A Method for Integrating EAM and BPM

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Abstract: Business Process Management (BPM) has been a widely accepted management tool for many years. Recently, the steadily growing complexity of IT landscapes, the increasing speed of change of business models, business processes and organisational structures in many business sectors, and the high pressure for cost reductions in the IT area have lead to the deployment of Enterprise Architecture Management (EAM) in a growing number of organisations. There is an obvious overlapping between BPM and EAM but there are also some significant differences. This paper presents a method to derive a sensible integration between BPM and EAM considering in particular organisation-specific objectives and conditions.

1 Introduction

It is well accepted that business processes are a core element of organisations. The better an organisation manages its business processes the more successful it is [Ka96]. There are numerous application areas in which business processes need to be considered, for example re-organisation, capacity planning, process costing, quality management, specification of IT applications, risk management and compliance. Therefore, we define in this paper "business process management" (BPM) in a wide sense, denoting all activities which deal with business processes. On the other hand nearly all organisations suffer from steadily growing complexity of IT landscapes, the increasing speed of changes of business models, business processes and organisational structures, and the high pressure to reduce IT costs. To address these challenges many organisations implemented Enterprise Architecture Management (EAM). Analogous to BPM we define EAM in this paper as all activities which deal with the Enterprise Architecture (EA). For EA we use the common understanding that it covers in a holistic and integrated way strategic aspects, business aspects (such as products, organisational structure, business processes etc.), (IT) applications, interfaces, technologies and infrastructure [Ai08, TO09a, TO09b]. Typical objectives of EAM, from our experience, are usually IT-driven, such as IT master planning (blueprinting), consolidation of application landscapes, implementation and management of service-oriented architectures (SOA), technology management etc. It is obvious from the objects considered within BPM and EAM that there is overlapping, in particular the consideration of business processes is one aspect covered by both disciplines. However, an integration of BPM and EAM is not as simple as it seems. In large organisations BPM

and EAM are organised by different people, with different objectives, and usually with different tools. For example, in EAM a higher abstraction level for business processes is normally appropriate compared to the flow level as is common in BPM.

The authors of this paper are practitioners. They are with a company (BOC) providing BPM and EAM tools (ADONIS, ADOit, ADOben) as well as EAM consulting [BO10]. The authors observed that many organisations tend to chose one of the extremes: Either there is no integration between BPM and EAM at all (usually when implementing EAM) there is a very tight integration between them. In the first case both initiatives do not profit from each other and their results are usually not consistent or might even be conflicting. In the latter case it is often discovered afterwards that a tight integration is not feasible and does not deliver the planned advantages. The main reason is that expectations regarding the exchanged artifacts cannot be fulfilled. Therefore we developed the presented method which helps to define a sensible integration between BPM and EAM considering organisation-specific objectives and conditions.

The remainder of this paper is structured as follows: Chapter 2 introduces a conceptual model for the integration of BPM and EAM and discusses related work. Chapter 3 illustrates the conceptual model by presenting two industry practices for the integration of BPM and EAM. Then, chapter 4 explains our method for integrating BPM and EAM. Chapter 5 concludes the paper with a summary and an outlook to future research.

2 Conceptual Model of the Integration Method and Related Work

The method possesses a process-oriented approach and is based on the terminology of TOGAF 9 [TO09a], one of the most common used EAM frameworks. Figure 1 depicts the conceptual model used to describe the integration between BPM and EAM (examples will be presented in chapter 3). It structures the integration method into three layers: metamodel, deliverable and organisational layer. On the metamodel layer the various information sources are integrated systematically. The metamodel – the language for representing the business processes, architecture artifacts, and their interdependencies - builds the frame for defining "deliverables" (deliverable layer). Deliverables are defined as work products that are contractually specified and in turn formally reviewed, agreed, and signed off by the stakeholders. For example typical EAM deliverables are as-is and to-be IT blueprints [GR07]. In BPM a typical deliverable is a work instruction described by a business process model (usually on an activity level). Artifacts are work products that describe the considered objects from a specific viewpoint. So, we see deliverables as specific types of artifacts. To characterise artifacts we use the determinants "abstraction level", "time relevance" (as-is, to-be, or even an exact point of time), "change frequency" and "organisational coverage" (parts of the organisation described by the artifact).
The way BPM and EAM are organised within an organisation can be described as processes which are executed by defined roles [De09, Ke07]. It is clear, that the integration between BPM and EAM takes place by handing over deliverables from BPM to EAM or vice versa. Hence, on the organisational layer, processes to create the deliverables and to organise hand-over's, as well as responsible BPM/EAM roles, have

