

COLLABORATIVE METHODS FOR BUSINESS PROCESS DISCOVERY

MÉTODOS COLABORATIVOS PARA A DESCOBERTA DE PROCESSOS DE NEGÓCIO

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ABSTRACT

Information flows across the organization are complex and procedures employed to understand, share and control organizational knowledge and experiences should be properly supported by collaborative environments. Nevertheless, few collaborative methodologies had been proposed to describe and evolve business processes. Existing tools don't provide the right methods for business processes discovery, modelling, monitoring and improvement. In the future, business processes models should be the result of cross-team and cross-departmental collaboration, with involved business people sharing their personal knowledge and formalizing it.

This discussion paper focuses on collaborative process discovery methods, tools and the importance to integrate local information into coherent and sound process definitions. Business Alignment Methodology is a methodology that provides guidance about how organizational practices and knowledge are gathered to contribute for business process improvement against current Business Process Modelling approaches.

Keywords: Business Process Discovery, Collaborative Work, Methodology, Modelling

RESUMO

A complexidade dos fluxos de informação organizacionais e os procedimentos aplicados na compreensão, partilha e controlo do conhecimento e experiência organizacional deverão ser suportados de forma apropriada por ambientes colaborativos. Porém, as propostas existentes sobre metodologias colaborativas para a descrição e evolução de processos de negócio são muito limitadas. As ferramentas actuais não providenciam os métodos apropriados para a descoberta, modelação, monitorização e controlo de processos de negócio. No futuro pretende-se que os processos de negócio resultem de colaborações entre diferentes equipas e departamentos, em que os actores organizacionais partilham e especificam formalmente o seu conhecimento individual.

Este artigo apresenta um método e uma ferramenta colaborativa para a descoberta de processos de negócio, bem como a importância de integrar informação individual e colectiva em descrições de processo coerentes e robustas. A Metodologia para o Alinhamento de Negócio, em oposição às abordagens correntes para a modelação de processos de negócio, é uma abordagem que descreve a forma de capturar conhecimento organizacional de forma a contribuir para a melhoria dos processos de negócio, a partir de práticas de trabalho individual e colectivas.

Palavras-chave: Descoberta de Processos de Negócio, Trabalho Colaborativo, Metodologia, Modelação

JEL Classification Z19

INTRODUCTION

The business world is continuously changing and is now aware of the need to improve interactions employee-employee and employee-client. Now organizations feel the urgent need to share, communicate and improve business processes descriptions that uncover such interactions. Information flows across the organization are complex and procedures employed to understand, share and control organizational knowledge and experiences should be properly supported by collaborative environments (Althoff, Bomarius, & Tautz, 2000).

An adequate supporting system requires attention to continuous changes and business process descriptions should emerge and evolve based on knowledge sharing within an organization (Mengoni, Graziosi, Mandolini, & Peruzzini, 2011). The time that senior managers defined and controlled business process models is coming to an end. In the future, business processes models should be the result of cross-team, cross-departmental and cross-organizational collaborations, with all the involved operational actors sharing their personal knowledge and formalizing it.

There is a vast literature about principles and theories behind collaborative processes and tools (Huettner, Brown, & James-Tanny, 2007). However, few collaborative tools had been specifically proposed to describe and evolve business processes. Existing tools don't provide the right methods for business processes discovery, modelling, monitoring and improvement. They don't allow gathering current experience and knowledge for business processes discovery and improvement purposes. They don't support the underlying collaboration mechanisms of operational actors that enable them to cope with changing contexts or react to existing problems. These are the main reasons for high rates of failure and disappointment in many approaches, methods, and techniques used for Business Processes Management (BPM).

There are several problems associated to current BPM approaches, such as: (1) existing BPM approaches are based on the top-down paradigm; (2) knowledge acquisition and modelling are time consuming activities; (3) existing BPM approaches don't provide means to react to change; (4) existing BPM mechanism don't allow identifying business practices which are diverging from its base business process description.

