



# Semantics of Business Vocabulary and Business Rules (SBVR), v1.5

## *Annex E - Overview of the Approach*

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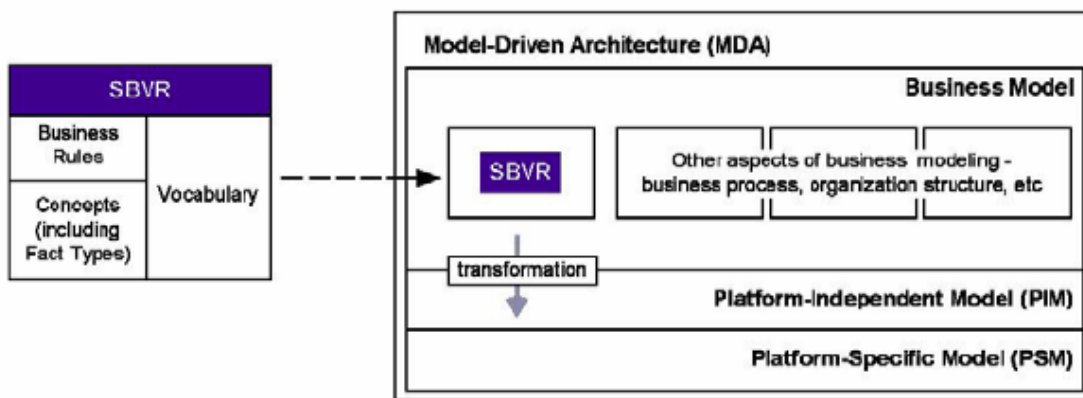


# Annex E - Overview of the Approach

(informative)

## E.1 Positioning of SBVR in Model-Driven Architecture

SBVR is positioned to be entirely within the business model layer of the OMG's Model Driven Architecture (MDA)<sup>1</sup>.



This positioning has two implications.

- SBVR is targeted at business rules and business vocabularies, including those relevant for usage in conjunction with those rules. Other aspects of business models also have to be developed, including business process and organization structure, but these are to be addressed by the OMG in other initiatives.
- Business models, including the models that SBVR supports, describe businesses and not the IT systems that support them.

In MDA, IT systems are specified using Platform Independent Models (PIMs) and Platform-Specific Models (PSMs). Guidance will be needed for transformation of business models to PIMs. Such guidance is outside the scope of SBVR. It is anticipated that the OMG will ensure that the metamodels for different aspects of business modeling form a coherent whole, and will call for development of guidance on the transformation from business model to PIM as appropriate.

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1. SBVR enables the specific capture of terminology and meaning for any level of the MDA, so SBVR could be used for PIM and PSM vocabularies and rules. However, this specification is focused on SBVR as a vehicle for describing businesses rather than their information systems. In the kinds of SBVR model assumed here, the concept called “customer” would be a role of a real-world person or organization. In a PIM, it would be a UML class whose objects represent real-world customers; the business rule “a rental car must not be handed over to a customer who appears to be intoxicated” would probably not appear in a PIM.

## **E.2 The Key Notions of the SBVR Approach**

### **E.2.1 What is Semantics?**

‘Semantics’ is “the meaning or relationship of meanings of a sign or set of signs” [MWCD]. In SBVR the signs can be of any form: words, phrases, codes, numbers, icons, sounds, etc. SBVR includes vocabularies for two deliverables:

- An SBVR Terminological Dictionary (see Clauses 7-17, 19-21) which deals with all kinds of terms and meanings (other than meanings of Business Rules).
- An SBVR Rulebook (see Clauses 16-21) which deals with the specification of the meaning of business rules, and builds on the “Vocabulary for Describing Business Vocabularies.”

These two groupings have been identified so that Terminological Dictionaries could be used independently - for example, as a basis for vocabularies for business processes or organizational roles.

The next two sub clauses deal with the semantics of business vocabularies and the semantics of business rules.

### **E.2.2 What is a Business Vocabulary?**

A business vocabulary contains all the specialized terms, names, and verb concept wordings of concepts that a given organization or community uses in their talking and writing in the course of doing business.

The SBVR specification is based on the ISO terminology standards:

- ISO 1087-1 (2000) “Terminology work — Vocabulary — Theory and application” [ISO1087-1]
- ISO 704 (2000) “Terminology work — Principles and methods” [ISO704]
- ISO 860 (1996) “Terminology work – Harmonization of concepts and terms” [ISO860]

These standards have been used for many decades for multilingual correlation of vocabularies in support of language translation work. SBVR is the result of the integration of these ISO standards, formal logics, linguistics, and practical experience from foremost practitioners in the field of business vocabulary for business rules. They have over ten years experience in the development and application of the applied techniques included in the SBVR approach.

