

SBVR - Semantics of Business Vocabulary and Business Rules

Knut Hinkelmann



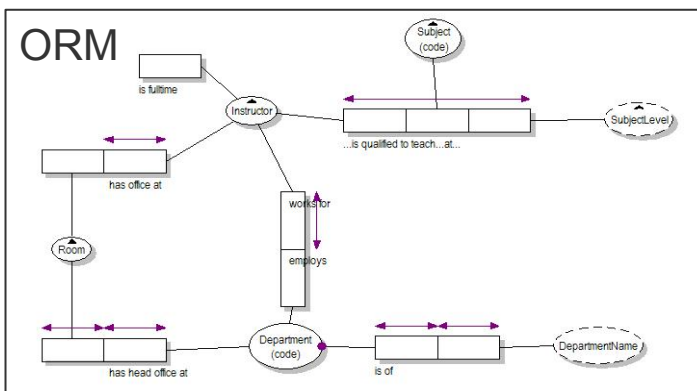
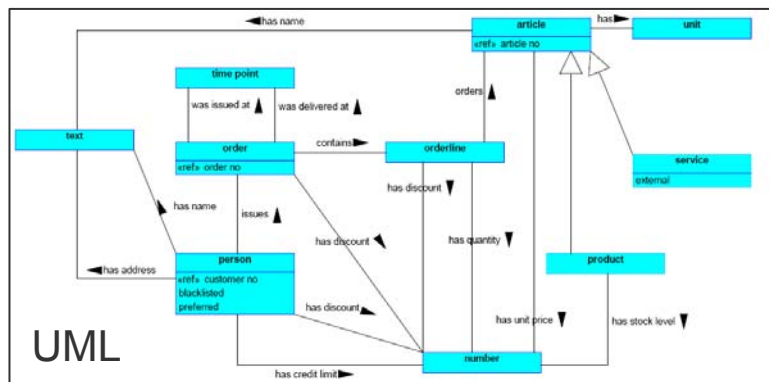
Notations for Business Rules

It is obligatory that each driver of a rental is qualified.

rental has driver

driver is qualified

The noun concept 'driver' is a facet of the noun concept 'person'.



- SBVR does not prescribe a specific language for terms, facts and rules
- Terms and facts can be represented, for example, in
 - ◆ SBVR Structured English
 - ◆ Unified Modelling Language (UML)
 - ◆ Object-Role Modeling (ORM)
- The SBVR specification itself uses SBVR Structured English to describe its vocabularies



SBVR Structured English Notation

There are four font styles with formal meaning:

term

The 'term' font is used for a designation for a noun concept (other than an individual concept), e.g. rental car, branch

Name

The 'name' font is used for a designation of an individual concept — a name. Names tend to be proper nouns, e.g. California, 25

verb

The 'verb' font is used for designations for verb concepts — usually a verb, preposition or combination thereof. Such a designation is defined in the context of a form of expression, e.g. local area *owns* rental car, rental *has* pick-up branch

keyword

The 'keyword' font is used for linguistic symbols used to construct statements – the words that can be combined with other designations to form statements and definitions, e.g., '*each*' and '*it is required that*'.

Quotation marks are also in the 'keyword' font. Single quotation marks are used (among other purposes) to mention a concept – to refer to the concept itself rather than to the things it denotes. In this case, a quoted designation or form of expression is preceded by the word 'concept' or by a term for a kind of concept, e.g. *the* concept 'walk-in rental' *is a* *category of the* concept 'rental'.

SBVR Structured English – An Example

It is obligatory that each rental car is owned by exactly one branch.