Business Alignment Methodology (BAM) is a methodology for business process improvement that sets out principles and strategies for improving the quality of business processes. This methodology provides guidance about how organizational knowledge and work practices are gathered and discussed to improve business process. BAM encompasses the following phases:(1) Business Process Discovery, (2) Business Process Supervision and (3) Business Process Analysis and Improvement.

A key driver of BAM, concerning business process improvement, is the ability to facilitate the alignment of business processes and daily work practices. In this regard, this paper focuses on the process discovery phase, particularly on the collaboration processes and tools that allow integrating local information about work practices into coherent and sound process definitions. A brief discussion of existing approaches for business process discovery (Ghose, Koliadis, & Chueng, 2007) allows identifying weaknesses and proposing improvements included in this methodology. One of the contributions of this paper is to present a new collaborative tool to support the process discovery phase through the annotation and discussion of business process descriptions among all operational actors somehow related with such processes.

The remainder of this paper is organized as follows; section 2 presents the state of the art about business process discovery methods. Section 3 briefly describes the phases of the proposed methodology, emphasizing on the business process discovery phase. Section 4 presents MAPA, a tool for Business Process Discovery. Finally, Section 5 concludes and introduces future work.

BUSINESS PROCESS DISCOVERY METHODS

Traditional Methods to discover business process requirements include: an initial meeting, interviews, questionnaires, observation and ethnography. However, these traditional methods are usually costly, take a great amount of time to complete and introduce a high percentage of human error (Houck, 2007). There are several reasons why traditional BPM approaches do not achieve expected goals:

- Top-down approach that provides a broad organizational perspective, however with lack of detail.
- Different people have different viewpoints and it is difficult to achieve shared process definitions.
- Organizations structures, rules and practices are constantly changing, it is important to provide mechanisms to align business process descriptions with actual structures, rules and practices.

Ethnography represents a form of descriptive observation where researchers embed themselves into a work (Ritter, Lyons, & Swindler, 2007). Within this field, a number of strengths and weaknesses have been identified. The strength of these insights is that they reflect actual work practices. Observation also uncovers features of the work that are not obvious to participants because they are deeply embedded in what they do on a day-to-day basis. The weaknesses are due to the fact that the wealth of information that is contained within an ethnographer's notes is highly unstructured and personalized. Recently, several authors have proposed automated process discovery techniques (Aalst et al., 2007; Houck, 2007). Nevertheless, these techniques are restricted to records created by Process-Aware Information Systems (PAIS), which are not always available.

From our perspective, Business Discovery (BD) requires hybrid techniques to detect process problems and the root causes for these problems (Houck, 2007). Interviews allow gathering viewpoints from selected key actors, while collaborative methods allow discussing such viewpoints among a larger number of actors enabling asynchronous discussions that reduce the need of face-to-face discussions. Regarding business processes, main benefits of collaborative tools are: uncovering several viewpoints of the same activities, an enhanced visibility of business processes to operational actors and deeper analysis of business processes.