to be defined. Additionally, it has to be defined when these hand-over's should take place. For this, the change frequency of the deliverables/artifacts has to be considered. If all the above aspects are clarified it usually makes sense to automate the integration by coupling the used BPM and EAM tools. In general it has to be noted that during projects the integration is relatively simple (and in the majority of cases a one-time effort). For example a BPM project might use some EAM deliverables and no sophisticated update activities are necessary. However, most EAM objectives can only be reached if EAM is implemented as a permanent activity within the organisation. The same applies to many BPM objectives.

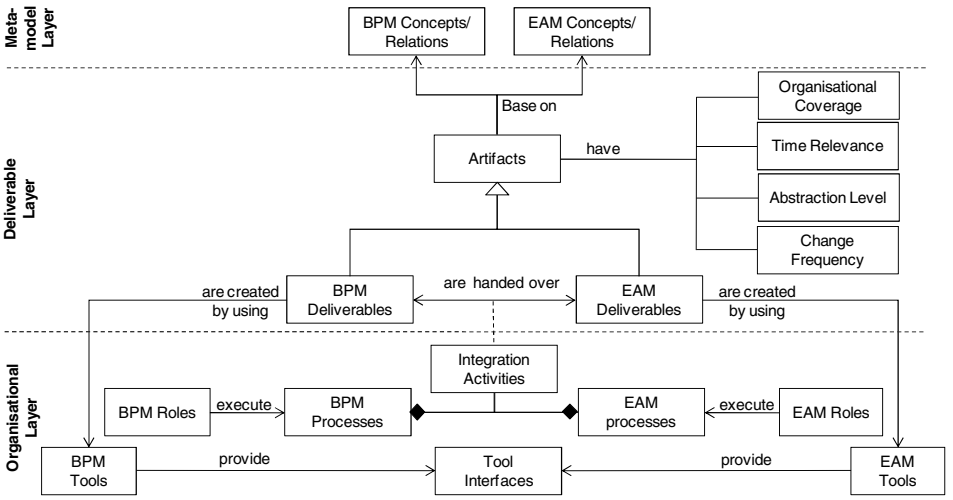

Figure 1: Conceptual Model for the Integration of BPM and EAM

In the EAM field, there are some publications about integrating EAM with other disciplines, discussing the re-use of existing artifacts from other areas within EAM. This is not surprising; EAM metamodels by definition cover many aspects of an organisation [Bu09, Ca08, En08, Fr02, TO09a, TO09b]. In general it is accepted that it makes sense to use federated approaches in EAM. TOGAF 9 [TO09a] states that knowledge of business architecture is a prerequisite for architectural work. According to TOGAF 9 a key objective is to re-use existing material, e.g. business process models (often catered in other organisational processes like enterprise planning, strategic business planning or business process reengineering) as much as possible, in order to keep efforts for architectural work to a minimum. However, there is nothing said on how to organise this in detail. [TO09b and St09] for example discuss integrated metamodels for EAM and BPM, but do not focus on procedural guidance, integration activities and obstacles in order to facilitate collaboration of (existing) BPM and EAM initiatives. In [Fi07] a generic process of how EAM data from various sources can be integrated is discussed. The abstraction level of artifacts is considered, but the other determinants of the presented method (time relevance, change frequency and organisational coverage) are not elaborated.

3 Some Integration Scenarios

In this chapter two sample integration scenarios, based on the practical experiences of the authors that leverage the integration method at hand, are discussed. Each scenario is described featuring the three layers of the conceptual model. As stated in chapter 1, depending on the particular objectives, specific methods are applied for EAM/BPM. The integration method brings the required measures for integrating BPM and EAM initiatives into focus. Hence, the discussed metamodels, deliverables, and organisational aspects, are not self-contained methods for BPM or EAM.

