Innovative Approach for Agile BPM

Marco Mevius
HTWG Konstanz
Constance, Germany
mmevius@htwg-konstanz.de

Rolf Stephan
Axon Active AG Schweiz
Munich, Germany
rolf.stephan@axonactive.com

Peter Wiedmann
HTWG Konstanz
Constance, Germany
pewiedma@htwg-konstanz.de

***Abstract*—Current challenges for companies require a high flexibility of business processes. The systematic combination of Cloud Computing and Business Process Management presents advantages, which are particularly useful for the modeling and automation of business processes. A targeted enhancement of Business Process Management with the help of these advantages generates significant new potentials for the optimization of business processes. Besides introducing topic-relevant fundamentals, this paper establishes an agile method with a corresponding support toolset, which allow the immediate capturing, fast implementation and high adaptability of business processes. This method can be used for handling the complexity of missing or insufficiently modeled business processes. In addition the paper presents a specific reference architecture. Based on this reference each phase – modeling, automation, monitoring - passes through the cycle efficiently and independently.**

Keywords – Agile Business Process Management, Cloud Computing, Service-oriented architecture

I. INTRODUCTION

For companies, fast and efficient business processes adaptability is increasingly becoming a critical competitive factor [1]. Furthermore, the belief that suitable tools for Business Process Management (BPM) are required is becoming more accepted [2]. In this context, Cloud Computing offers process participants properties which improve the conditions beyond conventional BPM. These advantages apply to both the development and the utilization of BPM tools. High scalability and possible cost reduction are two examples of these advantages [4]. BPM tools can be divided in tools for IT-BPM and Business-BPM. In IT-BPM, the tools can be categorized in the following classes: modeling, simulation, automation and monitoring. This categorization correlates with the BPM-cycle in general [5] and provides the foundation of this paper. Besides the constant enhancement of BPM and Cloud Computing, the topics of Service-oriented architectures and agile software development are also gaining importance. Together, these elements point to the need for a flexible and customer-specific composition of BPM tools. Therefore, the opportunity for an improved process orientation through the increased agility of supporting services is a topic of high relevance [6]. In section 2 the connection of BPM and Cloud Computing will be presented.

In section 3, it will be shown how the possibilities of a service-oriented combination of BPM and Cloud Computing can be used by applying BPM(N)^{Easy}. The acronym BPM(N)^{Easy} paraphrases the combination of Business Process Management (BPM) and Business Process and Notation (BPMN) with the ambition of making BPM easier. The BPM(N)^{Easy} method is supported by an agile toolset for efficient and effective BPM.

II. BPM AND CLOUD COMPUTING

With the rapid development of IT in the context of launching and running cloud-based architectures, companies are faced with new problems. In particular, collaborative business processes in use across company borders offer essential optimization potential through the combination of BPM and Cloud Computing. An essential commonality of BPM and Cloud Computing is the flexible and agile approach [cf. 15]. The Cloud Computing paradigm can be called an "enabler" of an improved combination of service-oriented architectures and an agile proceeding regarding the management of business processes. But this potential depends on different framework conditions. These are outlined from an economic and technical perspective below and build a further major motivation for BPM(N)^{Easy}.

A. Technical view

From a technical view, three dimensions can be identified for a successful design, implementation and operation of (BPM) tools in cloud environments: *programming*, *integration* and *security* (according to [7, 8]).

- *Programming* - Complex and distributed systems are ubiquitous in business IT landscapes nowadays. In connection with the goal of reaching a higher usability and flexibility, this complexity translates into new requirements for the Software Engineering unit. To solve this issue, the adoption of new or alternative program languages is necessary. Relying on new innovative concepts and techniques, the effort invested in development has to be reduced to render the complexity of these new IT landscapes manageable.
- *Integration* - Integration can be split in data integration, function integration and process integration. In light of challenges involved, the

 ISBN: 978-1-61208-254-7

topic of integration plays a key role in different scenarios. For instance, a cloud-based workflow engine could control variable activities distributed across company borders. For a smooth running of several business process instances, there is a need of defined integration interfaces and structured methods.

