Managing business rules in enterprises

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Abstract. Business rules are evidently an important business category since they describe how enterprises are doing business. Their value in developing applications that are flexible and amenable to change has made them attractive also within information system (IS) domain. In the paper we describe how business rules can be used as information resources that help in establishing the link between organization's business and its supporting IS. We show a business rule management scenario that integrates the activities for managing the business rule in an organization, and the activities that support business rule management across the IS development life cycle.

Key words: business rule, business rule management, business rule approach, information system development

Obvladovanje poslovnih pravil v organizacijah

Povzetek. Poslovna pravila so pomemben element vsake organizacije, saj se nanašajo na njeno poslovanje. Zaradi njihovega pomena pri gradnji prilagodljivih in za spremembe odprtih aplikacij so postala pomembna tudi na področju razvoja informacijskih sistemov. V članku poslovna pravila predstavimo kot nosilce informacij, ki so v pomoč pri vzpostavitvi zveze med poslovnim okoljem in podporno programsko opremo. Za obvladovanje poslovnih pravil v organizacijah opišemo scenarij, ki temelji na obravnavi poslovnih prvil z vidika organizacije ter predvideva aktivnosti za njihovo obravnavo skozi vse faze razvoja informacijskih sistemov.

Ključne besede: poslovno pravilo, obvladovanje poslovnih pravil, pristop na podlagi poslovnih pravil, razvoj informacijskih sistemov

1 Introduction

In the last decade business rules have become a popular artifact in the IS community. Proponents of the so-called *Business Rule Approach* propagate how business rules can be used as an instrument for developing flexible applications and databases that are amenable to change [2, 3, 15]. Various kinds of tools and systems can be used today that help IS developers to manage business rules across the IS development life cycle [1, 4, 21]. However, business rules do not pertain to the IS nor its application software. According to one of the simplest definitions *rules are declarations of policy or conditions that must be satisfied* [OMG]. Indeed, business rules are statements that allow user experts to specify policies, conditions and knowledge in small, stand-alone units. As such they reflect the enterprise's way of doing business and are set and owned by

the business. But at the same time they act as a key component in the IS life cycle. First, they represent a source for requirements determination when a particular IS is being designed, and second, they serve as a means through which the IS can be aligned to the business environment. The need for establishing an explicit link between business and the IS has been recognized before [23, 27, 28]. In this paper we show how business rules can be used to implement this link and how they can act as an integration point between business and the IS.

2 Business rule background

The first appearance of the phrase *business rule* in its present context goes back to the 1984, when Daniel Appelton wrote an article, called *Business Rules: The Missing Link* [22]. Appelton discussed problems that were caused by a lack of standardized business terms. His point was that business analysts could not provide business with common application solutions if business users used terms that varied in meaning from one organization department to another. After his discussion many computer information system professionals came to an idea that if the rules of business could be captured in processing machines (like rules in expert systems) then the machines could enforce the rules and assure business processes to be controlled and conducted according to business standards, policies and procedures [21]. This was only the start. Later, IS researchers and practitioners started to work on business rules from various perspectives.

Extensive research has been done in relation to active databases [17, 18, 19, 20]. Using active components, like triggers and database procedures, active databases per-

form their own data integrity functions instead of letting the integrity be managed by the application code. It appeared soon that active databases could be used as an instrument to enforce business rules. In fact, it turned out later, the active databases concepts contributed to the foundation of an automated business rule management system [21].

Once the idea of implementing business rules in database systems emerged, a substantial effort was put in discovering a robust and powerful method for representation of business rules in data models [cf. 12, 8, 9, 13]. As opposed to static business rules that can be expressed in Entity-Relationship-Models (ERM) easily, dynamic business rules are not supported, as ERM does not allow an explicit representation of events, conditions, or actions. Consequently, several extensions to ERM have been proposed (e.g. ER-RM [24] or BIER [25]) as well as other techniques and methods (e.g. ELH of SSADM [26] or Ross Method [12]). A comparison of selected methods can be found in [8].

As interests in business rules were growing, advocates of the approach became aware that an explicit manipulation of business rules was required in order to support the entire business rule life cycle. As a result, numerous research projects have been carried out in support of business rule discovery, analyses, classification, articulation, formalization and documentation [6, 15, 12, 30, 7, 9, 16].