3.1 Work Instructions (BPM) – Application Portfolio Management (EAM)

In this scenario, BPM focuses on the provision of work instructions (operational procedures) which is a very common application scenario of BPM [YG01]. Work instructions are depicted in the form of process landscapes (high level process architectures) and detailed activity diagrams advising employees on how to do their work. On EAM side we take the application scenario of Application Portfolio Management as an example (see [Ju08] for details). As depicted in the *metamodel* layer (see figure 2) BPM needs to assign applications to activities of the process descriptions, especially in a business area where users need to use multiple applications for performing the business processes. EAM reuses processes (the process maps) - originally created on BPM side for structuring the work instructions – forming a major building block of the business architecture. Applications are assigned to the processes, e.g. to analyse the support provided by applications for the individual business processes on a high level of abstraction (see method pattern "High Level Process Support" in [Bu09]). The *delivery layer* depicts the required deliverables exchanged between EAM and BPM in conformity with the metamodel. BPM provides process maps on an agreed abstraction level. Work instructions cover the as-is situation. Hence, EAM reuses the as-is process maps of BPM for analysing the as-is business architecture. As to-be processes are not required for work instructions the development of to-be process maps remains an EAM task. On the other side EAM usually possesses application architectures for as-is, to-be and intermediate time states. Since work instructions focus on the as-is only, only as-is applications (applications in state "productive") need to be delivered. On the *organisational layer* on the BPM side the process "Define/Update Process Map" ensures an appropriate structure for the work instructions mapped in "Define/Update Work Instructions". The third BPM process covers the provision of artifacts, like applications or other central elements of BPM (e.g. roles, organisational units), all of which can be reused multiple times in process flow models. In EAM processes for the maintenance of application data, technology products, and process maps (and certainly a lot more EA artifacts, see the metamodel of TOGAF [TO09a]) need to be in place. If process maps are reused then the effort on the EAM side is reduced significantly. For EAM, yearly synchronisation cycles are sufficient as architecture planning usually underlies a yearly cycle. However, BPM needs information on currently productive applications for keeping work instructions up to date and so synchronisation is done on a weekly basis (weekly synchronisation). The roles ‘Process Owner’ and ‘Enterprise Architect’ are accountable for the quality of the exchanged deliverables.