There are additional ISO standards for representing basic concepts such as country names and codes (ISO/IEC 3166), dates and times (ISO/IEC 8601), currency codes (ISO/IEC 4217), addresses (ISO/IEC 11180), which are likely to be adopted into vocabularies using SBVR as a matter of practice, but have not been included in this specification.

An SBVR-based model describing a business vocabulary strengthens the semantics of ordinary business glossaries of terms and their definitions in several ways. It provides:

1. A powerful multi-dimensional, hierarchical categorization capability to organize concepts from general to specific such as those used by library/information scientists to index documents. This is often referred to as taxonomies or categorization schemes. The ability to define categories is also included.
2. The capabilities associated with Thesauri including synonyms, abbreviations, ‘see also,’ multiple vocabularies for one set of meanings for different languages, etc. The function of the ISO 2788:1986 Monolingual and ISO 5964:1985 Multi-Lingual Thesaurus standards is included in SBVR-based business vocabularies.
3. The ability to specify definitions (both intensional and extensional) formally and unambiguously in terms of other definitions in the business vocabulary as a result of its formal logics and linguistic underpinning.
4. The ability to define connections between concepts that are of interest to the organization. These connections provide the business-level semantic structure required to find information about such relationships in text documents and

relational databases, as well as providing the ability to specify business rules formally and unambiguously. The function in the ISO/IEC 13250:2000 “Topic Maps” standard is supported by SBVR-based models.

5. A semantically rich set of templates to facilitate capturing the full semantics of each concept and connection between concepts of interest to the business community owning the business vocabulary.
6. A basis for identification and/or definition of individual entities, events and states, the relationships among them, and their relationship to time for text document and data mining.
7. The basis for tools that can support powerful visualization and ‘navigation’ of business vocabularies based on business meaning.
8. Business community ownership and management of their independent business vocabularies and business rules.
9. The basis to integrate separately created business vocabularies, using the ‘characteristic analysis’ capability from ISO 1087-1 and ISO 860. When separate business vocabularies are integrated and the business rules based on them are modified to reflect the vocabulary integration, the business rules will also be integrated.
10. The ability to minimize the number of definitions an organization needs to create by providing powerful, pragmatic features for vocabulary adoption on a well-managed basis. The SBVR approach encourages (a) incorporation of ready-made ‘outside’ vocabularies and (b) communication between people in different communities.
11. A comprehensively integrated capability to support the specification of the meaning of all kinds of business rules.

### **E.2.3 What is a Business Rule?**

The SBVR follows a common-sense definition of ‘business rule’:

Business Rule: *rule that is under business jurisdiction*

‘Under business jurisdiction’ is taken to mean that a business (or any other semantic community) can, as sees fit, enact, revise, and discontinue the business rules that govern and guide it. If a rule is not under business jurisdiction in that sense, then it is not a business rule. For example, the ‘law’ of gravity is obviously not a business rule. Neither are the ‘rules’ of mathematics.

The more fundamental question in defining ‘business rule’ is the meaning of ‘rule.’ Careful consideration was given to a variety of real-world interpretations of ‘rule,’ including numerous authoritative dictionaries and previously-published works on business rules. Foremost consideration was given to how people think naturally about ‘rule’ in everyday life, not only within business activities, but also outside of them. For example, several rule books for professional sports were reviewed.

Clearly, ‘rule’ carries the sense of ‘guide for conduct or action’ both in everyday life and in business. In one way or another, this sense of ‘rule’ can be found in most, if not all, authoritative dictionaries.

Examining the question more closely, it is obvious that if rules are to serve as guides for conduct or action, they must also provide the actual criteria for judging and guiding that conduct or action. In other words, for the context of business rules (and probably in most other contexts), rules serve as *criteria* for making decisions. The SBVR’s interpretation of ‘rule’ therefore encompasses the sense of ‘criteria’ as given by authoritative dictionaries.

This point is fundamentally important for professionals creating business models. In business process engineering, for example, the most prevalent understanding of ‘business rule’ is as criteria for decision points (‘branch points’) in business process models. Often such decision points are relatively simple (for example, “do we treat a customer as gold level, silver level, or bronze level?”). In other cases, such decision points may be highly complex (for example, “should an insurance claim be paid, denied, or considered as possibly fraudulent?”). For these more complex cases in particular, special inferencing techniques are quite likely to be helpful (for example, tools supporting ‘production *rules*’).

### E.2.3.1 Rules and Formal Logic

An additional and no less important driver in the SBVR's treatment of 'rule' is consistency with formal logics. Notable experts in this area recommended that the best treatment for the SBVR's interpretation of rules would involve *obligation* and *necessity* claims.

