

## Business Rule Solutions

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You are an experienced analyst, but business rules are more or less a new thing. What are some of the fundamentals you need to know? This discussion will help bring you up to speed.

In my last column, in October 2005, I highlighted the distinction between structural and operative rules<sup>1</sup>. Briefly:

- *Structural rules* organize (i.e., *structure*) basic knowledge of the business, always carrying the sense of *logical necessity* or *impossibility*. A structural rule can be ill-conceived, misunderstood or misapplied, but it *cannot* be directly violated.
- An *operative rule* can be violated *directly* by people involved in affairs of the business. Operative rules govern the on-going conduct of business activity, always carrying the sense of *obligation* or *prohibition*.

### More Elements of Guidance: Clarifications and Guidelines

Consider the statement: *A bank account may be held by a person of any age*. Although the statement certainly seems to give business guidance, it does not directly:

- Establish any necessity or impossibility for knowledge about business activities. (Therefore it is not a structural rule.)
- Place any obligation or prohibition on business conduct. (Therefore it is not an operative rule.)

In short, it is not a rule, but rather a *clarification* (or more formally, an *affirmation* or *admonition*).

*Aside: Indirectly*, the statement does place an obligation on business conduct. The reason for any guidance is presumably because the business wants workers and other parties to abide by it. If a worker refuses to give a person a bank account because of age, such action runs counter to the explicit guidance. However, it would be impractical to have a rule for every clarification simply instructing workers to abide by it.

Is it important then to write this clarification down (i.e., capture and manage it)? *Maybe*. Suppose the statement reflects the final resolution of a long-standing

<sup>1</sup> A distinction arising from: *Semantics of Business Vocabulary and Business Rules* (SBVR), by the Business Rules Team, August 2005. Available at <http://www.omg.org/astbe/2005-08-0>. BRT's revised submission to the Object Management Group's (OMG) *Business Semantics of Business Rules* RFP. For background on the SBVR and the consortium that produced it, refer to "A Brief History of the Business Rule Approach," *Business Rules Journal*, Vol. 6, No. 1. Available at <http://www.BRCommunity.com/a2005/b216.html>

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debate within the business about how old a person must be to hold a bank account. Some say 21, others 18, some 12, and some say there should be no age restriction at all. Finally the issue is resolved in favor of no age restriction. It's definitely worth writing that down!

Now consider the following statement: *An order \$1,000 or less may be accepted on credit without a credit check.* This clarification is different. It suggests a rule that possibly hasn't been captured yet: *An order over \$1,000 must not be accepted on credit without a credit check.* Assuming the business wants this rule, you should write *the rule* down — not the clarification — because the rule provides more explicit guidance.

*Aside:* Just because the clarification says *an order \$1,000 or less may be accepted on credit without a credit check*, that does not necessarily mean an order over \$1,000 *must not*. The rule, in contrast, can be presumed to indicate *over \$1,000* explicitly because the obligation to do a credit check does *not* apply below that threshold.

Suppose this operative rule is restated as follows: *An order over \$1,000 should not be accepted on credit without a credit check.* Note the *should* where before *must* was used. Now is it a clarification?

*No.* It is still a rule, only with a lighter sense of prohibition. What actually changed was its presumed *level of enforcement*. Rather than strictly enforced, now the rule has the sense: *It's a good thing to try to do this, but if you can't there's no sanction.* In other words, now it's simply a *guideline* (or *suggestion*, if you prefer).

Should you use *should* or *should not* (or similar forms) to express lightly-enforced operative rules? (Remember that only operative rules have level of enforcement; structural rules can't be violated.) *Not recommended* (the example above notwithstanding). In general, it's better to use consistent wording for all operative rules (e.g., *must* or *must not*). Remember, the level of enforcement for any given rule often varies with changes in business practice. Guidance is one thing; level of enforcement is another — best not to mix the two!

The important thing is that guidelines, like clarifications and all other rules, use the same underlying vocabulary. Let's put it this way: If you have the vocabulary to express rules for behavior, you already have the vocabulary you need for guidelines and clarifications. Powerful stuff!



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### Exceptions

Consider the operative rule: *A library card must not be held by more than one borrower, unless one of the borrowers is Bill Gates.* This rule includes a clear-cut exception. The normal rule for library cards is: *A library card must not be held by more than one borrower.* Loosely stated, the exception is: *Don't enforce this normal rule if Bill Gates is one of the borrowers for the library card.*

*Don't enforce*, of course, is not declarative. Instead, we should say something more *rule-ish* such as: *must not be enforced.* The exception now reads: *The normal rule for a library card must not be enforced if Bill Gates is one of the borrowers for the library card.* What emerges is another rule!

