Available online at www.sciencedirect.com

ScienceDirect

Procedia Computer Science 121 (2017) 129–136

Procedia Computer Science

www.elsevier.com/locate/procedia

CENTERIS - International Conference on ENTERprise Information Systems / ProjMAN - International Conference on Project MANagement / HCist - International Conference on Health and Social Care Information Systems and Technologies, CENTERIS / ProjMAN / HCist 2017, 8-10 November 2017, Barcelona, Spain

An Agile Business Process Improvement Methodology

Paula Ventura Martins[a,b]* , Marielba Zacarias[a,b]

[a]*Research Centre of Spatial and Organisational Dynamics, Universidade do Algarve, Faro 8005-139, Portugal*
[b]*Faculdade de Ciências e Tecnologia, Universidade do Algarve, Faro 8005-139, Portugal*

Abstract

Adoption of business process improvement strategies are now a concern of most organisations. Organisations are still facing challenges and finding transient solutions to immediate problems. The misalignment between IT solutions and organisational aspects evolves across space and time showing discrepancies. Unfortunately, existing business process approaches are not according with continuous business process improvement involving business stakeholders. Considering this limitation in well-known Business Process (BP) methodologies, this paper presents a comparative study of some approaches and introduces agility in the Business Process and Practice Alignment Methodology (BPPAM). Our intention is to present observed problems in existing approaches and introduce agility in our proposal to address features, like the alignment between daily work practices and business process descriptions, in a simple and agile way.

Peer-review under responsibility of the scientific committee of the CENTERIS - International Conference on ENTERprise Information Systems / ProjMAN - International Conference on Project MANagement / HCist - International Conference on Health and Social Care Information Systems and Technologies.

Keywords: Business process improvement; agile business process; daily practices

* Corresponding author. Tel.: +351 289 800 900.
E-mail address: pventura@ualg.pt

1877-0509
Peer-review under responsibility of the scientific committee of the CENTERIS - International Conference on ENTERprise Information Systems / ProjMAN - International Conference on Project MANagement / HCist - International Conference on Health and Social Care Information Systems and Technologies.
10.1016/j.procs.2017.11.018

1. Introduction

Adoption of business process improvement strategies are now a concern of most organisations [1]. Business Process Management (BPM) includes details on how to design and enact business processes into organisational practices [2]. Business Process Management System (PBMS) implementation involves an automatic execution of business processes that could not be constrained to a time period since organisational needs are always changing [3]. Organisations are always facing challenges and finding temporary solutions to immediate problems. The misalignment between IT solutions and organisational aspects evolves across space and time showing discrepancies.

Thiemich and Puhlmann [4], based on their experience, conclude that most BPM improvements are motivated by a project. Nevertheless, Lund-Jensen et al. [5] affirm that Feral Information Systems, Shadow Systems and Workaround will be created to solve business process not supported by a Business Process Management System (BPMS). Feral Information Systems (FIS) is a separated system developed individually or collectively by users to support their business processes. A Shadow Systems (SS) is described as an alternative to the existing system formally supported by the organisation. Workarounds can be described as informal temporary practices for handling exceptions to normal workflow. In order to avoid chaos based on these other solutions, we argue that continuous BP improvement will be advisable. However, the question remains on how to carry out continuous improvement in an integrated way with existing BPMS.

The quest for the benefits of improvements in resource optimization and organisational responsiveness has raised several proposals for Business Process Improvement (BPI) methodologies [6]. Today we can find a broad range of process improvement approaches, distinct from each other, either on its principles and techniques, or the target area on which the improvements are focused. There are three kinds of approaches [4]: 1) Enterprise-BPM focused on the enterprise-wide establishment of BPM, 2) BPM focused on the process level that tries to find possible business process improvements, and 3) BPM focused on the project that helps business departments to state their requirements as process models. This paper focuses on the second case, which means that the approach proposed concerns business process improvements at the process level with the observation of daily practices.

Improving business processes, conforming to existing approaches, do not always give a quick response to business needs. In some cases, it is indispensable to adopt agile approaches to business processes improvement. Nevertheless, the agile business process definition is not consensual since several proposals have been issued in the literature. So, we start presenting definitions for the main concepts in this paper, namely agile business process and agile business process methodology. We also intend to describe the relationships established between them.

