Data Science for FIBO

What is the Difference Between a Data Dictionary, Ontology, and Vocabulary?

FIBO Ontologies and Be Informed Metamodels for Financial Services Applications

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Figure Tinker Toys for Linked Open Data Literals
What is the Difference Between a Data Dictionary, Ontology, and Vocabulary?

Frank Guerino, Chairman, The International Foundation for Information Technology (IF4IT), says:

- A Data Dictionary defines "data" by giving you details about that data element (e.g. Attribute/Field Name, Description, Data Type, Constraints, etc.)
- A Term is a word that is accompanied by a Definition.
- A Vocabulary is usually a listing or grouping of words that are common a domain of context (usually without definition).
- A Glossary is a more detailed Vocabulary that is tied to a specific and limited Context. Unlike a Vocabulary that only provides a list or grouping of words or terms that are common to a context, a Glossary provides the long name, short name or acronym, and a description/definition. It rarely gets into a things like synonyms and antonyms.
- A Dictionary is often used interchangeably with a Glossary but is often considered to handle much more, like getting into phonetics, derivations, etc.
- A Data Model is a representation of how to aggregate and interrelate Data, which is defined by a Data Dictionary. This includes but is not limited to things like Primary and Foreign Key representations, how to deal with permutations, time, history, and much more.
- A Taxonomy is a categorization of "anything"... Words, Glossaries, Types, etc. Taxonomies can take on multiple forms, such as lists, hierarchies, interactive facets, etc.
- A Syntax is a set of rules for structuring elements, such as words and symbols to create things like phrases, sentences, and paragraphs.
- A Grammar is a means of defining how words are used to create meaning, within a Language.
- A Language is the inclusion of all of the above.
- An Ontology is the development of a combination of one or more of all of the above with the intent to facilitate higher order activities, such as communications, translation, learning, understanding, teaching, and making decisions.

I asked about the document this came from and was told the majority of the document the material originated from has proprietary/confidential content belonging to partners that cannot be shared. There are some pieces, like what was shared above that are not. It was part of a multi-enterprise knowledge sharing effort, between Chief Architects that represented a number of major financial firms.

I suggested providing some specific examples using the FIBO content below. This is like managing OMG objects!
I have been following a very interesting email conversation in which Andrea Westerinen says:

One of the questions proposed in the Ontology Summit 2014 Track A ([Common, Reusable Semantic Content](#)) asks whether the reuse problems (and perhaps their solutions) are different in the Linked Data and ontology spaces.

I do recognize that a lot of work went into FIBO to create smaller, more reusable content. In fact, that was one of the positives that I highlighted in my presentation yesterday [PDF](#). It was straightforward to find concepts and the annotation was amazing!

But, I did find that for many of the more "advanced" topics, there were imports of most of the FIBO Foundational Ontology. For example, People.rdf imported Organizations (and FormalOrganizations), Locations (and Countries and Addresses), Goals, etc. So, the more interesting topic ended up being rather "inclusive."

Might there be a way to modularize this even more?

She summarizes her presentation (see [Slides](#) below) in Slide 15 General Comments:

- Difficult to find specific semantics in ontologies
- Could not reuse full ontologies
  - Specific concepts/semantics very valuable
- Other (small) general ontologies were imported/used directly
  - For example, W3C’s Time and Provenance ontologies
- Targeted semantics very useful as starting points
  - Not open–ended
  - More complete analysis than network management perspective alone could have provided
  - Room to grow as needed

The responses came from:

- [Elisa Kendall on FIBO](#)
- [Leo Obrst on FIBO](#)
- [Mike Bennett on FIBO](#)
My summary of Elisa Kendall's response is:

I thought about this when we first started down the path, but the amount of work required just to get from the original EDM Council model in Enterprise Architect to where we are now was daunting as you might have guessed. The biggest challenge is that there are OMGers who really want us to have far fewer modules, and to have one single UML model that corresponds to all of the FIBO Foundations OWL modules, which I've vetoed so far, but I'm not sure how likely I am to win the war on that front. I think it defeats the purpose of having done all of the modularization work, and it would mean that the individual modules cannot evolve independently, which is a key requirement in my view.

We will need several integrating/mapping ontologies that bring all of the bits and pieces together for various use cases, I agree. We currently don't have that at all, though there are two modules in Foundations that bring most of the others in.

My summary of Leo Obrst's response is:

Sure, Elisa, this is not meant as a comment on FIBO, etc., but as a general paradigm for integrating OWL ontologies.

Plus, of course, it is a methodology that can be applied only when you have a certain complexity of ontology interaction and also, a certain maturity of understanding of ontologies by the larger community (our community is typically disparate software developers using the ontologies for various purposes, much smaller than that of FIBO, I think, and they kind of understand ontologies now and kind of trust us to do what's right – a rare circumstance, in my experience).

I think you all probably developed FIBO as you had to, given your constraints.

Yes, good idea, Andrea. We do that in our own OWL ontology work.

My summary of Mike Bennett's response is:

In the original draft FIBO material, we followed something very like "Ontology Design Patterns". As with design, part of the art is making the modules coherent and thinking of the interfaces between them.

An ontology standard like FIBO differs from a design exercise in two important ways:

1. As an ontology, it aims to document business concepts rather than to design a solution;
2. As a standard, its scope is not driven by individual use cases, but is defined by scope of the logical and physical data for which concepts are to be captured semantically.

Most of the work in figuring out the business concepts has been done, but we are just starting the process of identifying how to deliver the meanings of these concepts in a way which supports the full spectrum of possible applications. We also need to balance those different ways of putting the meanings to work, so that what works best for one kind of application does not make it harder to use the same material in other kinds of application, including both conventional technology deployment and Semantic Web applications.

https://semanticommunity.info/Data_Science/Data_Science_for_FIBO
Updated: Thu, 23 May 2019 01:32:49 GMT
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I also asked the question of Elisa Kendall: How about doing a/using a pre-existing metamodel in Be Informed? and her response was: Elisa Kendall on Be Informed

That's not my call -- the EDM Council is developing the FIBO ontologies, and they have a model that they've been building for more than 5 years with a host of subject matter experts. I'm certain that they would not want to adopt any vendor-supplied metamodel. They have done their homework on the financial standards front, though, and are integrating / modeling a number of those.

My role has been to take what was done as a UML model originally, add process and methodology, turn it into OWL, make it compliant with the Ontology Definition Metamodel (ODM) OMG standard, modularize the heck out of it, run reasoners over it to make sure it's consistent, play with test data for further validation, etc., but I have had little impact on the content of the ontologies.

If Be Informed has a model or set of models, preferably ontologies, and especially if they are in OWL, that they would like to submit to the OMG for standardization, I'm sure people would be interested. It would be great if their input could help short circuit the FIBO development process, or augment what's been done to date. But, Be Informed would need to agree to make it open source with appropriate licensing (namely, with attribution but at no cost to any of the banks that might want to use it, and at no cost to the EDM Council or OMG). That's a steep request if they are making $$ with their model/ontologies.

I have asked Be Informed for their response. From what I know about Be Informed Solutions (see below) I can respond:

Elisa Kendall: I'm certain that they would not want to adopt any vendor-supplied metamodel.

Brand Niemann: Be Informed is a member of OMG and their metamodels are available as part of Be Free that I am using for free!

Elisa Kendall: If Be Informed has a model or set of models, preferably ontologies, and especially if they are in OWL, that they would like to submit to the OMG for standardization, I'm sure people would be interested.

Brand Niemann: Be Informed has a set of models and they use RDF/OWL, but they are focused on full-fledged financial services applications for government, industry and academia, which solves the problems discussed above about modularizing and integrating ontologies for real-world applications. An example of this is my collaborative work with Kees van Mansom, Be Free Community Leader on the Healthcare.gov web application to be presented at our February 4th Federal Big Data Working Group Meetup.

MORE TO FOLLOW
Semantics - Crossing the Chasm OMG Workshop

Join us on Wednesday, March 26th in Reston, VA. This 1-day workshop will stress the importance of standards and semantics across corporate and regulatory landscapes, with break out tracks on what's working today and where we need to go with standards in semantics for healthcare and financial services. The goal is that the use of semantics, with an OMG style, model driven, disciplined methodology is increasingly critical to providing broader, more effective solutions to bear on tough business problems.

The day will also include a session outlining the work done by the OMG Finance Domain Task Force in creating a Financial Industry Business Ontology standard. Source: [http://www.omg.org/news/meetings/tc/...em-Fin_Day.htm](http://www.omg.org/news/meetings/tc/...em-Fin_Day.htm)

Please see my commentary below.

My Note: Slides to be added as they become available.

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<td><strong>MORNING GENERAL SESSION</strong></td>
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| 0900 - 0915 | Welcome & Introductions  
Richard Mark Soley, Chairman & CEO, Object Management Group |
| 0915 - 1000 | KEYNOTE: The Importance of Standards and Semantics Across the Regulatory Landscape  
Linda Powell, Chief Business Officer, Office of Financial Research, U.S. Treasury Department |
| 1000 - 1015 | Morning Refreshments |
| 1015 - 1100 | KEYNOTE: The Importance of Standards and Semantics Across the Corporate Landscape  
| 1100 - 1130 | Linked Data, Semantics, and Standards in Financial Applications  
Michael Atkin, Managing Director, Enterprise Data Management Council |
| 1130 - 1200 | Linked Data, Semantics, and Standards in Healthcare Applications  
Peter L. Levin, CEO and Founder Amida-Tech, former Senior Advisor to the Secretary and Chief Technology Officer |
| 1200 - 1330 | Attendee Lunch Break |

**AFTERNOON WORKSHOP TRACKS**

**FINANCE TRACK: What's Working Today and Where We Need to Go with Standards in Semantics for Financial Services**

| 1330 - 1335 | Session Goals and Agenda Review  
Chair - Michael Bennett, Head of Semantics and Standards, Enterprise Data Management Council and OMG Finance Task Force Co-Chair |
1335 - 1410

FIBO (Financial Industry Business Ontology) Crosses the Chasm

Dennis Wisnosky, Wizdom Systems, Inc.

As Semantic Technology, in the form of W3C and OMG standards moves into its third decade, it is important to both look back and to look forward in terms of known knowns as to what is really working and what is not. The theory behind Geoffrey Moore's "Crossing the Chasm" is that it applies to discontinuous and disruptive innovations. In this case, the move from concrete like warehouses of relational data, to the ability to federate source data in real time to solve seemingly intractable problems. The chasm is crossed when the ideas of visionaries and the experiences of early adopters reach a positive critical mass. This is when there is both a sufficient body of knowledge and an experience base that causes the risk of staying with the old way to be greater than moving to the new way. This is when the pragmatists clamor to jump on the bandwagon of change.

