Collaborative Process Design in Cloud Environment

Jiří Kolář and Tomáš Pitner

Masaryk University, Faculty of Informatics
Botanická 68a, 602 00 Brno, Czech Republic
{kolar,tomp}@fi.muni.cz
http://fi.muni.cz/~xkolar2/

Abstract. This paper presents an approach to adoption of BPM in an organization, with emphasis on collaboration with process participants. We present subset of our methodology for end-to-end BPM adoption, aimed to describe collaborative processes mapping, iterative process design and further process improvement. Such technique preserves organization's flexibility as it helps to obtain realistic processes easily adaptable to changing business requirements. We further explain how to foster collaboration by use of a cloud-based environment for process design and define some more general requirements on such environment. We approach general obstacles of BPM adoption observed by practitioners and scientist and explain how the methodology can help to deal with some of those obstacles by involving process participants to collaboration on process design and improvement.

1 Introduction

Business Process Management (BPM) is often considered as the quite rigid approach to managing organizations. As many recent successful adoptions of BPM were implemented in large enterprises, BPM is very often recognized as mostly suitable for large organizations. Thus many Small and Medium Eenterprises (SME) stay away from this management approach as they consider it clumsy and threatening to hinder their main competitive advantage [6]. We see elimination of the rigid flavour of BPM as a challenge and work on end-to-end methodology suitable for agile adoptions of BPM in SME sized organizations. [16] The methodology puts emphasis on agility and collaboration during adoption process, which should result in establishment of realistic processes, foster interactions among process participants and provide hospitable environment for continous process improvement. In this paper we present a subset of the methodology focused mainly on collaboration between process experts responsible for process modeling and process participants – subject matter experts performing the actual work within particular processes. Further we set requirements on supportive Cloud-based Process Collaboration Environment (PCE) which supports the collaboration namely during process mapping, design, further improvements and provide space for rich feedback and discussion.

A. Haller et al. (Eds.): WISE 2011 and 2012 Combined Workshops, LNCS 7652, pp. 55–69, 2013.

Firstly we briefly introduce modern BPM and state of the art in the area of Cloud-enabled BPM. Then we focus on recent research related to common obstacles of BPM adoptions, choose several of them relevant to our context and leading to problem definition. In the following section we evaluate some existing research approaches applied to solve the problem and highlight the main points that served as an inspiration for our approach. In the last section we present subset of our methodology and set requirements for the Cloud-based PCE supporting principles defined in the methodology. In the last part we conclude our findings and outline directions of further research.

1.1 Shift of Focus in Modern BPM

The contemporary understanding of Business Process Management can be seen from two different perspectives. From the Management perspective, BPM is a dynamic management approach where operations of an organization are described by processes. A process is defined as a repeatable sequence of activities, linked to organizational business goals. Execution of the processes contributes to fulfillment of those goals [5] [4]. On the other hand, BPM can be seen from the technical perspective which embodies design of Enterprise Information Systems (EIS) and the way of thinking about system's behavior. Such EIS design often incorporates use of Business Process Management Systems (BPMS) for process design and execution. However BPM can be still adopted without engine-based process automation [7]. Modern approach to BPM is often called "holistic BPM" encompasses both perspectives, addresses strategy, people, business processes and technology and puts emphasis on continuous process improvement after initial adoption phase [1] [2] [11]. In last few years quite some of BPM technologies have reached acceptable maturity level and the focus of many practitioners and researchers has consequently shifted from the technological perspective of BPM to the adoption process itself and the organizational changes towards the process-oriented principles [7] [4]. Such adoption process often involves significant changes in target organization, such as flattening the organization structure, definition of processes and adoption of role-based model. [7] Large organizations usually have performed their flattening in a natural way due to their size, as they use some form role-based model and often they have some kinds of workflow definitions. Therefore the BPM adoption does not mean complete change of mindset. A bit different situation is observed in SME's, as they stick very often with functional hierarchical organizational models, their tasks are often tight with concrete persons and a lot of their work is organized at hoc. In this case BPM adoption means a big step forward and significant organizational changes [14] [15].