- *Security* – (IT) security can be divided into three categories: functional security, information security and data security. All of these categories have a significant relevance for BPM, especially regarding complex business process grids. Functional security specifies how the current state corresponds with the target state of functionality. Information security is focused on the unauthorized changing or extracting of information. Data security takes care of the process-related data.

Furthermore, from a technical point of view, the question of which business processes are most appropriate for running on a cloud-based architecture has to be answered. Possible risks, for example insufficient integration options or application programming interfaces have to be taken into consideration.

B. Economic view

Two dimensions can be listed from the economic point of view.

- *Availability* - Services which are provided by a cloud infrastructure can be accessed any time. Based on a higher abstraction level, the customizing and the application setup become significant easier. In addition to the simplified procurement, the end user is able to work with the service immediately.
- *Investment risk* – In the context of variable billing models such as pay-per-transaction (pay in case of an actual use) the usage of cloud-based service results in certain charges. These charges contain all relevant costs (e.g. server costs, support costs, etc.). On this account, investment costs are significantly reduced, e.g. risk is minimalized in the procurement of a business process supporting application.

According to the user-oriented study by Northbridge [9], in which 417 companies of different sizes were surveyed, 75% of respondents estimate that two-thirds of the processing power will be obtained from the Cloud. The described promising tension between BPM and Cloud Computing generated the motivation for developing and testing the BPM(N)^{Easy} method in the context of the research project "BPM@Cloud" at KIPS (http://kips.htwg-konstanz.de) as presented in the following.

III. METHOD AND IMPLEMENTATION

For performing cloud- and service-oriented BPM, it is important to have a method which makes it possible to handle the complexity of technical and economic conditions.

A. BPM(N)^{Easy} method

The major intention of the method is to support the potential of BPM by a consistent use of cloud- and service-oriented infrastructures. Therefore, the method is based on the outlined (technical and economic) dimensions and connects aspects of agile software engineering with the conventional BPM cycle. Furthermore, the method is divided in two phases and three steps. The phases provide the time frame for performing the steps.

Figure 1 shows an overview of the BPM(N)^{Easy} method phases and steps:

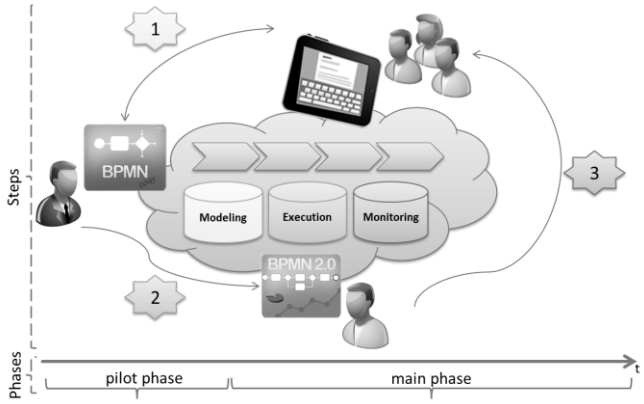

Figure 1. BPM(N)^{Easy} method

An additional intent of the method is to allow for a location independent modeling of business processes, supported by a continuous and integrated tool landscape. The number of unstructured business process repositories can be greatly reduced by using such a homogeneous system of resources to manage and store the business processes and information [cf. 10]. Furthermore, after running through a number of "Sprints" [cf. 11], the created (executable) business processes are provided in a cloud environment [cf. 12]. This release of business processes (or parts thereof) offers the chance to utilize these as service-oriented components in existing business process architectures. Within the steps of BPM(N)^{Easy} the "what must be done" is declared and the phases are used to specify "when and how it must be done".

1) Steps

The method steps are based on the conventional BPM cycle and describe the procedure into three categories:

- *Modeling* - The initial capture of a process, if there are no suitable business process models

available, is modeled by using standardized interviews which are based on observations carried out on site with help of a mobile application. The BPM(N)^{Easy} notation thereby reduces the BPMN 2.0 standard (http://www.omg.org/spec/BPMN/2.0/) on important control elements while allowing the collection of valuable information through various mediums e.g. by adding a video to a process activity. All business processes are saved in a Cloud repository with which they can be retrieved, analyzed, and changed at any time.