Consequently, in SBVR, a Rule is "an element of guidance that introduces an obligation or a necessity." The two fundamental categories of Rule are:

- **Structural Rule:** These are rules about how the business chooses to organize (i.e., 'structure') the things it deals with. Structural Rules supplement definitions (for example, from EU-Rent - pronounced "you rent").

Necessity: A Customer has at least one of the following:

- a Rental Reservation.
  - an in-progress Rental.
  - a Rental completed in the past 5 years.
- **Operative Rule:** These are rules that govern the conduct of business activity. In contrast to Structural Rules, Operative Rules are ones that can be *directly* violated by people involved in the affairs of the business (for example, from EU-Rent):

A Customer who appears intoxicated or drugged must not be given possession of a Rental Car.

### E.2.3.2 Rules, Verb Concepts and Concepts expressed by Terms

Informally, a verb concept is an association<sup>2</sup> between two or more concepts; for example "Rental Car is located at Branch."

In SBVR, rules are always constructed by applying necessity or obligation to verb concepts. For example, the rule "A Rental must not have more than three Additional Drivers" is based on the verb concept "Rental has Additional Driver."

By this means, SBVR realizes a core principle of the Business Rules Approach at the business level, which is that "Business rules build on verb concepts, and verb concepts build on concepts as expressed by terms." This notion is well-documented in published material by foremost industry experts over the past 10 years.

The Business Rules Approach is summarized in Annex F.

One important consequence of the SBVR's approach in this regard is that concepts (including verb concepts) are *distinct* from rules. This design permits SBVR's support for concepts (including verb concepts) to be optionally used on its own for building business Terminological Dictionaries.

### E.2.3.3 What 'Practicable' Means

All business rules (and advices as well) need to be practicable. Whether or not some element of guidance is practicable is decided with respect to what a person with legitimate need can understand from it.

- For an operative business rule, this understanding is about the behavior of people and what form compliant behavior takes. Because an operative business rule is practicable, a person who knows about it can decide directly whether it is being followed when that person observes relevant behavior.
- For a structural rule, this understanding is about how evaluation of the criteria vested in the rule always produces some certain outcome(s) for a decision or calculation as opposed to others. If a structural rule is practicable, a person who knows about it can also decide directly whether it is being followed when that person observes some relevant outcome from a decision or calculation.

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2. "Association" is used here in its everyday, business sense - not the narrower, technical sense that would apply to a UML class model.

A practicable business rule is also always free of any indefinite reference to people (e.g., “you,” “me”), places (e.g., “here”), and time (e.g., “now”). By that means, if the person is displaced in place and/or time from the author(s) of the business rule, the person can read it and still fully understand it, without (a) assistance from any machine (e.g., to “tell” time), and (b) external clarification.

All these criteria assume that the person understands the business concepts that underlie the business rule. A practicable business rule always imparts ready-to-apply knowledge of the kinds above ‘on top’ of such concepts.

An important best practice for business rules, following naturally from this, is that the underlying business vocabulary/ies must be well developed and well managed. Specifically, each business concept should:

- Be individually well defined.
- Fit logically into the overall structure of concepts.
- Be made available to the person in appropriate manner.

In addition, each business rule should be directly expressible in the given business vocabulary/ies. These best practices point toward the essential role of business vocabularies in supporting business rules – indeed, the bulk of SBVR is devoted to that area.

#### **E.2.3.4 Business Rules that Cannot Be Automated**

Just because business rules are practicable, this does *not* imply they are always automatable. Many business rules, especially operative business rules, are *not* automatable in IT systems. For instance, consider the obligation example given above, “A Customer who appears intoxicated or drugged must not be given possession of a Rental Car.”

This distinction is not important within SBVR, which focuses on rules only from the business perspective, regardless of whether the rules could be automated. However, it is obviously important in defining a transformation from business model to PIM. In particular, non-automatable business rules need to be implemented as user activity, supported by procedure manuals or rulebooks.

#### **E.2.3.5 What 'Directly Enforceable' Means**

All operative business rules need to be directly enforceable. To be enforceable, an operative business rule has to be defined in such a way that violations can be detected. The enforcement regime can then detect a violation and take appropriate action (e.g., correct the violation, notify other parties, and/or impose penalties on the violators).

Elements of governance directly govern what people do in the business, and they need to be enforceable. Being **directly** enforceable is what distinguishes business policies from operative business rules. The importance of this is that when the people specifying a business encounter (or need to define) elements of governance in the real world, they need to think about two things.

First, is the element of governance directly enforceable – i.e., is it possible to observe what people are doing, and recognize whether they are complying or not, without needing further amplification or explanation of the element of governance? If it is not, then the element of governance is a business policy and those who are defining the business haven’t yet finished. They also need to develop operative business rules, derived from the business policy, that are directly enforceable.