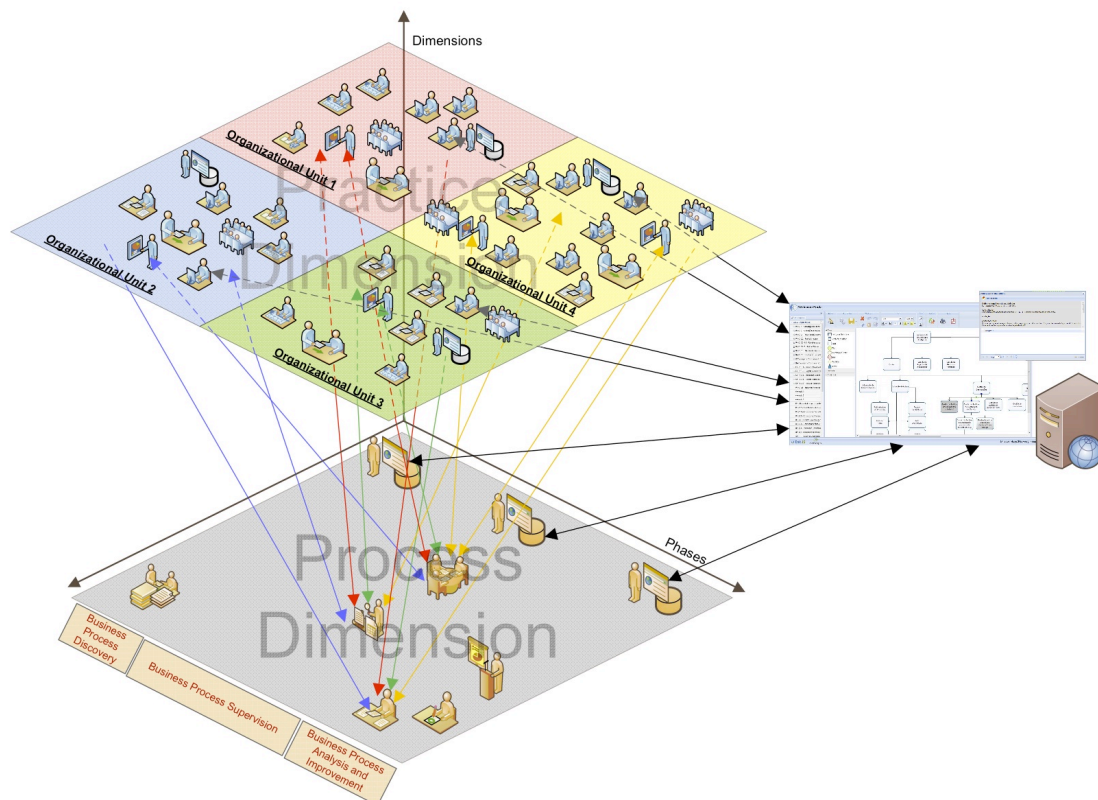
It is important to emphasize the difficulties common to ethnography and collaborative methods. In particular, when it comes to bridging the gap between business and IT view on business processes, results from these methods may have to be processed and structured to develop more accurate business models. We consider that a good collaborative tool that provides structured data of business processes for IT engineers should allow to discover, share, analyse and improve business process descriptions from non-structured and personalized information. Whereas the proposed approach allows non-structured annotations and discussions as well as personalized information, it provides the means to enable accurate, precise and structured representations of business processes.

METHODOLOGY

It is argued that existing business process (BP) methodologies do not offer the necessary flexibility or agility that new approaches require. Process-centric approaches tend to emphasize process (work-flow, decision, information, activities) as the dominant dimension (Hollingaworth & Services, 2004), but an activity-agent-product centric approach must also capture aspects about interactions between human, activity and informational components. Recent research in BPM pays more attention to flexibility as a way of coping with the unpredictability of business processes (Mutschler, Weber, & Reichert, 2008; Reichert, Dadam, Jurisch, Kreher, & Goser, 2008). Based on this new context, BAM methodology represents a multidisciplinary approach that allow business analysts to improve business processes discovery, monitoring and analysis, paying attention not only to process but to product, information and human dimensions through work practices.

Although business processes do involve different actor perceptions, this flexibility is important to adjust business processes in response to changes in the organization, in order to reach a global view of the real organization. BAM approach addresses the impact of individual knowledge, collaboration and knowledge sharing from a business perspective by examining actions at individual, group and organizational levels. To assist business analysts in creating, sharing and learning business process, the methodology proposes a two-dimensional approach. The two dimensions, Practice and Process (figure 1), will ensure the proper structure to articulate individual, group and organizational knowledge with business analyst knowledge acquisition. The Practice dimension explores day-to-day work based on practitioners descriptions. The methodology proposes to assist organizations in its efforts to assess and manage problematic situations of specific daily practices, and develop and implement solutions that help manage these problems. The Practice dimension covers real information needed to systematically support or reject many of decisions about the business process models. In the Process dimension, business analysts based on information of the Practice dimension formulate business process reviews and iterative business process improvement efforts.

