Business Rules – Important Artefacts of Software Development

Anca Ioana ADREESCU
Adina Ileana UŢĂ
Academy of Economic Studies, Bucharest, Romania

In today's business environment, characterized by competition enhancement, it is very important for an organization to be able to face changes. Therefore, the need for achieving and maintaining some competition advantages, led to the situation where the identification, specification and formalization of business politics and objectives became major concerns for many organizations. Literature refers to such politics and objectives as business rules. This article aims to analyze various business rules definitions and classifications schemas, from both business and information systems perspectives.
Keywords: *Business Rules, Software Development, Classification Schema*

1 Business rules concept

Business rules refer to the set of politics, procedures or definitions that govern the way an organization does business, together with the interaction between the organization and its clients and partners. It is important to distinguish between strategies and business rules, in the way that business rules are the foundation on which the strategies are build. A rules says only what the organization has to do, while a strategy has to provide additional guidelines for specifying how to achieve the desired objectives. Although largely spread, accepted and used in software systems development, both in practice and in academic research, since now, business rules (BR) do not have o common accepted definition. Over the time, many practitioners and researchers tried to define in a clear way the concept of business rules. Table 1 depicts, in chronological order, some of these definitions that have appeared in representative papers.

Table 1. Business rules definitions

Definition Code	**Source**	**Definition**
D1	Daniel S. Appleton (1984) [APL84]	"An explicit statement of a constraint that exists within a business's ontology"
D2	Ronald G. Ross (1987) [ROS87]	"Business rules are specific rules (or business policies) that govern behaviour of the enterprise and distinguish it from others. . . . These rules govern changes in the status [state] of the enterprise."
D3	H. Selveith (1991) [SEL91]	"A business rule is a rule stating something which impacts the business of concern, and the interpretation of the rule may heavily impact the quality of the information system to be developed."
D4	Ronald G. Ross (1994) [ROS94]	"A discrete operational business policy or practice. A business rule may be considered a user requirement that is expressed in non-procedural and non-technical form (usually textual statements). . . . A business rule represents a statement about business behaviour."
D5	David C. Hay, Keri Anderson Healy (1997) [HAH97]	"A business rule is a statement that defines or constraints some aspects of the business. It is intended to assert business structure and to control or influence the bihaviour of the business."
D6	D. Rosca & all (1995) [ROG95]	"Business rules are requirements that arise from the business objectives of the enterprise."
D7	S. Ceri, P. Fraternale (1997) [CEF97]	"Business rules respond to application needs; they model the reaction to events which occur in the real world, with tangible side effects on the database content, so as to encapsulate the application reactive behaviour to such events."

D8	Business Rules Group, 1998 [BRG98]	"A directive that is intended to influence or guide business behaviour. Such directives exist in support of business policy, which is formulated in response to risks, threats or opportunities."
D9	Tony Morgan, 2002 [MOR02]	"Basically, a business rule is a compact statement about an aspect of the business. . . . It's a constraint, in the sense that a business rule lays down what must or must not be the case. At any particular point, it should be possible to determine that the condition implied by the constraint is true in a logical sense; if not, remedial action is needed. This interpretation, which might be described as Boolean from a software perspective, is the main reason that the term *business logic* is so commonly used."
D10	Barbara Von Halle (2002) [VOH02]	"Conditions that govern a business event so that it occurs in such a way that is acceptable to the business."
D11	Ronald G. Ross (2003) [ROS03]	"…rules build directly on terms and facts. Actually, a rule should simply add the sense of must or must not to terms and facts that have already been defined in the fact model and Concepts Catalogue. In business problems involving hundreds or thousands of rules—not at all uncommon—there is no way to achieve consistency across such large numbers of rules without a common base of terms and facts."

In the process of identifying and analyzing some aspects regarding business rules involvement in software development cycle, this article approach will further include references to a well-known software engineering method, the Zachman Framework [ZAC87].