- *Enrichment* - New business process models are proposed automatically for enrichment. This enrichment includes the design of human-machine interaction by creating user interfaces, and the integration of needed services. For these actions, the latest concepts of software engineering such as library mechanisms and loose coupling or overwriting, are used. The result is a semi-automated or automated business process.
- *Monitoring* – The monitoring is separated into two categories. On the one hand, technical data are monitored, for instance to monitor the time required to access third party systems or application programming interfaces. On the other hand, the monitoring is based on specific indicators for measuring efficiency or effectiveness. A drill-down to the lowest-level information of an activity of the processes should be deliverable. Both categories are aligned with the previously discussed technical and economic considerations.

2) Phases

The typical flow through the various stages of the BPM often leads to the fact that important requirements at the beginning of a BPM project have not been considered or adequately described. Also, technical problems are often only identified during the implementation of the business process. Therefore the entire project costs can be significantly increased. In contrast, BPM(N)^{Easy} is based on the assumption that complex BPM projects can't be planned at the beginning. The approach of BPM(N)^{Easy} follows an empirical, incremental and iterative concept to increase the predictability of the process quality and to reduce project risks. Within a predefined cycle, there is always the aim to generate an executable version of the business processes in order to get feedback as early as possible. Fundamental principles of the agile method are transparency, controlling and flexible adjustment.

The phases of the BPM(N)^{Easy} method define in which intervals and with what accompanying activities the steps have to be carried out.

Figure 2 shows the different stages with the two phases schematically:

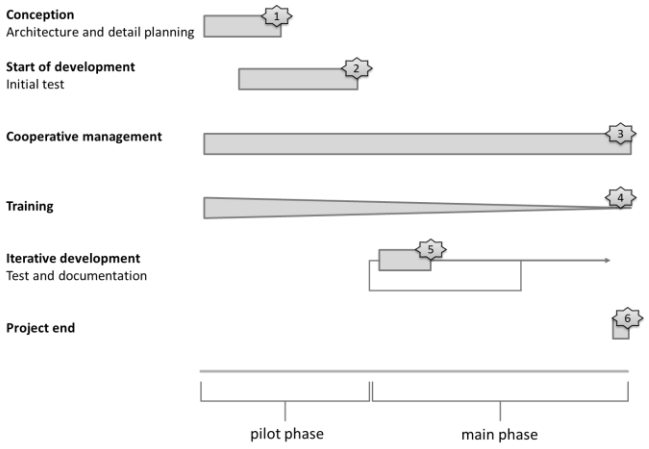

Figure 2. Method phases - pilot and main phase

The high parallelism of the tasks is meant to favor a consistent and systematic implementation of the BPM cycle from the very start. The tasks are derived with the execution of the steps, i.e. the phase sections (1-6) within the pilot and main phase are related to following methods steps:

(1) The conception task describes the modeling of the processes and the implementation of the system architecture.

(2) Shortly after the beginning and before the first sprint of the main phase, users should be able to find a runnable application, i.e. the cycle (steps) was already completed once. This increases the bilateral understanding of business and IT departments.

(3) The "Cooperative Management" is executed as a support activity over both phases. Examples for this task are the coordination of the project members or the writing of the product backlog – a list which contains all implementation requirements.

(4) Typically, new applications have to be provided to the users for reaching the goal of operating independently. This "training" supports the critical coordination process between processes developers and process users.

(5) During the main phase, each sprint is connected to a run through the cycle. If a task is completed already, for instance the modeling of a business process, the task has to be omitted.

 ISBN: 978-1-61208-254-7

(6) The end is defined by an end date and a final closing test. Conditions to closure include a completed cloud repository and an application without access restrictions.