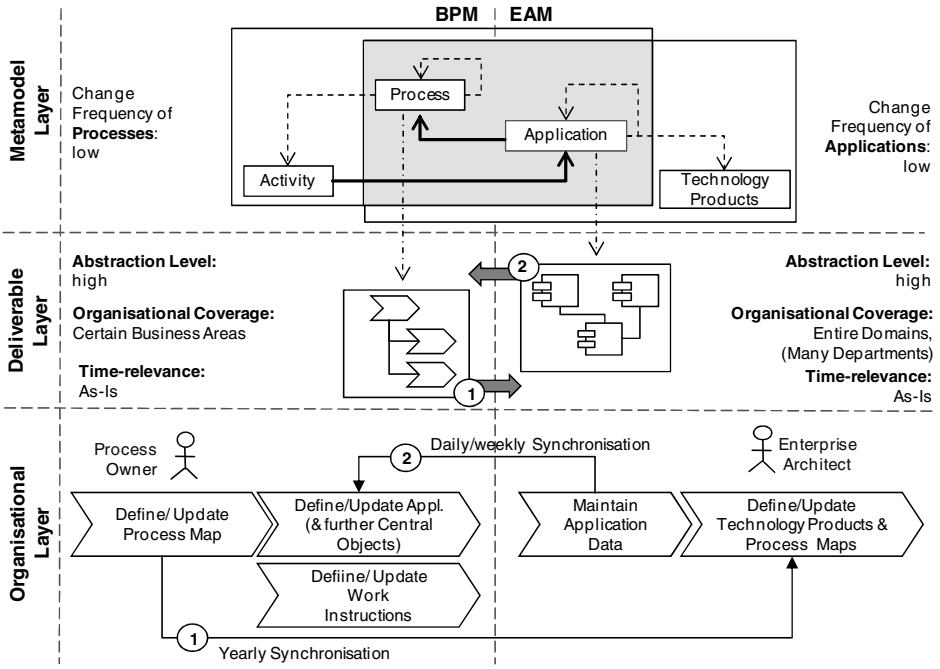

Figure 2: Work Instructions – Application Portfolio Management

3.2 Process-based IT Specification (BPM) – Service Enablement (EAM)

In this scenario business process models (on BPM side) represent a major building block for the specification of (IT) applications. Hence, on the BPM side of the *metamodel layer* process maps and process flows on activity level are important concepts. Towards a service-oriented architecture (SOA), the business processes need to be evaluated in order to identify required "services" – flexible software units that can be combined and reused to realise autonomous business functions. "Activities" which should be supported/automated by leveraging "services" need to be identified. On the EAM side our example includes "applications", "interfaces", and "services" as the main concepts. Services are decomposed into "service operations". In order to identify and enable reuse of existing services, the catalogue of services (see deliverable layer of figure 3) maintained by the EAM needs to be accessible for all application development projects on the BPM side. In EAM, the business architecture is usually the starting point for the service-oriented design of the IT application landscape [En08]. As process maps are one prominent way of representing the business architecture it is reasonable to reuse these on the EAM side. As this scenario is elaborated in detail in the scenario above (see chapter 3.1) it is not elaborated here.

On the *deliverable layer*, services are governed on the *instance level* (services versions, see chapter 4.3 for details) as BPM needs to know if the provided functionality of currently available services is sufficient or if a new, advanced version of the service

needs to be developed. As EAM covers cross-departmental domains or the entire organisation, all existing services need to be delivered allowing BPM to select appropriate services. BPM is usually interested not only in existing but also in upcoming services. Hence, the delivered catalogue of services must contain not only as-is services (state "implemented") but also service candidates (services in status "planned", "in development" etc.). This will allow software implementation projects (BPM side) to address requirements on planned services prematurely. This will enable EAM to increase the re-use of the services (one of the major objectives of SOA), by covering requirements of multiple projects. On the *organisational layer* BPM defines and updates process maps and activity diagrams. These business processes are analysed and services are assigned to activities. On the EAM side processes for maintenance of the EA artifacts are in place. Provision of the catalogue on services usually needs to take place in short time intervals (daily/weekly synchronisation) to avoid misguided decisions on service reuse/implementation. Of course, it is reasonable to define services (in state "planned") on the BPM side if no adequate services can be found in the service catalogue and to deliver these to the EAM in order to inform the EAM of required services. However, this is not elaborated here.

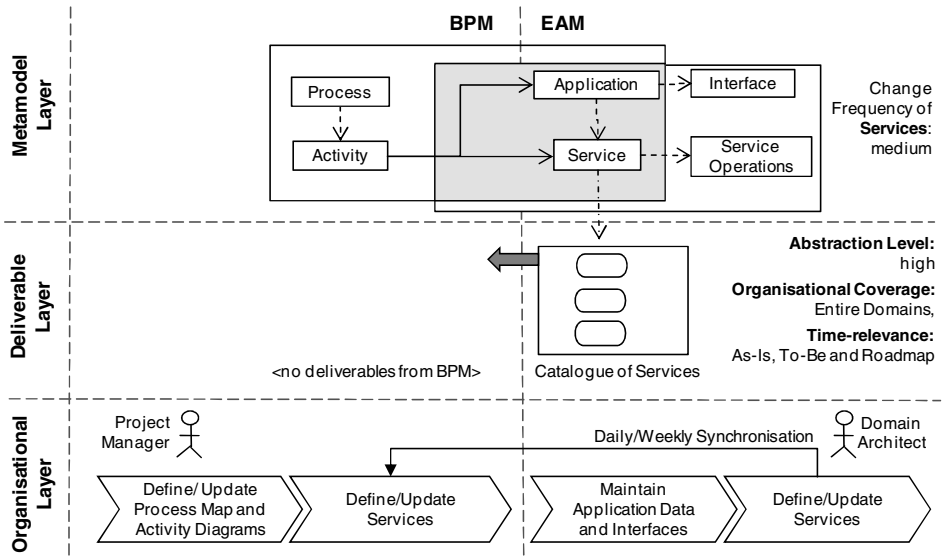

Figure 3: Process-based IT Specification – Service Enablement

4 Procedural Model for Integrating EAM and BPM

This section discusses the steps of the BPM/EAM integration method (see figure 4 for an overview). Step 3 and step 4 are discussed in detail. Prerequisites are clearly defined individual objectives of BPM and EAM. Problems to be resolved in EAM and BPM need to be elaborated.