Today, one of the most promising areas of business rule research is integration of organization's business environment and its supporting IS [27, 28]. While it is clear that an IS can act as a competitive asset to the organization, it must first conform to its real business needs. However, keeping an IS aligned with the business environment is not an easy job. Namely, the business policies constantly change on the business level, but we are not able to keep up with changes that are required in supporting the IS. Keeping an IS up-to-date with the business environment is also the main motivation for this paper. In this regard we describe the activities that support business rule management in enterprises and suggest a scenario which demonstrates how to perform the activities across business modeling and IS development.

3 Business rules in IS

As discussed in the introduction, business rules are specifications of the business policy, conditions and knowledge and are set and owned by the organization. Apart from being important as an organization asset, their value has been recognized also in the IS community. First, they represent significant input in determination of requirements for an IS, and second, they act as a means through which the IS can be aligned with the real business environment.

Changes in an organization's business environment almost never happen spontaneously, without any reason, but are a result of strategic and tactic decisions taken by the organization management. Such changes very often lead into adaptation of existing business processes and require either new or modified software. What usually changes in the supporting software in response to the new business requirements are implementations of business rules which are re-programmed to meet the new objectives, goals, and policy of the organization. Since the same rules may be executed in several systems and even within the same system with different components, the changes invariably need to be coordinated. Furthermore, if we want to make software applications amenable to change, we have to keep track about the software components that implement each particular rule in each particular application. Today, there are some tools that allow business rules to be extracted from other information and put into databases where they can be accessed and maintained separately, but they only support business rules management in context of a particular IS. Conversely, our purpose is to show a scenario that supports managing business rules in an overall organization. This includes:

- modeling business rules in the organization's business model,

- extracting inherent business rules from the business model,

- using extracted rules in requirements determination for an IS,

- linking rules that are implemented in an IS to their representation in an organization's business model.

The scenario is briefly illustrated in Fig. 1. As depicted, some of the scenario activities intersect with the activities that are traditionally performed in the IS development and represent either their new or complementary part. These activities include: business rule discovery, business rule analysis, business rule consistency and conflict validation, business rule modeling and business rule implementation. Apart from the activities that are performed through IS development, the business rule management scenario embraces also tasks that support management of the rules in an overall organization. These tasks are performed independently of the IS development and include: identification of strategic, tactic and operational rules, and business rule maintenance. In subsequent sections each of the activities is briefly described.

3.1 Business rule discovery

The purpose of business rule discovery is to analyse information about organization units for which the IS is being designed and to retrieve sources of information for derivation of business rumblings. Business rumbling is a term coined by Barbara von Halle [14] and represents

an unstructured piece of information concerning a specific aspect of a business. Business rumbling is highly unstructured, informal and can be ambiguous, inconsistent, in contradiction with other rumblings and may also contain more than a single rule.

The requirements specification document that includes information about the activities that occur in the business, the nature of data that are used, the work culture and ethics of the organization, the key members of the organization, etc. is the core input into business rule discovery. Business rumblings may also be elicited directly from business people through traditional requirement specification techniques such as interviews, questionnaires, observation at work, monitoring the use of ad-hoc working methods, etc. However, if the organization keeps a business model, then the initial set of rules can be derived directly from the information captured within the model.

3.2   Business rule analysis

Business rumblings are written in natural language and may contain more than a single business rule. Through the business rule analysis, business rumblings are analysed and decomposed into discreet, atomic and precise statements of information, called business rules. The process of decomposing business rumblings into business rules involves business rule classification, which is based on a predefined rule classification scheme. The purpose of the classification scheme is to provide structures into which business rules can fit with respect to the nature or type of information they convey. Today there are several taxonomies available for classification of business rules [cf. 3, 4, 6, 9, 11, 12, 15, 21].

3.3   Business rule consistency and conflict validation

Conflict and consistency validation is one of the most delicate and time-consuming tasks in the business rule approach as the semantics of the rules - specified in natural language - are essential to the understanding and development of the system [15]. In business rules each word has to convey a precise meaning.

In business rules discovery organization is divided into manageable units. Even though different areas of the organization have to respond to the same types of business events and have similar information needs to complete those events, they usually do not share the same vocabulary, procedures and approaches for allocating resources to fulfill their mission [10]. As a result, rules from different units many times conflict each other and are inconsistent.

The consistency and conflict validation ensures rule consistency and is to be meet across the entire organization. While consistency can be achieved through cross-referencing between business rumblings and business rules, validation is done by tracing the rules to the original sources to ascertain whether they adequately and correctly represent the information from a particular source.