- *Pilot phase* – In the pilot phase, the creation of a detailed specification is the focal point. Furthermore, the architecture for the underlying system has to be set up. Very soon afterwards, the recording of business processes begins and the implementation of the first pilot process application in a prototypical way is initiated. Accompanying this, various training sessions are conducted for the core team and the users to introduce them step by step to the new system. From this early first prototype, which can be used in the productive environment already, other design criteria and components are derived. In addition, all components are re-usable, and therefore an accelerated development is possible. The continuous contact through cooperative management also ensures the high acceptance of the users.
- *Main phase* - The main phase consists of sprints. A Sprint describes a timed interval in which the Sprint task list has to be worked through by the responsible team members. This task list has to be set up at the beginning of each Sprint. The task list is not bound to sequential development sections, but includes tasks for setting up the product – the business process – in general. Based on this iterative process, the possibility of parallel application testing is increased. Parallel to the goal of rapid, iterative development, the sprints of the main phase improve the communication between business and IT significantly and minimize typical barriers. Moreover, the final approval gets simplified by involving the end user in all steps of the method intensively. Through the direct coupling of the development team and users, the risk of implementation errors due to lack of consultation processes or misunderstandings can be reduced considerably.

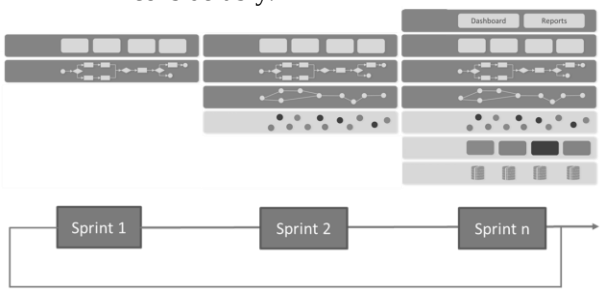

Figure 3. Illustration of the Sprint cycle

Figure 3 illustrates how the automated or semi-automated business processes in the context of the BPM(N)^{Easy} method are produced and how a system can be enriched through different levels. As previously introduced, an essential aim in each Sprint is the focus on the ultimate goal of the BPM project. As early as after the first sprint, it has to be possible to run through the business process from the "spring in the valley". Providing the full functionality of each process activity is neglected initially. At the end of Sprint n a system is available, which covers the defined requirements completely.

B. Reference architecture and implementation

As part of an operational application of the BPM(N)^{Easy} method a supporting reference architecture was developed and combined with various technical components.

1) Reference architecture

As an adequate basis for the method BPM(N)^{Easy} a generic reference architecture for a cloud-based BPM infrastructure was developed as shown in Figure 4 (in allusions to [13]).

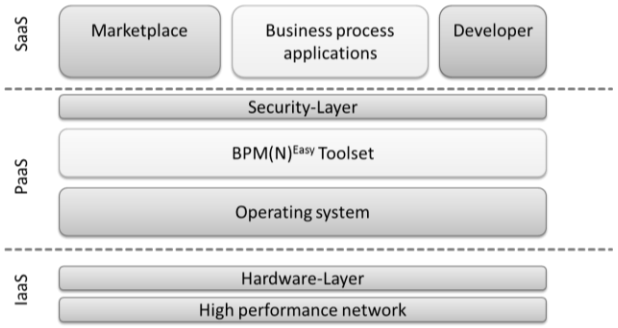

Figure 4. Reference architecture

The generic reference architecture is based on system-oriented services. The cloud typical layers, Software-as-a-Service (SaaS), Platform-as-a-Service (PaaS) and Infrastructure-as-a-Service (IaaS) can be distinguished [14]. IaaS describes resources, such as the network connection or processing power which are provided as a service. In this case the infrastructure is flexible and can be dynamically controlled depending on the load. PaaS describes a standardized platform for running basic applications (e.g. an operating system). PaaS is needed to load the various SaaS products from the toolset (suitable to the current step of the method). The SaaS layer contains the software which is necessary to offer services and user interfaces for the administration, execution and monitoring. In general, all three levels of the discussed technical aspects - programming, integration and security - are considered. Examples are the security layer within the PaaS, which protects the core architecture, or the separate developer interface, which allows for an easy development access.

 ISBN: 978-1-61208-254-7

As a result of the reference architecture's modular design, a high degree of integration can be ensured. Therefore, the selection of the process application and the corresponding toolset are vendor-independent.

2) Implementation

Based on the generic reference architecture in the context of a specific application project within the BPM@Cloud Labs, various components were used to apply the method and to test and validate the usage on a selected business process.