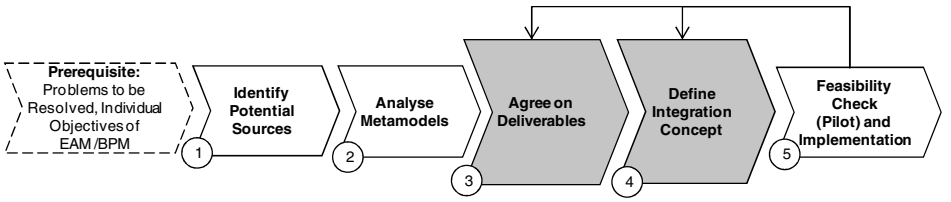

Figure 4: Procedural Model for BPM and EAM Integration

4.1 Step 1: Identify Potential Sources

Based on the individual objectives, BPM and EAM need to examine the organisation in order to identify existing and suitable data sources and data suppliers. From an EAM view, organisational and/or business departments might be a good contact point for provision of BPM information, if required for achievement of individual EAM objectives. For BPM the EAM team (e.g. the enterprise architect) or members of the IT management would be a first contact point. A high-level evaluation of the existing information is performed to assess the potential benefit of the integration. Main factors are actuality, accurateness, and internal consistency of the existing information.

4.2 Step 2: Analyse Metamodels

In this step the structure of the information sources taken into consideration is analysed in detail. The metamodels of EAM and BPM are compared and "shared concepts" (concepts represented in both metamodels) are identified. If no explicit metamodels are available or maturity level in terms of the structure of existing documentation is too low, the metamodels need to be derived first. Based on the results the metamodels might be adapted and/or expanded to make integration possible. For a structured approach for metamodel integration see [Zi07].

4.3 Step 3: Agree on Deliverables

After metamodel integration the determinants (*organisational coverage, abstraction level*, *change frequency* and *time relevance*) need to be defined and agreed for each deliverable and its associated elements. Examples are given in the previous chapter. E.g. for the deliverable "catalogue of services" (see scenario "Process-based IT Specification – Service Enablement", chapter 3.2) the element "service" is refined according to the determinates of the integration method. The resulting impact – in terms of practicality, costs, and benefits – needs to be evaluated (see cost-benefit analysis, chapter 4.4).

Organisational Coverage. In order to deal with missing or inconsistent information, the organisational coverage of EAM and BPM needs to be considered. Figure 5 depicts an example. In "Business Area A" the required process maps are available while for "Business Area B" no information is available. EAM covers the entire organisation.

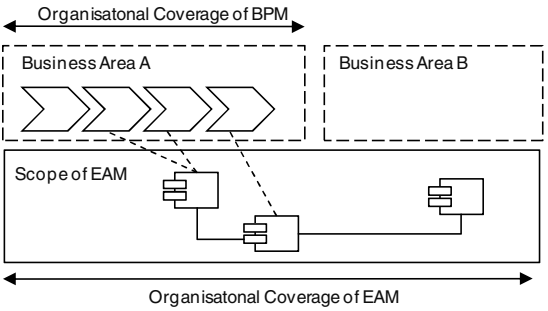

Figure 5: Organisational Coverage

Depending on the intended use, BPM will not stringently cover all business areas of the enterprise. Only some processes or business areas of the enterprise might be in scope for BPM. However, EAM needs a broad base information set that covers the whole organisation or at least entire domains to identify improvement potential [Ai09], e.g. to uncover potential reuse of web services. For this, the degree of organisational coverage has to be evaluated before deciding on scenario integration.

Abstraction Level. Due to the different objectives that the information is acquired for, often the level of abstraction varies between BPM and EAM. It is important to determine the appropriate abstraction level for the exchanged deliverables. The granularity of the deliverables needs to be determined according to objectives, and measures of BPM/EAM. Finer-grained deliverables permit closer management and measurement but require greater effort to govern and maintain. Figure 6 depicts different mechanisms for the definition of EAM and BPM artifacts on various abstraction levels (see [Mo08] for details).