The focus of our work is business process improvement in order to be adapted to organisational changes. In this paper, we consider agility in business process methodologies. Our approach concerns the cycles of the methodology and modelling principles applied to business processes. We will not consider system development.

In this paper, we present our ideas according to the following structure. In section 2, we overview the existing literature about traditional and agile business processes. Section 3 presents the proposal to adjust BPPAM to an agile business process philosophy. Finally, section 4 concludes and discusses future trends.

2. The agile (software development) manifest and BPM

The Manifesto for Agile Software Development [7] introduces the core principles of the agile philosophy in the domain of software development. This section discusses the principles behind the agile software development and how they can be adapted to BPM. However, Agile Business Process does not have a manifesto, neither a consensual definition accepted by practitioners and researchers. The first goal of this section is to clarify the differences between traditional and agile Business Processes (BP); traditional and agile BP methodologies.

Traditional Business Process (TBP) follows a strict action sequence, creates a detailed business process model and implements it in the organisation. This approach may not be suitable for organisations classified as dynamic because of the high degree of changes. The adjustment to new requirements is a complex and arduous procedure [8]. With regard to the definition of Agile Business Process (ABP), it concerns the ability to discover changes and new opportunities, reacting quickly to them. In software development, we can consider BPMS a special case of a software system. So, it is possible to consider BPM methodologies also a subclass of software development methodologies. In the domain of agile approaches, the sequential life cycle associated with a TBP will require a

change to a new BPM lifecycle. In this context, this section presents and compares six different traditional/agile BP methodologies.

Bider and Jalali [9] affirm that exists a lack of theoretical models on this subject and suggest a framework to solve this gap. They consider that tacit and explicit knowledge is not enough. Their proposal creates an extra knowledge category that is built into the system and called by embedded knowledge. They propose two different BP life cycles for traditional and agile BP. The traditional approach includes 4 phases: *Externalization-Combination-Embedment-Adoption* (ECEA). The agile approach only includes 3 phases: *Socialization-Embedment-Adoption* (SEA). In SEA, the first difference relies on process modelling, system design, and manufacturing that are merged in one phase (Embedment). The second difference is the cycle dimension that is replaced by smaller and shorter ones. SEA constitutes an iterative approach that starts with the basic functionalities. Details are added to the system in the following short cycles.

In ECEA, the *Externalization* phase produces a detailed model verified by involved stakeholders. The main risks are to understand the complex model, identify omissions, identify wrongly captured details and situations not captured at all. The system model and manufacturing may also have different interpretations and the final result may not match the needs. Finally, while the system is under development, the needs evolve and change. As consequence, the final product does not satisfy the most recent organisational needs.

In SEA, associated errors in modelling, design, and manufacturing continue but several and shorter cycles are the mechanisms to mitigate this problem. In each cycle, few functionalities are introduced and tested. So, it is easy to make corrections and verify again in the next cycle. Nevertheless, in some situations, new functionalities require integration with existing systems resulting in extra effort and frustration at not meeting short cycles. Another issue to consider is the difficulty in applying formal methods in business process optimization when an explicit process model does not exist.

AGILe busIness PrOcess (AGILIPO) [10] follows the agile software development principles. It is more human-centered and supported by a collaborative tool. The authors propose starting with the most critical business activities and based on the feedback of implemented processes they continue modelling and implementing business processes applying incremental and iterative approaches. According to the proposal, an organisational development project should follow a plan with small activities of short duration. After a cycle, a new observation provides an opportunity to identify organisational changes. This approach promotes the bottom-up specification, model and implementation of processes and it is supported by collaborative modelling and execution tools. Design is a continuous activity adapting to the organisation's evolution. The main features of the proposal are: incompleteness (the process does not need to be completely understood), empower people (promote collaboration and creativity), business process design integrated with technology (integrate the execution and modelling) and design at instance level (case-by-case approach, describe unplanned exceptions). AGILIPO propose three roles: executor, modeler and developer. The executor makes use of specified activities or creates a generic activity instance whenever an activity is not planned. Employing a folksonomy, executors tag their activities, share and search these tags. The modeler can change the business process model including additional activities. A newer version of the process model will be established. The developer makes the code to automate the activity.