1410 - 1515

Transforming Laws, Regulations and Policies into Ontologies and Business Rules: A Real Life PoC with Regulation-W (Reg-W)

David Newman, Strategic Planning Manager, Senior Vice President, Wells Fargo
Wesley Moore, Managing Director, Compliance Controls and Infrastructure, Wells Fargo Securities, LLC
Elie Abi-Lahoud - GRC Technology Centre, University College Cork, Ireland,
Dr. Grit Denker, Senior Computer Scientist, Computer Science Laboratory, SRI International
Benjamin Grososf, CTO, CEO, Co-Founder, Coherent Knowledge Systems
Dr. Terrance Swift, Principal Engineer, Co-Founder, Coherent Knowledge Systems

In June of 2013, the Enterprise Data Management Council (EDMC) held a FIBO Technology Summit during the Semantic Technology & Business Conference (SemTechBiz) in San Francisco. How to unambiguously understand and automatically comply with regulatory rules was one of the four topics addressed by the world's leading semantic technology experts. It was decided at the Summit to focus on Regulation W (Reg-W) as a test case for the use of the Financial Industry Business Ontology (FIBO) in combination with advanced semantic rules (Rulelog/Flora-2) to automatically keep a bank in compliance as transactions were being processed. This presentation will showcase the resulting PoC including live demonstrations of available software.

1515 - 1530

Afternoon Refreshments

1530 - 1630

The Perfect Match - Linking FIBO and Business Processes Through Semantic BPMN

Mohamed Keshk, Semantic BPMN
Lloyd Dugan, Business Process Management, Inc.

1630 - 1700

Roundtable Discussion

Michael Bennett, Head of Semantics and Standards, Enterprise Data Management Council and OMG Finance Task Force Co-Chair
Wesley Moore, Managing Director, Compliance Controls and Infrastructure, Wells Fargo Securities, LLC
Linda Powell, Chief Business Officer, Office of Financial Research, U.S. Treasury Department
Elie Abi-Lahoud, GRC Technology Centre, University College Cork, Ireland, Coherent Technology,

https://semanticommunity.info/Data_Science/Data_Science_for_FIBO
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SRI and Wells Fargo  
Alan Deaton, Acting Associate Director, Statistics Branch Division of Insurance and Research Federal Deposit Insurance Corporation  
Marty Loughlin, Vice President Financial Services, Cambridge Semantics

**Topics of Discussion:**

- What other areas should OMG members and partners focus to demonstrate business value of standardized financial business data semantics?
- What role regulators can play to drive the prioritization of financial data standards and data innovation in financial industry?
- Now that FIBO has crossed the chasm, how do we get it to the tipping point?
- What are some of the most vexing technical problems that may stand in the way of innovations such as FIBO?

### HEALTHCARE TRACK: What’s Working Today and Where We Need to Go with Standards in Semantics for Healthcare Services

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<tr>
<td>1330 - 1335</td>
<td><strong>Chair - Randy Coleman, Principal Partner, Wizdom Systems, Inc.</strong></td>
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| 1335 - 1410 | **Critical Steps in Making EHR and Information Exchange Improve Patient Care**  
Dr. Rafael Richards MD MS, Adjunct Assistant Professor, Johns Hopkins, VA Office of Informatics and Analytics |

Doctor Richards will use his real world experiences in working with the department of Veterans Affairs and others to show why Healthcare is critically dependent on Semantic Technologies. While data science has many flavors and implementations based on differing standards and open or proprietary solutions, Healthcare ultimately comes down to the meaning of those few words that a Doctor or a Specialist puts down in a patients chart.

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| 1410 - 1515 | **Standards and Semantics for Biomedicine**  
Dr. Olivier Bodenreider M.D., Ph.D., Senior Scientist and Chief of the Cognitive Science Branch of the Lister Hill National Center for Biomedical Communications at the U.S. National Library of Medicine [Slides](https://semanticommunity.info/Data_Science/Data_Science_for_FIBO) |

There is a lot going on in biomedicine in terms of standards and semantics (standard vocabularies for clinical documentation, semantic integration of terminology, common data elements for clinical research, clinical information models). NLM/NIH is involved in most of it, often in collaboration with other agencies (e.g., the Office of the National Coordinator for Health Information Technology (ONC)) and organizations (e.g., HL7, academia).

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<td>1515 - 1530</td>
<td><strong>Afternoon Refreshments</strong></td>
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<td>Time</td>
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<td>1530 - 1630</td>
<td><strong>Empowering Healthcare Through Semantics</strong>&lt;br&gt;Michael Grove, Chief Software Architect, Clark &amp; Parsia&lt;br&gt;&lt;br&gt;Mr. Grove will show that you can use semantics to offer your business logic using high level declarative languages such as RDFS and OWL. You can bring business logic out of the code base and take it out of the hands of the programmer and into the hands of the business experts. Additionally, Mr. Grove will speak about the work accomplished to support academic and NIH domain ontologies for synthetic biology and a cancer thesaurus.</td>
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<tr>
<td>1630 - 1700</td>
<td><strong>Roundtable Discussion</strong>&lt;br&gt;Kenneth S. Rubin, OMG Healthcare Domain Task Force Co-Chair&lt;br&gt;Dr. Olivier Bodenreider M.D., Ph.D., Senior Scientist and Chief of the Cognitive Science Branch of the Lister Hill National Center for Biomedical Communications at the U.S. National Library of Medicine&lt;br&gt;Dr. Rafael Richards MD MS, Adjunct Assistant Professor, Johns Hopkins, VA Office of Informatics and Analytics&lt;br&gt;Michael Grove, Chief Software Architect, Clark &amp; Parsia&lt;br&gt;Harold Solbrig, IS Technical Specialist II, Mayo Clinic&lt;br&gt;&lt;br&gt;Discussion will focus on:&lt;br&gt;- What other areas OMG members and partners should focus on to demonstrate business value of standardized healthcare data semantics?&lt;br&gt;- What role regulators can play to drive the prioritization of healthcare data standards and data innovation?&lt;br&gt;- EHR is still reaching for acceptance, how is it perceived amongst other Healthcare IT initiatives?&lt;br&gt;- What are some of the most vexing technical problems that may stand in the way of EHR?</td>
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**CLOSING GENERAL SESSION**

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<tr>
<td>1700 - 1800</td>
<td><strong>Panel Discussion</strong>&lt;br&gt;Dennis Wisnosky, Wizdom Systems, Inc.&lt;br&gt;&lt;br&gt;Panel discussion lead by keynote/session leaders to summarize workshop results.</td>
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<tr>
<td>1800 - 2000</td>
<td><strong>Attendee Reception &amp; Exhibits</strong></td>
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*My commentary:*

Linda Powell stressed the need for collaboration and innovation so I asked about the Data Coalition/Data Act activity and the CapitolOne Bank Data Science story.
Lewis Alexander stressed the need to understand dependencies in financial agreements that led to the recent financial meltdown.

Larry Mitchell (attendee) stressed that the financial model was wrong which led to the recent financial meltdown.

My comment was the need for semantics to be part of something bigger, like Data Science, which has already crossed the chasm.

My Note: More comments to be added when slides are posted and I can review them.

Prior to the workshop I sent the following email to Richard Soley (OMG President) and other OMG Members:

I am trying to update the vision of semantics for George Strawn and other senior government leaders by showing its role in each of the following Federal initiatives in our Federal Big Data Working Group Meetups:

- Big Data (White House OSTP)
- Digital Government Strategy (Federal CIO)
- Public access mandated for "scientific results" supported by the U.S. government (White House OSTP)
- Federal agencies have submitted their "initial plans" for public access to scientific data to OSTP (White House OSTP)
- Digital Object Architecture: One result will be to make the scientific record into a first class scientific object (George Strawn)

The essence of all of this seems to be using the Data Mining Standard (for which Barry Smith pointed out recently there is an ontology: http://www.ontodm.com/doku.php) and three modeling approaches the Federal Big Data Working Group Meetup semantic data science teams are using:

- Semantic Medline
  - Semantic MEDLINE Query: mesothelioma and Data Science for VIVO
  - http://semanticommunity.info/api/deki/files/28559/TomRindflesch02272014.doc
  - http://semanticommunity.info/Data_Science/Data_Science_for_VIVO#Semantic_MEDLINE_Query:_mesothelioma

- Data Papers:
  - Sepublica 2014: The Semantics for e-science in an intelligent Big Data Context
  - http://sepublica.mywikipaper.org/

- Nanopublications:
  - The smallest unit of publishable information: an assertion about anything that can be uniquely identified and attributed to its author.
  - http://nanopub.org/wordpress/?page_id=65

In preparation for an April 15th Data Science for FIBO Meetup I have prepared the following:

Three approaches to Semantic Normalization and Interoperability:

- Frank Guerino (invited-accepted): Standardizing the Terminology for Financial Institutions
• Andrea Westerinen (invited-accepted-changed to Cambridge Semantics): Reusing the FIBO Ontologies for Financial Institutions
• Kees Manson (invited-will be replaced): Be Informed Metamodels for Financial Services

So I am wondering where OMG is really going with semantics for big data in general and the Federal government specifically. Is it “crossing the chasm” with semantics for financial and health services or some broader objective?

I look forward to discussing this on March 26th.

Following the Workshop, the 2014 Ontology Summit Hackathon work led me to the following conclusion:

• The OntoDM (Ontology for Data Mining):
  ◦ http://www.ontodm.com/doku.php
• and the UMLS (Unified Medical Language Ontology):
  ◦ http://semanticommunity.info/Data_Science/State_Health_Databases#Unified_Medical_Language_System
• are best practices for working with theDataMap ontology:
  ◦ http://thedatamap.org/states.html
• following the Data Science Data Mining Standard:
  ◦ http://semanticommunity.info/Data_Science/State_Health_Databases#Story
• in order to accomplish the goal of this Hackathon:
  ◦ http://semanticommunity.info/Data_Science/State_Health_Databases#Ontology_Design_Patterns_and_Semantic_Abstractions_in_Ontology_Integration

QED

It may be obvious, but it bears restating: Ontology requires strong relationships that can be quantified in order to realize the full benefits like data integration and reasoning, but real world activities and their data usually lack those strong relationship and the ability to quantify them so data science following the data mining process standard to produce semantically linked data is a way to “cross the chasm” with semantic technologies into the main stream because semantics are an important part of the data mining process and data science has crossed the chasm.