For example, the EU-Rent element of governance ‘rental cars must not be exported’ is not sufficiently precise to be enforced. It is a business policy and needs operative business rules through which it can be enforced. For example:

- Each rental car must be registered in the country of the local area to which it is assigned after purchase.
- The country of registration of a rental car must not be changed.
- If a car is at a location outside its country of registration, it may be assigned only to a rental with return location in its country of registration.

- If a rental car is at a location outside its country of registration for more than five days, it must be returned to its country of registration.

Second, if an element of governance is directly enforceable, it ought to be derived from a business policy. If it is not, the business designers ought to be aware that this is so (and might choose to question whether the rule is appropriate).

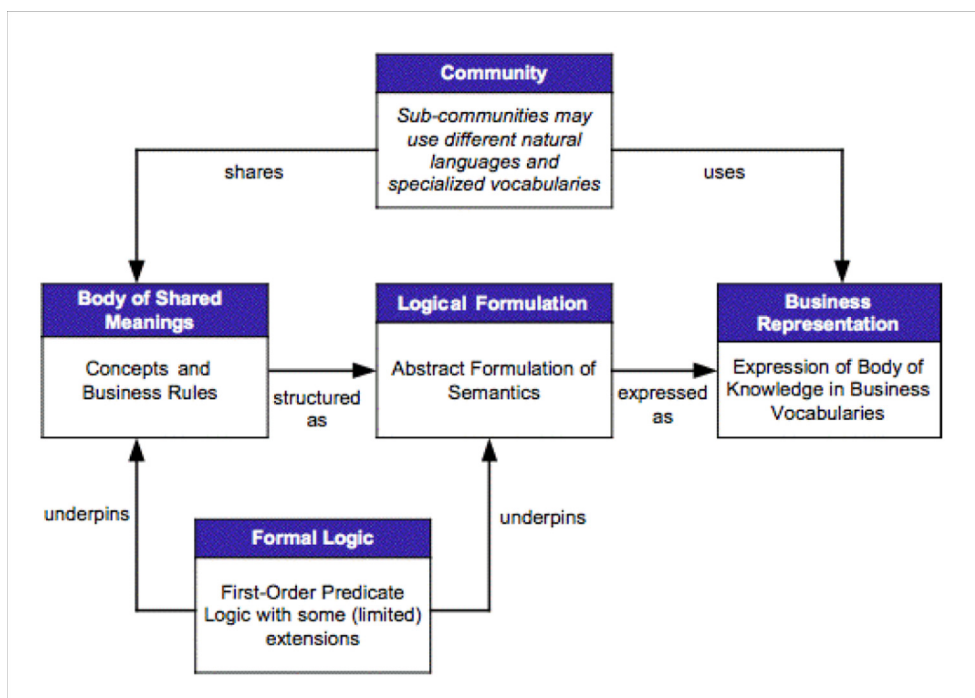
### E.3 Informal Overview of SBVR

SBVR can be viewed as having five major aspects, as illustrated below:

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#### E.3.1 Community

The basis for business vocabulary is community. At the business level, communities of primary importance are enterprises for which business rules are being established and expressed. However, other communities - the industry in which an enterprise operates, partner enterprises, standards groups, regulatory authorities, etc. - also need to be recognized. An important aspect of community is that sub-communities within an enterprise may need its body of shared meanings (starting with fundamental concepts) to be expressed in different vocabularies, ranging from specialized jargon to different natural languages. In SBVR, such sub-communities are called “speech communities.”

#### E.3.2 Body of Shared Meanings

A community has a body of shared meanings, comprising concepts (which include verb concepts) and business rules. What is shared is the meaning, not the verb concept wording. Clearly, for shared meanings to be exchanged, discussed, and validated,



they must be expressed. But SBVR separates the business meaning from any particular verb concept wording. The structure of the body of shared meanings (i.e., which concepts instances play which roles in facts, which facts form the basis of which rules, etc.) is defined by associating abstract concepts, verb concepts, and business rules, not by associating statements in any given language.

### **E.3.3 Logical Formulation**

Logical formulation provides a formal, abstract, language-independent syntax for capturing the semantics of a body of shared meanings. It supports multiple forms of representation, such as: noun and verb verb concept wordings, reading of associations in both directions.

Logical formulation supports two essential features of SBVR. First is the mapping of a body of shared meanings to vocabularies used by communities. Second is the mapping to XMI that enables interchange of concepts, facts, and business rules between tools that support SBVR.

### **E.3.4 Business Representation**

The concepts and business rules in a body of shared meanings need to be represented in vocabularies acceptable to, and usable by, speech communities that share their meaning. These vocabularies may be in different natural languages, in artificial languages such as the UML, or in specialized subsets of natural languages, as used by, for example, engineers or lawyers.