The Notify and Register methodology [8] is an entirely different business process modeling approach which intends the attainment of agility. The authors argue that the main goal is to specify autonomous actions. At execution time, in order to facilitate change, the sequence of activities evolves dynamically based on events. At design time, it is not predefined a specific activity sequence. The proposal includes an event-driven modelling approach to specify autonomous actions. The capability of a business process change is provided through autonomous actions initiated or triggered by events. This approach also allows an event to be followed by another event caused by it. According to this approach, business processes can be composed on the fly and driven by events during execution time. As a source of information, the approach suggests an initial identification of involved actors. The methodology is organized into four phases: 1) actor categories identification; 2) action identification; 3) action modeling and 4) definition of event interrelations.

Agile BPM Project methodology[4] is built on the traditional integrated BPM project methodology (IBPM) with waterfall project execution. The IBPM methodology has a strong focus on analysis and design and the main challenge is the separation of concerns between the process model and design of software implementation aspects. The IBPM approach introduces five different project phases: Planning, Analysis, Business Design, Implementation

Design and Implementation. The Agile BPM project methodology is based on the assumption that improvements are motivated by a project. Authors of the agile BPM do not believe in continuous improvement. In an agile BPM project, a work process is delivered and integrated into the PBMS frequently. Nevertheless, this kind of project requires close involvement of business professionals, since it also includes organisational changes. The success of an agile BPM project depends on the initial focus in the architecture design. The approach cut off the overhead involved in analysis and design phases. Details are required for implementation-related requirements in the following iterations.

Business Process and Practice Alignment Methodology (BPPAM) [11] is a hybrid approach that combines the best practices of top-down and bottom-up approaches. In engineering, BPPAM is an approach to describe the processes of an enterprise, so that the current process may be analysed and improved. BPPAM encompasses three phases: 1) *Business Process Discovery*, 2) *Business Process Supervision* and 3) *Business Process Assessment and Improvement*. *Business Process Discovery* provides an initial process specification through interviews and collaborative methods. *Business Process Supervision* assures that daily practices follow a base business process models. *Business Process Assessment and Improvement* allows analysing performance measures to improve and refine business process models.

Each phase integrates two dimensions: Process and Practice. The Practice dimension explores day-to-day work based on individual actions and practices. This dimension captures and represents on-site information needed to systematically validate business process models, eliciting the knowledge of operational stakeholders (represented by individuals or groups). At this level, knowledge is local and frequently tacit, thus it is hard to formalize. However, it encompasses information needed to validate process execution. In the Process dimension, business analysts discover, review and improve business process descriptions, based on information provided by the Practice dimension. The Process dimension addresses knowledge that crosses functional divisions and organisational boundaries (clients, suppliers). Therefore, it is not confined to particular individuals or groups. The Process dimension also addresses the need of continuous business process supervision and improvement as a reaction to fast-changing environments. These two dimensions, Practice and Process, will ensure the proper structure to articulate individual, group and organisational knowledge with the knowledge of business analysts.

Table 1. Business Process Methodologies.

Methodology	Type	Lifecycle	Knowledge	Change management	Modelling	Design	Manufacture
ECEA	traditional	4 phases/long cycles	tacit/explicit/embedded	not included	√ / complex model	√/inappropriate system design	√/different interpretations of the design
SEA	agile	3 phases/short cycles	tacit/explicit/embedded	introduced in new cycles	√/ no explicit model	√	√/smaller portions of the system
AGILIPO	agile	case by case/ short feedback cycles	tacit	feedback and new observation in each cycle	√/ no explicit model	√/ continuous activity	√/small artefacts
Notify and Register	agile	4 phases	event based	execution time	actions modeling	actions design/ event interrelations	-
Agile BPM Project	agile	sprints	based on a traditional approach IBPM and Scrum	introduced in a new project	√/ simple model	√/ simple design	√/work process
BPPAM	traditional	3 phases/long cycles	explicit/tacit	based on daily practices	√/detailed model	√/detailed design	-

The main problems related to these proposals are:

- ECEA and SEA follow a top-down approach driven by organisational strategies, policies and procedures. This approach does not allow to capture different perspectives and tacit knowledge based on daily practices.
- Concerning AGILIPO, final users resist to perform unplanned activities and integrate them with planned activities because they do not have enough confidence and knowledge about this kind of operations. Experience shows that in situations where final users cannot handle exceptions to specified activities, they create informal temporary solutions (Workaround systems).
- At design time, the Notify and Register approach assumes that all actions, events and actors are identified. This constraint could restrict the introduction of new processes. Nevertheless, we consider that this approach leads to chaos in situations where organisation and structure are advisable. This feature also permits the creation of multiple and different models related to the same scenario.
- The agile BPM project methodology introduces business process changes through projects. Agility is introduced with scrum practices [12] and reduction of the overhead in modelling and design. The focus continues at the organisational level and changes in daily practices are not under consideration.
- BPPAM is a traditional approach with hard-design activities although the approach considers daily practices descriptions.