1.2 BPM in Cloud Context

Cloud based BPMS is a wish of many BPM experts since the times of introduction of Software as a Service (SaaS) cloud model. As BPM technologies are complex and hard to deploy and maintain, SaaS sounds like perfect solution,

where the entire complex of BPMS could be provided as service [3]. However in practice most of BPMSes are far from being provided as SaaS due to several reasons. Even the most complete BPMSes are still being tailored and modified for most of deployments, which in not so easy to do if they would be provided as SaaS. Secondly, BPMS is often used to integrate services running local intranets whereas integration of such local services with remote Cloud environment is still seen as an issue in the integration context [21]. Although we can see some efforts to provide entire BPMS functionality in SaaS, these services have still not matured at the moment. Something a bit closer to the state of maturity are Cloud based environments for process design (PCEs). Such environments can be provided in cloud quite easily. They operate similarly to other popular SaaS collaborative applications, and can be very helpful during process design and foster efficient collaboration, one of critical factors of well designed processes.

2 Problem Definition

Recent research, case studies and reports from practice [24] [22] [23] identify several obstacles of adoptions of BPM in organizations. In this section we are going to describe some of them considered as important in context of our research focused on SME sized adoptions, discuss how they are related to each other and formulate the problem we are trying to solve.

As BPM in its holistic form is quite modern approach, we still lack methodologies and best practices for end-to-end BPM adoptions. [7] [13] [10] We can find several useful techniques for initial phases of adoption, initial business analysis and organization assessment such as Business Motivation Model [19] and later implementation of a BPM solution, usable in later technical phases of adoption [25] [26],but we lack end-to-end methodologies guiding from the early phases of adoption, such as gathering the information for process modeling, process design, mapping business goals to processes and linking business KPI's to process metrics. [1] [13] [27] According to mentioned sources, lack of methodologies covering end-to-end adoption process with respect to principles of holistic BPM is a valid problem to be solved.

Second important obstacle is related to external subjects conducting BPM adoptions. BPM projects are often being conducted by team of BPM specialists , an external subject or eventually internal team operating independently from the rest target organization. [8] Such conducting subjects often acquire only simplified external view on organization's business and they do not involve target organization's process participants as much as they should. They often perform contracted part of the job, results are handed to target organization, necessary changes are executed and eventual SW solution deployed. Usually adoption process organized according to such waterfall model ends at this point, there is no space for feedback from process participants, correction of faulty or inefficiently modeled processes. Such waterfall adoption often does not bring core

BPM adoption benefits, as BPM adoption should be iterative process which continue after initial adoption further by continuous process improvement and maintenance [28].

One of very important outcome of BPM is building systematic knowledge-base in target organization. Mapping and defining processes do not only help to codify the existing know how, but also bring opportunity to share knowledge across process participants. [28] [8] It is an opportunity to review how the work is currently done, evaluate efficiency, provide space for fresh ideas how to make the work better and help to maintaining and extend shared knowledge base. [8] [7] [10]. Well expressed by [30]: "Process can serve as transitional object for mental models". In other words, involvement of process participants into process design phase can be seen as a social activity, which lead to extension of their knowledge. At the same time more space for efficient collaboration across all process participants is being created by observing such "mental models" of the others. [28] [8]. Thus according to those findings, systematic involvement of process participants and organization stakeholders in process design has positive effect on quality of modeled processes, make participants more accountable for their tasks within their process and initiate collaboration among process participants. According to mentioned obstacles, we believe there is a need for complex methodology which provide guidelines for performing end-to-end BPM adoption, performed in agile manner in short iterations, with strong involvement of target organization's participants in adoption process. Such methodology should also guide organization trough the later phases following initial adoption and describe how to further maintain defined processes, update them to reflect changes in business and perform continuous process improvement.

3 Literature Review

3.1 Collaborative Process Methods

One of the important sources of inspiration is "G-MoBSA framework" [8]. This research heavily focused on socio-cognitive perspective of process modeling provide some significant new ideas how to extend the concept of knowledge creation and sharing during adoption process and propose complex methodology for group model building and complementary argumentation schema. The framework also proposes a BPM experimentation module, which serve as a discrete simulation environment. Despite the fact this framework bring several highly innovative ideas about collaboration on process design, it put a lot of requirements on process participant's knowledge of the proposed framework, which can lead to waste of participant's time dedicated to process design. Because in most cases the time process participants can spend on process design collaboration is limited, the tool they use should be simple and intuitive and their activity should be very straightforward, to capture maximum of their "subject matter knowledge". Also the argumentation schema seems to be a bit overkill for most of cases, as several iteration and concluding discussion can provide same results as long and complicated argumentation according to the schema, which also do not reflect the

fact that arguments of people with stronger position on the organization have usually higher importance and taken as authoritative.

