# Interpreting Regulations with SBVR

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**Abstract**. The wide and complex spectrum of regulations, especially in the financial services industry, calls for machine assistance in making sense of, and in consuming, regulatory text. This paper describes an approach to interpreting regulations with SBVR. The purpose is to clarify ambiguity in regulations by developing a shared vocabulary and shared guidance based on the regulatory text. The on-going work presented in this paper is part of the Governance, Risk and Compliance Technology Centre's (Ireland) current research activities that include the development of policy advice on compliance with US Anti-Money Laundering (AML) regulations for companies that are governed by these regulations. The approach is based on the navigation of US public databases – Federal Register, Code of Federal Regulations and US Code – to identify subsets of AML regulation relevant to companies based outside the USA. These subsets are imported into an SBVR toolset, where they are analysed and, if necessary, interpreted by the legal and financial experts on the team. A standardized vocabulary for AML is being developed in SBVR, together with advice on regulatory intent and formal expression of rules with which regulated companies must comply.

**Keywords**: case study, compliance, human language, regulation, SBVR.

## 1 Introduction

### 1.1 Overview

The work described here is a proof of concept undertaken by Ireland's Governance, Risk and Compliance Technology Centre (GRCTC) - an application of the Semantics of Business Vocabulary and Business Rules (SBVR) [11]. It consists of:

- Analysis of US regulations that are relevant to companies based in Ireland;
- Interpretation of the regulation source text and editing it into more formal representations using SBVR tools;
- Development of policies and rules for enforcement of the regulations, and advice to regulated companies on compliance.

The concept definitions developed in SBVR will eventually become part of two OWL2 ontologies being developed by GRCTC for the financial industry.

### 1.2 GRCTC

The GRCTC is an industry led, collaborative programme of research and innovation into Governance, Risk and Compliance (GRC) of the financial services industry. It has a consortium of academic partners and an industry steering consortium. Membership is open to companies and research providers with an office in Ireland and an interest in developing competence, outputs and technologies related to GRC in the financial services industry.

The programme is led by a multidisciplinary team of computer scientists and legal and financial subject matter experts (SMEs) at University College Cork. Its mission is to research

and develop industry-ready GRC solutions for the financial services industry to help industry stakeholders commercialise related GRC technologies.

### 1.3 Context

A major strand of GRCTC's activity is development of the Financial Industry Regulatory Ontology (FIRO) and the Financial Industry Governance Risk and Compliance Ontology (FIGO). FIRO will enable efficient access to the wide and complex spectrum of financial industry regulations, relying on formal semantics and regulatory rules. FIGO will provide formal semantics, a GRC knowledge base, and data models to inform and integrate GRC practices and data in the financial industry.

GRCTC has been invited by the Finance Domain Task Force of the Object Management Group (OMG) to submit FIRO for progression to an international standard.

### 1.4 SBVR

In 2013, GRCTC adopted the OMG's SBVR as its basis for FIRO and FIGO. SBVR is a vocabulary – more precisely, an ISO terminological dictionary – for defining business concepts and rules, represented in simplified natural language. It is based on ISO terminology standards and practice.

SBVR is business-oriented. It was developed for definition of things in a business (rather than the data that would represent them in information systems) and policies and rules that constrain the relationships between them and govern the activities in which they play roles.

An SBVR terminological dictionary + rulebook ("business vocabulary + rules") comprises:

- Noun concepts, which correspond to things in a business
- Verb concepts, which correspond to relationships between defined things
- Definitional rules, which constrain these relationships
- Behavioral rules, which govern business activities in which defined things play roles

SBVR contains the noun concepts, verb concepts and definitional rules needed to define the noun concepts, verb concepts, definitional rules and behavioral rules for a specific business or business domain, such as Anti-Money-Laundering. SBVR is itself defined in SBVR, and any domain-specific terminological dictionary + rulebook is an extension of SBVR.

SBVR itself does not include behavioral rules. SBVR is a terminological dictionary that defines what SBVR is, including what behavioural rules are and how to specify them. But behavioral rules govern business activities and SBVR contains no business activities. The rules that govern how SBVR should be used are a matter for tool developers, methodologists, trainers and quality auditors.

Behavioral rules are typically defined for operational business activities. For GRCTC's work they are the rules that govern what regulated companies must do in order to comply with the AML regulations.

A terminological dictionary + rulebook defined with SBVR should be complete and consistent:

- Each noun concept must be explicitly defined, or adopted from an authoritative source, or acknowledged as 'implicitly understood' (the everyday natural language meaning of the term used).
- Only recognized noun concepts may play roles in verb concepts
- Rules may be built only from defined verb concepts and a defined set of structure elements (obligation, necessity, if … then, that, at least…).

SBVR does not have a normative syntax; any syntax that has adequate expressive power is acceptable. SBVR is specified in SBVR Structured English (SE), a simplified version of natural English, and SBVR SE is probably the most widely used syntax for domain-specific SBVR models. The conceptual model is separated from the external representation, and any (suitable simplified) natural language may be used.

SBVR definitions and rules are intended for people in the business. They can be transformed to machine-readable ontologies, or to data models and rules for information systems that would support a business defined using SBVR.