*Aside:* Exception rules represent the way people actually communicate — not the way rules might be handled in formal logic or by some rule or inference engines *under the covers*. Indeed at some level, exceptions may disappear altogether, their conditions being included in other rules. It would be very nice if the results remained business-friendly, but that seldom happens. Experience demonstrates that managing rules for business people is simply a different problem than rendering rules for suitable treatment by rule or inference engines.

Unfortunately, the business rule approach offers no silver bullet to the *business* problem of having too many exceptions to rules (which many companies do!). However, by always viewing exceptions as simply more rules, exceptions are at least put onto the same playing field as other rules. For reengineering business processes and/or streamlining business operations, that positioning can sometimes represent an important breakthrough in and of itself.

### Decision Tables

As you scale up to larger numbers of rules, having an effective means to visualize and manage entire *sets* of rules at a time becomes more and more important. Decision tables are excellent in that regard. In general, decision tables can be used where the following three criteria are met:

1. A significant number of rules are parallel — that is, they share the same subject, have exactly the same evaluation term(s), and are equivalent (but not identical) in effect. In other words, the rules all share a common pattern and purpose.
2. Each evaluation term has a finite number of relevant instances or of relevant collections of instances, usually represented as ranges of values (a.k.a. *brackets*).



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3. Given the different instances or brackets of the evaluation term(s), the outcomes cannot be predicted by a single formula. (If a single formula could predict the outcomes, using a single rule or set of rules to give the unified formula is a better approach.)

Here is a simple example.

**Rule 1:** Applicable sales tax is to be 6.0% if year = 1999.

**Rule 2:** Applicable sales tax is to be 6.5% if year = 2000.

**Rule 3:** Applicable sales tax is to be 6.5% if year = 2001.

**Rule 4:** Applicable sales tax is to be 6.5% if year = 2002.

**Rule 5:** Applicable sales tax is to be 6.25% if year = 2003.

**Rule 6:** Applicable sales tax is to be 7.0% if year = 2004.

**Rule 7:** Applicable sales tax is to be 8.0% if year = 2005.

**Rule 8:** Applicable sales tax is to be 8.15% if year = 2006.

*Aside:* Note that the sales tax rate decreased in 2003 from the previous year. This decrease represents an apparently infrequent (and perhaps improbable!) tax cut.

This set of rules satisfies all three criteria above:

1. The eight rules are exactly parallel. They share the same subject, applicable sales tax; have exactly the same evaluation term, year; and are equivalent (but not identical) in effect, an indicated sales tax percentage for each given year.
2. The evaluation term, year, has a finite number of relevant instances (eight).
3. The outcomes — the percentages indicated for applicable sales tax — cannot be predicted by a formula.

The following rule, on the next page, along with Decision Table A shows the consolidated business logic for the eight rules given above. Quite an improvement!



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**Rule:** Applicable sales tax is to be the percent value in Decision Table A for a given year.

**Decision Table A**

Year	Applicable Sales Tax
1999	6.0
2000	6.5
2001	6.5
2002	6.5
2003	6.25
2004	7.0
2005	8.0
2006	8.15

Decision tables are also useful for finding missing rules — that is, for assessing the *completeness* of a rule set. For example, if any cell in a decision table has nothing in it, then that outcome is possibly missing and probably should be addressed. (If a majority of cells have nothing in them, a decision table might not be the best way to represent the given set of rules.) I will return to the crucial issue of completeness in a moment.

Decision Table A has only a single evaluation term. Most decision tables have more than that. To illustrate, the following rule, along with Decision Table B, adds a second evaluation term *county* to determine *applicable sales tax*.

**Rule:** Applicable sales tax is to be the percentage in Decision Table B for a given year and county.

**Decision Table B**

Year	County			
	Harkin	Lopes	Qwan	Quail
1999	6.95	8.2	7.35	4.0
2000	6.73	8.3	9.0	4.5
2001	6.15	8.4	9.0	5.0
2002	6.15	8.3	9.0	5.5
2003	6.15	8.4	6.75	6.0
2004	6.15	8.2	6.75	6.75
2005	5.75	8.2	6.75	7.0
2006	5.95	8.4	7.5	7.25



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Representing *more* than two evaluation terms using a two-dimensional media (for example, paper) is problematic. A different approach is generally required (as well as specialized automated support!). The following rule, along with Decision Table C, illustrates.