Figure 1 - Business Alignment Methodology



The present approach integrates collaborative methods into a methodology that allow discover and improve business descriptions. There are three phases outlined in the methodology: (1) *Business Process Discovery*, (2) *Business Process Supervision* and (3) *Business Process Assessment and Improvement*. *Business Process Discovery* phase main goal is an initial process specification through interviews and collaborative methods. *Business Process Supervision* phase involves provides assurance that daily practices follow the base business process model or reveals the need to take corrective actions because real activities performed by operational actors are different from those specified in the business process model. In *Business Assessment and Improvement* phase, initially, business analyst and managers analyse real business performance and produce assessments focused on business processes issues, respectively. After that, the results gathered during assessments enable improvements

and consistent refinements of the base business process model creating a new version. Each phase includes specific working methods and goals that are presented in the following subsections.

Since the focus of this paper is on business process discovery methods, we only describe in detail the business discovery phase. The other two phases only have a brief description of methods and goals.

Phase I - Business Process Discovery

The first goal of a *Business Process Discovery* (BPD) is just to get personal descriptions of business processes. Operational actors have knowledge of their actions, nevertheless their knowledge is personal and to a certain extent tacit, hence it is hard to formalize. In fact, most organizations simply do not know their end-to-end processes accurately or in detail, since their process knowledge is tacit and decentralized (Verner, 2004). On the other hand, organizational knowledge crosses functional divisions and outside the organization (clients, suppliers). Therefore, organizational processes embody specific accumulated knowledge that is not confined to particular individuals or groups. This knowledge, which is explicit, must be transmitted but this is not enough. Business process modelling approaches should consider the effect of continuous business processes improvement as a reaction to fast-changing environments in the business world.

BPD phase aims at developing an organizational profile of people, activities, technology, and information in order to understand business processes. This phase includes two main sub-phases: (1) *Learning (Eliciting) Business* (LB) and (2) *Modelling Business* (MB). *Learning Business* is knowledge acquisition, a set of tasks that can be the most time consuming portion of BPD. Some of the major considerations include the choice of the methods to use for acquiring specific types of knowledge (Koschmider, Song, & Reijers, 2010). In order to serve this purpose, the methodology will not consist only on translating natural language descriptions of business processes but also includes guidance in the form of instructions, templates and examples. Modelling Business consists in an intensive interaction between actors of the two dimensions, operational actors and business analysts.

Learning Business

Initially, the sub-phase *Learning Business* includes interviews where the business analyst interacts with operational actors as key to the success of business discovery. At an organizational level, the methodology proposes to assist organizations in their effort to assess and manage problematic situations based on daily actions and implement solutions related to these problems.

Table 1: Learning Business Process guidelines

Guideline	Description
Goal	Find out organization's needs regarding business discovery, analyse and understand problems with senior managers, and define an initial business process view.
Purpose	The business analyst finds current process practices to include in an initial business process description.
Method	Initial meetings with senior managers mainly covered questions about the organization's mission and goals. Also important was information retrieved through interviews and questionnaires. The organization also delivered several documents relevant for an initial development process definition. A kick-off meeting mainly covered a description of the collaboration process and a presentation of a process draft.
Actors	Business Analyst and operational actors.
Activities	Kick-off meeting, interviews and questionnaires. Business process specification.
Milestones/Outputs	Organization's goals list and initial. Business process specification.