We can find more simple and intuitive approaches to the same problem such as [29]. This research effort is focused primary on design of simple collaboration tool based on MediaWiki software with semantic extension. Use of such intuitive technology seems to be very close to our approach, however this paper also introduce simple process language defined inside Semantic Wiki used for process description. Such approach can be useable for very simple processes, nevertheless as there is BPMN 2.0 L1 subset, intuitive enough to be even understandable by people without knowledge of BPMN notation, but still extendable to complete process model, use a non-standardized process description language does not make much sense today.

One of the most complete methodologies for end-to-end BPM adoption, which can serve in many ways as inspiration for development for mode light-weighted methodologies is CBM-BPM-SOMA developed in IBM. It is a merge of three separate methods linked to each other. This triplet cover technique used for organization assessment and business analysis (Component Business Modeling - CBM), the core method focused on process analysis (BPM) and technically-oriented Service Oriented Modeling and Architecture (SOMA) mainly focused on efficient identification, definition and composition of services [9]. However this methodology is designed for adoption of large scale full featured BPM solution, which includes automation by usage of one IBM BPM products and integration of various services and systems. Such solutions fit well complex BPM solutions of large enterprises, but they seem not suitable for agile small scale BPM adoptions. There are some other approaches which outline the whole adoption lifecycle like [27], but those does not seem to be detailed enough to be successful.

3.2 Process Collaboration Environment (PCE)

We mentioned before an idea of PCE an environment for collaborative process design is not completely new and many important BPM vendors also visible in Gartner's magic quadrant such as IBM, Signavio, Intalio, Pega [12] make extensive efforts to develop server-side environments for collaborative process design. However most of them allow only local installations on private servers, which get them closer to "private cloud" concept. Some existing public cloud services rely on open-source technologies. Probably the most popular tool of that type is Oryx editor, developed as open source project [20]. Oryx is being tailored by several BPMS vendors for example Signavio and Alfresco. Oryx itself is only visual modeling tool, and for full blown PCE it have to be extended for some advanced features such as mechanism for providing and managing feedbacks, real-time multi-user collaboration and change tracking.

4 Results

4.1 Agile Methodology for Collaborative Approach to Process Design

In this section we will present subset of our methodology focused on small-scale BPM adoptions. This subset is focused primarily on collaboration of initial process design and also on further collaborative improvement of processes. We will put emphasis on involvement of process participants, as they play key role in gathering of requirements in initial process design as well as consequent iterations focused on process improvement. Early draft of the methodology was applied in practice so far in two case studies. First case study was performed in commercial environment, SME software company: IT Logica s.r.o [18] ,focused on Web-Application development. Second case study was performed in ICT department of Masaryk University in Brno and was focused primarily on ICT services provided at University [17]. In both cases agility and need for more iterative approach to process design and need for further process maintenance was identified as a drawback of our methodology, so we did recently several changes towards more iterative agile principles. Planning the BPM adoption Adoption consists of several phases. At the end of each phase results should be reviewed and the plan for forthcoming phases should be detailed. In general estimation of effort for each phase is not easy at the beginning and many details about next phase are uncovered at the end of preceding phase. We should also keep in mind that BPM adoption often means changes in both organizational structure and used ICT technologies. This means that changes should be committed iteratively and all new systems should run in parallel and migration should be very careful. Obvious seems to be usage of conventional project management tools which help project manager to deal with planning complexity and make the plan systematic and understandable.

4.2 Adoption Participants

BPM adoption should start with identification of participants. Key participants should be chosen very carefully as their contribution can significantly influence the whole adoption. We have to make sure all participants are properly informed about the adoption process, they understand the adoption goals and they should be convinced about potential benefits of adoption process.