SBVR supports mapping of business meaning to concrete language by representing elements of the body of shared meanings with signifiers. Examples of these representations are terms such as “customer,” “car,” “branch” for noun concepts, and designations (often verb phrases) such as “rents,” “is located at” for verb concepts. Designations are used in statements and definitions whose logical formulations are structures of business meaning.

SBVR supports adoption from external sources, such as standards bodies and industry groups. For example, SBVR itself adopts some of its basic definitions from ISO standards for terminology and vocabulary (ISO 1087-1 and ISO 704).

### **E.3.5 Formal Logic**

SBVR has a sound theoretical foundation of formal logic, underpinning both logical formulation and the structures of bodies of shared meanings. The base is first-order predicate logic (with some restricted extensions into higher-order logics), with some limited extensions into modal logic – notably some deontic forms, for expressing obligation and prohibition, and alethic forms for expressing necessities.

## **E.4 SBVR Beneficiaries**

A different perspective of SBVR is provided by considering the different groups of people who will benefit from it.

### **E.4.1 Business Analysts and Modelers**

Business analysts and modelers work in enterprises such as EU-Rent. Their business view is the enterprise business view, or perhaps a view of part of the business.

Their view of Community is generally the enterprise in which they work, and its Speech Communities. Within this, they are most concerned with building on the enterprise’s Body of Shared Meanings and Vocabulary in which to express it. They have to negotiate with the Integrators/Administrators (see next sub clause) for inclusion of new concepts and business rules and new signifiers in the Vocabularies.

Business analysts and modelers need to specify business policies and rules precisely, but to do so they do not need any in-depth knowledge of SBVR’s Logical Formulation or Formal Logic. They will see the effects of these parts of SBVR in facilities

provided by tools that support their enterprise's business vocabularies and rules, e.g., templates, options, constraints, consistency checks.

## **E.4.2 Business Vocabulary+Rules Integrators/Administrators**

Business Vocabulary+Rules integrators/administrators generally work within enterprises. Their business view is maintaining a consistent enterprise-wide Body of Shared Meanings, plus Vocabularies for Speech Communities within the enterprise.

They are responsible for integrating and quality-assuring content provided by business analysts and modelers. An important part of this is deciding what to adopt from external vocabularies. They will also be responsible for maintaining the Business Vocabulary+Rules over time. This is outside the scope of SBVR; Business Rule Management is a separate issue to be addressed by the OMG as appropriate.

Integrators/administrators will generally be more aware than business analysts and modelers of Logical Formulation. However they do not need to understand it formally: they will see its effects in administration tools.

## **E.4.3 Tool Builders**

Two kinds of tool will be needed to support SBVR:

1. For interchange of business vocabularies and rules between different platforms.
2. For developing and maintaining business vocabularies and rules for a community.

Interchange standards (and tools that use them) are of great importance to the OMG. Compliance with MOF and XMI was mandated by the OMG, and its achievement is a major part of SBVR. Developers of interchange tools will have four major concerns:

1. The types of construct in a Body of Shared Meanings – Concepts, Verb Concepts, Facts and Business Rules - and the types of relationship between them.
2. The association of elements of the Body of Shared Meanings with elements of Vocabulary – verb symbols, verb concept wordings, definitions, references to external sources.
3. Logical Formulation.
4. Mapping to MOF/XMI.

The developers will not be concerned with the content of Business Vocabulary+Rules for enterprises. And although tool architects and designers will need to understand the Formal Logic theory underpinning of SBVR, the developers will not (although it should be reassuring that it is there).

Business analysts and modelers and integrators/administrators will need tools for developing and maintaining enterprise Business Vocabulary+Rules.

Development of such tools is not the direct concern of the OMG; they will be developed by vendors to meet market demand. However, it is important that they are developed – it would be futile to have good interchange standards and tools if nobody was developing worthwhile content for interchange.

Ensuring that the SBVR model will provide a sound basis for development and maintenance tools has been a judgment call by the BRT. Tools will need to support Body of Shared Meaning, Business Expression and Logical Formulation, plus multiple Communities and vocabulary adoption between them. Tool developers will also have to work with methodologists to ensure support of processes for development and integration of Business Vocabulary+Rules.

#### **E.4.4 Logicians, Semanticists, and Linguists**

Logicians, semanticists, and linguists provide the logical, mathematical, and linguistic capabilities that make it possible to transform business vocabularies and rules from the business perspective to PIM and PSM information systems designs, to structure a variety of natural language statements into SBVR constructs, and to verbalize SBVR entries into any number of natural language statements.

They design the algorithms to ensure integrity in Business Vocabulary+Rules interchange documents, and in the translation between interchange documents and internal tool designs. They also help ensure the formal logic, mathematic, and linguistic integrity of the internal designs of Business Vocabulary+Rules tools.