2. Equivalence classes for business rules definitions

Starting from the definitions of Table 1, we have identified five equivalence classes, that separate the above definitions in:

- Class 1: where BR are seen as constraints;
- Class 2: where BR are seen as declarations that influence business behaviour;
- Class 3: where BR are seen as definitions or restrictions;
- Class 4: where BR are discussed at business level;
- Class 5: where BR are discussed at information system level;

Populating equivalence classes with definitions from Table 1, will lead to the following sets:

Class 1 = {D1, D9, D11}
Class 2 = {D2, D3, D4, D5, D6, D10}
Class 3 = {D5}
Class 4 = {D1, D2, D5, D6, D8, D9, D10, D11}
Class 5 = { D3, D4, D7, D8}

Hereinafter we are enouncing two definitions that will introduce the inclusion and divergence relationships on the equivalence classes presented above:

Definition 1: We define the **inclusion relationships** on the equivalence classes, as follows: *Equivalence class A **includes** equivalence class B, only and only if the selection criteria of class A elements is broader than the selection criteria of class B.*

Based on **Definition 1**, we can establish the following relationships:

- Class 3 **includes** Class 1, because the selection criteria of Class 3 distinguish BR as definitions, but also as restrictions and constrains.
- Class 2 includes Class 3, because both definitions and constrains of a business could be seen as declarations that influence the behaviour of the business.

Because definition D5 is included in both Class 2 and Class 3, we may conclude that, speaking from its informational content point of view, this definition is the widest. This anticipates the fact that it must be at leas two types of business rules: constraints or restrictions and definitions of business rules concepts.

Definition 2: We define the **divergence relationships** on the equivalence classes, as follows: *Equivalence classes A and B are **divergent**, only and only if their selection criteria*

are different in scope.

In order to analyze the relationship between Class 4 and Class 5, we are starting from the Zachman Framework. This way, the two classes will correspond to the following situations:

- Class 4 correspond to the "second row" of the Zachman Framework (Business model), which describes the organization within the system will function;
- Class 5 correspond to the "third row" of the Zachman Framework (System model), which consists of system modeling and structure according to beneficiary's requirements.

Because the selection criteria of the two equivalence classes correspond to two different visions or scopes, we can conclude that, according to Definition 2, Class 4 and Class 5 are divergent. Therefore, according to its audience, a business rule can be seen at two different levels: business level and information system level

3. Classification schemas

From the definitions presented in the above paragraph, we can conclude that the notion of business rule didn't crystallize yet as a universal accepted concept. Regrettably, there isn't also, a general classification schema for business rules. Because literature offers us numerous such classifications, this paragraph intends to create a relevant selection.

After ten years of studying business rules, **Business Rules Group (BRG),** has published in 2001, an important report accorting to which a business rule must be one of the following [BRG01]:

- **A stuctural assertion** is a defined concept or a statement of a fact that express some aspects of the structure of the enterprise. This encompasses both terms and facts assembled from these terms.

A **term** is defined as a word or a phrase that has a specific meaning for the business. In the context of a library, examples of business terms might be: "subscriber", "librarian", "loan".

A **fact** asserts an association between two or more terms. For example, the phrase "a subscriber can reserve a copy of a certain book" is a fact that involves three terms: subscriber, book and copy.

In most cases, structural assertions are described in the form of entity-relationships models.

- **An action assertion** is a statement of a constraint or condition that limits or controls the actions of an enterprise. Each action assertion can be classified as: an authorization, a condition or an integrity constraint.

An **authorization** defines a specific prerogative or privilege specific to the business and it is represented by the following predicate: (Only) *x* may do *y* . For example, "only a librarian may issue a subscriber card" is an authorization.

A **condition** is an assertion saying that if something is true, another business rule will apply. It can be thought as "if …then…" test and it may be the basis for enforcing and testing another action assertions. A condition may ask questions like: "does a subscriber have overdue books?" or " has a subscriber presented a valid card?".

An **integrity constraint** is an assertion that must always be true. It is considered to have immediate enforcement power because it prohibits any action that would result in a false truth value. While a condition can realize a test and obtain a truth value – "does a subscriber have the required minimum age?" – an integrity constraint must stipulate: "to become a subscriber, a person must be at least 14 years old", thus prohibiting any action that could break this rule.

- A **derivation** is a statement of knowledge that is derived from other knowledge in the business.

Derivations (or derivation rules) may be mathematical calculus (such as: "penalties are calculated by multiplication of the penalty tax specific for the borrowed item and the number of overdue days") or inferences (for example: "If a subscriber doesn't want to pay penalties, then his card will be annulled.") We can observe that a mathematical calculus will produce a derived fact based on a specified mathematic algorithm, while an inference will produce a derived fact based on logical induction or deduction.