We are going to describe following participant roles:

- Sponsor
- Organization's management
- Adoption coordinator
- Process analyst
- EIS designers and developer
- Process participant
- Process maintainer

Sponsor. This role usually belongs to organization owner or CEO. Sponsor provides resources for adoption process such as funding and allocates internal human resources. His commitment is absolutely necessary for success of adoption and he has to clearly understand potential benefits, risks and overall impact on organization. Organization's management Each manager has to be fully familiar at least with impact of adoption on his area of responsibility and also understand the big picture of the adoption. On the side of lower management we face often fear of loss of responsibility and importance. This is very important to be solved, managers play important role in the adoption and we have to carefully explain all benefits adoption can bring to them and make sure all their fears are dispelled. Adoption coordinator Usually member of external "BPM team". He usually acts as Project manager of the adoption and he is the core person responsible for entire adoption process. He has to plan the adoption process carefully, execute it and periodically monitor the progress. He should be familiar with organization's business context, cooperate closely with Sponsor and Organization's management. He should be experienced process analyst familiar with issues of process modeling and manage team of process analysts.

Process Analyst. Usually also member of external "BPM team", responsible for interviewing process participants, modeling and documenting organization's processes. Good communication skills are a must. He has to have strong knowledge of process modeling techniques and he should have at least basic knowledge of organization's business domain as well.

EIS Designers and Developer. Internal or external person responsible for design of EIS in target organization. He should have at least basic knowledge of BPMS technologies if a BPMS is used and understand at least basic BPM concepts. He should be aware of desired impact of adoption on organization's EIS.

Process Participant. Internal organization's worker performing activities of modeled processes. He usually has a key knowledge about how the process works in details and he should serve as main sources of information about modeled processes. Similarly to organization's managers, participants are often afraid of negative impact of BPM adoption on his work. Thus we have to carefully explain all benefits adoption can bring to him and make sure he is willing to collaborate.

Process Maintainer. Internal person made responsible for further maintenance and improvement of processes after adoption. He should work closely with adoption coordinator and team of process analysts and learn as much as possible. He should learn how to model and modify processes, synchronies changes between organization's business goals & objectives and processes, how to set measures on processes and transform measured data into KPIs. In short, he should be able to perform those steps periodically after end of initial adoption on his own and further develop the organization's processes.

4.3 Setting Preceding the Adoption

There are several activities, which should be done shortly after kickoff the adoption process.

Introductionary Meeting. There should be a meeting which introduce the plan of adoption and create common understanding across all involved subjects.

Such meeting should be attended at least by:

- Sponsor and part of organization's management directly involved in adoption process
- Adoption coordinator, eventually some process analysts
- As much as possible process participants
- Process maintainer

On such meeting we should present most important facts about the adoption and provide space for discussion Presentation should cover:

- Basic facts about the adoption, such as purpose, goals and expected outcomes
- Highlight the importance collaboration across all the involved subjects
- Outline the whole adoption plan and rough time schedule
- Brief introduction of process used process modeling technique
- Introduction of used PCE
- Rough structure of process interviews

PCE Setting. We have to make sure all users of our PCE are able to access it and know how to use it. We should also provide a person supporting PCE users to achieve maximum contribution. There should be some example processes as well as feedbacks, so users can use it as a template.

4.4 Adoption Phases

Adoption consists of several phases performed in a recommended order. However in some cases the sequence of these phases has to be tailored to the situation. For example when the business goals and objectives of the organization are relatively simple, but the business of the organization itself is built on critical mass of EIS components and ICT services, the analysis of those systems turns to be more important and it can be performed earlier. However this leads to the bottom-up approach to BPM adoption, which is not really in scope of the researched methodology.

We are going to describe following phases:

- Organization assessment phase
- Initial process mapping phase
- Iterative process improvement

Organization Assessment Phase. In this phase we gather context information about organization and its business, collect business related information and use it as an input for process analysis and design. These activities are done by Adoption coordinator by performing interviews with organization's management and root stakeholders.