Keywords for
a modality

Quantifier

Designation for
an object type


Designation for
a fact type

Quantifier

Designation for
an object type



SBVR Structured English- Quantification



each	<u>universal quantification</u>
some	<u>existential quantification</u>
at least one	<u>existential quantification</u>
at least n	<u>at-least-n quantification</u>
at most one	<u>at-most-one quantification</u>
at most n	<u>at-most-n quantification</u>
exactly one	<u>exactly-one quantification</u>
exactly n	<u>exactly-n quantification</u>
at least n and at most m	<u>numeric range quantification</u>
more than one	<u>at-least-n quantification</u> with $n = 2$

SBVR Structured English – Logical Operations

it is not the case that p

logical negation

p and q

conjunction

p or q

disjunction

p or q but not both

exclusive disjunction

if p then q

implication

q if p

implication

p if and only if q

equivalence (see exception explained under Modal Operations below)

not both p and q

nand formulation

neither p nor q

nor formulation

p whether or not q

whether-or-not formulation

SBVR Structured English – Modal Operations

it is obligatory that p	<u>obligation formulation</u>
it is prohibited that p	<u>obligation formulation</u> embedding a <u>logical negation</u>
it is necessary that p	<u>necessity formulation</u>
it is impossible that p	<u>necessity formulation</u> embedding a <u>logical negation</u>
it is possible that p	<u>possibility formulation</u>
it is permitted that p	<u>permissibility formulation</u>

The following key words are used within expressions having a verb to form verb complexes that add a modal operation.

... must ...	<u>obligation formulation</u>
... must not ...	<u>obligation formulation</u> embedding a <u>logical negation</u>
... always ...	<u>necessity formulation</u>
... never ...	<u>necessity formulation</u> embedding a <u>logical negation</u>
... may ...	<u>permissibility formulation</u>

SBVR Structured English – Modal Operations

The key word phrase “**only if**” is used in combination with some of the key words and phrases shown above to invert a modality.

... **may** ... **only if** p is equivalent to ... **must not** ... **if not** p

it is permitted that q **only if** p is equivalent to **it is obligatory that not** q **if not** p

it is possible that q **only if** p is equivalent to **it is necessary that not** q **if not** p

For example, the following two statements have the same meaning.

A car **may** be rented **only if** the car is available.

A car **must not** be rented **if** the car is **not** available.

The key word “**only**” can also be used before a preposition in combination with “**may**” to invert a modality. The noun phrase after the preposition is then understood as a negated restriction as shown in these two equivalent statements:

A car **may** be rented **only** to a licensed driver.

A car **must not** be rented to a person **that** is **not** a licensed driver.

Because of the use of “**only**” in stating modal operations, the pattern “ p **if and only if** q ” for equivalence is not used if p involves a modal operation.

SBVR Structured English – Other Keywords

- the**
 1. used with a designation to make a pronominal reference to a previous use of the same designation. This is formally a binding to a variable of a quantification.
 2. introduction of a name of an individual thing or of a definite description
- a, an** universal or existential quantification, depending on context based on English rules
- another** (used with a term that has been previously used in the same statement) existential quantification plus a condition that the referent thing is not the same thing as the referent of the previous use of the term
- a given** universal quantification pushed outside of a logical formulation where ‘a given’ is used such that it represents one thing at a time – this is used to avoid ambiguity where the ‘a’ by itself could otherwise be interpreted as an existential quantification. Within a definition, ‘a given’ introduces an auxiliary variable into the closed projection that formalizes the definition.
- that**
 1. when preceding a designation for a noun concept, this is a binding to a variable (as with ‘the’)
 2. when after a designation for a noun concept and before a designation for a fact type, this is used to introduce a restriction on things denoted by the previous designation based on facts about them
 3. when followed by a propositional statement, this used to introduce nominalization of the proposition or objectification, depending on whether the expected result is a proposition or an actuality. See C.1.5.
- who** the same as the second use of ‘that’ but used for a person
- is of** The common preposition “of” is used as a shorthand for “that is of.” For any sentential form that takes the general form of ‘<placeholder 1> has <placeholder 2>’ there is an implicit reversed form of ‘<placeholder 2> is of <placeholder 1>’ that has the same meaning.
- what** used to introduce a variable in a projection as well as indicate that a projection is being formulated to be considered by a question or answer nominalization. See C.1.5 below.