### 1.5 Proof of Concept (PoC)

The GRCTC is developing a number of proofs of concept for FIRO and FIGO. One is the work described here. This focuses on the application of US Anti-Money-Laundering (AML) regulations. Some financial companies based in Ireland, including Irish companies that trade in the USA and Irish subsidiaries of US companies, are governed by a subset of these regulations. The scope of this PoC, however, is broader because the US Anti-Money-Laundering regulations apply to all Financial Services companies, in Europe or elsewhere, doing business in the US.

The purpose of the proof of concept is to demonstrate the capture of relevant US AML regulations and the formalisation of their vocabulary and rules as a basis for guidance on compliance. The results are:

- The relevant subsets of US AML regulations
- Interpretation of regulatory intent
- Behavioral rules with which industry partners must comply, and the vocabulary that defines their meaning, expressed in SBVR SE
- AML content for FIRO and FIGO

### 1.6 Related Work

The basis of the approach used by GRCTC originated in OntoRule [http://ontorule-project.eu], an EU Framework 7 project that ran from 2009 – 2011. The OntoRule case study for interpretation of regulation was undertaken by Laboratoire d'Informatique de Paris Nord (LIPN) and Audi AG, using a subset of EU regulations for car safety systems (seatbelts, airbags, brakes). The approach for the case study used SBVR constructs as patterns for analysis of regulation source text, using LIPN's Terminae software; it is described in [12]. LIPN has continued to develop the approach, as described in [9], [10] and [11].

## 2 The US Regulatory Framework

The approach taken for the proof of concept is enabled by the framework of US law and regulation.

US laws are created by Congress and most are codified in the United States Code (USC) [2]. Congress delegates authority for rules and regulations to departments and executive agencies, such as the US Treasury Department, which publish enforceable regulations that implement the laws. The division of authority is summarised in Figure 1.

| **Congress passes Laws** | **Executive Agencies Issue Rules/Regulations** |
|---|---|
| Publish in Slip Law/Statutes at Large: codified in *US Code (USC)* | Publish in *Federal Register (FR)*: codified in *Code of Federal Regulations (CFR)* |
| Power is determined by Constitution<br>Courts review for:<br>• Constitutionality | Power is delegated by Congress<br>Courts review for:<br>• constitutionality & limits of delegated authority<br>• arbitrary and capricious actions<br>• Administrative Procedure Act requirements |
| Congress acts collectively to represent the will of the people | Agencies must seek and consider public comment on benefits of rules *vs.* burdens and costs |
| Set broad social and economic goals and legal requirements | Prescribe specific legal requirements to meet goals |

**Figure 1: US Regulatory Authority**

Regulations ('rule' and 'regulation' are synonyms in the US regulatory domain) are published in the Federal Register (FR) [3], a daily journal that includes all proposed and final rules.

The Code of Federal Regulations (CFR) [4] is the codification of the final rules published in FR, showing the aggregated effect of related rules. Rules published in FR are defined as changes to be made to CFR.

Entries in CFR refer to laws in USC for authorizations and definitions. The relationship between FR, CFR and USC is illustrated in Figure 2.

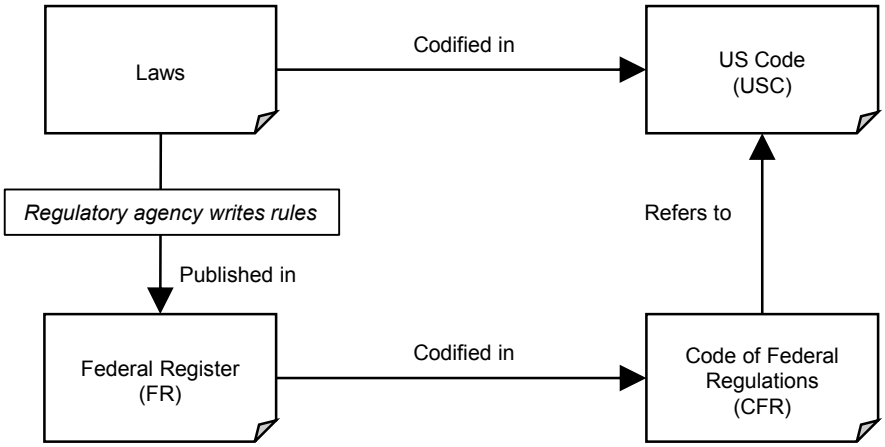


**Figure 2: US Regulatory Framework**

There is a statutory obligation to publish rules in FR, first as proposed rules, open for public discussion, and then as final rules, which define explicit changes to CFR. Final rule documents include the public discussion and responses from the regulatory agency, which is helpful for SMEs in understanding the intent of the rules.

The Code of Federal Regulations is organized as:

- 50 Titles, each naming a broad subject area for regulation (e.g. 12: Banks and Banking)
- Chapter: the rules of a single agency
- Part: rules on a single program or function
- Section: one provision of program/function rules

Sections are composed of paragraphs, numbered to up to 6 levels of subparagraph. A rule published in FR is normally within the remit of a single agency, and usually specifies CFR changes as addition, deletion or replacement of individually-identified paragraphs or subparagraphs.

# 3 Proof of Concept

## 3.1 Scope

The base document for the proof of concept was the FR final rule (76 FR 45403) "Bank Secrecy Act Regulations - Definitions and Other Regulations Related to Prepaid Access" [5], an 18-page document from the Financial Crimes Enforcement Network of the Treasury Department. Its scope is illustrated in Figure 3.