The BAM methodology was designed for explicitly addressing the social dynamics of business process specification. It is based on social interactions as proposed in a two-dimensional space. The Practice dimension covers information needed to systematically support or reject many process decisions based on the result of daily experiences. The exact process representation concerns activities, resources, decision points and work flows (topology). In the Process dimension, business analysts capture best practices from the practice dimension that leads to business process reviews and improvement. The dynamic interplay between these two dimensions (practice and process dimensions) shows the synergy between activities performed by key operational actors and activities described by business analysts involved in BPD. Table 1 outlines the guidelines regarding method, actors, activities, milestones and goal.

Modelling Business

After an initial business process definition, business analyst starts modelling business processes. The sub-phase *Modelling Business*, from the knowledge management point of view, involves several stakeholders (business analyst, process owner, organizational unit responsible and operational actors) into four interrelated activities: (1) model construction; (2) model revision and evaluation and (3) model approval (table 2). Model construction is an activity that transforms tacit and implicit knowledge and specific contextual situations into more structured and documented forms. The model revision and evaluation activity results from a critical review of existing knowledge about business processes.

All participants may present alternative proposals that result from associating different facts and new meanings. The updating process provides support to business process model discussions and negotiations to correct represented activities and other aspects. Finally, the model approval activity concludes the interaction process and collaboration among the parties involved in a business process model specification by approving or rejecting the model.

The model revision and evaluation activity will use the annotation as a mechanism to capture the updated proposals made by business actors. Annotations are used mainly to make proposals to correct the model (corrective maintenance), to capture changes in action or interaction contexts (adaptive maintenance), to make free comments that could anticipate problems (preventive maintenance) and promote continuous process improvement (perfective maintenance). If business actors detect any misalignment between the model and their knowledge of activity current states-of-affairs, they can make a textual or graphic annotation with the correction proposal.

Booth dimensions (practice and process) involve the same actors (business analyst, organizational unit responsible and operational actors). Organizational unit responsible has modelling responsibility of the practices within his organizational unit. At process dimension, modelling responsibilities should be attributed to process owners. All actors have annotation and reviewing rights over practices of their organizational units. Nevertheless, they also have rights to annotate and review processes related with their work.

Table 2: Modelling Business Process guidelines

Guideline	Description
Goal	Support business process model discussions and negotiations to improve an initial proposal.
Purpose	Obtain a business process model accepted by operational actors.
Method	The business analyst constructs and initial business process model, which triggers business process model changes based on annotations of involved operational actors. The phase ends the approval of a final version of the business process model.
Actors	Business Analyst, Organizational Unit Responsible and operational actors.
Activities	Model construction, model revision and evaluation model approval.
Milestones/Outputs	Business process models.

Phase II — Business Process Supervision

In the *Business Process Supervision* (BPS) phase, formal control mechanisms are designed in order to ensure that operational actors carried out real business activities as described by business models. Control mechanisms consist of three main activities: (1) compare real business activities with base business models (2) annotations/reviews and (3) identify new business descriptions.

Each annotation/review should be adding or validating new features to improve the business process. During this phase, the organizational unit responsible and operational actors will analyse improvements against oldest daily practices. In this context, operational actors will become more and more confident on suggestions of the business analyst. From iteration to iteration, confidence will increase and results will start appearing.

The milestone that marks the end of this phase and the beginning of the *Business Assessment and Improvement* phase is crossed when business analysts and operational actors agree that: business process model describe the detailed behaviour that address real needs, major problems have been solved, business process practices provides some useful value to the organization and these practices are stable enough to implement a new and improved business process version.

Phase III — Business Process Assessment and Improvement

Business Process Assessment is a mean for organizations to identify their strengths, weakness, existing improvement activities and key areas for improvement. It enables organizations to determine the current state of their business processes and to develop improved models. In the begin of the Business Process Assessment and Improvement (BPAI) phase, the business analyst analyse change proposals and through a comparison between base business process models and proposed changes, a new set of models is build to correct work that is not proceeding well, by showing where adjustments need to be made. In the end, the results gathered during assessments enable improvements and consistent refinements in order to produce an improved set of business process models. This phase ends when all the involved actors agree that: the objectives set during BPD (and modified throughout the second phase) have been met; and especially if all participants are satisfied with the new business process model version. BAM directs attention to organization's needs for communication, coordination and collaboration within and between operational actors and business analysts. The methodology is about how business processes are represented and how business analysts acquire and use knowledge to improve business process. BAM methodology includes model and control activities that intend to develop and implement organizational business processes (process dimension). Nevertheless, control activities also include monitoring and tracking of day-to-day work (practice dimension).