- Xpert.ivy BPM Suite

The Xpert.ivy suite of Axon Active AG (http://axonactive.com) was used for the development of an executable process model. Connected to a cloud repository, it is possible to create a high degree of structuring reusable modules and execute the created process on the web, managing it by versions. The Xpert.ivy module "Monitor" provides functionality for real-time measurement of process parameters and status. On basis of this module service level monitoring and reporting are supported.

- Fujitsu Cloud

Fujitsu services were used both as Infrastructure and Platform-as-a-Service to create an own cloud repository for storing all relevant data. In addition, the services were the base for the Software-as-a-Service level which gives the option to bring release-ready processes immediately up to the Fujitsu Cloud Store. For instance, the SaaS layer contains components which enable the users to monitor or perform the business processes.

- Mobile Easy Tool

This mobile application is based on Android (http://developer.android.com) and has been developed at the KIPS. It can be used for modeling the selected business processes interactively. The application provides a few BPMN 2.0 elements which can be dragged & dropped easily for modeling the business processes intuitively. Moreover, all steps/activities can be enriched by adding metadata directly on site (videos of interviews, images, etc.). Tablets with camera function are used for this purpose. An impression of the very user-friendly ("Easy")- OnClick technology is shown in Figure 5. The Android native features facilitate the operation of the application. For example, all share options, such as e-mail, MMS or Google+ are available.

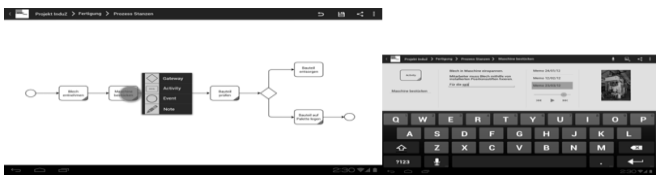

Figure 5. BPM(N)^{Easy} mobile application

An example of a typical approval process is shown in Figure 6.

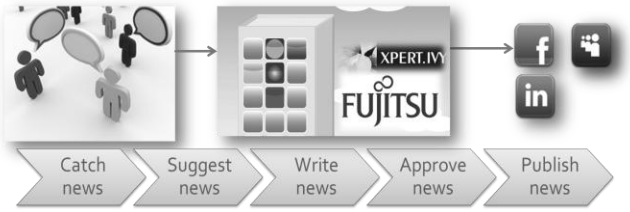

Figure 6. BPM(N)^{Easy} test process

The business process describes the steps involved in publishing company news on social media platforms. On the one hand, the exemplary process enables an overview of the complete phases and steps to go through. On the other hand, requirements emerge which have to be dealt with, such as the collaborative, mobile news writing and the integration of external systems. In sum, all presented technical challenges must be considered and dealt with.

The test scenario was started by modeling the business process with help of the simple and efficient BPM(N)^{Easy} notation. Using cloud repositories, the communication between business and IT was ensured at any time so that early user tests could be performed agilely. Within the Sprint cycles, the Ultimo, a defined project end, has always had the highest priority. From a technical point of view, it was also required to develop a specific, security-related client management which initiates a trigger automatically when the business process has been subscribed to over the cloud marketplace. This trigger receives various activities at the application level of the Ivy server, such as creating new users or the activation of other functions (in terms of Basic / Premium versions). The service-oriented usage of third-party systems (social media platforms) has been implemented by calling web services - therefore the system can easily be extended.

IV. SUMMARY AND OUTLOOK

The integration of BPM tools or entire business processes (BPaaS) in a cloud environment can be assigned a high potential. Cut costs and reduced complexity represent fundamental goals for BPM projects. Furthermore, the improved distribution of services or business processes increases the ubiquitous availability of business applications and provides a significant target value.

The transfer research project BPM@Cloud is currently run by the Constance Institute for Process Control (KIPS) in collaboration with the Axon Active AG. This paper introduced an agile method called BPM(N) ^{Easy}. Furthermore it has been presented a reference architecture which supports the agile method for efficient and effective BPM.