In conclusion, I did the following:

• Integrated ontology, semantic web, and "big data" to address the goal of the 2014 Ontology Summit
• Made the background information and two OMG FIBO Standards documents "data papers" by using the The OntoDM ontology and rules for building three knowledge bases as follows:
  ◦ Overall which corresponds to the Upper-level ontology
  ◦ Business Ontology Foundations (268) which correspond to the Mid-level Ontologies
  ◦ Ontology Business Entities (176) which correspond to the Domain ontology
• Made the 114 tables in the two OMG FIBO Standards documents linked data format
• Combined the 114 tables with 969 columns and 2129 rows into an Excel spreadsheet and Spotfire dashboard

Now we are ready to cross the chasm with the upcoming Data Transparency Summit and government financial data sets that will become available because of the Data Act. See Data Transparency Summit knowledge base in development.
Through our unique approach and our packaged solutions, we have helped to improve services for organizations involved in:

**Public Sector**
Based on its unique business process platform Be Informed offers a number of packaged solutions for the Public Sector. More on [Public Service Platform](#)

**Financial Services**
Financial services institutions such as banks and insurers are facing a simple choice: adapt or go bust. More on [Financial Services](#) **My Note: See below**

**Regulated Industries**
How to deal with regulatory complexity on a global scale? More on [Regulated Industries](#)

**Model-driven business applications: just add rules** *(Video)*

“Just add water” is a well-tested recipe for consumer goods and medication. All the nutrition, vitamins and active ingredients are there, and it is up to the consumer to mix it to their taste and needs. Model-driven business applications work in very much the same way. They contain all the standard components and structures to get you started quickly, but they continuously reconfigure to adapt to specific strategic, customer or regulatory requirements.

Solutions paper: [Model-driven business applications: just add rules](#) **My Note: See below**

**Be Informed Financial Services**

Banking, insurance, pensions

Financial services institutions such as banks and insurers are facing a simple choice: adapt or go bust. Be Informed is there for those organizations that choose to lead this transformation. For those organizations that want to rewrite the rules and play their own game. The Be Informed [business process platform](#) comes into its own when adopted by financial services companies that focus on the customer and want to engage in a relevant dialogue. Or conversely, for those organizations that want to embrace extreme operational excellence. If you want to take a huge step forward in your operation, your value chain or your business models, Be Informed is the partner you are looking for.

Administering Life & Pension plans is a knowledge-intensive process. There is a growing need for flexibility and agility in offerings of financial services institutions (FSI). At the same time, FSIs need to comply to legal rules and regulations, and lower costs.

https://semanticommunity.info/Data_Science/Data_Science_for_FIBO
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Powered by mindtouch
The Be Informed Life & Pensions Solution is a multi-client, multi-scheme life & pensions administration on a single system, allowing straight-through processing, and fast on-boarding of new clients. With Be Informed’s Life & Pensions Solution, both cost savings and commercial benefits are realized.

More information

Why complexity hurts financial services institutions

Financial Services - Solutions

Life & Pensions

Administering Life & Pension plans is a knowledge-intensive process. There is a growing need for flexibility and agility in offerings of financial services institutions (FSI). At the same time, FSIs need to comply to legal rules and regulations, and lower costs.

The Be Informed Life & Pensions Solution is a multi-client, multi-scheme life & pensions administration on a single system, allowing straight-through processing, and fast on-boarding of new clients. With Be Informed’s Life & Pensions Solution, both cost savings and commercial benefits are realized.

Governance, Risk & Compliance

In this book John Coyne and Thei Geurts present a Governance, Risk and Compliance (GRC) value proposition and value architecture that marks the difference between the old way of supporting knowledge intensive processes in heavily regulated industries and the new way of surviving and being successful in a highly volatile and uncertain future.

The authors describe an actionable framework and the underlying principles that allow organizations to break the vicious spiral in which they are caught. The result is a GRC-intelligence position in which the workforce is fully engaged and able to face the pace of regulatory change, smash bottom line costs, increase top line revenue and profitability and – most important – restore trust. And compliance issues? They will be over, because processes are compliant by design.

Model-driven business applications: just add rules

Source: Web and PDF

The best of both worlds “Just add water” is a well-tested recipe for consumer goods and medication. All the nutrition, vitamins and active ingredients are there, and it is up to the consumer to mix it to their taste and needs. Model-driven business applications work in very much the same way. They contain all the standard components and structures to get you started quickly, but they continuously reconfigure to adapt to specific strategic, customer or regulatory requirements.
Business Process Management has long promised to bridge the gap between build and buy, but clearly hasn’t delivered. Traditional BPM software offers complicated solutions which try to capture the business logic in programming language and system code, making the business too dependent on IT. Organizations do not speak programming language, and customers do not understand code. Furthermore, all traditional BPM typically does is hide the complications of the underlying systems landscape, by adding yet another layer, instead of offering a true solution. BPM has been a stopgap.

Model-driven business applications allow organizations to drive meaningful change themselves.

**Introduction**

Model-driven business applications have emerged as a third alternative, in between the traditional “build” and “buy”; between a standard business application and a tailor-made solution. Both build and buy offer benefits, but also have serious shortcomings. Standard business applications are considered cost-effective, but not very flexible. Tailor-made solutions offer a perfect fit with requirements, but imply long implementation periods, and their customized design often poses risks. Model-driven business applications have proven to offer the best of both worlds.

**Figure 1: Buy, Model, Build**

According to analyst firm Gartner, “the complexity of SOA, MDM and BPM initiatives is driving organizations to demand technologies that enable them to use more abstracted, model-driven approaches. A new application style is emerging […] to create what Gartner call a model-driven packaged application …The behavior of the application is configured through direct manipulation of an explicit business process model.”

**The Model Driven Business Application**

Model-driven business applications, such as the Be Informed solutions, allow organizations to quickly adapt to change, and drive meaningful change themselves. In contrast to traditional business applications, where all the business logic is hidden in code and databases, Be Informed separates “the know” from “the flow”. The “know” consists of all relevant business rules which are stored and managed in a central repository. The “flow” uses knowledge where and if necessary. So each case may follow a different, best suited path in order to reach a decision. Changing a rule in the central repository immediately leads to changes in the business application.
Be Informed model driven solutions

Be Informed has created a set of specific solutions that help customers to be productive in an extremely short time span. All solutions are based on a common technology: the Be Informed business process platform. It contains all the functionality to model, run and govern the various solutions. Be Informed-based solutions address both generic and specific issues, support different paces of change, and bring unity in a wide variety of case types.

Figure 2: The Be Informed business process platform enables next-generation model-driven business applications

Generic and specific

At the bottom of our solutions stack, we offer a generic set of components. Some of them are technical, such as common services for managing the solutions stack. Others are more business-oriented, such as common case types in government, financial services and other industries.

The Be Informed model-driven solutions help organizations distinguish themselves from their competitors through their core administrative processes. Within the public sector, examples include permits, benefits, taxes, subsidies and other government tasks. In financial services, they include the full range of administrative activities involved in the creation, maintenance and execution of, for instance, life insurance policies and pensions. The Be Informed model-driven solutions contain all the patterns and components you need in order to get started. But, being a model-driven technology, they allow you to add your own business rules, without customizing the technology or application. You’re just adapting the models that are executed by the application.

Pace of change

Not every part of a solution has the same pace of change. Be Informed recognizes this and has optimized its solutions for each type of life cycle.
• Basic registrations of products, customers and objects see relatively little structural change. The same applies for standard integration with other technologies, such as authentication, and electronic payments. In the Be Informed stack of solutions, these components are predefined, and can be adapted if needed. Change is typically IT-led.

• Case types, business activities and business rules change regularly, and their life cycle is not always predictable. This is the core of Be Informed’s model-driven approach. Be Informed solutions come prepackaged with a core set of rules and activities to get you started with the essentials. Additions and changes are business-led.

• Interactions change continuously. Customers (or citizens) need the freedom to choose any which channel they want for any activity. In principle, every case they offer is unique in terms of sequence and configuration. Some people have simple questions; others require a complex combination of products and services. Be Informed solutions determine what activities are needed when at run-time. Change is built in by design. The process is interaction-led, instead of the other way around.

Unity in diversity

All Be Informed Solutions support a wide variety of case types.

• Every pension plan is a unique combination of life events, regulations which change over time, and the specifics of a customer profile. Be Informed’s Life & Pension Solution covers every combination.

• There are many types of permits, and they all require the same high-level activities. However, each permit type has its own unique set of rules. Once identified, all permit types can be managed by Be Informed’s Multi-Permit Solution.

• In essence, health, social and other types of benefits all follow the same principles. One needs to qualify, payments need to be made, and there is a need for appeals and enforcement. Be Informed’s Multi-Benefit Solution manages all types of benefits.

• There are only so many types of taxes. Some taxes are imposed (VAT), while others need to be filed (income). Some taxes cover a time span, whereas others are based on an event. The difference between taxes lies simply in the rules that apply for each type. Be Informed’s Multi-Tax Solution covers all types of tax.

All Be Informed solutions support policy-making, execution & enforcement, customer self-service, dynamic case management and interoperable services with existing systems of record.

Be Informed Benefits

Be Informed distinguishes itself in multiple ways from other model-driven business applications.

• The Be Informed business process platform applies a direct model-driven technology. The business logic in the model is interpreted directly, and there is no coding, or continuous generating of large sets of suboptimal code.
• In other model-driven technologies, business processes still need to be spelled out. With Be Informed, only business activities are modeled, including their pre- and post-conditions. The actual process flow is inferred from the case and the model at run-time level, creating mass-customized administrative processes.

• The Be Informed model is completely “above the line,” i.e. business analysts and users maintain the business logic themselves. At the same time, the Be Informed model is also very detailed; there is no need to convert low-level requirements in IT terms.

• The Be Informed model is goal-oriented. It starts with the end decision of a process in mind, and only asks for the information it needs to arrive at that decision. This approach guarantees a minimal number of steps to complete each specific case.

• Be Informed solutions are standard commercially available software, yet allow organizations to distinguish themselves through their core operations.

• Be Informed solutions are standard commercially available software, yet allow organizations to differentiate in their core operations.

Why complexity hurts financial services institutions

Web and PDF

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Challenges

Financial Services Institutions worldwide are facing a number of challenges;

• **Trust**: following the credit crunch, public trust in financial services needs to be regained.
• **Regulation**: national and international supervisory agents must regulate transparency and compliance with the legislation.
• **Customer self-service**: technological developments are prompting consumers to demand state-of-the-art self-service concepts so that they can deal with financial matters whenever and wherever they wish.
• **Outdated business model**: the costs of operations are too high and are reducing margins to critical values.

Together with the dynamic of an ever-changing environment and sometimes dramatic events, these issues are creating a complex world in which financial organizations have to operate. Traditionally, those organizations have tried to reduce this complexity by simplifying reality. But they can no longer deny that globalization is taking place or insist that customers wait patiently for their insurance claim or money order. Financial organizations need to deal with all of these issues right now.
Old versus new

Worldwide, the financial sector is on the threshold of a new era. An era in which public trust in financial services must be regained through customer orientation, transparency and compliance. Traditional financial services institutions are hesitant about letting go of the old business models and administrative processes. Meanwhile, new labels are seizing this opportunity and are offering easy-access, low-cost services through innovative channels. The ability to react swiftly to new market developments requires a flexible and interactive administrative organization. And keeping track of personnel, projects, customers, offerings, activities, positions and risk exposure and the accompanying money transfers requires decisive and agile software support.

Problems

The complexity of today’s world is leading to a number of bottlenecks in financial organizations related to the way they have evolved through the years. These bottlenecks include the following:

• Costs

Many financial services institutions have high operational costs, resulting in lower margins. The traditional business model is no longer working. To regain their margins, these organizations need to boost efficiency and achieve higher yield through lower costs.