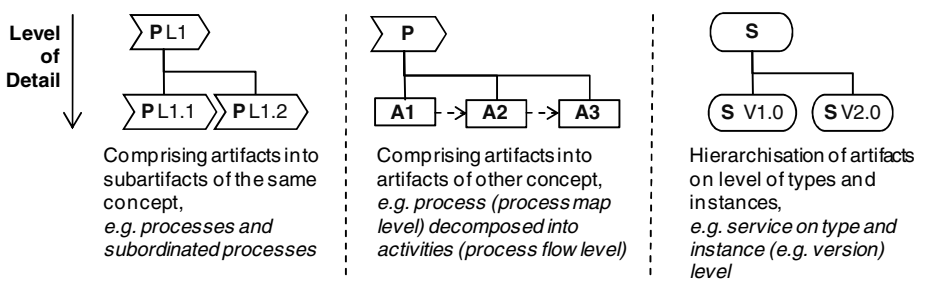

Figure 6: Different Levels of Abstraction in BPM and EAM

Change Frequency. In reality artifacts, like processes and applications, are subject to continuous change. However, the change frequency of the deliverables describing these artifacts highly depends on the chosen abstraction level (see above). While artifacts on a low abstraction level are rapidly changing (e.g. versions of services or activities of a certain process) artifacts on a higher abstraction level (e.g. services on type level or top level processes) tend to be more stable. As a consequence creating and exchanging deliverables on high abstraction levels reduces the need for short synchronisation cycles and efforts for integrating the "external" deliverables. Figure 7 depicts change frequency of (a) applications and (b) processes on different abstraction levels.

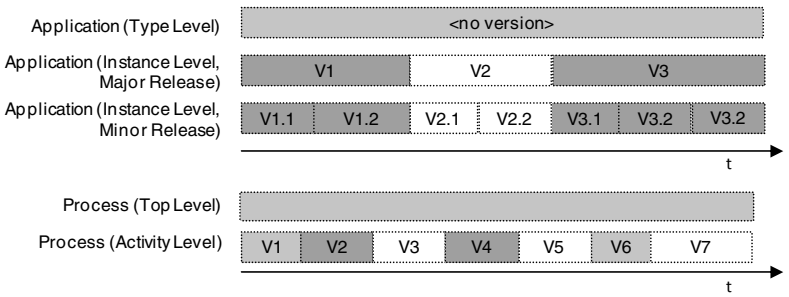

Figure 7: Change Frequency of Artifacts/Deliverables

Time Relevance. Usually the considered time horizons of BPM and EAM differ (see figure 8). In BPM the as-is state (e.g. mapping of work instructions, see chapter 3.1) or a mid-term time horizon (e.g. specification of IT systems, see chapter 3.2) is considered. Strategic aspects in EAM (e.g. planning for new products, business models) require the modelling of to-be architectures in the long-run. Therefore the EA is typically described by as-is and to-be states and several intermediate states (roadmap states) that vary in their level of detail. When suitable information for future architectural planning is not available on the BPM side, it needs to be created and maintained on the EAM side. An example is given in chapter 3.1 where the BPM delivery "process maps" represents the as-is but no to-be process maps can be delivered by BPM.

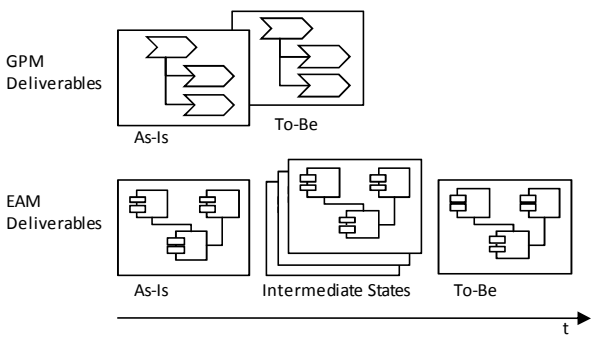

Figure 8: Time Relevance

4.4 Step 4: Define Integration Concept

Depending on the complexity of the integration scenario "clarification of data ownership", "adaptation of existing processes", "provision of adequate tool support", "execution of cost-benefit analysis" and "definition of SLAs" is required.

Define Data Ownership. The data ownership for the exchanged artifacts is clarified to ensure data integrity and consistency. Responsible roles and accountabilities have to be determined. BPM usually has sovereignty on artifacts of the business architecture (e.g. business processes and organisational structures). EAM usually owns technical artifacts like applications, interfaces and technologies forming the IT architecture. However, this

is not always true. Chapter 3.1 brings up the example of process-based work instructions depicting the as-is process maps. It is mentioned that defining the to-be process maps might be up to EAM. Figure 9 depicts roles involved in the BPM and the EAM and ownership of artifacts/deliverables.