Roles involved: Sponsor, Organization's management, Organization's management, Adoption coordinator

Phase inputs:

- Previous efforts of organization assessment
- Business plan
- Any documents describing organization structure
- Definitions of metrics and previous business data
- ICT services documentation

Phase activities:

1. Review and refine business plan & vision
2. Review and refine goals and objectives (G&O)
3. Review and specify business metrics and KPIs mapped to objectives
4. Describe in detail organizational structure, including roles and responsibilities
5. Describe business components (organization units)
6. Describe ICT services both consumed and provided internally and externally
7. Create priority list of business activities
8. Create complete list of relevant processes mapped to business activities

We first collect the AS-IS state, discuss it with the management and define initial TO-BE state. Nevertheless TO-BE state should not involve much reengineering at this stage. It can involve:

- Business plan re-engineering
- KPI's and metrics definition and re-engineering
- Estimation of quality and costs of ICT services
- proper mapping of G&O to processes
- clear definition of roles

For more formal description of organization business plan&vision and Goals&Objectives we can use some more formal techniques such as Business Motivation Model (OMG 2008). However BMM is quite complex technique and can fit only for organizations with more complex business planning. Phase outputs:

- Refine business plan, vision,
- G&O and related KPI definitions
- Description of organizational structure with subordinations, roles and responsibilities
- Prioritized list of business activities mapped to existing processes

Initial Process Mapping Phase. To obtain realistic processes that correspond to reality, the involvement of each process participant to the process definition in "design time" is crucial. Otherwise we can easily end up with idealistic process definitions dreamed by management that have nothing to do with reality. The more intuitive technology we use for sharing the modeled processes with process participants, the more efficient collaboration we achieve.

Phase inputs:

- Prioritized list of business activities mapped to existing processes (from previous phase)
- Any documents describing activities involved in modeled processes
- KPI definitions (from previous phase)

Phase activities:

1. Complete prioritized process list (existing and new) with process owners assigned
2. Interview process participants and define initial processes
3. Create Detailed BPMN 2.0 models of chosen processes and write complementary descriptions
4. Define roles within processes and map them to organization's roles
5. Identify and refine process metrics linked to KPI's
6. Set up PCE and publish processes there.

Phase outputs:

- Prepared PCE
- Complete list of prioritized processes with assigned owners and roles
- Initial version of process BPMN 2.0 models and descriptions published in PCE
- Clear definitions of process metrics and mapping to KPI's
- Initial feedbacks about processes from participants stored in PCE

The main responsibility of good process design of the modeled processes lies on Adoption coordinator. It is generally assumed that the processes should be modeled by Process Analysts who are dedicated to this activity, but they do not usually understand each process in detail. Thus they have to cooperate with process participants who are involved in the activities performed within the process. Initial set of defined processes should be also approved by organization's management and sponsor of the BPM solution. Steps of the initial process mapping phase are described in Figure 1. Here the adoption coordinator captures the scope of the organization and creates list of processes. Then he models and describes the selected processes and publishes the draft to the PCE. At this step the process participants and organization's management should provide rich feedback and comments, they have to identify parts of the process which are faulty, unclear or too general. Such feedback is stored in the PCE. After the predefined period of time, Adoption coordinator collects the provided feedback and closes the initial phase.

