-based structure. Ontological BPML category considers flexibility at convenient level, which let modification to be based on primary definition of BPs (e.g. process model definition in OWL-s).

5.5 Understandability

CN stackholders are quite varied, and BP representation shall facilitate their proper underestandability for their interactions. This notion has been reviewed and analysed during several works especially verses the complexity as the other extreme. Generally, understandability comprises the following two aspects in (Mendling et al., 2007):

- Model-related factors, which affect the understandability, e.g. unambiguity, simplicity.
- Person-related factors, which have close relations to domain knowledge of participants and their experiences.

Although, for supporting understandability, there is a number of guidelines e.g. the smaller size of the model, makes models better for understanding but, the ease of “comprehension of a model”, “presenting without error”, and “labelling less ambiguous” constitute main understandability’s principles in BPMLs.

Usually, graph-based languages are more understandable than rule-based ones (Lu and Sadiq, 2007). That is also the reason why they become more popular at enterprises. However, within graphical standards, BPMN is more complex for understanding compared to UML and EPC (Green et al., 2007). Even by adopting graphical depiction and interfaces, the formal category of BPMLs is less understandable than graphical languages, namely EPC versus Petri-Net.

Executional and ontological BPML categories because of having less cooperation with human side, their understandability is under criticism. Also, the interoperational standards (e.g. the PIP technics in Rosettanet) are at a more abstract level of (Damodaran, 2004).

5.6 Comparing Results

A set of requirement indicators is represented for evaluating BPML categories at the second level of our evaluation. Through goal-based approach and by using a CFA method, we have identified six requirement criteria that help us to measure the collaboration support by BPMLs. The result of our evaluation is summarized in table 3.

In this table we use four levels of support as: *Strong*, *Sufficient*, *Moderate* and *Not addressed* levels, from the CN’s members relative points of view. Because of the analytical theme of the paper, we have opted for the qualitative survey method.

As it is studied in previous sections, the *graphical* category has the main advantages of understandability and availability. *Executional* category is strong in enactability and flexibility of BPs, further to offering less ambiguity whose importance in modelling the real world should not be disregarded. Although lacking interactive graphical depiction, needed for less technical users, is a serious criticism.

Table 3: Summary of comparisons.

Requirements indicators in support of CN / BP Modeling Languages Categories	Understandability	Expressibility	Enactability	Availability	Flexibility
Graphical	++	+/-	+/-	++	+/-
Formal	--	++	+/-	--	+/-
Executional	+/-	+/-	++	--	+/-
Ontological	+/-	++	+/-	+/-	+/-
Interoperational	+/-	+/-	++	+/-	+/-
Monitorial	N	N	N	N	N

++: Strong support +/-: Sufficient support
--: Moderate support N: Not Addressed

Formal Languages due to complexity of their user interaction, are not pervasive, but should be considered as the supporting layer for soundness for graphical modeling languages. Ontological BPMLs, because of their well-defined semantics, and their focus on graphical and executional aspects, are desirable but not yet sufficiently mature and popular.

The interoperational BPML category is just used for support of interaction/collaboration, but they mostly emphasize interactions instead of abstract BP modelling from real world, also their flexibility level and understandability problems are of serious concerns for users. Monitorial BP Languages are not practically fitting in this context to evaluate, although promising for future CN requirements.

6 CONCLUSIONS

In this paper, we presented a review of BPMLs, from the point of view of their suitability for supporting collaboration among enterprises. Rooted in (Frank, 98), we extended the model for evaluation of BPML categories. First our "*focus*" represents categories of BPMLs (section3). Then the "*contextual model*" is proposed based on CN's reference model. Our "*review"* step resulted in six BPML categories (table 1). As the guidelines for evaluation, the "*primary guidelines*" is provided by CSFs, and the "*complementary guidelines*" gives us requirement indicators (table 2 and figure2). Finally, representing "*context analysis*" of these guidelines through discussions (in subsections 5.1-5.5) and the summary (table 3).

Due to adopting a partially qualitative analysis approach used for reviewing and evaluating BPMLs, our analysis conclusions are not fully objective. Nevertheless, our results in table 3 represents the most appropriate categories of BPMLs that can support each aspect of collaboration, e.g. for technical BP expressability purposes, the formal and ontological BPML categories are more suitable than others, especially for adoption in VBEs and VOs.

Applying the results gained in our evaluation approach, in practice to model the processes in typical CN context, and depending on the environment requirements, the domain experts may tends towards taking advantage of the BPMN or OWL-s for BP integration purposes.

ACKNOWLEDGEMENTS

This work is partially supported by the FP7 project GLONET, funded by the European Commission.

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