• Rigidity

Administrative processes have become too complicated. The relevant knowledge and business rules have been hard-coded into systems and processes. It has simply become too difficult to change a process or parts of a process or it takes too much time.

• Business users are not in control

The rigidity of administrative processes has caused business users to lose control of their primary processes. If a process or system needs to be adapted, only a few people in the organization (usually the IT department) know what needs to be done.

• Not customer-friendly

New customer service concepts are emerging every day in every corner of society. Thanks to mobile and other channels and new media, customers now have access to state-of-the-art solutions 24/7. While producers and/or service providers are working together to win over customers, financial organizations are lagging behind in these developments.

• Not transparent

Today’s complicated systems and processes are blocking transparency; customers cannot find out about the status of their request because their providers simply do not have the required information. Furthermore, legacy systems often do not provide enough information to be able to determine compliance issues.

These problems can be successfully dealt with using a new concept called "dynamic case management".
Using case management to achieve customer orientation

From a purely objective point of view, many administrative processes consist of just a few steps. If we focus on the process of arranging a change in a pension plan as a result of, for example, a marriage we can see that the process basically consists of four steps:

1. Providing the relevant information of the pension scheme towards intermediary or customer
2. Filing the request
3. Deciding on the request and drawing up a proposal
4. Executing the decision: i.e. sending the revised pension policy and starting to collect premium.

Every step consists of a limited set of activities that can be executed multiple times.

The center of the process is the case file that links the results of the activities. After each step, the case has a specific status, such as "requested", "approved", "rejected", "checked" or "signed". The rules that determine which activities are allowed by whom, which deadlines apply and which regulations apply to the specific request, are managed separately and infused into the process at run-time. Exceptions no longer exist because they are dealt with in the business rules. The data that is required for the request and is located in databases is also merged into the process so that no time is wasted searching for information that is already known to the financial service provider.

One proven way of defining the context of the applicant is the use of biographical events such as birth, studies, marriage or work. In line with these events, other events and appropriate scenarios can also be defined that are specific to a certain type of service. By identifying the actor and the event in this way, we can deduce the rules that apply to the specific combination.

One of the great benefits of this approach is that financial services can be offered as self-service to customers and businesses. The users are then addressed in a language that they understand. Their replies and the context are mapped onto the "financial" - in a very transparent and manageable way. This type of semantic interoperability is also vital for specialists in diverse disciplines that have to work together in any given situation.
Advantages

In short, dynamic case management solves all the problems facing financial organizations in this increasingly complex world by simplifying business processes:

- **Cost reduction**

  With Be Informed, cost savings amount to tens of percent, sometimes as much as 60 percent compared to traditional business process management. Productivity improves dramatically and the time to change is reduced from months to days.

- **Straight Through Processing**

  Be Informed achieves high STP rates, improving the efficiency of providers and the control that customers have over their requests.

- **Agile**

  Dynamic case management uses a generic flow of activities, executing only those activities that are necessary to reach a decision. Rules and other relevant knowledge are stored in a repository, allowing for continuous reusability. If a requirement or any other business rule changes, one adjustment will change the process. Thus, business users are no longer dependent on IT professionals to adapt the systems because they can do it themselves. Even better, business users can test the effects of possible rule changes before they are actually implemented.

- **Customer-friendly**

  One of the great benefits of dynamic case management is that financial services can be offered as self-service to customers and businesses. Users are addressed in a language they understand, and their replies and context are mapped onto the "financial"-speak in a very transparent and manageable way. This type of semantic interoperability is also vital for specialists in diverse disciplines that have to work together in any given situation.

- **Transparent**

  Customers can be given constant updates on the status of their requests. Management has access to up-to-date information on the number of requests being handled, issued, etc. Management experiences no problems in proving compliance with legislation and guidelines.

- **Guaranteed compliance and risk**

  Management applying the compliance and risk management rules and regulations directly in the operational process enforces the right and consistent appliance of these rules, thus guaranteeing compliant execution. Traceability: the automatic recording of all activities on all cases enables to trace “who has done what and when” at all times.

About Be Informed

Be Informed is an internationally operating, independent software vendor. The Be Informed business process platform supports administrative processes, which are becoming increasingly knowledge-intensive. Thanks to Be Informed's unique approach to dynamic case management, the next wave after business process management, organizations
using Be Informed often report cost savings of tens of percents. Further benefits include a much higher straight-through processing rate leading to vastly improved productivity, and a reduction in time-to-change from months to days.

Mike Bennett on FIBO

Source: January 26, 2014, Email see: http://ontolog.cim3.net/forum/ontology-summit/

Modularity is certainly an interesting challenge. The basic questions are not that different to the modularity considerations in any design exercise: too small and you run the risk of an explosion of complexity between the modules; too large and you lose the flexibility to use and combine the modules in different ways for different use cases. As with design, part of the art is making the modules coherent and thinking of the interfaces between them.

An ontology standard like FIBO differs from a design exercise in two important ways:

1. As an ontology, it aims to document business concepts rather than to design a solution;
2. As a standard, its scope is not driven by individual use cases, but is defined by scope of the logical and physical data for which concepts are to be captured semantically.

However, in developing an ontology standard which may be used both as a conceptual model and as a means to derive semantic tech applications, we do need to consider the "design" aspects of modularity as though this were a design effort. The OMG participants in this initiative have given us considerable leadership in this regard, and there are a number of explorations in how to derive operational ontologies. The lessons learned from these are what needs to feed back into the thinking about how big or small the modules should be and where the boundaries should be drawn between them. That is, the disposition of the modular representation of the business reality, needs to be helpful to developers. As an example, we have identified a broad range of concepts around parties in roles, and a number of different operational patterns that would each use different sub-sets of these concepts.

In the original draft FIBO material, we followed something very like "Ontology Design Patterns", in the form of archetypical sets of concepts and the meaningful relationships between them (stuff like events, activities, parties in roles, actors in processes, contracts, transactions and so on). Different coherent sets of concepts are recognizable within each broad domain, but the messiness of the real world presents real challenges in the dependencies. As an example, you can't have an incorporated company without equity, but you can't define equity without talking about a company. Similarly in the archetypical models, the relationships among agreements, parties, entities, commitments, contracts, transactions and so on, have a lot of mutuality.

So I think there is a lot to think about in this area, and we should draw lessons from the sort of experience Leo describes below. We are still early enough in this part of the journey, to have a chance of getting this right. Most of the work in figuring out the business concepts has been done, but we are just starting the process of identifying how to deliver the meanings of these concepts in a way which supports the full spectrum of possible applications. We also need to balance those different ways of putting the meanings to work, so that what works best for one kind of application does not make it harder to use the same material in other kinds of application, including both conventional technology deployment and Semantic Web applications.
Elisa Kendall on Be Informed
Source: January 25, 2014, Email

How about doing a/using a pre-existing metamodel in Be Informed?

That's not my call -- the EDM Council is developing the FIBO ontologies, and they have a model that they've been building for more than 5 years with a host of subject matter experts. I'm certain that they would not want to adopt any vendor-supplied metamodel. They have done their homework on the financial standards front, though, and are integrating / modeling a number of those.

My role has been to take what was done as a UML model originally, add process and methodology, turn it into OWL, make it compliant with the Ontology Definition Metamodel (ODM) OMG standard, modularize the heck out of it, run reasoners over it to make sure it's consistent, play with test data for further validation, etc., but I have had little impact on the content of the ontologies.

If Be Informed has a model or set of models, preferably ontologies, and especially if they are in OWL, that they would like to submit to the OMG for standardization, I'm sure people would be interested. It would be great if their input could help short circuit the FIBO development process, or augment what's been done to date. But, Be Informed would need to agree to make it open source with appropriate licensing (namely, with attribution but at no cost to any of the banks that might want to use it, and at no cost to the EDM Council or OMG). That's a steep request if they are making $$ with their model/ontologies.

Leo Obrst on FIBO
Source: January 26, 2014, Email see: http://ontolog.cim3.net/forum/ontology-summit/

Sure, Elisa, this is not meant as a comment on FIBO, etc., but as a general paradigm for integrating OWL ontologies.

Plus, of course, it is a methodology that can be applied only when you have a certain complexity of ontology interaction and also, a certain maturity of understanding of ontologies by the larger community (our community is typically disparate software developers using the ontologies for various purposes, much smaller than that of FIBO, I think, and they kind of understand ontologies now and kind of trust us to do what’s right – a rare circumstance, in my experience).

I think you all probably developed FIBO as you had to, given your constraints.

Source: January 25, 2014, Email see: http://ontolog.cim3.net/forum/ontology-summit/

Yes, good idea, Andrea. We do that in our own OWL ontology work, so that either the integration ontology I, consisting of equivalence or sub/superclass relations between the two ontologies A and B (you can also establish local property restrictions on the mappings if they make sense), simply makes those mappings or imports A & B, then makes those mappings.

We’ve also used this approach to expedite changes more dynamically (we have multiple kinds of software that use those ontologies), given that the individual ontologies may have distinct ontologists (sometimes in different companies)
developing them. We then publish these mappings to the individual integrated ontology developers (A & B), who may choose to incorporate some/all of the integration ontology changes into their own ontologies directly. Then, when the next versions of ontologies are pushed out, we look at the integration ontologies and the other non-integration ontologies (using ontology-diffing tools, admittedly still relatively primitive), to determine the changes we need to make to the integration ontologies. Occasionally, it means that the integration ontology can go away, since one of the integrated ontologies has incorporated the changes, rendering the mappings moot.

Elisa Kendall on FIBO

Source: January 25, 2014, Email see: http://ontolog.cim3.net/forum/ontology-summit/

I thought about this when we first started down the path, but the amount of work required just to get from the original EDM Council model in Enterprise Architect to where we are now was daunting as you might have guessed. The first pass was really to get a decent baseline, and as you might imagine, there were many stakeholders with conflicting requirements to support. I think this initial pass was really very informative for Mike Bennett and some other folks who have been following the process, though, and that may make them more amenable to doing even more modularization along these lines. The biggest challenge is that there are OMGers who really want us to have far fewer modules, and to have one single UML model that corresponds to all of the FIBO Foundations OWL modules, which I've vetoed so far, but I'm not sure how likely I am to win the war on that front. I think it defeats the purpose of having done all of the modularization work, and it would mean that the individual modules cannot evolve independently, which is a key requirement in my view.

The next phase of the OMG process is called finalization, and as part of that I have been thinking of filing issues against the current Foundations ontology to do some of this where it won't be disruptive to the other work in progress and where it makes sense to split things further. We will need several integrating/mapping ontologies that bring all of the bits and pieces together for various use cases, I agree. We currently don't have that at all, though there are two modules in Foundations that bring most of the others in.