Like many FR rules, the direct scope was fairly narrow; it changed only 5 sections of 31 CFR Chapter X (namely, §1010.100, §1022.210, §1022.320, §1022.380, §1022.420). The open-ended aspect was the dependence on definitions in USC and other sections of CFR, which were needed for full understanding of the business impact of the changes.

The solution adopted was to introduce 'stubs', determined by the SMEs who were interpreting regulatory text. If a reference is encountered to a concept that would be familiar to people working in the domain (e.g. "investment company as defined in section 3 of the Investment Company Act of 1940 (15 U.S.C. 80a–3)"), an SME can declare it as a 'stub' and no further referencing will be followed. Over time, this truncation will be corrected. When the scope of

the work extends into areas that affect the concept, the stub will be replaced by the full definition, together with any further referencing needed.

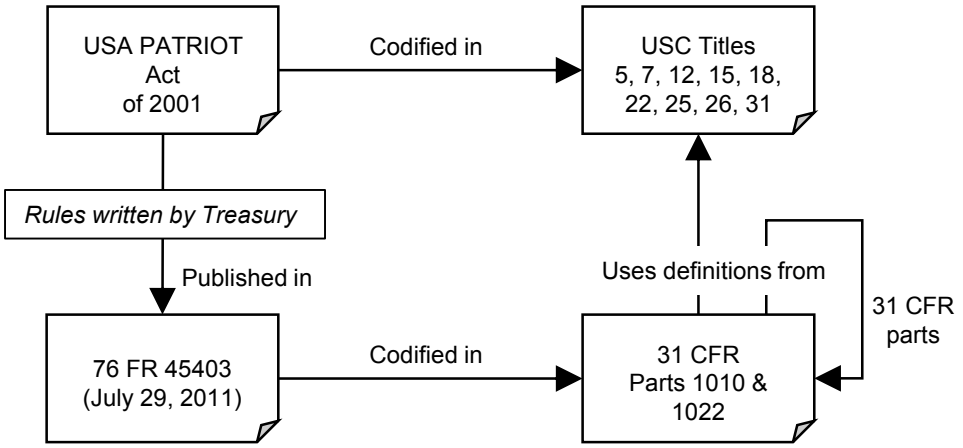


**Figure 3: Scope of Proof of Concept**

### 3.2 Selection of Regulatory Content

The regulations are presented in CFR. Two approaches were considered for selection of relevant subsets:

- Analysing the full content of 31 CFR X. This at first seemed the simpler approach, but would require consideration of over 100,000 words of source text, before following references to USC.
- Starting with the FR rule and following its changes through 31 CFR X. This resulted in a text of less than 26,000 words (equivalent to a little over 38 pages of 10-point type), including 28 references to USC, 16 to parts of 31 CFR X not directly changed by the rule, and 6 stubs.

The second approach was adopted. It provided a more 'digestible' text size for SMEs, and focused on the regulatory intent of the published rule. Also, it provides an approach that can be used directly with new rules as they are published.

### 3.3 Analysis and Formalization

The sections of 31 CFR 1022 amended by 76 FR 45403 use terms defined in section §1010.100 "General Definitions". Before capturing in SBVR the interpretation of sections amended by 76 FR 45403, the SMEs captured, in SBVR SE, the definitions of §1010.100. These definitions are reused, in their SBVR format, while interpreting 76 FR 45403. The SMEs were able to capture in SBVR SE the definitions of 66 terms/concepts directly from section §1010.100. They also identified another set of 180 external terms/concepts. Those terms are not directly defined in §1010.100. Domain practitioners implicitly understand more than half, while the rest could be defined using business dictionaries or standardised industry vocabularies. In this proof-of-concept, terms defined in the Financial Industry Business Ontology[1] (FIBO [6]) were identified.

Having the "general definitions" in SBVR, the next step is to capture the interpretations of the four sections of 31 CFR X amended by 76 FR 45403. The task was assigned to a team of four SMEs. A straightforward division of labour could be done by attributing a section to each SME. However, a quick read of the amended sections reveals overlaps between them. To minimise having two or more SMEs modelling the same 'Things' (i.e. defining the same SBVR elements for the same Thing - *noun concepts*, *verb concepts*, etc.), a theme-based

[1] FIBO is an Industry standard being developed by the Enterprise Data Management Council and the Object Management Group. As a common language, it bridges the language gap between business and technology. As a machine-readable knowledge model, it facilitates the development of semantic applications for the financial industry.

division of labour was adopted. First, the content of each section is broken down into themes or categories. For example, §1022.380 Registration of money service business could be broken down in three themes or categories as follows:

1. Agency related provisions: 1022.380 (a) (3) and (4) (d)(1)(2) (E) (F) (G)(H)(ii)
2. Registration related provisions: (a)(1)(b)(1)(i)-(iii) (a)(2)(3)(4)(c)
3. Compliance related provisions: (e) (f)

Second, the identified themes are cross-referenced between sections and consolidated under theme headers. The result is eleven consolidated themes, which are then regrouped in four work streams, one for each SME. Appendix B details the division of labour aiming to attribute a (cross-sections) theme to each SME.