## E.4.5 Summary of Audiences (Business Beneficiaries) by Activity and Business Context

Business Context (excluding recordkeeping & information system activities)

- Creating Business Content in a ‘Business Vocabulary+Rules’ (e.g., EU-Rent)  
*Audience:* Business People in General
- Integrating & Quality Assuring Business Content in a ‘Business Vocabulary+Rules’ (e.g., EU-Rent)  
*Audience:* ‘Business Vocabulary+Rules’ Integrator/Administrators

‘Business Vocabulary+Rules’ Technology and Tool Context

- Providing the Semantic and Logical Foundation for all ‘Business Vocabulary+Rules’  
*Audience:* Linguists, Semanticists, and Logicians
- Designing a ‘Business Vocabulary+Rules’ Tool for Business People to Document Business Content (e.g., EU-Rent)  
*Audience:* Designers of vocabulary and rules software tools for business people
- Designing Tool capability to interchange Business Content in a ‘Business Vocabulary+Rules’ (e.g., EU-Rent) among Business Communities within and between Organizations  
*Audience:* Infrastructure Designers for Business Vocabulary and Rules Tools

Information System (Recordkeeping) Context (Out of Scope for SBVR)

- Designing Information Systems that Talk and Work according to the Business Content in a ‘Business Vocabulary+Rules’ (e.g., EU-Rent)  
*Audience:* Designers of information systems that support business vocabularies or automate business rules

## E.5 Technical Overview of the Approach

SBVR is designed to support interchange of business vocabularies and rules among organizations. SBVR is conceptualized optimally for business people and designed to be used for business purposes independent of information systems designs.

It is also intended to provide the business vocabulary and rules underpinned by First Order Predicate Logic for transformations by IT staff into information system designs. Note that, in most cases, such transformations will not be fully automated; there will be many options for information system design, with decisions required from system architects and PIM modelers.

### E.5.1 How SBVR is Underpinned by Formal Logics

The formal semantics of SBVR is based on the following formal approaches: typed predicate logic; arithmetic; set and bag comprehension (grounded in ur-elements), with some additional basic results from modal logic. The logic is essentially classical logic, so mapping to various logic-based tools should be straightforward. Typed logic is used for convenience but is easily translatable into untyped logic.

SBVR is neutral as to whether types may be instances of other types in the same model. We provide a basic formalization in first-order logic for those who wish to exclude higher-order types. We also provide an extended formalization for those who wish to allow higher-order types. The extended formalization uses a restricted version of higher-order logic that is closely related to Henkin semantics in restricting the range of types over which quantification is permitted. In first-order logic, quantification is permitted only over individuals (objects: lexical or non-lexical). The SBVR’s restricted higher-order formalization also allows quantification over at least one (one may choose either or both) of the following: general concepts

that are instances of a declared categorization type (whether or not these instances have been explicitly declared); general concepts (primitive or derived) that are explicitly declared in the schema.

It is well known that any function may be rewritten as an equivalent relation, and vice versa. For simplicity, SBVR treats all functions (including mathematical operations) as relations. Relations may be of any arity (1, 2, 3, etc.).

SBVR has no dependency on artificial identifiers (such as MOF ids, surrogate keys), so that all individuals are identified by definite descriptions that are ultimately grounded in lexical constants (note that this does not prevent businesses from using artificial identifiers within their specific SBVR models). Individual constants may be introduced by definition as a shorthand for definite descriptions. Unnamed structures are permitted. For example, sets may be identified by their extensions, and formulae may be identified by their structural composition. The avoidance of artificial identifiers ensures that business statements may be easily understood and communicated between businesses. This is not to discourage the use of names, which is highly recommended, but only to cater for cases where they are not supplied. This also does not prohibit the use of artificial identifiers by supporting tools, provided that such identifiers are hidden from business users of such tools.

Modal operators used include the alethic operators ‘It is necessary that,’ and ‘It is possible that,’ and the deontic operators ‘It is obligatory that,’ and ‘It is permissible that.’ Other modal operators are allowed at the surface level but are translated into these more basic operators with the help of negation (e.g., ‘It is forbidden that’ is captured internally as ‘It is obligatory that it is not the case that’). Apart from standard modal operator transformations involving negation, no other use is made of modal logic theorems, so there is no requirement to choose one out of many specific modal logics for a given modality.

The term ‘fact’ is used in the sense of epistemic commitment, but the underlying logic used for logical connectives is isomorphic to standard truth-functional logic rather than epistemic logic. Ultimately all ground facts are existential or elementary. The truth functional logic is two-valued, with negated existential formulae being used to avoid the use of null values.