Source: January 24, 2014, Email see: http://ontolog.cim3.net/forum/ontology-summit/

I agree wholeheartedly with your suggestions, below. For the work we do at OMG, we are trying very hard to create smaller, reusable ontology "modules" for FIBO, and to make them understandable, not adding any axioms that we can't support for a wide variety of applications, and not including any that the SMEs can't agree on. We also use a couple of other tests for modularization - whether or not a concept is useful independently, and whether or not its definition might evolve independently, which seem to be holding up in the testing we've done so far on the early FIBO specifications. Your thoughts on defining axioms based on context are similar to an approach I use for client work with segregating axioms by use case. I wish more practitioners would think along these lines.

Andrea Westerinen on FIBO

Source: January 25, 2014, Email see: http://ontolog.cim3.net/forum/ontology-summit/

In an offline conversation with TSchneider, I was discussing a possible approach for addressing the modularization vs "inclusive" definition problem (that occurs because you have to import all the related ontologies).
In a recent project, I used the equivalentClass OWL semantic to address the issue. So, for example, in a Person ontology, I defined the Person concept with its relevant properties, but when it came to the Person's Location - that was just an under-specified Location class (in the Person namespace). I reused a Location ontology (with its own namespace) for a complete definition of that concept. Lastly, I defined an "integrating" ontology that specified the mappings between the concepts. So, Person:Location would be defined as an equivalentClass to Location:Location.

Obviously, the application covered up all this for the users and my triple store (with reasoner) handled the rest.

That left me with a lot of flexibility for reuse and ontology evolution, and didn't force imports except in my "integrating" ontology. And, each application could have its own "integrating" ontology.

Source: January 24, 2014, Email see: http://ontolog.cim3.net/forum/ontology-summit/

I do recognize that a lot of work went into FIBO to create smaller, more reusable content. In fact, that was one of the positives that I highlighted in my presentation yesterday [1]. It was straightforward to find concepts and the annotation was amazing!

But, I did find that for many of the more "advanced" topics, there were imports of most of the FIBO Foundational Ontology. For example, People.rdf imported Organizations (and FormalOrganizations), Locations (and Countries and Addresses), Goals, etc. So, the more interesting topic ended up being rather "inclusive."

Might there be a way to modularize this even more?


Source: January 24, 2014, Email see: http://ontolog.cim3.net/forum/ontology-summit/

One of the questions proposed in Track A (Common, Reusable Semantic Content) asks whether the reuse problems (and perhaps their solutions) are different in the Linked Data and ontology spaces.

Certainly, the uses of the two technologies are different ... as Linked Data is about the "links" and supplying relatively simple semantic annotations and new links ... but ontologies come down to T-boxes (more formal class, relationship and/or axiomatic definitions) and A-boxes (instance definitions). It is much easier to reuse small, targeted schemas that define Linked Data and various annotations (such as schema.org) than it is to reuse (typically much larger) foundational or domain-specific ontologies.

In terms of time spent "getting up to speed", small, targeted definitions always win. However, it is also much more likely to be able to do reasoning over (and more complex analysis of) ontologies and A-boxes. And, one can more easily combine multiple ontologies (for example, with constructs such as OWL’s sameAs, differentFrom, disjointWith, ...) than to combine (or reuse) multiple Linked Data schemas. In my experience, I have seen developers typically pick one schema and just stick with that.

Taking a lesson from the Linked Data world, I would posit that the characteristics that make Linked Data schemas more
friendly and reusable could be applied to ontologies. That would argue for:

* Smaller, more modular, targeted ontology fragments
* Separation of semantic (class and relationship) definitions from the axioms that prescribe them
* (Perhaps) Definition of a context in which the axioms apply (and the assumption that there may be more than 1 context and therefore more than one set of axioms)

Another lesson that the ontology world must learn is that the fragments must be vetted, have real uses and sponsors, and not devolve to multitudes of overlapping and (sometimes) contradictory proposals. (I think that the biomed BioPortal community has done a good job with this.)

What do you think?

**Slides**

**Slide 1 Reuse of Content from ISO 15926 and FIBO**

Reuse of Content from ISO 15926 and FIBO

Andrea Westerinen

andrew@ninepts.com

January 23, 2014

**Slide 2 Agenda**

• Really quick overviews
  
  – ISO 15926
  
  – iRING User Group
  
  – FIBO

• Network Management Motivation
• Reuse Specifics
• Experiences

**Slide 3 ISO 15926**

• Designed for data integration and exchange regarding the llifecycle of an “installation” and its components
  
  – A “babel fish” for project information

• Established for the process industry
– Large projects with many participants, being built and maintained for long periods of time

• Technology useful outside the process industry if have a vocabulary of reference data

**Slide 4 iRING**

• Acronym for ISO 15926 Realtime Interoperability Network Grid


• Four purposes:
  – Prove that information exchange is possible using the full ISO 15926 spec
  – Develop tools and make them available under an open-source license

• Supporting configuration and execution
  – Develop best practices
  – Encourage vendors to collaborate and support iRING interfaces within their products

**Slide 5 FIBO**

• Acronym for the Financial Industry Business Ontology

• [http://edmcouncil.org/financialbusiness](http://edmcouncil.org/financialbusiness)

• Effort to standardize the language and define:
  – Terms, conditions, and characteristics of financial instruments
  – Legal and relationship structure of business entities
  – Market data
  – Obligations and process aspects of corporate actions

**Slide 6 Motivation for Reuse for Network Management**

• Overlapping semantics
  – Key concepts such as physical and planned entities and service level agreements between various parties

• Reuse of iRING tooling
  – Data needs to be defined and exchanged across multiple products and sites in an enterprise
• Similar to the process industry customer, vendor and supplier environment

• Small budget and Tight Timeframe
  – Can’t/shouldn’t create an ontology from the ground up, want to find/reuse basic concepts

**Slide 7 Concepts from ISO 15926 (I)**

• Possible versus actual individuals
  – In support of network planning

• Property and indirect property

• Activities with beginnings and endings
  – Configuring, monitoring, following, occurring, process, creating, completing, … (especially for trouble Ticketing)

• Role

• Information, note, data sheet, guideline, …

**Slide 8 Concepts from ISO 15926 (II)**

• Units of measure (interlaced with the QUDT ontology)

• System and feature

• Physical object, container, compartment, component, connector, … especially for inventory and sparing)

• Connection (would have been nice)
  – Problematic since it is defined as transferring “matter, energy or both”, ~physical

**Slide 9 To Use iRING Tools, Extend …**

• Class_of_arranged_individual with network_individual concepts

• Standard_class with relevant standards (such as IETF)

• Class_of_activity with both operator, user and equipment/service activities (such as establishing connection)

• Class_of_direct/indirect_property with networking values (such as jitter or bandwidth)

• …

• Would be defined regardless of the use/reuse of ISO 15926
Slide 10 Concepts from FIBO

- Agreements, commitments, contracts, contractual elements, and objectives
- General concept of autonomous agent, person, organization, role and group
  - But legal specifics are not relevant at this Time
- Physical location and address
- Many of the:
  - Object properties ("relations")
  - Data properties
  - Annotation properties

Slide 11 FIBO Ontology

Slide 12 ISO 15926 Experiences

- Valuable concepts, especially when coupled with domain-specific insights
- Too physically oriented
- No single source for a complete explanation
– http://www.15926.info
(text)

– https://www.posccaesar.org/wiki/ISO15926#Resources
(browsable interfaces)

– http://www.iso15926.net
(more condensed, targeted browser)

(OWL definitions)

Slide 13 ISO 15926 Experiences

• Intimidating…
  – Too much complexity, mind-boggling tens of thousands of classes
  – Annotations (definitions and examples) separate from class definitions for “Part 2”
    • General concepts in “Part 2”; Specific concepts in “Part 4”; Groupings/templates in “Part 7”

• OWL 1 (DL) definition
  – Programmatic/syntactical, generated from EXPRESS
  – Limited use of OWL semantics/constructs
    • Defined using Class, subClassOf, disjointWith, equivalentClass
    • But independent concepts of relationship and possible_/actual_individual (versus object properties and named individuals)

Slide 14 FIBO Experiences

• Reuse more limited than ISO 15926 due to targeted nature of the specification
  – But more specificity meant that info was more obvious and easier to immediately use or discard

• Still early in development and too generic
  – Depth and details

• Zip file contained all the necessary OWL files except:
  – OMG’s SpecificationMetadata (which was obvious but annoying on import to a tool like Protégé)
• Defined in OWL (versus translated)
  – Much easier to understand, import, …
  – Annotations integrated with the concept definitions

Slide 15 General Comments

• Difficult to find specific semantics in ontologies

• Could not reuse full ontologies
  – Specific concepts/semantics very valuable

• Other (small) general ontologies were imported/used directly
  – For example, W3C’s Time and Provenance ontologies

• Targeted semantics very useful as starting points
  – Not open-ended
  – More complete analysis than network management perspective alone could have provided
  – Room to grow as needed

Slide 16 Questions?

Reuse of Content from ISO 15926 and FIBO

Key WordS: "OntologySummit, ontology summit, OntologySummit2014, ontology summit 2014, Big Data and Semantic Web Meet Applied Ontology, big data, semantic web, applied ontology, ontology, common resuable semantic content, ISO 15926, FIBO,"

Consultant and Researcher

Nine Points Solutions, LLC

email: arwesterinen [at] gmail.com
email: andreaw [at] ninepts.com
see: http://organizingknowledge.blogspot.com

see: http://www.ninepts.com

Andrea Westerinen is an independent software engineer and systems architect at Nine Points Solutions, LLC. She specializes in ontology development and knowledge engineering, and has extensive software development experience. Andrea has strong interests in policy-based management and semantic technologies, and has worked in the computer
industry since 1979 (at SAIC, CA Technologies, Microsoft, Cisco, Intel and IBM). She held the positions of Senior Technical Expert at SAIC, Distinguished Engineer at CA Technologies, and Principal Architect at Microsoft. Andrea has been focused on policy-based management for more than 13 years, and gave the keynote address at the IEEE 2003 Policy Conference and wrote several technical articles and IETF Internet-Drafts on the subject. She has a B.S. in Physics and Mathematics from Marquette University, and an M.S. in Computer Science from Nova Southeastern University. Andrea has lead and participated in many network and systems/storage management standards organizations. She held the positions of Technical Director for the Storage Networking Industry Association (SNIA) and Vice President of Technology for the Distributed Management Task Force (DMTF).

Story

Dennis Wisnosky on FIBO

"Since leaving the DoD, I have been engaged with the Enterprise Data Management Council (EDMC) in building the Financial industry Business Ontology (FIBO). The key objective is transparency and confidence in data for risk assessment and ensuring the financial stability of our system. In addition, the process that the financial industry and the regulatory community is engaged in associated with data management is hugely inefficient. The primary goal is transparency/financial stability. The bonus goal is operational efficiency. We can make the process more effective and do so with operational Wizdom (sic).

The idea of FIBO is that it will serve as the lingua franca for the financial industry both for the regulators (FDIC, SEC, CFTC, etc) and the operators (banks, traders, etc.). Imagine if the regulations could really be understood in a uniform manner by the operators, and the data being provided by the operators could really be understood by the regulators. It is estimated by American Banker that each operator spends $150M-$300M a year on compliance with no business benefit. They want to stop this. The regulators agree, and want 100% assurance of the provenance of the data that they are receiving.