Each SME starts interpreting the rules assigned to him/her following the protocol described in Figure 4. The aim is to identify modified *verb concepts*, supporting *verb concepts* and *noun concepts*.

```
1- Read the text
2- Identify modalities (Obligations, prohibitions, etc.)
3- For each modality
       a. Add the relevant modality keyword
       b. Identify the English verb on which the modality is applied
       c. Stylise this verb using the SBVR verb style
       d. Identify the noun concepts (general, individual, etc.) or the
          verbal phrase(s) playing the roles in this verb
       e. If the verb roles are played by noun concepts, complete the
          SBVR modified verb concept by stylising the identified the
          noun concepts
              i. Add all the stylised noun concepts the
                 noun_concepts_list
       f. If the verb roles are played by verbal phrases, stylise each
          verbal phrase by identifying English verbs, SBVR noun
          concepts and keywords
              i. Add each verbal phrase to the
                 supporting_verb_concepts_list
4- For each noun concept in noun_concepts_list
              i. Start enriching by identifying the characteristic of
                 each noun concept (if any)
             ii. Identify other definition elements
```

**Figure 4: SBVR-based Rule Interpretation Protocol**

To illustrate the previously described protocol, take for example, §1022.210 (d)(iv):

> "iv) Money services business […] must establish procedures to verify the identity of a person who obtains prepaid access under a prepaid program and […]"

The first part of this rule expresses the obligation to "establish procedures to verify […]". The obligation is on the verb "establish". It will be stylised in the SBVR *verb* style (blue italic in SBVR SE). The first role is played by "Money services business" which is a *general noun concept* in SBVR (styled as green underlined in SBVR SE). According to Figure 5, Money services business is stylised as a *noun concept* and added to the noun concepts list to be further defined. The second role is played by "procedures to verify […]". Procedures is styled as a *noun concept*, "to verify" as a *verb*, "the" as a *keyword* (styled orange in SBVR SE), etc. Below is a suggested formalisation of the rule based on the protocol described in Figure 5:

> It is obligatory that each money services business ***establishes*** procedures to ***verify*** the identity ***of*** the person ***obtaining*** prepaid access ***under*** a prepaid programme.

The modified verb concept is 'money services business ***establishes*** procedures'. One supporting verb concept is 'person ***obtaining*** prepaid access ***under*** a prepaid programme'. Note each of the noun concepts are added to the noun concepts list and defined in a later phase (if the definition is not given by the current section or the general definitions section). Appendix C describes a more detailed example of SBVR interpretation of § 1022.210 (a).

# 4 Implementation and Future Work

Two software tools assist the SMEs in their SBVR interpretation along with a rich text editor (MS Word in this case). First, Confluence by Atlassian is a shared wiki with commenting functionalities that serves as a collaborative editing platform. Second, Designs for Management™ by Business Semantics is an SBVR editing suite that validates SBVR interpretations and generates machine-readable vocabularies and rules in the XML Metadata Interchange format based on the SBVR metamodel.

## 4.1 Phase 1: Collaborative Interpretation

The first phase consists of collaborative interpretation of the regulatory text limited in scope as described in section 3.1. An MS-Word template is used to capture the interpretations following the protocol described in Figure 4, whereas a classic collaborative wiki is mainly used to capture definitions of *noun concepts*. Its commenting functionalities allow the SMEs to interact on a given concept definition and discuss potential semantic precisions. They could vote on a definition or on a revision leaving an audit trail of the Vocabulary development. Appendix D illustrates how the SMEs used this wiki in the context of this proof of concept.

This phase resulted in identifying more than 300 noun concepts. Those concepts were (i) defined within the scoped regulation or (ii) commonly understood or (iii) defined by SMEs using domain authoritative sources. It also resulted in formalizing around 200 behavioral rules based on 76 FR 45403. This number along with the number of definitional rules is expected to evolve after the completion of phase 2 described hereafter.

## 4.2 Phase 2: Validation and Generation of a Machine-readable Vocabulary

Having a candidate vocabulary and a set of candidate behavioral rules, the second phase consists of validating and presenting them in a machine-readable format using Designs for Management™ (DesignsForManagement.com). The latter is an SBVR-based software suite. It is used to ensure that the SBVR regulatory business vocabulary, and the regulatory guidance rules content are complete, consistent and compliant with the SBVR standard.

Designs for Management provides three ways to capture SBVR content:

1. Import from MS Word documents that use an SBVR SE template. This capability was used by the Object Management Group to import the SBVR and Date-Time Vocabulary standards as well as the SBVR EU-Rent Example.
2. Convert text in existing documents into SBVR terms and definitions with a right mouse menu option in the module: Smart Documentation™ editor.
3. Add new SBVR business vocabulary and business policy & rule entries using a forms interface that is supported by an AutoComplete function that inserts defined terms; definitions can be viewed by moving the mouse over the terms.

Once SBVR interpretations are entered in Designs for Management™, it validates them against the SBVR specification using several techniques. SBVR Terminological Dictionaries and Rulebooks, whether validated on under construction, can be displayed, printed and saved in HTML, MS Word and PDF formats. Moreover, SBVR model content can be exchanged in conformance with clause 2 of the SBVR specification [11] in the XML Metadata Interchange format. Appendix E, further describes the software architecture of Designs for Management™ and briefly presents its major modules, namely, Smart Glossary™, Smart Documentation™ and Clear Guidance™.