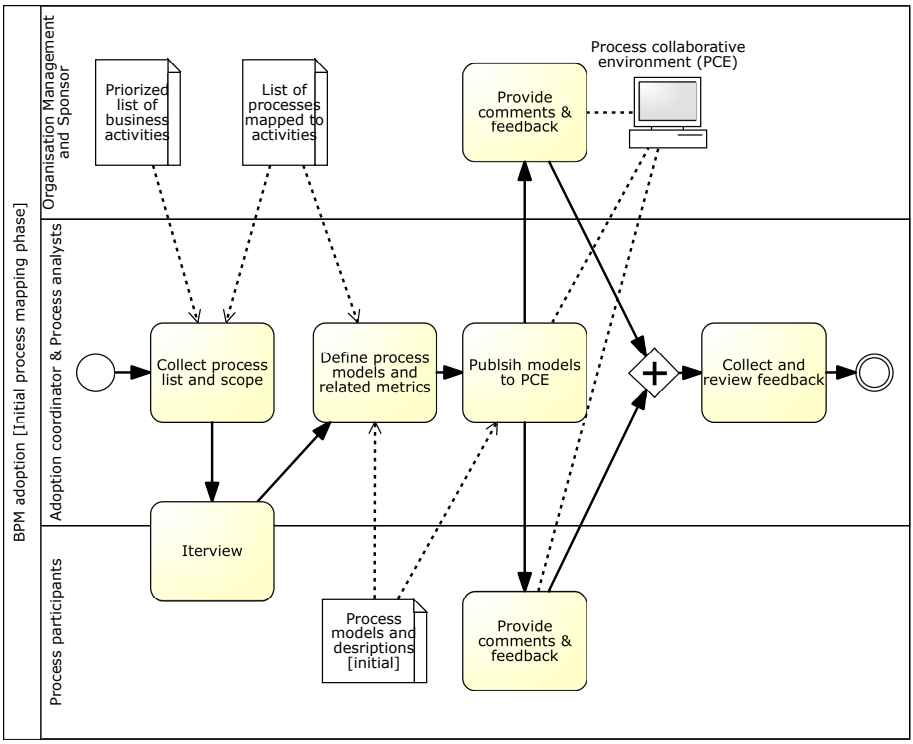

Fig. 1. (Initial process mapping phase)

Iterative Process Improvement. This phase should be performed in short iteration cycles (I would recommend 1-6 months), the anticipated changes should be also of reasonable size, corresponding to the available human resources. Phase inputs:

- Feedbacks about processes from participants and management stored in PCE
- Process update requests (2+ iteration)
- Process data (2+ iteration)

Phase activities:

1. Modify process models and descriptions according to feedbacks and change requirements
2. Discuss changes and get approval with Organization's management and Sponsor
3. Publish updated processes to PCE and open for discussion
4. Implement changes in processes in EIS
5. Measure process execution automatically or manually
6. Collect process data
7. Let the Organization's management and Sponsor to evaluate measured data

8. Collect Process update requests from Organization's management and Sponsor

Phase outputs:

- Modeled and described processes published to PCE
- Updated processes implemented in organization's EIS
- Process data
- Process update requests for next iteration

Steps of this phase are described in Figure 2. Here the Adoption coordinator initiates first iteration of improvement phase, reviews collected feedbacks and modifies defined process models according to it. Modified models are reviewed by organization's management and are either approved or disapproved and send back for further modification. In case of approval the solution designer publishes modified version to the PCE and implements the approved processes in EIS. Implementation depends on the agreed level, it can start from simple modification of existing activities in EIS for completing process-engine based implementation in a BPMS. By completing these steps the implementation processes are measured. In case of basic implementation of conventional EIS processes, they have to be measured manually, by collecting events indicating performance of particular activities or even by noting progress per process. In case of automated monitoring tools, data are collected automatically by such tool. After the period of measurement, process data are evaluated by Organization's management, and process changes are requested for processing to the next iteration.