The State of the Art of IT in the financial industry has been shocking to me. After a 60 day survey of CTO’s, CIO’s and CRO’s in the major Western operators and their service providers, I presented a no holds barred statement of the problems. They begin with the consolidation of banks as a result to the 2008 crash caused a culture shock that has yet to be overcome within the operators. They end with the signing of a nearly 900 page Dodd-Frank bill 2 years ago that today is 9000 pages of rules.

The law firm David Polk & Wardell LLP, did a study that shows how 46 rules written by four different regulators that cover just one aspect of the financial markets -- interest-rate swaps -- have literally thousands of references to other rules.

All of this is the sweet spot of Semantic Web Technology. The Financial Industry gets it. My belief in the need for a strong Defense Department has not been shaken now that I am on this side of the table. But, I also now understand that without a strong financial base, this is unsustainable. If we don’t fix this, the memory of sequestration in 2013 will end up being thought of as pleasant compared to what will need to be done."
See presentations at Cloud SOA Semantic and Data Science Conference and WS-4 Using Process Model-Driven Business Architecture To Design Shared Services* and FIBO Technology Summit Report below.

**Semantic Community on Implementing FIBO**

After reading the FIBO Technology Summit Report, I suggest implementing the following excerpt from the report:

"There is a need for a mechanism for the generation of Operational Ontologies from Business Conceptual Ontologies. A business Conceptual Ontology is an annotated high level graph that shows and logically links all legal entities, processes, instruments, etc. in the Financial Industry. It is like a roadmap of the industry. It is intended for this Conceptual Ontology to be readable and understood by executives working in the industry. He or she should be able to easily see his or her role in their business and how their business is connected to other roles and businesses. From the FIBO Conceptual Ontology it must be possible to generate W3C standard RDF/OWL data stores. These data stores are the seeds of industry best practice Operational Ontologies. These Ontologies must be people readable, machine readable and executable. Currently the process of building, verifying and converting the relevant parts of the Conceptual Ontology to an Operational Ontology is essentially manual and arduous. The process is not scalable to the needs of the industry. There is a need for software to substantially automate this process."

The FIBO is available at: [http://www.omgwiki.org/OMG-FDTF/doku.php](http://www.omgwiki.org/OMG-FDTF/doku.php)

I asked the following questions:

- So is it possible to import FIBO into Be Informed and "be readable and understood by executives working in the industry"?
- Do you have an example of work for a financial institution with rules that can be shown publicly in a webinar?
- Can Be Informed and Yarc Data "generate W3C standard RDF/OWL data stores"? This is fundamental for all big data work (e.g. US Census Bureau, Healthcare.gov, etc.)

I will start doing the data science work like I did for Healthcare.gov. Then I can schedule it for the Federal Big Data Working Group Meetup!

**Other Approaches**

The Ontolog Community on Big Data and Semantic Web Meet Applied Ontology:

- Since the beginnings of the Semantic Web, ontologies have played key roles in the design and deployment of new semantic technologies.
- Yet over the years, the level of collaboration between the Semantic Web and Applied Ontology communities has been much less than expected.
- Within Big Data applications, ontologies appear to have had little impact.

These three statements appear to be contradictory and/or false: semantic technologies seemed to have downplayed the importance of ontologies, the ontology community has not seemed to be "very applied" to the Semantic Web community, and "big data" applications have used ontologies (e.g. Semantic Medline uses the UMLS).

I would cite Dennis Wisnosky on FIBO and Semantic Community on Implementing FIBO above as a specific example.
Spreadsheets are being produced now, from MagicDraw via FIBO spreadsheet plugin

- These provide the means for business domain folks to review and comment on / validate definitions
- Some changes needed for Restrictions

But I am not sure that Magic Draw imports ontologies yet so it would seem better to use a leading tool like TopBraid Composer for the following:

- Import ontologies
- Understand the ontologies
- Visualize the ontologies
- Develop an application based on the ontologies
- Export the ontologies

I downloaded and tried to work with the following:

- FIBO Business Entities RFC finance/2013-11-01 (150 pages)
- FIBO Business Entities OWL Files (ZIP) be-owl-20131110.zip (6 folders with 13 files)
- FIBO Foundations as issued for comment Finance/2013-09-02 (184 pages)
- FIBO-Foundations OWL Files (ZIP) fnd-owl-20130827.zip (11 folders with 24 files)
- Inventory file Finance/2013-09-05 showing all the components which make up this submission and indicating which of these form a normative part of the proposed standard. (15 pages)

So I can try to learn this new tool myself or form a data science team that includes an expert that I know and admire who knows how to use this tool, Dean Allemang, Working Ontologist.

At this point I need to form a data science team to get ready for a presentation to the Federal Big Data Working Group Meetup

### Data Science Team for Implementing FIBO

The team selected so far is as follows:

- Dennis Wisnosky and Mike Bennett, EDMC
- Randy Coleman, Wizdom Systems
- Elisa Kendall, Thematix
- Brand Niemann, Semantic Community
- Dean Allemang, Working Ontologist
- Aaron Bossett, YarcData
- Kees van Mansom, Be Informed
- More to be added if needed
Data Science for FIBO

Now that I have built a Knowledge Base (this page) and given structure to the three Word documents (see sub-pages: Financial Industry Business Ontology Business Entities, Financial Industry Business Ontology Foundations, and Inventory of Files for a Submission), I can build relational and graph tables in spreadsheets that include the many tables in the Word documents and built visualizations in Spotfire.

It is of interest to note that the 24 RDF, XML, and XMI files have URLs that are "File Not Found", while the rest in the spreadsheets have content at their destination URLs.

The mission of the Federal Big Data Working Group Meetup (FBGWGMU) is to organize frequent results-focused meetups that provide opportunities for a broad community of participants to focus on big data products for the Federal Big Data Initiative as follows:

- Federal: Supports the Federal Big Data Initiative, but not endorsed by the Federal Government or its Agencies;
- Big Data: Supports the Federal Digital Government Strategy which is "treating all content as data", so big data = all your content;
- Working Group: Data Science Teams composed of Federal Government and Non-Federal Government experts producing big data products (see Possible Team Presentations below); and
- Meetup: The world’s largest network of local groups to revitalize local community and help people around the world self-organize like MOOCs (Massive Open On-line Classes) being considered by the White House.

This means we want to do a Data Science for FIBO product for the Federal Big Data Initiative that treats all the FIBO content as data using a team of experts in the Meetup environment similar to our recent Semantic Medline/YarcData and Healthcare.gov/Be Informed big data products and their tutorials for aspiring data scientists. All are welcome to join and participate in this exciting endeavor!

Postscript

Thank you for the feedback. We have scheduled this for April 1st subject to team members and venue since this was the first opening in our schedule of meetups.

Some next steps are to finish the spreadsheets, do analytics and visualizations in Spotfire, and work with the ontologies in TopBraid ME and Be Informed.

TIBCO Spotfire for Financial Services

TopBraid Composer USA Government Spending Linked Open Data

Be Informed Financial Services

Semantic Community: Data Transparency Coalition.Org (Data Act of 2014), Federal Transparency.gov, and USA Spending.gov

Email Request and Reply

Dear Colleagues,
This year's Ontology Summit: [http://ontolog.cim3.net/cgi-bin/wiki...logySummit2014](http://ontolog.cim3.net/cgi-bin/wiki...logySummit2014) has as its topic: “Big Data and Semantic Web Meet Applied Ontology”.

Track A of the programme is: "Use and Reuse of Semantic Content - The Problems and Efforts to Address Them" - see the Synthesis Page at: [http://ontolog.cim3.net/cgi-bin/wiki...tent_Synthesis](http://ontolog.cim3.net/cgi-bin/wiki...tent_Synthesis)

So to kick off Track A, we would like to ask: "Is there a good body of common, re-usable semantic content which may be put to work in almost any ontology application?"

If so, would the same material be appropriate as a common semantic reference for Linked Data? For Big Data? Or are the re-use questions different?

Is it even a matter of re-use, or should we be thinking more in terms of ontology design patterns? Or is there some more appropriate approach to making use of the different ontology resources that are available out there?

Please let us know your thoughts as replies to this email. Please also feel free to add ideas, pointers etc. to the Community Input page for Track A, at: [http://ontolog.cim3.net/cgi-bin/wiki...CommunityInput](http://ontolog.cim3.net/cgi-bin/wiki...CommunityInput)

Best regards, Mike Bennett, Andrea Westerinen and Gary Berg-Cross Track A Co-champions

Excellent questions and my answers are:

"Is there a good body of common, re-usable semantic content which may be put to work in almost any ontology application?" YES

If so, would the same material be appropriate as a common semantic reference for Linked Data? YES For Big Data? YES Or are the re-use questions different? NO, INTER-RELATED IN THE SEMANTIC COMMUNITY DATA SCIENCE PROCESS

Is it even a matter of re-use, or should we be thinking more in terms of ontology design patterns? BE INFORMED'S BE STRUCTURED PATTERN

Or is there some more appropriate approach to making use of the different ontology resources that are available out there? THE SEMANTIC COMMUNITY DATA SCIENCE PROCESS

Our examples so far:

Semantic Medline/YarcData

Healthcare.gov/BeInformed

FIBO/Spotfire

More in process based on our Data Science Approach of: How was the data collected, where is it stored, and what are the results?