On-going work currently consists of importing the templates populated in phase 1 into Designs for Management™. This import/validation exercise helped identifying inconsistencies and/or omissions to be addressed by the SMEs. At the time of writing this paper, the curation and the consolidation of the vocabulary and the rules from phase 1 is not complete. However, a demonstration of a consistent SBVR vocabulary and rulebook for the EU Rent example 1.2 from the SBVR specification is publicly available in Designs for Management™ (at DesignsForManagement.com).

### 4.3 Future work

Part of the GRCTC research roadmap (cf. section 1) consists of creating a set of ontologies and data models for the financial industry using the developed SBVR vocabularies and rules as a starting point.

Currently, there is limited support for automated transformation. The SBVR-based vocabularies in the work done by LIPN, described above, were transformed to OWL ontologies, but this was done with LIPN's own software rather than SBVR-specific tools.

In general, transformation from SBVR to machine-readable ontologies involves manual intervention by SMEs. The process is well understood, but the transformation requires business decisions about business content that is not easily represented in formal information structures such as logical data models (other than as carried-forward text, perhaps styled in SBVR SE). Chapin and Hall [2] present a tutorial on transformations from an SBVR terminological dictionary to one or more logical data models. Tool support is currently experimental.

The OMG's Date-Time Vocabulary, developed as a foundation vocabulary to extend SBVR, has been transformed to an OWL2 Ontology [7]. Aspects of SBVR that have no OWL equivalents are carried forward as OWL annotations. This approach is one option raised in [8], which suggests several possibilities for separating SBVR content that is not easily represented in OWL.

There is less experience in transforming rules. SBVR has two kinds of rules: definitional (alethic) and behavioral (deontic). Definitional rules are the basis of constraints on associations in data models and ontologies and are addressed in the work referenced above. Behavioral rules govern or support activities. In SBVR they are declarative – they define states the business must be in (e.g. "a customer's debt must not exceed his credit limit"). They can be directly supported in relational database systems by stored procedures and data base triggers, but many rules-based applications use production rules, which are procedural (e.g. "if the price of a new order would take the customer's debt over his credit limit, then reject the order"). There is a fairly simple tutorial for transforming SBVR behavioral rules into production rules compliant with the OMG's Production Rule Representation (PRR) standard, referencing the data model derived from the corresponding SBVR terminological dictionary.

Future work will, therefore, consist of leveraging the techniques previously mentioned to transform the SBVR interpretations to machine-readable ontologies, data models and rules.

## 5 Conclusions

This paper described a proof-of-concept on interpreting regulations using Semantics of Business Vocabulary and Business Rules (SBVR). This work was carried out as part of the research program of the Governance, Risk and Compliance Technology Centre in Ireland (GRCTC). After a brief description of the research context and the US Regulatory Framework, the proof of concept was detailed. First, the approach taken to limit to scope of interpretation within a regulatory document is described. Second, the division of labour between Subject Matter Experts (SMEs) is discussed. Third, the SBVR-based rule interpretation protocol was described and illustrative examples were provided. Finally, the software tools assisting the SMEs in their SBVR interpretation were presented.

The described approach is a step towards rendering the wide and complex spectrum of regulations more accessible. It tackles uncertainty and imprecision in regulations by combining Subject Matter Expertise and SBVR precision in representing domain knowledge. The produced vocabulary and guidance rules allow several practitioners to share their respective views on, and understanding of, the regulatory requirements while broadening their perception of the regulations. Capturing regulations in SBVR could also play a role in providing the regulators with national/ international view on the way the regulated perceive the regulations. However, the impact of the produced vocabulary and guidance rules is subject to their accessibility in terms of size and coherence. A large vocabulary including a high

number of fine grained and redundant concepts is likely more precise than a smaller, less expressive one, but might be less accessible in terms of complexity (harder navigation due to its size, contains more definitions, etc.). We believe that seeking an appropriate trade-off between accessibility and expressiveness is the key to a successful adoption of an SBVR based vocabulary and guidance rules.

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14 United States Code (http://uscode.house.gov)

## Appendix A - Glossary of Abbreviations

| Acronym or Term | Meaning or Definition |
|---|---|
| AML | Anti-Money-Laundering |
| CFR | Code of Federal Regulations |
| FIBO | Financial Industry Business Ontology |
| FIGO | Financial Industry GRC Ontology |
| FIRO | Financial Industry Regulatory Ontology |
| FR | Federal Register |
| GRC | Governance, Risk and Compliance |
| GRCTC | Governance, Risk and Compliance Technology Centre |
| ISO | International Organization for Standardization |
| OMG | Object Management Group |
| OWL | Ontology Web Language |
| OWL2 | Ontology Web Language 2 |
| RDF | Resource Description Framework |
| SBVR | Semantics of Business Vocabulary and Business Rules |
| SBVR SE | SBVR Structured English |
| SME | Subject Matter Expert |
| USC | United States Code |

## Appendix B - Attributing cross-sections themes to SMEs from 76 FR 45403

### Part One – each section broken down into different categories

§1022.380 Registration of money service business could be broken down in three themes or categories as follows:

1. Agency related provisions: 1022.380 (a) (3) and (4) (d)(1)(2) (E) (F) (G)(H)(ii)
2. Registration related provisions: (a)(1)(b)(1)(i)-(iii) (a)(2)(3)(4)(c)
3. Compliance related provisions: (e) (f)

§1022.210-Anti money laundering program for money service businesses could be broken down in five themes or categories as follows:

1. Definition related provision-1022.210 (a)
2. Required Standards for AML MSB programs-(b), (c), (d), (1)(i)(A)-(D), (d) (ii), second part of (iii) and (2)(i)-(ii), ( e).
3. Identity related provisions-(d)(iv)
4. Educational\Training related provisions-(2)(iii), (3)
5. Compliance date related provisions-(4)

§1022.320 Reports by money services businesses of suspicious transactions could be broken down in five themes or categories as follows:

1. Reporting and Identification related provisions-§1022.320 (a)(2)(i)-(iv), (a) (3)-(4).
2. Filing related provisions- (b)(2)-(3)
3. Retention of Records related provisions-(c )
4. Confidentiality/Disclosure of SARs related provisions-(d)(1)(i)-(ii) (A) (1)-(2), (B)(2), (e).
5. Other areas in this provision-(a)(1), (f) and (g)

§1022.420 Additional records to be maintained by providers and sellers of prepaid appears to be a self-contained provision

**Part Two - Cross-referencing and consolidating break down of provisions between sections**

1. Agency provisions
   - §1022.380 (a) (3) and (4) (d)(1)(2)(i)- (ii)
2. Identity and Reporting related provisions
   - §1022.210 (d)(1)(iv)
   - §1022.320 (a)(2)(i)-(iv), (a) (3)-(4)
3. Compliance related provisions
   - §1022.380 (e), (f), 1022.320 (f)
   - §1022.210 (d)(4)
4. Registration related provisions
   - §1022.380 (a)(1), (b)(1)(i)-(iii), (b)(2)(3)(4), (c)
5. Definition related provision
   - §1022.210 (a)
6. Required Standards for AML MSB programs
   - §1022.210 (b), (c), (d) (1)(i)-(ii), second part of (iii) and (d)(2)(i)-(ii), (e)
7. Educational\Training related provisions
   - §1022.210 (d)(2)(iii), (3)
8. Filing related provisions
   - §1022.320 (b)(1)-(3)
9. Retention of Records related provisions
   - §1022.320(c ), 1022.420
10. Confidentiality/Disclosure of SARs related provisions
    - §1022.320 (d)(1)(i)-(ii) (A) (1)-(2), (B)(2), (e).
11. Other areas in this provision
    - §1022.320 (a)(1), and (g).
    - §1022.380 (a)(2)

**Part Three - Regrouping themes and allocating to four SMEs**

**SME 1:** 1) Agency Provisions, 2) Identity and Reporting related provisions and 3) Compliance related provisions.

**SME 2:** 4) Registration related provisions, 5) Definition related provision and 6) Required Standards for AML MSB programs.

**SME 3:** 7) Educational\Training related provisions, 8) Filing related provisions and 9) Retention of Records related provisions.

**SME 4:** 10) Confidentiality/Disclosure of SARs related provisions and 11) Other areas in this provision.

## Appendix C - An Example of SBVR Interpretation of §1022.210 (a)

**§ 1022.210 Anti-money laundering programs for money services businesses.**

(a) Each money services business, as defined by § 1010.100(ff) of this chapter, shall develop, implement, and maintain an effective anti-money laundering program. An effective anti-money laundering program is one that is reasonably designed to prevent the money services business from being used to facilitate money laundering and the financing of terrorist activities.

**Business Rules**

It is obligatory that each money services business ***develops*** an anti-money laundering programme

It is obligatory that each money services business ***implements*** an anti-money laundering programme

It is obligatory that each money services business ***maintains*** an anti-money laundering programme

It is obligatory that each anti-money laundering programme ***is effective***

It is obligatory that each anti-money laundering programme ***prevents*** money services business ***being used to facilitate*** money laundering and terrorist activities

**Verb Concepts**

**Modified verb concepts**

anti-money laundering programme ***is developed by*** money services business

anti-money laundering programme ***is implemented by*** money services business

anti-money laundering programme ***is maintained by*** money services business

anti-money laundering programme ***is effective***

Necessity: Each anti-money laundering programme ***is reasonably designed***

anti-money laundering programme ***prevents*** money laundering and terrorist activities

**Supporting verb concepts**

money services business ***is defined by § 1010.100(ff)***

anti-money laundering programme ***prevents*** money laundering and terrorist activities