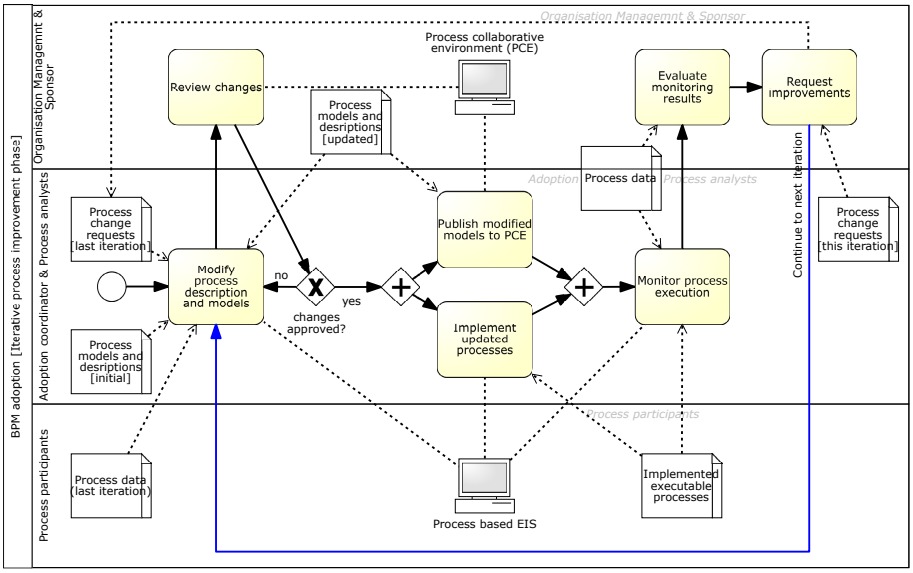

Fig. 2. Iterative process improvement phase

4.5 Cloud Environment Requirements

BPM adoptions including any form of BPMS-based implementation are usually done context of a chosen technology. Choice of the technology often depends on factors such as desired level of automation, amount of human tasks in processes, ICT technologies already present in target organization,budget for BPMS software and many others. Because we want to keep our methodology versatile and technology independent we set just very general requirements on PCE and let the subject performing the adoption to choose the most suitable tool which will fit project size, complexity and general adoption context. PCE, a software application used to support the methodology providing an environment for broad collaboration on designed processes should fulfill following general requirements:

- Provide simple interface or integration with modeling tool for publishing process models and their text descriptions
- Track revisions and changes done by particular user in published processes back in history at the very beginning
- Display categorized list of published processes to a user
- Display diagram of each process with complementary description and chosen comments of other users
- Allow users to comment on particular process or it's part
- Allow users to mark faulty or inefficient part of process model or description (optional)
- Allow user to propose process changes and improvements
- Allow administrator to manage visibility of comments among users

In most simple cases any kind of WIKI, or web Content Management System which allow users to write comments to content can be considered as the tool for PCE.. Ad-hoc solution built on organization's Document Management System can serve for this purpose as well. Some process authoring environments or modeling tools also provide PCE functionalities and allow users to collaboratively model processes. However this can be too complicated for process participants, as they usually have poor knowledge of process modeling.

There are several potential advantages of moving PCE into cloud environment:

- Efficient sharing and real-time collaboration
- PCE is easily accessible from any environment and OS, it does not require any local installations of the dedicated tools
- Centralized storage allows proper versioning, tracking of changes and history

5 Conclusions and Future Research

According to amount of existing research around collaborative process design we believe that we are working on valid research problem. Extending the knowledge in collaboration can help to perform BPM adoptions better and leverage full potential of BPM even in SME context. The presented subset of methodology should contribute to solution of defined problem and requirements on collaboration tool should help to choose or develop the right technology that fit for

particular situations. We believe in further improvement of our methodology according to feedback from practice and we want to end up with comprehensive set of guidelines of the whole adoption process. Our aim is to keep the methodology versatile and technologically independent, provide guidelines for as much aspects of the adoption as possible, but also provide space for ad-hoc customizations, so the methodology still can be tailored to particular situation. Modern Cloud-enabled collaborative tools help to foster better collaboration in many cases and we believe that process modeling can be one of them. However the human factor remains still most crucial influence in BPM adoption context and the will to collaborate across all subjects have to be initiated by wise decisions made by people and a PCE still remain just a tool that can support such collaboration.

Acknowledgements. "This work was supported by the European Union's territorial cooperation program between Austria and the Czech Republic of the under the EFRE grant M00171, project "iCom" (Constructive International Communication in the Context of ICT)."

References

1. Ackoff, R.L.: Re-creating the Corporation: A Design of Organizations for the 21st Century. Oxford University Press, New York (1999)
2. Jackson, M.C.: Systems Thinking: Creative Holism for Managers. Wiley, Chichester (2003)
3. Jiang, J., Le, J., Wang, Y., Sun, J., He, F.: The BPM Architecture Based on Cloud Computing. In: KAM 2011: Proceedings of the 2011 Fourth International Symposium on Knowledge Acquisition and Modeling. IEEE Computer Society (October 2011)
4. Smith, H., Fingar, P.: Business Process Management: The Third Wave. Meghan-Kiffer Press, Tampa (2003)
5. Harmon, P.: Business Process Change: A Manager's Guide to Improving, Redesigning, and Automating Processes. Morgan Kaufmann, San Francisco (2003)
6. Raymond, L., Bergeron, F., Rivard, S.: Determinants of business process reengineering success in small and large enterprises: an empirical study in the Canadian context. Journal of Small Business Management 36(1), 72–85 (1998)
7. Jeston, J., Nelis, J.: Business Process Management: Practical Guidelines to Successful Implementations. Butterworth-Heinemann (2008)
8. Adamides, E., Karacapilidis, N.: 'A knowledge centred framework for collaborative business process modelling'. International Journal of Business Process Management 12(5), 557–575 (2006)
9. Fiammante, J.: Dynamic SOA and BPM: Best Practices for Business Process Management and IBM Press (2009)
10. Singer, R., Zinser, E.: Business process management — S-BPM a new paradigm for competitive advantage? In: Buchwald, H., Fleischmann, A., Seese, D., Stary, C. (eds.) S-BPM ONE 2009. Communications in Computer and Information Science, vol. 85, pp. 48–70. Springer, Heidelberg (2010)
11. Gartner Research: Gartner position on Business Process Management, Gartner Research note, ID: G00136533 (2006)