Brand

https://semanticommunity.info/Data_Science/Data_Science_for_FIBO
Updated: Thu, 23 May 2019 01:32:49 GMT
Powered by [MindTouch](https://mindtouch.com)
Slide 1 Data Science for FIBO

Data Science for FIBO
Dr. Brand Niemann
Director and Senior Data Scientist
Semantic Community

- Dennis Wisniosky on EDAM and FIBO
- Transmittal Email from Dennis Wisniosky
- FIBO Technology Summit Report Outline
- FIBO Technology Summit Report MindTouch
- Semantic Community on Implementing FIBO
- Semantic Community Plan for Implementing FIBO
- Other Approaches
- Google Search for FIBO Ontology Download
- EDMA Council Financial Business Ontology
- OMG-EDAC Joint Working Group Web Site
- OMG-EDAC Joint Working Group MindTouch
- OMG-EDAC Joint Working Group Slides
- OMG-EDAC Draft Specification Documents
- OMG-EDAC Draft Specification Documents Downloads
- Data Science Team for Implementing FIBO
- TopBraid Composer
- TopBraid Composer Maestro Edition
- Install and Launch TopBraid Composer ME
- See Help Contents: Open an existing ontology
- Open An Existing Ontology: Corporations.rdf
- Data Science for FIBO
- Federal Big Data Working Group Meetup
- Mission Statement
- More To Follow

Slide 2 Overview
Slide 3 Dennis Wisnosky on EDMC and FIBO

Dennis Wisnosky on EDMC and FIBO

* Since leaving the DoD, I have been engaged with the Enterprise Data Management Council (EDMC) in building the Financial Industry Business Ontology (FIBO). The key objective is transparency and confidence in data for risk assessment and ensuring the financial stability of our system. In addition, the process that the financial industry and the regulatory community is engaged in associated with data management is highly inefficient. The primary goal is transparency/financial stability. The bonus goal is operational efficiency. We can make the process more effective and do so with operational Wisdom (v2).
* The idea of FIBO is that it will serve as the lingua franca for the financial industry both for the regulators (FDIC, SEC, CFTC, etc) and the operators (banks, traders, etc.).
* See presentations at Cloud SOA Semantic and Data Science Conference and WS-4 IT: «Process Model-Driven Business Architecture for Design, Shared Services» and FIBO Technology Summit Report

http://semanticommunity.info/Data_Science/Data_Science_for_FIBO

Slide 4 Transmittal Email from Dennis Wisnosky

Transmittal Email from Dennis Wisnosky

You are encouraged to look at the report and to send me your comments and ideas.

http://semanticommunity.info/Data_Science/Data_Science_for_FIBO/Transmittal_Email

Slide 5 FIBO Technology Summit Report Outline

FIBO Technology Summit Report Outline

* Foreword
* Executive Summary and Recommendations
* Preface to the Summit
* Organization of the Summit
  * Opening Session: There is a need to produce operational ontologies from conceptual ontologies in RDF/OWL.
  * Session 1: There is a need to internalize the content of the FIBO model by stakeholders' semantic rules statements.
  * Session 2: There is a need for shared ontologies and analytics in the massive scale of the financial system.
* Session Summary
* Footnotes
* Appendix A FIBO Technology Summit Hypothetical and Technology Issues
* Appendix B Sample letter of Invitation
* Appendix C Michael Add Change to the Assembly
* Appendix D Participants
Slide 6 FIBO Technology Summit Report MindTouch

Slide 7 Semantic Community on Implementing FIBO

Slide 8 Semantic Community Plan for Implementing FIBO

- After reading the FIBO Technology Summit Report, I suggest implementing the following excerpts from the report:
  - There is a need for a mechanism for the generation of conceptual ontologies from business conceptual ontologies.
  - It is intended for this conceptual ontology to be readable and understood by executives working in the EDM space.
  - From the FIBO conceptual ontology, it must be possible to generate R3C standard RDF/OWL data stores.
  - There is a need for software to substantially automate this process.
- I asked the following question:
  - Is it possible to import FIBO into Be Informed and be readable and understood by executives working in the EDM space?
  - Do you have an example of work for a financial institution with rules that can be shown publicly in a webinar?
  - Can Be Informed pull new Data (generate R3C standard RDF/OWL data stores)? This is fundamental for all big data work (e.g., U.S. Census Bureau, Healthcare.gov, etc.)
- I will start doing the data science work like I did for Healthcare.gov, then I can schedule it for the Federal Big Data Working Group Meetup!
Slide 9 Other Approaches

Other Approaches

- The Ontolog Community on Big Data and Semantic Web Meet Applied Ontology:
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  - These three statements appear to be contradictory and/or false: semantic technologies seemed to have downplayed the importance of ontologies, the ontology community has not seemed to be “very applied” to the Semantic Web community, and “big data” applications have used ontologies (e.g. Semantic Medline and Proteins).
  - I would cite Dennis Winsosky on FIBO and Semantic Community on Implementing FIBO above as a specific example.

Slide 10 Google Search for FIBO Ontology Download

Google Search for FIBO Ontology Download

My Note: Not useful!
My Note: See next slide
My Note: Very useful!
My Note: 10 articles about FIBO
My Note: June 2011 slides presentation

My Note: See below
http://www.youtube.com/watch?v=m5P7YXzR

Slide 11 EDM Council Financial Business Ontology

EDM Council Financial Business Ontology

http://www.edmcouncil.org/financialbusiness
Slide 12 OMG-EDMC Joint Working Group Web Site


Slide 13 OMG-EDMC Joint Working Group MindTouch

http://semanticommunity.info/Data_Science/Data_Science_for_FIBO/Specification_Documents

Slide 14 OMG-EDMC Joint Working Group Slides

- Slide 13 Business Facing Views says:
  - Spreadsheets are being produced now, from MagicDraw via FIBO spreadsheet plugin
  - These provide the means for business domain folks to review and comment on/validate definitions
  - Some changes needed for restrictions
- But I am not sure that Magic Draw imports ontologies yet so it would seem better to use a leading tool like TopBraid Composer for the following:
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Slide 15 OMG-EDMC Draft Specification Documents

Slide 16 OMG-EDMC Draft Specification Documents Downloads

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- So I can try to learn new tool myself or form a data science team that includes an expert that I know and admire who knows how to use this tool, Dean Allemand, Working Ontologist.

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Data Science Team for Implementing FIBO

- The team selected so far is as follows:
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  - Dean Allemand, Working Ontologist
  - Aaron Bossett, YarcData
  - Kees van Mensom, Be Informed
  - More to be added if needed
Slide 18 TopBraid Composer

TopBraid Composer

- TopBraid Composer is the world’s most powerful modeling environment and an IDE for building semantic applications. Fully compliant with W3C standards, Composer offers complete support for developing, managing and testing configurations of ontologies and linked data. As part of TopBraid Suite, Composer provides a comprehensive IDE for developing semantic solutions that can integrate disparate applications and data sources.
- Implemented as an Eclipse plug-in, Composer serves as a development environment for all the applications delivered using TopBraid Live™. Composer is used to develop ontology models, configure data source integration, and create semantic web services and user interfaces. Extensive Help is provided within the tool.

http://www.topquadrant.com/products/Composer.html

Slide 19 TopBraid Composer Maestro Edition

TopBraid Composer Maestro Edition

- TopBraid Composer - Maestro Edition (TBC-ME) is the most comprehensive version of TopBraid Composer. It is a full IDE optimized for developing web applications and services based on the TopBraid Live platform.
- TBC-ME includes its own internal web server for testing applications. It provides all of TopBraid application development tools – SPARQL, Rules, SPARQL Web Pages and SPARQLMotion data processing. It also has the most comprehensive collection of data source adaptors. TBC-ME includes stand-alone demo versions of TopBraid Solutions.
- TopBraid Composer users that do not decide to purchase Maestro can download and evaluate the full version for a 30 days evaluation period. After that time, the additional capabilities will be disabled. At any time, a different license key can be entered in the Help menu.

http://www.topquadrant.com/products/ME_Composer.html

Slide 20 Install and Launch TopBraid Composer ME

Install and Launch TopBraid Composer ME
Slide 21 See Help Contents: Open and existing ontology

See Help Contents: Open an existing ontology

Slide 22 Open and Existing Ontology: Corporations.rdf

Open An Existing Ontology: Corporations.rdf

Slide 23 Data Science for FIBO

Data Science for FIBO

- Now that I have built a Knowledge Base (this page) and given structure to the three Word documents (see sub-pages: Financial Industry Business Ontology Business Entities, Financial Industry Business Ontology Foundations, and Inventory of Files for a Submission), I can build relational and graph tables in spreadsheets that include the many tables in the Word documents and built visualizations in Spotfire.
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Slide 24 Federal Big Data Working Group Meetup

Federal Big Data Working Group Meetup

• The mission of the Federal Big Data Working Group Meetup (FBGWSMU) is to organize frequent results-focused meetups that provide opportunities for a broad community of participants to focus on big data products for the Federal Big Data Initiative as follows:
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  • Big Data: Supports the Federal Digital Government Strategy which is "treating all content as data," so big data is all your content;
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Slide 25 Mission Statement

Mission Statement

• This means we want to do a Data Science for FIBO product for the Federal Big Data Initiative that treats all the FIBO content as data using a team of experts in the Meetup environment similar to our recent Semantic Medline/YarcData and Healthcare.gov/Be Informed big data products and their tutorials for aspiring data scientists.
• All are welcome to join and participate in this exciting endeavor!

Slide 26 Conclusion

Conclusion

• In conclusion, I did the following:
  • Integrated ontology, semantic web, and "big data" to address the goal of the 2014 Ontology Summit
  • Made the background information and two OMG FIBO Standards documents "data papers" by using the OntoOWL ontology and rules for building three knowledge bases as follows:
    • Overall which corresponds to the Upper-level ontology
    • Business Ontology: Foundations which correspond to the Mid-level Ontologies
    • Ontology Business Entities which correspond to the Domain ontology
  • Made the 15 tables in the two OMG FIBO Standards documents linked data format
  • Combined the 15 tables with 909 columns and 2129 rows into an Excel spreadsheet and Spotfire dashboard (see next slides)
  • Now we are ready to cross the chasm with the upcoming Data Transparency Summit and government financial data sets that will become available because of the Data Act. See Data Transparency Summit knowledge base in development.

Slide 27 Data Science for FIBO: Spotfire Cover Page

Web Player
Slide 28 Data Science for FIBO: Spotfire Example Tables

Web Player

Slide 1 OMG Finance Domain Task Force

OMG Finance Domain Task Force (FDTF)

Monthly Status/review call
Wednesday Dec 4th 2013
Slide 2 Highlights

Highlights

- FIBO Foundations completed and submitted
  - Initial responses positive
  - Commenting period ended
  - Expect to convene FTF in December
- FIBO Business Entities
  - To be voted on at OMG December FDTF and AB
- OMG Quarterly Meeting / FDTF Tue/Wed 10-11 Dec
  - Day 1: FIBO
  - Day 2: Other FDTF Initiatives and talks

Slide 3 Timelines

Timelines

- Foundations
  - FTF from December
  - Additions for Securities, Derivatives in RTF
- FIBO-BE
  - Vote to adopt at OMG Meeting, Dec
  - Out for public comments Dec - Feb
  - Convene Finalization Task Force, March OMG Meeting
  - Ratify June 2014 (earliest)
    - Precise timing depends on volume of comments in the commenting period
    - FTF will process comments / issues and specify updates to the final version of the specification
    - One quarter is the minimum time for this.
Slide 4 FIBO-BE Specification

FIBO-BE Specification

- Submitted Nov 11
- Two annexes did not make the cut
  - Direct Relations
  - Jurisdiction Specific Partnerships
  - in preparation for Santa Clara meeting
- Testing on OWL instance data ongoing
- Terms for functionally defined entities will be in a future iteration
  - SPVs
  - Banks and other institutions

Slide 5 Process Definition

Process Definition

- Work is in hand to formally define and enhance the process for development of OMG FIBO specifications
- Wraps together 3 existing processes:
  - EDM Council SME Review Process
  - OMG FIBO Standardization / Architecture changes
  - OMG RFC Process
- Process requirement
  - Define what needs to happen, independently of individuals and of tools (repeatable process)
- Next steps:
  - Tooling: having defined the requirements, what tools?
  - Test and QA: Use of established ontology evaluation techniques and QA process
Slide 6 Other Considerations

