

Survey on Requirements and Approaches of Business Process Repositories

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Abstract- Business processes manifest the business knowledge and related logics. As it becomes more common for organizations to describe their operations in terms of business processes, it is necessary to establish a Business Process Repository to manage thousands of process models while providing capabilities for effective sharing and reusing of valuable business and process related knowledge. Even though there are number of repositories exist to store process models, the heterogeneity of current process repositories makes it difficult to relate and share process knowledge across them. A survey of existing business process repositories has been reported here by reviewing number of available process repositories and the existing literature. Analyzing the principles on which development of these repositories are based, a comparison is made to identify the strengths and shortcomings. Founding on these principles, a number of essential properties that a successful process repository solution should possess are proposed as to support process repositories development efforts. Consequently, such a repository would become a common information asset to all business users and especially facilitate reuse over different business domains while enhancing assuring sharing and reuse business process knowledge.

Index Terms- Business Process Management, Process Model, Sharing & Reuse, Business Process Repository

I. INTRODUCTION

Business Process Management (BPM) refers to activities performed by organizations to manage and to improve their business processes. Basically, a business process is a series of activities occurring within an organization. Most often, it focuses on meeting the needs of the customer and delivering a good or service that will fulfill their needs. As business process models serves as blue prints for implementing business processes management solutions, the notion of a process model is foundational for BPM [3]. Identifying the activities and their relationships and representing them by business process models allows stakeholders to communicate about these processes in an efficient and effective manner [3]. By making business process models as common communication platform, business processes can be analyzed and then deciding on potentials improvement opportunities [3].

Traditionally, business processes are enacted manually. However, as the number of business processes and their enacted instances increase, it is difficult for business users to manage them all and to meet business process information requirements

effectively [8]. In that case, since the current interest in BPM is fueled by concepts and technologies from different areas of business administration and computer science, one solution is to collect and share process knowledge through a process model repository. The main benefits of such a repository are model reuse and knowledge exchange. This trend in modern BPM is discussed under emerging field known as Business Process Repository (BPR).

In general, a repository is a shared database of information about engineered artifacts produced and/or used by an enterprise [4]. Consequently, it should provide common database management services for data model creation and adaption, data retrieval, enabling data views, integrity management, access management and state management [7]. It should also provide services that are specific for managing objects as opposed to data in general; check-in/out, version management, configuration management, notification management, context management and workflow management [7]. The functionality for general repositories can be specialized and extended to accommodate repositories requirements specifically for storing and managing business processes [7].

Today, there exist a number of efforts to build BPRs, e.g. the MIT Process Handbook (MIT), Phios Process Repository for Supply Chain (SCOR), SAP Business Map (SAP), IBM Process Repository (IBM-PR), IBM-BPEL Repository (IBM-BPEL) and Semantic Business Process Repository (SBPR). Even though there are number of repositories exist to store business processes, the heterogeneity of current process repositories makes it difficult to relate and share process knowledge across them [5]. One of the promising approaches to overcome these limitations are through the identification of business process repository requirements and then establishment of development standard based on them for existing and future BPR solutions.

The main purpose of this survey is to establish a universal list of requirements for a BPR to facilitate process model reuse and knowledge exchange. Five process repositories; MIT, SCOR, IBM-PR, IBM-BPEL and SBPR are subjected to the said evaluation in this work. The survey is conducted through reviewing a set of available BPRs [9, 10] and the existing literature [1, 2, 4, 5, 6, 7, 8]. Having identified strengths and shortcomings of selected BPR solutions, a number of essential properties that a BPR should possess are proposed.

The remainder of the survey paper is organized as follow. Section 2 introduces five existing BPRs. In Section 3, the results

of the repository comparison are presented and a list of BPR requirements is proposed. Section 4 concludes the paper.

II. AN OVERVIEW OF EXISTING BUSINESS PROCESS REPOSITORIES

This section provides a brief overview of five existing BPRs which are chosen to perform the evaluation.