MAPA – TOOL FOR BUSINESS PROCESS DISCOVERY

To support the Process Discovery Phase, we used a tool named MAPA Discovery (Monitoring and Annotation of Processes and Activities) (Castela, Dias, Zacarias, & Tribolet, 2010). MAPA features are:

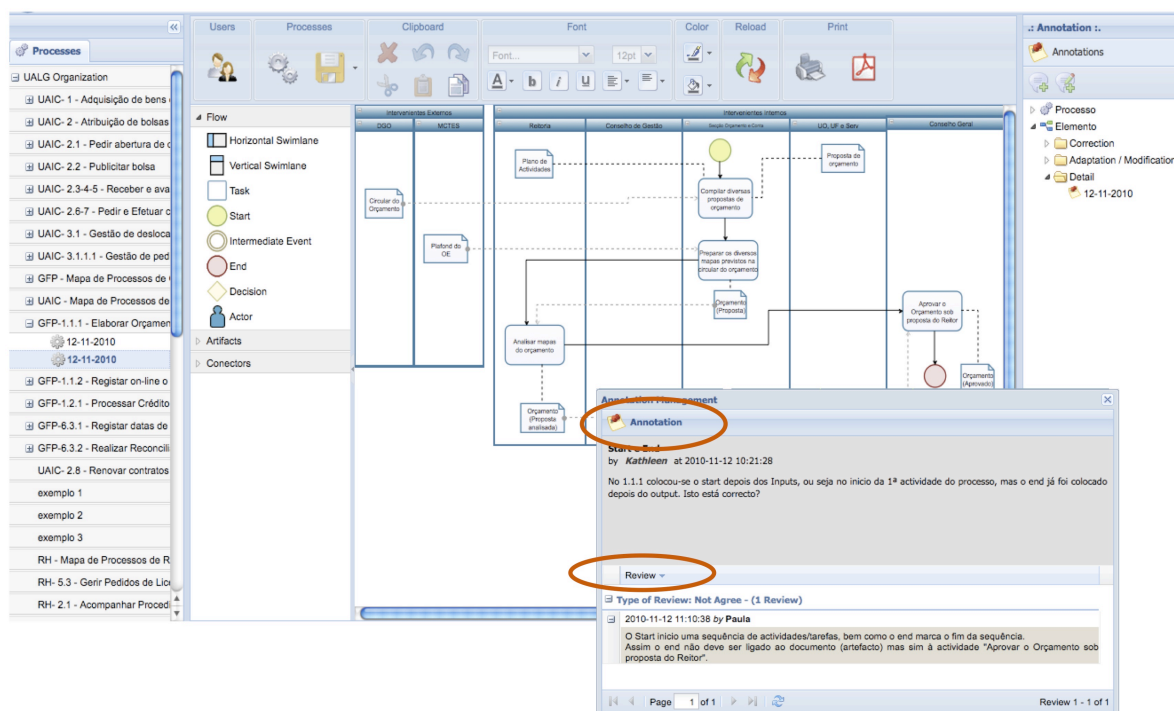
- Graphical Business Process Editor
- Support for annotations, revisions and approval of business process diagrams
- Different levels of granularity
- Configuration of access rights and notifications
- Allowing annotations of diagram elements
- Version and Annotation History