## **E.5.2 SBVR Inherent Extensibility**

1. The Vocabularies in SBVR Clauses 8 through 21 are themselves vocabularies that can be included in other business vocabularies. An extended SBVR vocabulary can be created by including an SBVR vocabulary into another business vocabulary that has other designations. An extended SBVR vocabulary can, for example, provide for expression of additional information about designations and rules that is not covered by this specification. An extended SBVR vocabulary can add new designations and word concept wordings for existing concepts as well as add new concepts along with designations that represent them.
2. The Vocabularies in SBVR Clauses 8 through 21 are based on the English language, but can be used to define vocabularies in any language. Alternative SBVR vocabularies based on a different language can be defined by providing designations from the different language for the concepts represented in the SBVR Vocabularies.
3. The Vocabularies in SBVR Clauses 8 through 21 are used to express rules in this specification concerning the definition of business vocabularies and formation of business rules. The SBVR Vocabularies can be further used to express other rules or to form expressions for other purposes. Such other rules can stipulate additional requirements concerning, among other things, what constitutes valid business vocabularies and what is allowable and required in the expression of rules. This specification describes how such rules, like other rules, are formally modeled and communicated and makes no requirement concerning enforcement of such additional rules.

Use of an SBVR vocabulary outside this specification (as in 1 through 3 above) does not change the SBVR vocabulary itself, but only uses it by way of reference.

## **E.5.3 MOF/XMI Models for SBVR**

A business vocabulary provides a means of recording and communicating facts. Following OMG’s Model Driven Architecture, a business vocabulary developed as an information system independent model of business communication is

used to drive the creation of a platform independent MOF model. The MOF model is, in turn, used to drive generation of Java interfaces (based on JMI) and an XML schema (based on XMI).

SBVR is mapped to MOF in two ways. First, the SBVR Vocabularies are mapped to a MOF-based model of repositories that can hold representations of facts that can be meant by any atomic formulation expressible using the business vocabulary. This first mapping does not capture the full SBVR with all of its semantics. It only maps the business vocabulary, using MOF as a mode of representation. The metamodel is described in Clause 23.

Second, the full SBVR is captured in terms of the MOF-based model created from the SBVR Vocabularies (the first mapping). This includes the definitions of concepts, terms, business rules and other facts of the SBVR XMI Metamodel that are expressed in terms of the SBVR Vocabularies.

## **E.6 Special Features of SBVR**

### **E.6.1 Coherent Business Example: EU-Rent**

It is valuable to have a common, consistent base for a large body of examples to illustrate the SBVR approach and use of the SBVR XMI Metamodel. SBVR uses EU-Rent, a (fictitious) car rental company that has been used in several other R&D projects and publications, including papers published by the Business Rules Group. EU-Rent was also used as the basis for the *Business Rules Product Derby*, held at the Business Rules Forum in (New Orleans, 2002, Nashville, 2003, and Las Vegas, 2004), and as the common case study for vendors at the European Business Rules Conference (Zurich, 2003, and Amsterdam, 2004).

EU-Rent includes a broad range of concepts, facts and rules. Most readers of this specification should find the business requirements easy to understand. They should be able to move into the detail of the examples without having to spend much time on the general business scenario.

An important feature of EU-Rent is that it is an international business, which has requirements for expression in different natural languages, and for adaptation of some policies and rules to local regulation, custom, and practice.

### **E.6.2 Internationalization**

Internationalization is handled from two directions. First, the meanings of concepts (including verb concepts) and rules within a body of shared meanings are modeled separately from how they are expressed. The same meaning can be expressed in different languages, both natural and artificial (such as UML and XML).

Second, communities who define concepts and set rules can be grouped and associated. An international company could, for example, define core concepts. Each of its regional divisions would adopt the core into its local body of shared meanings, which also addressed adaptation to local regulation, custom, and practice.

The resulting content could then be mapped into different languages. For example, global policies and rules could be expressed globally in a common language such as English, but operational detail mapped to as many languages as are needed. Communities can also adopt business vocabularies, so that the Swiss division could adopt business vocabularies developed and maintained by the French, German and Italian divisions. SBVR uses “ISO 639-2 Codes for the Representation of Names of Languages” [ISO639-2] to specify the language used to express a given vocabulary (see Part II entry for ‘language’).

One issue still to be addressed in internationalization concerns adoption of business vocabularies from outside the business. Adoption of such business vocabularies, e.g., from trade associations or special interest groups, has two major advantages: it reduces the work needed to maintain the adopting company’s own vocabulary, and it eases communication with other organizations in the same business area. If such business vocabularies are adopted in different natural languages for the same meaning there is some risk of inconsistency in the mappings. The issue that needs further discussion is the trade-off between:

- Adopting an externally-defined vocabulary and supplementing it as needed.
- Modifying an externally-defined vocabulary to create a new one and taking on the overhead of maintaining the modifications.

The outcome is likely to be heuristics to be applied case by case, rather than a general recommendation one way or the other.