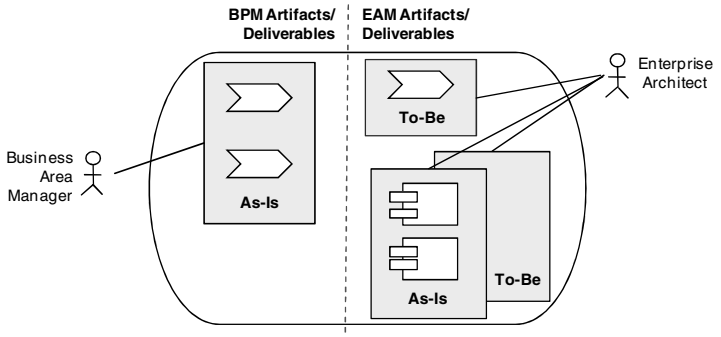

Figure 9: Agreement on Data Ownership of Artifacts and Deliverables

Adapt Existing Processes. To keep the conjoint information base up to date, procedures and guidelines for the creation, approval and exchange of deliverables needs to be defined and integrated into existing processes on the BPM and the EAM side (see integration activities of the conceptual model, figure 1). [Mo09] and [Fi07] discuss patterns/methods for organising federated data acquisition for EAM. These can be applied on the BPM side as well. Besides the processes, responsible and accountable roles need to be defined and staffed. If the necessary skills to create the required deliverables are not available among the staff, then these skills need to be developed.

Tool Support. When the criteria of chapter 4.3 have been agreed upon and on both sides structured information is available, automating the exchange of the deliverables is feasible. Required tool mechanisms for putting architecture artifacts (EAM side) under appropriate control are presented in [Mo08], discussing functionality like versioning, release workflows, metamodelling functionality and logical deletion of artifacts.

Cost-Benefit Analysis. The determinants *abstraction level* and *change frequency* are effort drivers for integration of EAM and BPM. It has to be considered, that update mechanisms are usually needed at the receiving side because when having received a former version of the deliverable it has been assigned to other artifacts. Hence, besides the effort for creating the deliverables on supplier side, the effort for integration of the deliverables on receiver side also needs to be considered carefully. Costs in terms of effort for creation and integration of the deliverables need to be balanced with the gained benefits. Appropriate tool support lowers efforts for delivery and integration. *Organisational coverage* and *time relevance* mainly influence the possible benefits of integration. Consider the sample scenario of chapter 3.1. As working instructions might focus on a single department, that may not cover a significant part of the organisation, and only contains as-is process maps, reuse of these process maps might be of little value to the EAM.

Agree Service Level Agreements on Deliverables. [Fi07] proposes to set up maintenance contracts to ensure the quality and maintenance schedule of the deliverables. This also applies for the method presented here. In practical terms, Service Level Agreements (SLAs) must be defined in sufficient detail and scope for the deliverables exchanged. The criteria discussed in chapter 4.3 and 4.4 must be defined.

4.5 Step 5: Feasibility Check (Pilot) and Implementation

In this step the integration concept is piloted. Based on this pilot the original motivation for the integration is checked. The solution is fit for the purpose of supporting subsequent work in BPM/EAM. If the solution does not bring the aspired effects, the structure and granularity of the deliverables (see step 3, chapter 4.3) and the defined integration concept (see step 4, chapter 4.4) needs to be reconsidered. If the pilot is successful the integration concept can be implemented.

5 Experiences and Outlook

This paper presented a method for BPM/EAM integration. The most important advantages – business/IT alignment and reduction of efforts due to the reuse of existing documents/models – were stated. A conceptual model, covering all aspects to be considered for the scenario was developed. Then, real-world examples were briefly discussed in order to clarify the elements of the conceptual model and the problem domain being addressed. Then the main steps of the integration were introduced. The paper then focused on the criteria to be agreed upon for sustainable and effective integration, taking the cost-benefits of the scenario into account.

The discussed mechanisms evolved step by step during the various EAM and BPM projects conducted by the authors. The authors are aware that the presented method, to a great extend, can be applied to various integration scenarios in any other domain of enterprise modelling. An example is the integration of EAs with data of Configuration Management Systems.

The suitability of the presented method certainly needs to be proven in a more structured manner. Our evaluation approach will define and evaluate key performance indicators (KPIs), e.g. the "reduction in scenario integration implementation time/effort" and indicators evaluating the reduction in workload on the BPM and EAM side. Soft indicators, like improved business/IT alignment will be collected via structured interviews. Among our future research objectives is the development of concrete patterns for BPM and EAM integration based upon the presented method, which can be understood as an extension of the EAM pattern catalogue [Bu09] and the EAM process patterns of [Mo09].

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