 ISBN: 978-1-61208-254-7

The phases and steps of the agile method do not require rigorous planning at the beginning of the BPM project. Therefore, a highly flexible and close cooperation with all participants is possible. As a result of this, the implementation of the business processes can be achieved significantly.

The test of the method was performed at the BPM laboratory of KIPS and reached a successful result regarding the implementation of new business processes. Related and further work is currently investigating to what extent $BPM(N)^{Easy}$ can be used not only for the first implementation but for continuous business process improvement. From the authors' point of view, there is significant potential for optimization of business processes in this context. In addition, cloud-based services will be created to complement the methods-supporting toolset.

V. REFERENCES

[1] Bekele, T.M.; Weihua Zhu; Towards collaborative business process management development current and future approaches, Communication Software and Networks (ICCSN), 2011 IEEE 3rd International Conference on vol., no., pp.458-462, 2011.

[2] Chaudhry, S.; Moller, C.; Advances in Enterprise Information Systems II, The role of BPM in the IT value-chain: Exploring how manging business processes can decouple business and IT, pp. 56-58, CRC Press/Balkema, AK Leiden, 2012.

[3] Chee, B. J. S.; Franklin Jr., C.: Cloud Computing: Technologies and Strategies of the Ubiquitous Data Center. CRC Press Taylor & Francis Group, 2010.

[4] Voorsluys, W.; Broberg, J.; Buyya, R.: Introduction to Cloud Computing. In (Buyya, R.; Broberg, J.; Goscinski, A. Hrsg.): Cloud Computing Priniples and Paradigms. John Wiley & Sons, Inc., Hoboken New Jersey, 2011.

[5] Weske, M.: Business Process Management: Concepts, Languages, Architectures, Springer Verlag, Berlin New York, 2010.

[6] Abelein, U.; Becker, A.; Habryn, F.: Towards a Holistic Framework for Describing and Evaluating Business Benefits of a Service Oriented Architecture.13th IEEE Enterprise Distributed Object Computing Conference Workshops, Auckland, 2009.

[7] Briscoe, G.; Marinos, A.: Digital Ecosystems in the Clouds: Towards Community Cloud Computing. 3rd IEEE International Conference on Digital Ecosystems and Technologies, Istanbul, 2009.

[8] Fehling, C.; Konrad, R.; Leymann, F.; Mietzner, R.; Pauly, M.; Schumm, D.: Flexible Process-based Applications in Hybrid Clouds. 2011 IEEE 4th International Conference on Cloud Computing, Washington, 2011.

[9] Skok, M.: Future of Cloud leadership panel. Version 2011-Jun-20.2 Future of Cloud Computing. http://www.futurecloudcomputing.net/media-gallery/detail/91/286, accessed 19th October 2012.

[10] Kurniawan, T.; Ghose, A.; Le, L.; Dam, H.: On Formalizing Inter-process Relationships, BPM 2011 Workshops, Part II, Springer Verlag Berlin Heidelberg, 2012.

[11] Schwaber, K.; Sutherland, J.; The Scrum Guide, The Definitive Guide to Scrum: The Rules of the Game, 2011, http://www.scrum.org/Portals/0/Documents/Scrum%20Guides/Scrum_Guide.pdf, 19th October 2012.

[12] W. van der Aalst, Business Process Configuration in The Cloud:How to Support and Analyze Multi-Tenant Processes?, Ninth IEEE European Conference on Web Services, 2011.

[13] Jiang, J.; Le, J.; Wang, Y.; Sun, J.; He, F.: The BPM Architecture Based on Cloud Computing, Knowledge Acquistion and Modeling, 4th International Symposium, Sanya, 2011.

[14] Mell, P.; Grance, T.:The NIST Definition of Cloud Computing, Recommendations of the National Institute of Standards and Technology http://csrc.nist.gov/publications/nistpubs/800-145/SP800-145.pdf, 2011, accessed 19th October 2012.

[15] Trifu, M.: SOA, BPM and Cloud Computing: Connected for Innovation in Higher Education. In (Jusoff, K.; Zhu, Z. Hrsg.): ICEMT 2010 International Conference on Education and Management Technology. IEEE Verlag, Cairo, 2010.

 ISBN: 978-1-61208-254-7