Even though the consistency and conflict validation is initially done in business modeling, it is repeated here due to additional rules that may be discovered in development of a particular IS.

3.4   Business rule modeling

The final activity of the system analysis process is the development of conceptual models, which are then used as a source of information for detailed system design. In our scenario, conceptual modeling is closely related to the business rule acquisition process. In contrast to traditional approaches, where conceptual models are developed entirely from requirements specification documents, we advocate the use of business rule documents as the core input, and suggest establishing a link between business rules and associated information objects. The link is essential for understanding why a specific information object is defined and used in a specific manner.

3.5   Business rule implementation

The automated support of business rules has been one of the hottest topics in the IS community for the last few years. While it is evidently important to know the rules that govern our business, it doesn't really help that much if we don't have an automated way to enforce them. Today, there are several technologies available that support implementation and maintenance of business rules in an IS [1, 2].

3.6   Identification of strategic, tactic and operational rules

Identification of strategic, tactic, and operational rules is typically done in correlation with business modeling. While some of the rules require explicit determination (e.g. rules that are associated with business goals and business processes), many other are inherent in business model diagrams. Such rules can be automatically extracted from the business model and represent useful input in requirements determination of a particular IS.

3.7   Business rule maintenance

Business rules are very dynamic in nature and constantly change (e.g. in response to external forces, such as regulations, actions by competitors, etc., or, for instance, when business achieves a goal and establishes a new one.) The purpose of the business rule maintenance is to coordinate
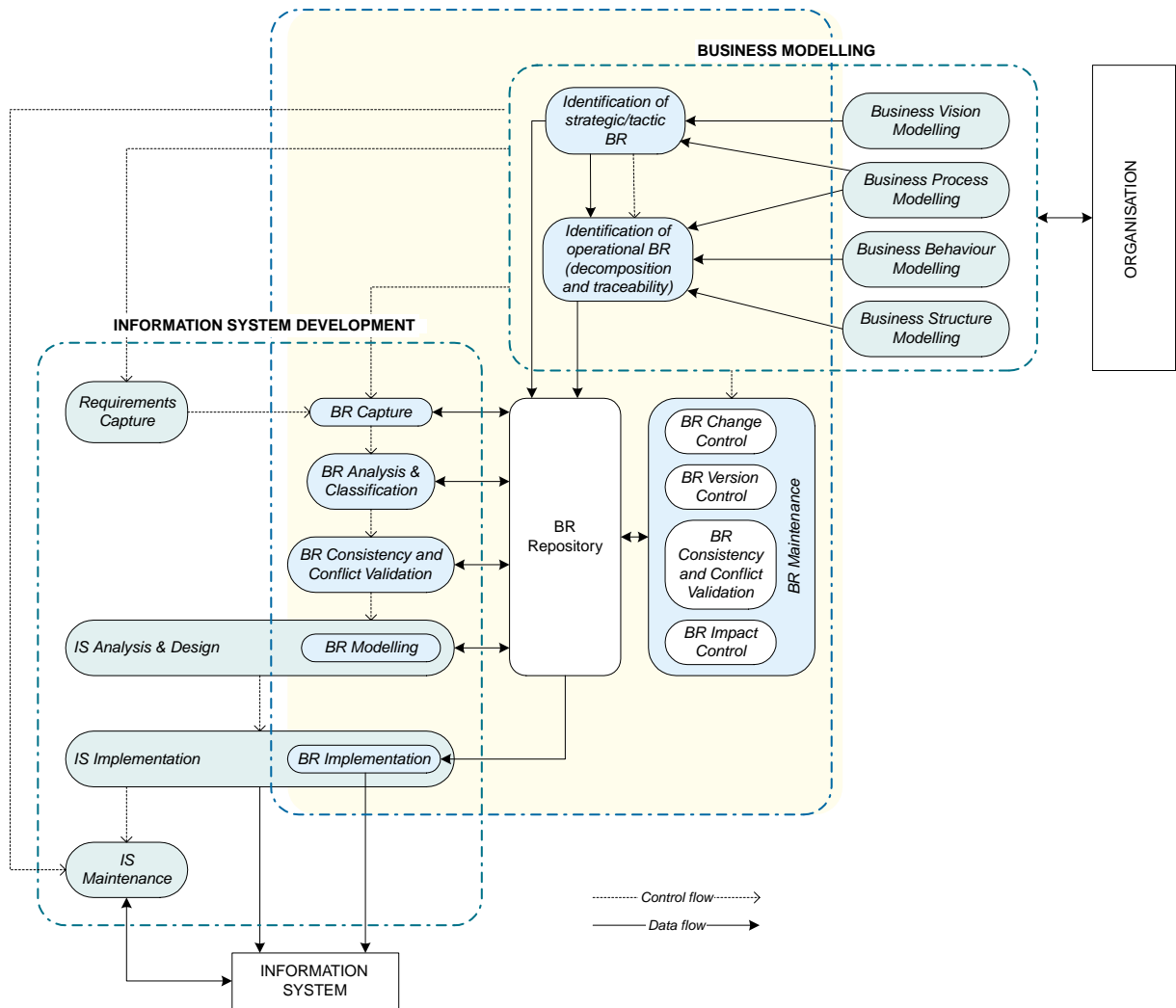
Figure 1. Business rule management scenario