- 1) MIT: With respect to the presentation form, the repository describes business processes only in a textual form. The process mapping technique analyzes business processes using two dimensions; the vertical dimension distinguishes different parts of a process and the horizontal dimension distinguishes different types of a process [6]. In fact, the process categorization is based on the process compass. From any activity in the repository, user can go in four different directions; down to the different parts of the activity (its sub activities), up to the larger activities of which this one is a part (its uses), right to the different types of this activity (its specializations) and left to the different activities of which this one is a type (its generalizations) [6]. Besides from standard functionality for storing and retrieving information about process models, the repository supports browsing the process models along the two dimensions [7]. In addition to that it supports text-based search [7]. To support specialization, rather than just lump all different kinds of specializations into a single undifferentiated list, the repository separates them into categories called bundles. Bundles are based on the basic questions that can ask about any activity; how, what, who, when, where, and why [7]. In addition, the repository processes are grouped into ten root categories; procurement, supply chain management, marketing, sales, information systems, human resources, strategic planning, finance or accounting, manufacturing or logistics and engineering [2].
- 2) SCOR: This is a proprietary repository that stores business processes related to supply chain management only [2]. A process compass is used for classification, in the same way as MIT. Further classification is based on four verbs; create, destroy, modify, and preserve [2]. The processes in SCOR are organized around five management root processes; plan, source, make, deliver, and return [2].
- 3) IBM-PR: The IBM-PR is proprietary to IBM and gives a graphical representation of e-commerce related process models with the aim of providing an explicit control flow. Especially, it supports the storage of process objectives together with the process [2]. It classifies processes into five major groups; B2B direct, consumer direct, demand chain, hosting, and supply chain [2]. Each group has three sub groups: direct admin processes, direct starter stores, and direct solution [2].
- 4) IBM-BPEL: IBM has published another repository called BPEL (Business Process Execution Language) repository for storing business processes along with associated metadata. The IBM-BPEL is an Eclipse plug-in originally built for BPEL business processes and other related XML data [1].

The repository can easily be extended with additional XML schemas because of its flexible architecture [1]. It uses the BPEL XML format as its external format and stores the process models and their elements internally as objects in an EMF (Eclipse Modeling Framework) repository [7]. The processes are not presented in textual or graphical format instead they are treated as objects in IBM-BPEL [2]. The processes are stored without any classification scheme [2]. Besides the standard functionality for storing and retrieving process models, the repository can interact with query engines that are built on the EMF repository, EMF extensions and other external software [7].

- 5) SBPR: The SBPR is an ontology based repository for storing business process models [7]. It does not commit to a particular set of aspects of business process models that must be stored. Instead, it requires that the repository is configured with a process ontology, of which the concrete process models are be instances [7]. The processes in SBPR are neither presented in textual or graphical form nor classified into groups [2]. Besides from the standard database management functionalities, the SBPR supports semantic querying which can only be processed, when the ontological knowledge of the process models is taken into account. The SBPR is open for change by potential users. To avoid the production of inconsistent process models, it provides check-in and check-out capabilities; the process model in SBPR is locked when the modeling tool obtains it (check-out), so that no other users can modify the process model in the SBPR in the meantime [8]. After the modeling work has been done, the process model is updated in the SBPR and any locks that have been held for the process model are released (check-in) [8]. The repository also provides versioning functionality.

III. DISCUSSION

This section presents a comparison of repositories to identify the strengths and shortcomings of each and proposes a number of essential properties that a BPR should possess.

Based on the survey of repositories in the preceding section, a number of existing repository properties are chosen as criteria for evaluating repositories. The resulting criteria are as follows:

- 1) Provides graphical interfaces for user interaction (A)
- 2) Allows for maintenance by public (B)
- 3) Focuses on storing a domain specific business process models (C)
- 4) Classifies the processes in to categories (D)
- 5) Stores the processes described independently of the process modeling language used (E)
- 6) Presents business process in graphical form (F)
- 7) Describes the activities that are performed in the context of a process (G)
- 8) Describes the control flow relations between activities (H)
- 9) Describes the business objectives that will be satisfied through the use of a process (I)
- 10) Stores metadata about a process (J)
- 11) Supports the create, update and delete functions (K)

- 12) Supports process navigation (L)
- 13) Supports process search (M)
- 14) Supports process querying (N)
- 15) Enables version management function (O)
- 16) Enables check-in/out management (P)

Accordingly, the evaluation is performed to identify the extent to which each repository meets those criteria. Table I shows the results of the evaluation. The criteria are identified by alphabetic letters as given in the above list. The possible values of each criterion are: the repository meets the criterion (✓) or the repository does not meet the criterion (*).