**Rule:** The delivery method for an order is to be as in Decision Table C.

**Decision Table C**

<b>Decision Criteria</b>	<b>Delivery Method for an Order</b>		
	<b>Picked Up by Customer</b>	<b>Shipped by Normal Service</b>	<b>Shipped by Premium Service</b>
<i>Rush order</i>	No	Yes	Yes
<i>Order includes fragile item</i>	No	Yes	—
<i>Order includes specialty item</i>	No	No	—
<i>Order includes high-priced item</i>	No	No	—
<i>Order includes item involving hazardous materials</i>	No	Yes	Yes
<i>Category of customer</i>	Silver	Gold	Platinum
<i>Destination of order</i>	—	Local	Remote

Decision Table C establishes the basis for determining the delivery method for an order. Three possible delivery methods (the outcomes) are indicated along the top. Seven decision criteria appear at the left as labels for the rows. (This table therefore involves seven dimensions.) Six of these decision criteria are binary (*yes, no* or *local, remote*), whereas one, *category of customer*, involves three possibilities (*silver, gold, platinum*). The choice of delivery method for an order depends on what appears in the cells of a column. A dash (—) in a cell indicates that the associated decision criteria does not matter in determining the outcome; that is, *any* alternative for that decision criteria will produce the same outcome.

Unfortunately, such multi-dimension decision tables are prone to anomalies and other problems, so they must be developed with care and then scrutinized closely. For example, consider the issue of completeness. How complete is the sample decision table above? *Only about 6%! Can you tell why?*



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### Rule Quality

Determining the quality of large sets of rules — their *fitness* — is an issue of foremost concern not only to rule analysts, but to business people as well. Fortunately, *Rule Independence*<sup>2</sup> opens significant opportunities in this area. Never before has the business been in a position to shape and refine its own guidance and know-how so directly and proactively. Assessing the quality of rules falls into two general areas: *validation* and *verification*.

**Validation** means assessing fitness with respect to *business purpose*. The goal is not only to ensure correctness of the rules from the perspective of business people but also to ensure that, when applied, the results will be appropriate in all relevant circumstances. Validation is largely a matter of analysis, but there are many ways in which automated analysis tools can help. For example, diagrams can depict logical or computational dependencies between rules; test scenarios can be retained so prior results can be compared with new results for modified rule sets; rules can be analyzed to identify all events where they need to fire to ensure complete coverage; etc.

**Verification** means assessing fitness with respect to *logical consistency*. Verification is always performed on an entire rule set at a time, looking for two or more rules that in combination exhibit some anomaly. Below is a quick sampler of common anomalies, along with simple examples.

#### Samples of Common Anomalies in Rule Sets

##### Linguistic Equivalences

- A permanent employee must receive a salary.
- An employee who is permanent must receive a salary.

##### Modal Equivalences

- An order over \$1,000 must not be accepted on credit without a credit check.
- An order for over \$1,000 may be accepted on credit only with a credit check.

##### Logical Equivalences

- A high-risk customer may not place a rush order.
- A rush order must not be placed by a high-risk customer.

##### Subsumations

- A rush order must have a destination.
- An order must have a destination.

##### Conflicts

- A shipment must include more than 1 order.
- An out-of-state shipment may include only 1 order.

<sup>2</sup> Refer to: *Business Rules Manifesto ~ The Principles of Rule Independence*, Business Rules Group, 2003. Available at <http://www.BusinessRulesGroup.org> (in English as well as translations to numerous other languages).



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In practice, remember that rules are often captured by different people at different points in time, so such anomalies can appear even in the best-coordinated efforts. By the way, such anomalies are not the result of a rule-based approach; rather, they are just much easier to spot. Fortunately, comprehensive detection of such anomalies can be automated. There is only one caveat, but it's a big one: *You must coordinate the business vocabulary the rules use.*

An additional area of concern in rule quality, as mentioned for decision tables, is the *completeness* of rules — that is, whether there are gaps or holes in coverage. As a simple example, consider the clarification discussed earlier: *An order \$1,000 or less may be accepted on credit without a credit check.* A missing rule might be: *An order over \$1,000 must not be accepted on credit without a credit check.*

One final word: Rule quality is not an IT issue — it's primarily a business one. You want to ensure quality *before* rules are translated into an implementation language (so business people can better understand them) and/or are used in production (so you don't have to detect anomalies *live* – or maybe worse, *you never detect them at all*). Isn't that just the kind of process hygiene every process professional should be looking for?

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