Based on the comparative study presented in this section and the main problems identified, we consider that none of the agile approaches are consistent with continuous improvement in business processes involving business stakeholders. It is important to develop an approach that includes the observation of daily practices and facilitates the descriptions of these practices by non-expert users. From our point of view, BPPAM should be configured in order to address all the features related with agility. The approach will be adapted to include the following principles of the agile manifesto for software development [7]:

- Individuals and interactions over processes and tools: collaboration between involved stakeholders and developers; Enable face-to-face interactions.
- Working software over comprehensive documentation: frequent delivery of working software; working software is the primary measure of progress.
- Responding to change over following a project plan: accommodate changing requirements; simplicity.

In the following section, an adaptation of the BPPAM methodology will be presented. The agile BBPAM will preserve the most important features related to the alignment between daily work practices and business process descriptions. Following the principles of the agile manifesto, the traditional BPPAM will be reviewed.

3. Agile BPPAM

The purpose of adapting BPPAM to the agile philosophy is to provide a mechanism to react quickly to changes in business processes with the simplicity necessary to non-expert users since they will collaborate to describe daily practices. As mentioned above, this section begins with a brief description of the traditional BPPAM which is organized into three phases as shown in figure 1. Then we describe specific features of the agile BPPAM highlighting the differences from the traditional approach. We start with a brief description of the traditional BPPAM lifecycle, identifying different best practices applied in each phase. We also reinforce that before a business process description starts, the team must identify the complexity level involved in the business process improvement. Nevertheless, the focus of this paper is the second phase, *Business Process Supervision*, specifically the supervision of daily work performed by business stakeholders.

Phase 1-Bu*siness Process Discovery* (BPD). BPD phase aims at developing an organisational profile in order to understand business processes which contain information about people, activities, technology and data. This phase includes two main sub-phases: *Learning (Eliciting) Business* and *Modelling Business*. *Learning Business* (LB) is knowledge acquisition, a set of tasks that include interviews where the business analyst interacts with operational stakeholders to discover business processes. At an organisational level, the methodology proposes to assist organisations in their effort to assess and manage problematic situations based on daily actions and implement solutions related to these problems. 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* (MB) consists in an intensive interaction between users in the two dimensions (operational stakeholders and business analysts). It consists in a set of activities that transform tacit and implicit knowledge and specific contextual situations into more structured and documented forms. At this stage, teams must take into account the organisation's dimension and business processes complexity. For large enterprises, we propose an initial stage that includes a description of all organisational processes, an agile approach is not advisable. In this case, the traditional methodology should be applied. For small or micro enterprises, where it is possible to analyse the behaviour of individuals and their effect on the organisation, it is advisable an agile approach with short cycles and quick response to changes in business processes.