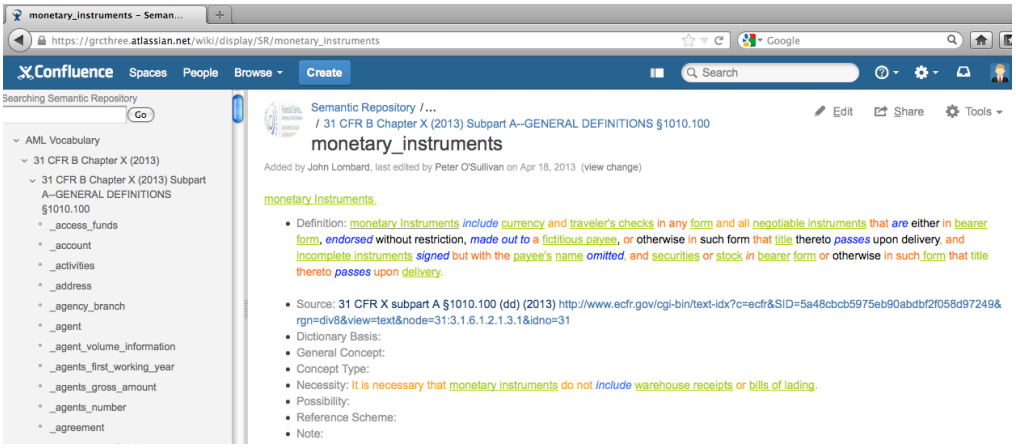
**Noun concepts**

anti-money laundering programme

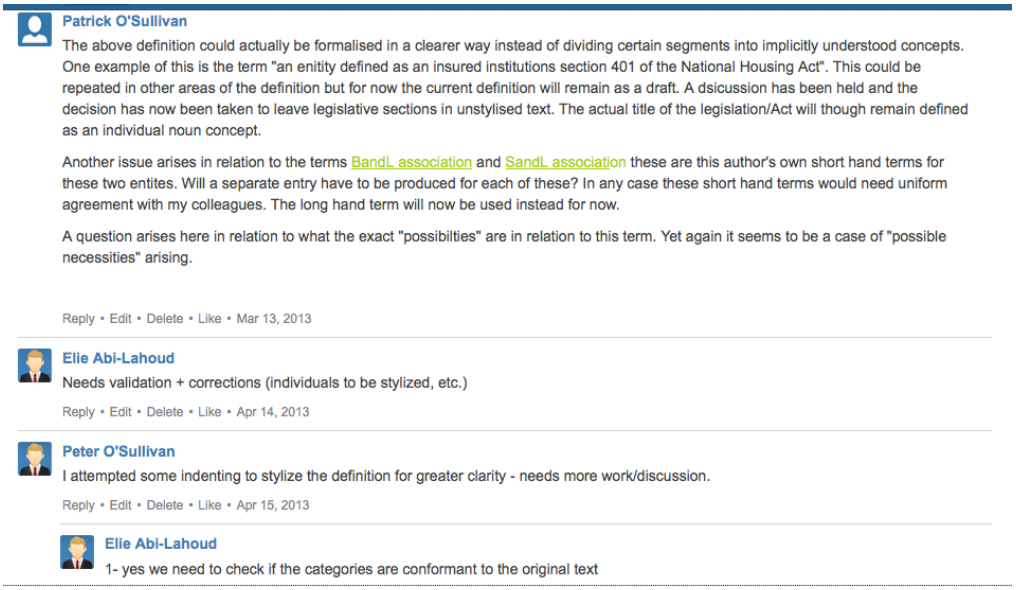
money services business

money laundering and terrorist activities

## Appendix D - Using Confluence for Collaboration




This screenshot presents the wiki editing interface. Here the definition of monetary instruments is displayed along with a necessity identifying what should not be considered as a monetary instrument. The left frame presents a tree list of vocabulary entries with several search capabilities.

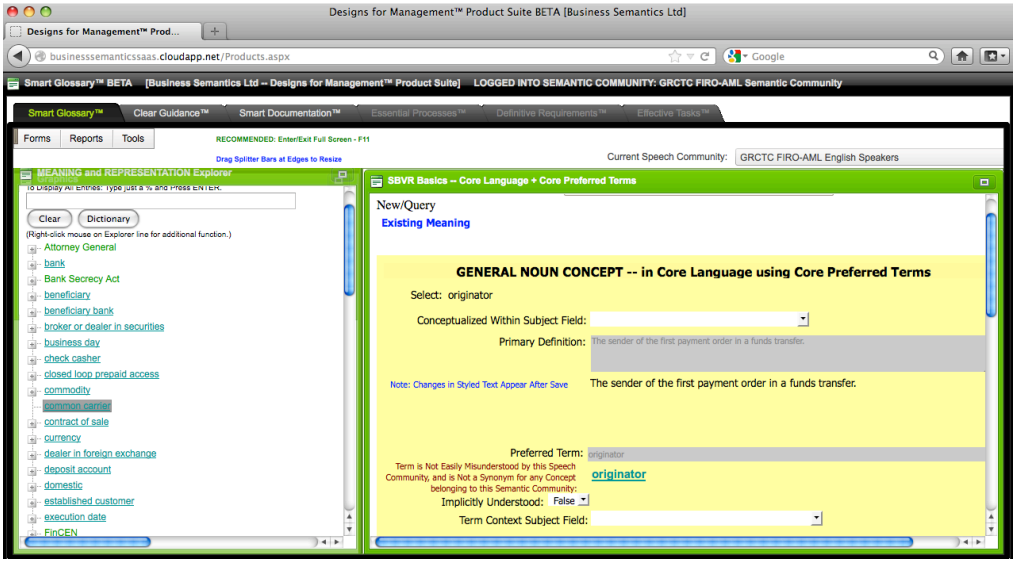



This screenshot illustrates an example of interaction between SMEs working on detailing the definition of Bank in the context of 31 CFR X.

## Appendix E - Using Designs for Management to Capture and Validate SME Interpretations

The Designs for Management™ software suite is hosted as a MS Windows Azure cloud service and uses an Azure-hosted SQL Server database. On the user's computer, it runs entirely within an Internet Browser and requires nothing additional to be installed on the user's computer. The four major browsers, Internet Explorer, Firefox, Chrome and Safari, are supported in all the environments for which they are available. This software suite is developed as a Visual Studio .Net Web Forms application, supplemented with Telerik cross-browser components and the Kendo UI HTML5/CSS3 JavaScript framework. It uses .Net Framework Forms Authentication for user authentication and authorization.