In a similar position with BRG are Taveter

and Wagner [TAW01], who consider that, fundamentally, there are three types of business rules: **integrity constraints** (also known as constraint rules or integrity rule), **derivation rules** and **reaction rules** (also known as stimulus-response rules, behavioural rules or event-action rules). The fourth type of rules, **deontological assignments**, assign rights and duties to people involved in the organization, realizing the deontological structure of the organization. Deontological assignments are similar to authorizations proposed by the BRG. But in addition to the BRG proposal, Taveter and Wagner have identified two types of integrity constraints: state constraints and process constraints. State constraints are similar to integrity constraints proposed by Business Rules Group. Process constraints refer to the dynamical integrity of a system and restrict the admissible transactions of the system from one state to another.

Ronald Ross, one of the most important advocators of the business rules approach, proposed a taxonomy known as BRS Rule Classification Schema, which reflects how rules react to events [ROS03]. Ross has identified thee categories of such rules: Rejectors, Producers and Projectors - all of this being intrinsic, definitive, and mutually exclusive, and thus providing a sound foundation for the comprehensive set of rule sentence templates.

Another relevant classification schema come from the world of knowledge engineering, having its roots in the CommonKADS methodology [COK]. According to this classification, business rules can be divided into thee major categories: structural, behavioural and managerial, each having associated certain types of rules.

Finally, we mention CJ Date vision [DAT00], who proposed a classification based on the logical data structure, where rules can be constraints of the: domain, columns, table or database.

Conclusions

Starting from Barbara Von Halle's observation [VOH02], that a business rules classification schema depends on the objectives of its audience, we will again reference the Zachman framework and conclude that the business and system perspectives can also be applied to the classification schema: some of them are business people oriented ([BRG00], [HEW02]), other better serve the software developers ([TW01], ([DAT00]). But it is obvious that a classification schema can greatly improve the process of business rules identification, analysis, design and implementation, this process being the source of a series of future articles.

References

[APL84]- D. Appleton - *"Business Rules: The Missing Link," Datamation*, October 15, 1984, pp. 145–150

[BRG01] - *Defining Business Rules ~ What Are They Really?* http://www.businessrulesgroup.org/first_paper/br01c0.htm

[BRG98] - Business Rules Group - www.brgroup.org

[CEF97] – S. Ceri, P. Fraternale - *Designing Database Applications with Objects and Rules: The IDEA Methodology*, Addison-Wesley, 1997

[COK] - CommonKADS, Engineering and Managing Knowledge http://www.commonkads.uva.nl/

[DAT00] – C.J. Date, *What Not How: Business Rules Approach to Application Development*, Addison-Wesley Professional, 2000

[HAH97] - D. Hay, K.A. Healy - *GUIDE Business Rules Project, Final Report – revision 1.2*. GUIDE International Corporation, Chicago, 1997

[MOR02] – T. Morgan - *Business Rules and Information Systems*, Addison-Wesley, 2002

[ROG95]- D. Rosca, S. Greenspan,C. Wild, H. Reubeinstein, K. Maly, M. Feblowitz.- *Application of a decision support mechanism to the business rules life cycle*. Proceedings of the 10th Knowledge-Based Software Engineering Conference, , 1995

[ROS87] – R. Ross - *Entity Modeling: Techniques and Application*, Database Research Group, Inc., 1987

[ROS94] – R. Ross - *The Business Rule Book* (First Edition), Business Rule Solutions, LLC., 1994

[ROS03] – R. Ross - *Principles of the Business Rules Approach*, Addison-Wesley, 2003

[SEL91] – H. Selveith - *Modelling Business Rule,*. Report on TEMPORA Project, Ianuarie 1991

[TAW01] - K. Taveter, G. Wagner. *Agent-oriented enterprise modeling based on business rules*, Proceedings of 20th Int. Conf. on Conceptual Modeling,Yokohama, Japan, Noiembrie 2001

[VOH02] – B. Von Halle - *Business Rules Applied*, John Wiley & Sons, Inc., 2002

[ZAC87] - J.A. Zachman - *A framework for Information Systems Architecture*, IBM Systems Journal, Vol. 26, No. 3, 1987.