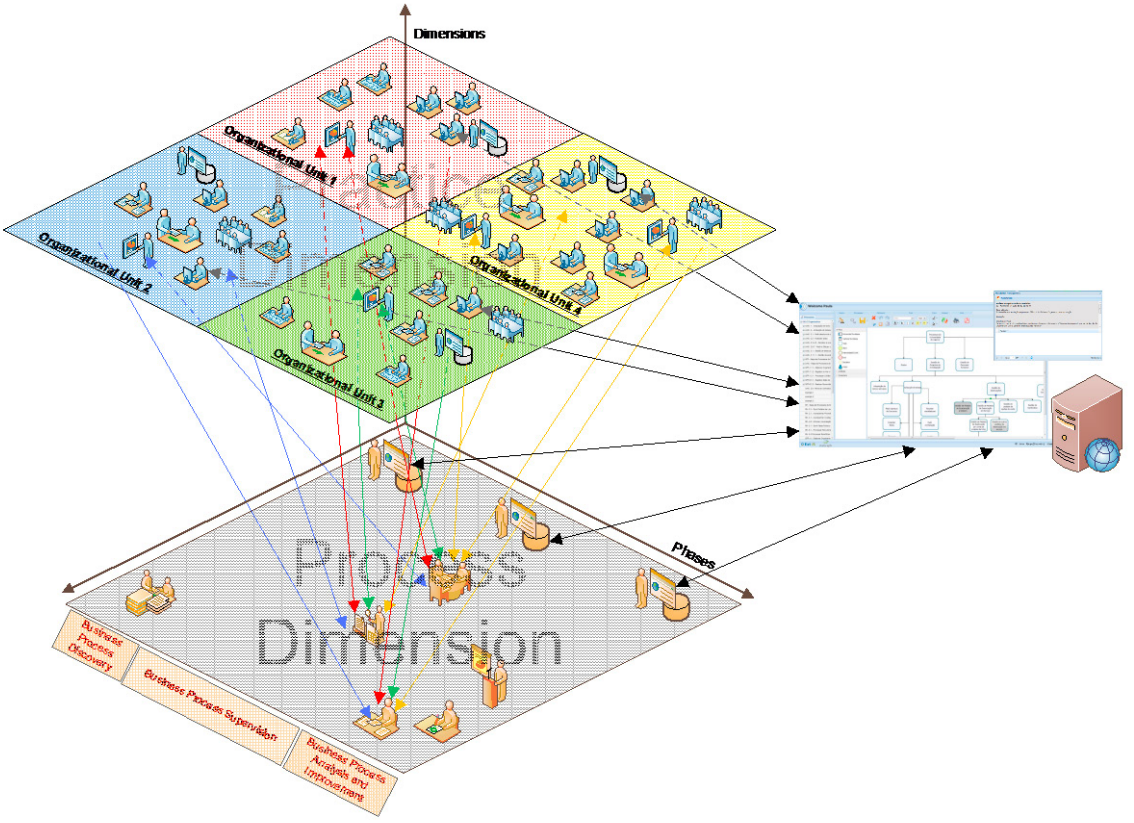

Fig. 1. BPPAM methodology

Phase 2-*Business Process Supervision* (BPS). In BPS phase, formal control mechanisms are designed in order to ensure that operational stakeholder 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) annotate/review models and 3) identify new business descriptions.

Phase 3-*Business Process Assessment and Improvement* (BPAI). BPAI is a mean for organisations to identify their strengths, weaknesses, existing improvement activities and key areas for improvement. It enables organisations to determine the current state of their business processes and to develop improved models. In the begin of the BPAI phase, the business analyst evaluates change proposals and through a comparison between base business process models and proposed changes, a new set of models is built to correct specific misalignments and imbalances. In the

end, the results gathered during assessments enable improvements and consistent refinements in order to produce an improved set of business process models.

The agile BPPAM differs from the traditional approach in four subjects:

- For small or micro enterprises, in the first phase (BPD) when possible to analyse the behaviour of individuals and the effect on the organisation, it is advisable an agile approach with short cycles and quick response to changes in business processes
- The second and third phases are merged into one phase – *Business Process Change*.
- The structure of the *Business Process Change* phase change against the practices of the two old ones. It consists in transferring knowledge gathering directly from business stakeholders. Providing a simple language, similar to user stories from agile software development methodologies, to describe observed changes. The big cycles of the phases, *Business Process Supervision and Business Process Assessment and Improvement*, is replaced by smaller cycles and shorter iterations length. The reaction to changes is immediate, the change in the BPMS is made iteratively and following the three principles of the agile manifesto described in the previous section.
- Integrating multiple roles and assigning them to one person (stakeholder) is important to simplify the review and approval of business processes described by business stakeholders.

Concerning the first phase, time-consuming activities, such as interviews and detailed descriptions of use cases, should be replaced by shorter descriptions with a simple language, similar to user stories. This registry will be performed by operational actors. Since the proposal is based on an iterative approach, essential or volatile requirements will emerge in following iterations as natural as possible. Mapping business process models to user stories will facilitate the communications with involved stakeholders and allows the verification of user stories completeness and correctness. Concerning daily practices, the main goal is to provide means to capture actions and identify contexts. It will enable a faster communication and collaboration among all stakeholders throughout the process.

Based on these new features, the challenge is to define a new method to transfer knowledge in the description of business stakeholders to business process models. However, that subject is out of the scope of this paper and will be presented in further publications.