12. Gartner Business Process Management Summit, Gartner Research note (April 2011)
13. Indulska, M., Chong, S., Bandara, W., Sadiq, S., Rosemann, M.: Major issues in business process management: a vendor perspective. In: Proceedings of the Pacific Asia Conference on Information Systems, PACIS 2007 (2007)
14. Chapman, R., Sloan, T.: Large firms versus small firms - do they implement CI the same way? The TQM Magazine 11(2), 105–110 (1999)
15. Spanos, Y., Practacos, G., Papadakis, V.: Greek firms and EMU: contrasting SMEs and large-sized enterprises. European Management Journal 19(6), 638–648 (2001)
16. Kolar, J.: A framework for Business Process Management in small and medium enterprises. Unpublished Dissertation Proposal. Masaryk University (2011)
17. Kolář, J.: Procesní analýza pro Centrum Informačních Technologií Filozofké fakulty MU. Unpublished commercial case study (September 2011b)
18. Kolář, J.: Procesní analýza pro společnost IT Logica s.r.o., Unpublished commercial case study (July 2011c)
19. OMG. Business Motivation Model (BMM) Specification, v1.0. (2008), http://www.omg.org/cgi-bin/doc?formal/08-11-02.pdf (retrieved June 2012)
20. Oryx website from, http://bpt.hpi.uni-potsdam.de/Oryx/ (retrieved June 2012)
21. Dillon, T., Wu, C., Chang, E.: Cloud Computing: Issues and Challenges. In: 2010 24th IEEE International Conference on Advanced Information Networking and Applications (2010)
22. Mertens, W., Van den Bergh, J., Viaene, S., Schroder-Pander, F.: How bpm impacts jobs: An exploratory field study. IEEE Computer Society (2011)
23. Chong: Business process management for SMEs: an exploratory study of implementation factors for the Australian wine industry. Journal of Information Systems and Small Business 1(1-2), 41–58 (2007)
24. Imanipour, N., Talebi, K., Rezazadeh, S.: Obstacles in Business Process Management (BPM) Implementation and Adoption in SMEs (January 23, 2012), SSRN: http://ssrn.com/abstract=1990609
25. Aksu, F., Vanhoof, K., De Munck, L.: Evaluation and Comparison of Business Process Modeling Methodologies for Small and Midsized Enterprises Intelligent Systems and Knowledge Engineering, ISKE (2010)
26. Roser, S., Bauer, B.: A Categorization of Collaborative Business Process Modeling Techniques. In: 7th IEEE International Conference on E-Commerce Technology Workshops (CEC 2005 Workshops), Munchen, Germany, July 19, pp. 43–54. IEEE Computer Society (2005)
27. Benjamin, P., Erraguntla, M., Mayer, R., Painter, M., Marshall, C.: A Framework for Adaptive Process Modeling and Execution (FAME), wetice. In: Seventh International Workshop on Enabling Technologies: Infrastructure for Collaborative Enterprises, p. 3 (1998)
28. Bruno, G., Dengler, F., Jennings, B., Khalaf, R., Nurcan, S., Prilla, M., Sarini, M., Schmidt, R., Silva, R.: Key challenges for enabling agile BPM with social software. Journal of Software Maintenance and Evolution: Research and Practice 23(4), 297–326 (2011)
29. Dengler, F., Lamparter, S., Hefke, M., Abecker, A.: Collaborative Process Development using Semantic MediaWiki. In: Proc. of 5th Conf. of Prof. Knowl. Management (2009)
30. Morecroft, J.: Mental models and learning in system dynamics practice. In: Pidd, M. (ed.) Systems Modelling: Theory and Practice, pp. 101–126. Wiley, Chichester (2004)