MAPA complements traditional graphical business process edition capabilities with generic features of collaborative tools (comments and discussions) and requirements specific to collaborative

business process modelling by embedding a annotation-review-approval process named PROASIS (Castela, Zacarias, & Tribolet, 2010) where annotations, revisions and approvals are performed by users with specific responsibilities within each process. PROASIS identifies four organizational roles (annotator, reviewer, approver and modeller) and four types of actions (annotation, review, approval and modelling). Modellers create and update activity or process diagrams using standard graphical edition features. Annotators are operational actors with rights of making annotations on process elements (activities, information flows or other actors), process fragments or processes as a whole. Annotations are (1) change proposals or (2) arguments regarding perceived errors or lacking details. In MAPA, annotations are used mainly to make proposals to correct models (corrective maintenance), however, they can be used also to capture changes in (adaptive maintenance), to make free comments that could anticipate problems (preventive maintenance) and promote continuous process improvement (perfective maintenance).

Reviewers are actors with rights to comment supporting (agree) or counter-arguing (not agree) such annotations by making revisions of the annotation. Each annotation initiates a discussion thread around the annotation subject that is replied through one or several revisions. Approvers are actors with rights to end discussion threads by approving or discarding the proposal or argument contained in the initial annotation. Once approved, modellers proceed to make the changes or corrections on the corresponding diagram. Once modellers complete approved modifications, a new version of the model is created and annotations, revisions and approvals are cleared. However, this previous version is not deleted. Instead it is shown as part of the diagram history. Each annotation, revision and approval triggers e-mail notifications to all actors associated to the corresponding indicating the process, type of transaction and actor who performed it. According to PROASIS, MAPA should provide two perspectives; (1) Process and (2) Organizational perspectives.

Figure 2 - The MAPA tool



The process perspectives encompasses two main different views; (1) Execution View and (2) Process Owner View. The execution view aggregates the activity and its context (used and produced documents, information systems, previous and subsequent activities, annotations, etc.). The process owner view shows process descriptions and its history. It also shows the organizational units crossed by the process. The Organizational perspective encompasses two main views (1) Organizational unit

where the actor works, and (2) Organizational unit headed by the actor. This view also shows the processes where the organizational unit participates. However, the current version of MAPA only includes the Process Perspective and Process Owner view.

Figure 2 depicts an image of the MAPA interface. The top area includes some standard editing commands. In that area, the tool includes two essential buttons: users and processes. The processes button allows creating new processes or new processes versions. The users button allows configuring users rights regarding processes. Users are associated to processes through roles (annotator, modeller, reviewer and approver). The left side of screen shows the list of processes that the particular user has modelling, annotating, reviewing or approving rights. The process list shows not only the current process version but also previous versions. The window over the diagram shows one annotation and review of the process in the main window. The right side area shows all the annotations and reviews of a particular model version. Central area is reserved for a standard process edition task.

CONCLUSIONS AND FUTURE WORK

This paper described a methodology for Business Process Improvement with focus on Business Process Discovery phase, particularly on collaboration methods and tools support. Incorporation of multiple viewpoints into the business modelling process also contributed to learn and change business processes specifications. Embedding a annotation-review-approval process named PROASIS, MAPA tool improve participation, providing a structured support to disseminate business process models, express opinions and negotiate perspectives.

The proposed methodology is the result of several case studies for business process improvement. However, a pilot case study regarding collaborative process modelling was conducted using the MAPA tool. Preliminary results show that it stimulated the involvement of all actors (business analyst, organizational units responsible and operational actors) in validating (and thus updating) the enterprise model, aligning it with the reality in an interactive and shared way. So, annotations and reviews fit the requirement of being a suited mechanism to generate, debate and insight about the organization in order to propose changes and improve the organizational business model.

In the future, we will focus on incorporating new functional requirements in the MAPA tool in order to: (1) model daily actions (practice model) and (2) align practice model (practice dimension) with business process models (process dimension). Future work will also include new efforts to gather empirical data on its use that will help refine the methodology.

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