4. Conclusions

In section 2, several problems were identified concerning BPI based on several BPM approaches. Agile BPPAM is an alternative approach to BPI focused on gaps and problems identified in existing approaches. However, the adoption of the methodology requires that teams be aware of certain limitations. Limitations of the agile BPPAM are mainly related to three issues:

- The methodology is based on daily practices, so it is highly context sensitive. There are many factors affecting final results, such as people, facilities and culture. It is important to separate daily practices and process practices and take decisions considering interests of the organisation.
- BPPAM is an iterative BPM methodology. People involved in iterative process improvement must be aware of how to perform BPI and keep this process under control. It is important that the process manager shows that a BPI initiative has final goals and identifies milestones.
- Through the realization of business process agility, it should also be emphasized the efficiency in designing and readjusting the model during daily practices.

First and foremost, we are not saying that BPPAM is better than any other BPM methodology. One of the major premises of BPPAM is that it helps organisations implementing BPI programs, in situations where other approaches are not feasible. In a sense, BPPAM methodology yields the "best compromise" approach, the one that tries to fulfill the gaps identified in traditional and agile BPM methodologies analysed.

In conclusion, the fundamentals of agile BPM propose a different view on certain aspects of traditional BPM. Following the trends of new agile software development models, BPI methodologies should also reflect agile practices. Namely, they must address the importance of using the experience of business stakeholders as an important source to BPI. Another gap observed is the deficient alignment between the process and daily practices caused by processes that are unrelated to the reality of organisations. Presented BP discovery techniques are questionnaires and individual or group interviews, its main focus is not the actions performed by involved stakeholders. BPM methodologies should also include iterative improvement with validation of deployed practices complemented by feedback meetings. Although the research work presented several contributions to agile BPM methodologies, a complete collaborative infrastructure to support BPI is still missing.

Acknowledgements

This paper is financed by National Funds provided by FCT- Foundation for Science and Technology through project UID/SOC/04020/2013.

References

1. B. Curtis and J. Alden, “Business Process Improvement Guided by the BPMM,” *BPTrends*, 2006.
2. BPMI, “Business Process Management Initiative,” 2008.
3. D. Karagiannis, et al., “Introduction to Business Process Management Systems Concepts,” *Business Process Modelling*, B. Scholz-Reiter and E. Stickel, eds., Springer Berlin Heidelberg, 1996, pp. 81-106.
4. C. Thiemich and F. Puhlmann, “An Agile BPM Project Methodology,” *Business Process Management: 11th International Conference, BPM 2013, Beijing, China, August 26-30, 2013. Proceedings*, F. Daniel, et al., eds., Springer Berlin Heidelberg, 2013, pp. 291-306.
5. R. Lund-Jensen, et al., “- Feral Information Systems, Shadow Systems, and Workarounds – A Drift in IS Terminology,” *Procedia Computer Science*, vol. 100, no. -, 2016, pp. 8; DOI - http://dx.doi.org/10.1016/j.procs.2016.09.281.
6. G. Bruno, et al., “Key challenges for enabling agile BPM with social software,” *J. Softw. Maint. Evol.*, vol. 23, no. 4, 2011, pp. 297-326; DOI 10.1002/smr.523.
7. K. Beck, “Manifesto for Agile Software Development,” 2001; http://www.agilemanifesto.org/principles.html.
8. N. Alexopoulou, et al., “Infusing agility in business processes through an event-centric approach,” *Int. J. of Business Information Systems*, vol. 6, no. 1, 2010, pp. 21.
9. I. Bider and A. Jalali, “Agile business process development: why, how and when—applying Nonaka’s theory of knowledge transformation to business process development,” *Information Systems and e-Business Management*, vol. 14, no. 4, 2016, pp. 693-731; DOI 10.1007/s10257-014-0256-1.
10. A.R. Silva, et al., “AGILIPO: Embedding Social Software Features into Business Process Tools,” *Business Process Management Workshops: BPM 2009 International Workshops, Ulm, Germany, September 7, 2009. Revised Papers*, S. Rinderle-Ma, et al., eds., Springer Berlin Heidelberg, 2010, pp. 219-230.
11. M. Zacarias and P.V. Martins, “Business Alignment Methodology: The Discovery Phase,” *Inf. Resour. Manage. J.*, vol. 27, no. 1, 2014, pp. 1-20; DOI 10.4018/irmj.2014010101.
12. K. Schwaber and M. Beedle, *Agile Software Development With Scrum*, NJ: Prentice-Hal, 2002.