Table I: Comparison of repositories

	MIT	SCOR	IBM-PR	IBM-BPEL	SBPR
A	✓	✓	✓	✓	*
B	*	*	*	✓	✓
C	*	✓	✓	*	*
D	✓	✓	✓	*	*
E	✓	✓	✓	*	*
F	*	*	✓	*	*
G	✓	✓	✓	*	*
H	*	*	✓	✓	✓
I	*	*	✓	*	*
J	✓	✓	*	✓	✓
K	✓	✓	✓	✓	✓
L	✓	✓	✓	*	*
M	✓	✓	*	*	*
N	*	*	*	✓	✓
O	*	*	*	*	✓
P	*	*	*	*	✓

The table shows that, all other repositories, except SBPR, provide graphical interfaces for user interaction. Instead, SBPR provides a Java API for interaction. Nearly, most repositories support for create, update and delete functions. Exceptions are MIT, SCOR and IBM-PR because although they do allow processes to be created, updated and deleted, do not provide public interface to do that. In addition, SCOR only stores process models related to supply chain management and IBM-PR only contains e-commerce related process models while MIT, IBM-BPEL and SBPR are unrestricted in scope. As classifications, 3 out of the total repositories classify processes in accordance with various classification schemes.

In contrast to IBM-BPEL and SBPR, all other repository contents are developed independently of any particular specification technology. IBM-BPEL focuses on storing the processes described in BPEL XML format. In SBPR, the business process models are based on process ontologies. Moreover, IBM-PR presents the process models in graphical format, whereas MIT, IBM-BPEL, and SCOR give a textual explanation of processes. Only MIT, SCOR and IBM-PR are able to store the textual phrasing of a process model that describes the activities of a process, the involved entities and their interaction. Also, except MIT and SCOR, other repositories have the ability to describe and store the control flow aspects of a process.

Aside from IBM-PR, no repository supports the storage of process objectives together with the process models and most repositories store process related information such as creation date, last modification, and number of versions, except IBM-PR. Furthermore, most repositories support one or more functions to search, query or navigate the repository. The table shows which type of functionality each process repository supports. With the exception of SBPR, no repository provides facilities for handling changes to process models by maintaining versions and for check-in/out management, to avoid the production of inconsistent process models.

Based on this comparison, the following repository requirements are proposed as the essential properties that a BPR should possess:

- 1) Should provide graphical interfaces for users to interact with the repository, so that users can easily interact with the functions provided by the repository
- 2) Should accessible for public creation, editing, and deletion, so users can be encouraged to reuse models
- 3) Should be able to store process models in general, hence the reusability of models between business domains can be increased
- 4) Should arrange its content according to a business classification scheme to allow quickly browsing the collection of processes
- 5) Should support to store the processes described independently of the process modeling language used, as a consequence the repository content can be developed independently of any specific technology
- 6) Should be able to present the process models in both graphical and textual formats, so such a repository will provide an easy and understandable access to its content
- 7) Should be able to cover description of: activities that are performed in the context of a process, control flow relations between activities, relationships between processes, physical resources that are required to execute a process, who is authorized to perform which part of a process, how the performance of a process should be monitored, the business objectives that will be satisfied through the use of a process and process related information such as creation date, last modification, and number of versions, hence users can clearly identify the related aspects of each process model
- 8) Should provide support for navigating, searching and querying facilities for users to locate content effectively
- 9) Should be able to maintain multiple versions of the same process model, produced during the customization, so that users can simply go back to old versions and develop process models from old versions further
- 10) Should be able to create private and public views on a process, which represents the process as it is performed inside an organization and which provides of what the behavior of the process to the out-side world will be like, so users will not be bothered with details that do not concern them
- 11) Should provide check-in/out functions to avoid the production of inconsistent process models as it opens for change

- 12) Should enable notifications to be generated in case an object in the repository is changed, so that users can get to know about most recent works

IV. CONCLUSION

In order to support the development of future BPRs which are capable for model reuse and effective knowledge exchange, the proposed set of repository requirements can be used as the basis. Such a BPR would become a common information asset to all business users and especially facilitate reuse over different business domains.

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