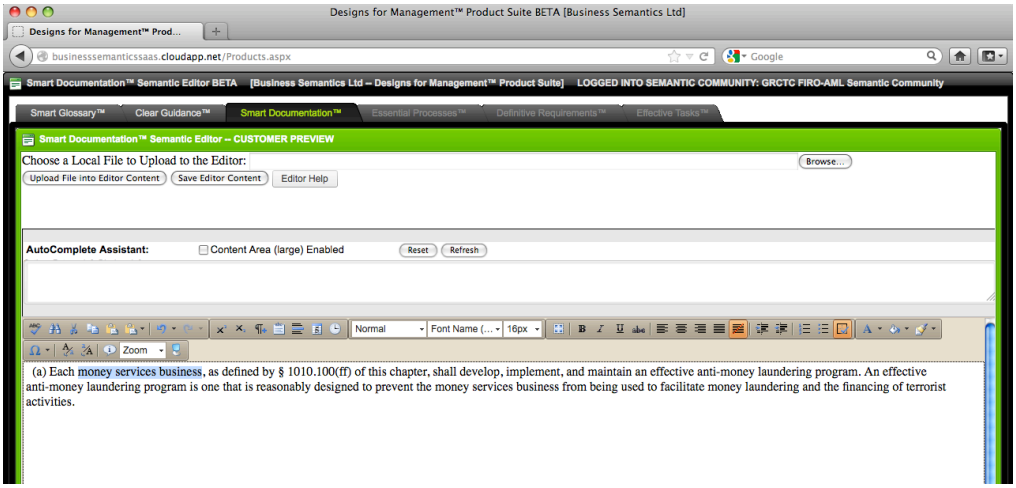
### Smart Glossary™




This is a screenshot of *Smart Glossary*™. It is used to capture SBVR vocabulary elements. The terms identifying business concepts, their definitions, characteristics (if any) and other related elements are entered manually in the right frame. *Smart Glossary*™ provides the SME

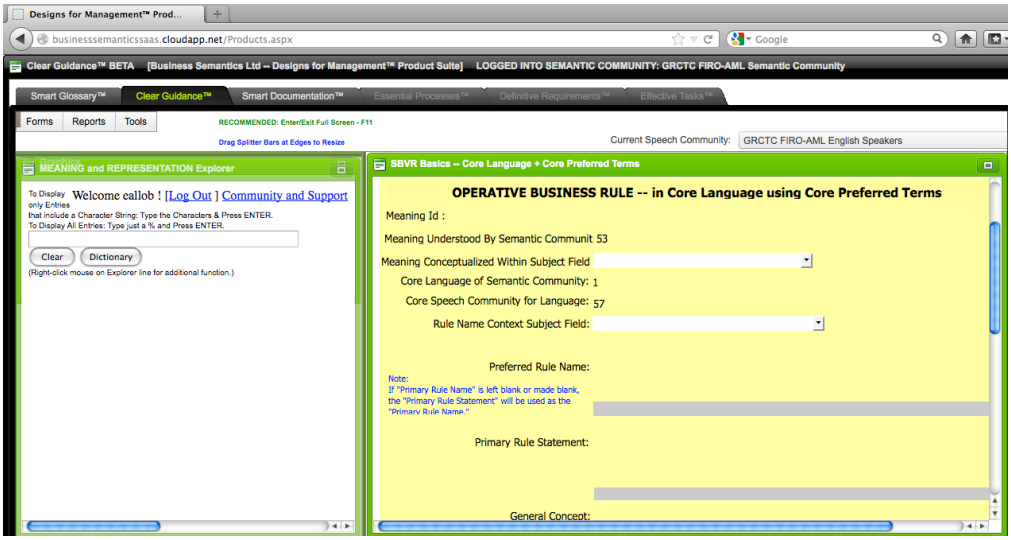
creating vocabulary entries with a list of SBVR predefined keywords and autocomplete functionalities taking into account previously entered vocabulary elements. The left frame displays an hierarchy of concepts in the vocabulary being edited.

### Smart Documentation™




This is a screenshot of *Smart Documentation*™. This module allows the SME to upload a regulatory text and start constructing the vocabulary by highlighting SBVR elements (general noun concepts, individual noun concepts, etc.) in the original text. Further refinement of the vocabulary entries identified in *Smart Documentation*™ could be done in *Smart Glossary*™. This functionality was not used in the described proof of concept since the SMEs drafted their vocabularies in an MS Word template that was later imported into Designs for Management.

### Clear Guidance ™




This is a screenshot of *Clear Guidance*™. The interface of this module resembles to *Smart Glossary*™. The left frame displays a list of operational rules (captured from the regulation in this case). The right frame allows the SME to build or edit the rule using built in SBVR keywords and elements from the previously created vocabulary.

### Seeing the Semantic Connections

A Meaning and Representation Explorer displays all or a selected part of the SBVR content and enables the browsing from any SBVR entry following the chain of semantic relations to anywhere in the SBVR content. The ability to choose at every point which kind of semantic relation(s) to browse next is available. In every context the full display of the entry, any styled term, other designation or verb concept wording can be seen