### E.6.3 Independence

**Rule Independence.** SBVR bases the expression of all business rules on business vocabularies. By doing so, business rules can be specified independently of all processes and events.

**Enforcement.** SBVR carefully segregates business rule specification from any aspect of enforcement.

**Methodology and Notation.** Although proven compatible with both existing notations and new innovative visualization techniques, SBVR is completely neutral with respect to methodology or notation, permitting the widest possible adoption.

### E.6.4 Notations for Business Vocabulary+Rules

#### E.6.4.1 Special Note on Notations

‘Notation’ is used in SBVR (as instructed by OMG) to mean any language used to represent semantics, or more precisely, abstract syntax. Notations can be verbal, graphical or any combination thereof. Other words for ‘notation’ are ‘grammar,’ ‘syntax,’ and ‘concrete surface syntax.’

It is specifically *not* the intention of SBVR to mandate any particular notation(s) that must or should be used with the SBVR XMI Metamodel. Indeed, this would be neither productive nor desirable. Instead, SBVR encourages wide innovation, experimentation, and value-adding software development in the area of compliant notations.

#### E.6.4.2 SBVR Structured English

It should be remembered that SBVR Structured English (presented in Annex C) is just one of possibly many notations that can be used to express the SBVR XMI Metamodel, and, as a notation, is nonnormative in the SBVR standard. Indeed, additional compliant notations are welcomed and encouraged.

Compliant enrichments of various parts of SBVR Structured English itself are also welcomed and encouraged. Two styles of SBVR Structured English are documented in this specification:

1. Prefixed Rule Keyword Style
2. Embedded (mixfix) Rule Keyword Style

The Prefix Style introduces rules by prefixing a statement with keywords that convey a modality. Examples of some of the prefixes are shown in the table below.

<b>Operative</b>	<b>Structural</b>
It is obligatory that	It is necessary that
It is prohibited that	It is impossible that
It is permitted that	It is possible that

This style, which is explained in Annex C, is included in this specification for two primary reasons:

1. It is supported by the commercial reference implementation of Unisys Corporation, an implementation that satisfies the OMG submission’s compliance requirements.

2. Its rule keywords correspond to the modal operators in the logical formulation portion of SBVR, so it illustrates the translation of notation to metamodel in the most direct and easy-to-understand fashion.

The Embedded Style features the use of rule keywords embedded (usually in front of verbs) within rules statements of appropriate kinds. Examples of some of the embedded keywords are shown in the table below.

<b>Operative</b>	<b>Structural</b>
... must ...	... always ...
... must not ...	... never ...
... may ...	... sometimes ...

This style of notation, which is introduced in Annex F and examined more closely in Annex I, is included in this specification for two primary reasons:

1. It is an existing, documented notation<sup>3</sup> (RuleSpeak<sup>®</sup>, by Business Rule Solutions, LLC) that has been used with business people in actual practice for a number of years.
2. It clearly demonstrates that alternative notations for business rules, which some business people find more natural and/or friendly, are easily accommodated under SBVR Structured English.

## **E.6.5 State**

‘State’ is an important notion for business vocabularies and business rules. As far as business people are concerned, ‘state’ is a concept they can refer to and use in creating definitions, facts, and rules. For example, in EU-Rent a car’s states would include: ‘available,’ ‘allocated to rental,’ ‘on rental,’ ‘damaged,’ and so on. The company uses these state names in defining business rules, e.g., “The car assigned to a walk-in rental must be the available car with the lowest odometer reading in the requested car group.” One way to express states is using unary predicates, e.g., “car is available.”

Businesses name only those states that are useful to them, and these may be only a small subset of the real-world states that real-world cars may have. For example, a car will, early in its EU-Rent life, have a state ‘just delivered and checked out, ready for its first rental.’ But EU-Rent can decide that this has no practical difference from ‘returned from rental, cleaned and refueled’ and combine the two (with others, like ‘transferred in from another branch’) into a named state called ‘available.’

The SBVR approach to Business Vocabulary+Rules regards state as largely definitional (‘available’ is the concept we use for a car that is ...), unlike in a system design or implementation, where state handling is often about applying rules to data (“when a car is returned from a rental, its state must be set to ‘available’”). And selection of the states that are useful to name and define is a business decision.

States are associated with other kinds of concept, including concepts that represent:

- things in the business (like cars and rentals).
- things happening in the business (like rental reservation, late return from rental).
- other states (“when a car is in state ‘due for service’ it cannot become ‘available’ again until it has been serviced -- i.e., been through the pattern of events that describe servicing”).

‘State’ may need some further development; for example, *dynamic* models of events, cycles, schedules, etc. were considered to be outside the scope of SBVR. As SBVR is, states can be represented using concepts and verb concepts.

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3. [Ross2003], Clauses 8-12