those changes in a way that the system remains consistent and aligned with the business strategy. It is important that business rules are maintained on the organization level and not within a particular IS. As we described before, business rules may have several implementations (within the same or in several ISs), but from the organization's point of view, they always reflect the same business environment. Business rule maintenance includes several activities, most notably *efficiency control*, *version control*, *consistency and conflict validation*, and *impact control*.

- *Measuring effectiveness*: we must constantly determine how effective business rules are in achieving the organization's goals. If any deficiency is found, either in the business rule or in the support for the rule, we must take all the necessary actions to correct the situation.

- *Version Control*: business rules may have several versions over time. We must keep the business rules'

history in order to track rule evolution so as to perform assessments for different rule versions.

- *Impact Control*: since business rules are rarely independent, a change to a particular rule may cause several other rules to change, too. In order to manage changes we must keep track of all dependencies between rules and other resources that the rule relates to. When a business rule is targeted for change, the impact analysis must be done for the entire business system, including the affected information resources and implementation components.

Essential for the business rule management scenario is a rule repository, which is a place where business rule information is stored. As indicated in Fig. 1, the repository is not a part of an IS. It rather serves as a global store for business rules of an overall organization. To support business rule management, the repository keeps information about business rules along with other business ele-

ments that business rules either relate to or are composed of. But foremost, the rule repository includes information on rule implementation components, which are physical constructs that implement business rules in different systems. The basic meta-elements of the repository include:

- *Business vision elements*: goals, problems, domain concepts, their attributes, and relationships, allowable values, allowable states, etc.,

- *Business structure elements*: organization roles, organization units, business functions, documents, etc.,

- *Business behaviour elements*: resource states, actions, events, guards, state conditions, etc.,

- *Business process elements*: business processes, activities, events, conditions, etc.,

- *Business rule implementation elements*: actors, software systems, components, packages, libraries, procedures, subprograms, functions, triggers, stored procedures, tables, table constraints, column constraints, database constraints, rule engines, etc.

- *Business rule view elements*: business rule, business rule source, business rule version, business rule type, business rule impacts, etc.

Along with an appropriate software tool, information from the repository may suffice for automatic generation of initial requirements on a particular IS. The repository information is also crucial for business rule maintenance as it preserves the link between business environment and implementation components.

4   Conclusion

Rapid and constant changes that are very common to today's business environments affect not only the business itself, but also its supporting applications. As a result, the applications require constant change, renovation and adaptation to meet the real business needs. In the last decade, business rules have become recognized in the IS community as information resources that can contribute in developing applications which are flexible and amenable to change. While a lot of work has been done in various fields of business rule research, most notably in relation to rule analyses, classification, articulation, and formalization, a broader view, namely an organization view on business rules, is required. A continuous business rule management environment can only be established if there is an explicit link between each business rule instance as exists in business environment and its implementation in one or several application systems.

In the paper we described a business rule environment in which a link between organization's business and its supporting IS could be established. Illustrating the business rule management scenario, we demonstrated how business rules should be managed in enterprises. We discussed both, the activities that should be performed in IS development, and those that are primarily concerned with managing business rules from the organization's perspective.

To complement the research presented in this paper, our future work includes:

- Detailed design of the business rule repository.

- Development of the necessary facilities for extraction of business rules from organization's business model.

- Specification of the necessary operations for integration of IS repository with the business rule repository. The integration should support automatic generation of business rules for a specific application domain, and binding business rules to their implementations in application systems.

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