Other Considerations

- Business/ SME Presentation
- Written definitions reviews
- Future FIBO Specifications
  - Products (reference data for securities, loans, derivatives)
  - Temporal terms (pricing / analytics)
  - Process related terms (corporate events, issuance, payments)
- Proofs of Concept
  - Bank of England – reporting via semantics
  - Operational Ontologies
    - Classification
    - Counterparty exposures

Slide 7 Roadmap

Roadmap

- (1) Business Entities/Foundations
- (2) Common Concepts for all Instruments
  - Listed Instruments
    - US Issues
      - Stock
    - Other
      - Market price
      - Bond
      - US Structured Finance (dependence on bonds and mortgages)
      - US Private Market (private equity, loans, government, agency, etc.)
- Derivatives
  - US Common Concepts for all Derivatives
    - Credit
      - Collateral (collateral in equities, bonds and common stock terms)
    - Default
      - Counterparties
    - Other
      - Product family
      - Transaction
      - Risk
      - Cash Flow
      - Valuation
      - Risk Management
      - Market Capital
      - Counterparty exposures
    - (G4) Market Exposure Tracker
- (1) Iago Rights and Instruments (dependent on common concepts for all instruments)
- (2) Iago Collective Investment Vehicles (dependent on listed instruments, derivatives and indices)
- (3) Market Instruments
  - SME Loans
    - SME Common concepts for loans
    - Terms
      - Guarantees
      - General
      - Underwriting
      - Transfer
      - Issued
      - Monitoring
    - (Available in Iago prior, not yet in Meta)
Slide 8 FIBO Roadmap: Reference Semantics

- Have decided to break the dependencies linkages by releasing in tranches:
  - Indices and Indicators
  - Securities (Debt, Equity)
  - Loans (general / common concepts)
  - Derivatives (rate-based, CDS, Fx)
  - Mortgages
  - Structured Finance (MBS, ABS, CDO) + Money Markets
  - Other derivatives (Asset, Commodities, CFD)
  - CIV (Funds)
  - Exchange traded Derivatives (Futures, ET Options)
  - Loans (Construction, Student, Miscellaneous)
  - Rights and Warrants

Slide 9 FIBO Roadmap: Longer View

- Reference data terms semantics – see previous
- Temporal Terms: Pricing, Analytics
  - By instrument class (Common, Debt, Equity)
  - By type (prices, yields, analytics, ratings, status
- Process Terms
  - Corporate Actions
  - Securities Issuance
- Portfolio / Positions
- Payments
Slide 10 Future FIBO Specifications

Future FIBO Specifications

- Migration of FIBO “Product” ontologies to the new RDF/OWL architecture (addition of restrictions)
- Each of these will entail an update to FIBO Foundations and sometimes FIBO BE (e.g. for Funds entities).
- Foundational Concepts “Externality Review”
  - To be identified and completed as needed for each product class
  - Working groups of domain experts and academia to be convened on these on a per requirement basis

Slide 11 Eternality Review Examples

Externality Review Examples

- **Derivatives:**
  - Needs Transaction Shared Semantics
    - Extends Foundations model of commitments, agreements etc.
    - In line with ISO 15944-4 (REA)
  - Other e.g. Margining, Collateral
- Securities, Derivatives have **Schedules**
  - Phase 1 of OMG Date Time Vocabulary alignment
    - Now available in OWL
    - Shared Semantics strategy
- **Funds / CIV:** FIBO-BEs update in Trusts, Entities
- **SPVs:** FIBO-BE update to add core SPV model
- **Temporal Terms**
  - Phase 2 of OMG DTV alignment
Slide 12 Deployment Questions

Deployment Questions

- Logical data models
  - Mapping – different architectures / experiences
  - UML Trace linkage within MDA environment
- Data feed / message integration
- Semantics for rules
- Accessing definitions and meanings
  - What should people see when clicking on a link?
  - Reference from data model metadata
- SPARQL end point
- Deriving operational ontologies

Slide 13 Business Facing Views

Business Facing Views

- Initial business-facing diagrams in spec
- Improved versions (aliasing of Restrictions)
  - MB has draft proposal for formats
- Also working with Adaptive to host and present static views of the same content, for a business SME audience.
  - This is separate from the SPARQL End Point requirement
- Spreadsheets are being produced now, from MagicDraw via FIBO spreadsheets plugin
  - These provide the means for business domain folks to review and comment on / validate definitions
  - Some changes needed for Restrictions
Slide 14 Questions

Questions?

Spotfire Dashboard

For Internet Explorer Users and Those Wanting Full Screen Display Use: Web Player Get Spotfire for iPad App

Media, iframe, embed and object tags are not supported inside of a PDF.

Research Notes

Google: fibo ontology download

http://www.omgwiki.org/OMG-FDTF/doku.php
http://www.omgwiki.org/OMG-FDTF/lib/...apping_v11.xls
http://www.edmcouncil.org/searchresults?search=spreadsheet

Two past presentations that I think are significant here:

tibco-semantics_and_cep-omg_0309_v1.pdf

Transmittal Email

December 05, 2013
Dear Wizdom Friend,

Last June the Enterprise Data Management Council invited the top Semantic Technology Experts on the planet to participate in a two day summit on the Financial Industry Business Ontology (FIBO) technology challenges. Nearly 60 people deliberated 4 key requirements for FIBO to maximize its opportunities for success.

Summit topics were:

- Work Session Definition - Challenge one - There is a need to generate operational ontologies from conceptual ontologies in RDF/OWL.
- Work Session Definition - Challenge two - There is a need to convert requirements (e.g. regulatory rules) into executable semantic rule statements.
- Work Session Definition - Challenge three - There is a need to visually represent all forms of semantic content.
- Work Session Definition - Challenge four - There is a need for shared semantics and analytics at the massive scale of the financial system.

The Objective of the summit was to discuss these challenges and then to develop short, mid and long term answers to these challenges.


Supporting the findings of the workshop are more than 50 citations to Finance Industry requirements and Semantic Technology sources.

You are encouraged to look at the report and to send me your comments and ideas.

Happy Holidays, Dennis E. Wisnosky email: DWiz@Wizdom.com

![Image of Dennis Wisnosky]

Former DoD Business Mission Area CTO, member of the Enterprise Data Management Council, Founder, Wizdom Systems, Inc.

WS-4 Using Process Model-Driven Business Architecture To Design Shared Services*


10/28/2013

9:00 AM - 12:30 PM
This workshop will help attendees in getting EA certification by demonstrating though the material and the exercises the practical application of EA framework concepts. It will show how these can be used to design deployable shared services using BPMN*. 

*Presented by:
Utilizing the Business Architecture Methodology as a practical factor demonstrating the pulling together of business requirements articulated through process models, data and standards ontologies to create agile and lightweight, semantic architecture knowledge. This knowledge would then directly drive development and deployment of shared business services. Understanding practical applications of EA framework concepts will help in getting EA Certification.

Learning Objectives:

- Learn how the Object Management Group (OMG) standard Business Process Modeling and Notation (BPMN)* is now a visual programming language for designing component and composite services.
- How BPMN* can thus be used to model enterprise (shared) services (e.g., identity management, event notification, case management, etc.), and that the model information in the BPMN* XML provides the data that can be incorporated into repositories, consumed by project teams tooling, analyzed for alignment with controlled or common vocabularies, and transformed into deployable services.
- Learn that such services can be represented as “super requirements” for consuming processes and systems to satisfy, and that BPMN* models facilitate this understanding.

Module 1: Introduction to Process Model-Centric Business Architecture
- Business Architecture (BA) as lightweight alternative to full-blown Enterprise Architecture for business services
- Applicability of the concept in government and commercial domains
- Modeling language standards and tools for supporting creation of BAs

Module 2: Overview of Business Architecture Framework Concepts
- Capability+Activity+Resource+Performer (CARP) Concepts and ontology
- Relationship to other Enterprise Architecture concepts (e.g., E2E)
- Relationship to enterprise (shared) services

Module 3: BPMN* Modeling for BA
- Process modeling overview
- BPMN* primer (basic concepts needed for the workshop)
- Relationship to BA framework concepts (CARP) for controlled vocabulary
- Modeling meta models and their relationships to each other

Module 4: Modeling Enterprise (Shared) Services
- BPMN* for services modeling
- Shared services as “super requirements”
- Controlled vocabulary becomes common vocabulary
- Governance issues and challenges (on-boarding new services)

*Business Process Modeling and Notation (BPMN) and Model Driven Architecture (MDA) is a Trademark of the Object Management Group (OMG)

Attendees of the Workshop will need to bring a laptop, netbook, or tablet that is WiFi-enabled. Exercises will make use of an online web modeler for BPMN* modeling. A WiFi signal will be available at the conference site. Attendees of the Workshop will use a free trial version of a leading web-based BPMN* modeler, BPMN* Web
Modeler from the Business Process Incubator (http://www.bpmnwebmodeler.com/), to do the BPMN* modeling required in the Workshop.

Attendees will be able to take away continued access to this free trial version for a period of time, which can be converted to a paid version. Attendees of the Workshop must attend the full workshop and complete all exercises to be eligible for a Certificate of Attendance. The certificate can be used to reflect practical experience and application of architecture skills and knowledge toward EA Certification.

Cloud: SOA, Semantics, & Data Science

Source: http://www.afei.org/events/3A03/Pages/default.aspx

<table>
<thead>
<tr>
<th>Industry Opening Keynote Speaker</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moving Semantics Into the Mainstream</td>
</tr>
<tr>
<td>Dennis Wisnosky, Wizdom Systems, Former DoD Business Mission Area CTO, member of the Enterprise Data Management Council</td>
</tr>
</tbody>
</table>

Semantics in the Mainstream – Real cases of semantic technology applied to mission/business transformation needs

Department of Veterans Affairs Process Modeling and Design Center (PMDC) – Semantically rich process models for SOA solution design.

Randy Coleman, Wizdom Systems, Inc.
The VA PMDC Operational Framework results in a consistent look and understanding of process models and designs created in the PMDC. Consistency and common representation of business processes through the use of BPMN 2.0 promotes comparability of business processes and IT solution requirements and designs across VA OIT. Process modeling creates most value when the models are tightly coupled with a clear community domain vocabulary (ontology).

Services Modeling Using BPMN 2.0 – It’s Not Just Boxes and Arrows Anymore!

Lloyd Dugan, BPMN4SCA
BPMN is now a visual programming language for designing component and composite services. Leveraging this requires modeling conventions, primitives and patterns, and attribution schemes to populate and enrich the BPMN XML. BPMN can thus be used to model enterprise services, and the BPMN XML provides the model data that can be consumed and transformed.

Semantic BPMN: BPMN-2.0 Ontology-Based Query Engine

Mohamed Keshk, Semantic BPMN
BPMN ontology-based query engine will enable business users to automate retrieving and searching information
located in any BPMN-2.0 repository. The engine leverages the integration power of semantic technology to seamlessly link different BPMN repositories and find out patterns and anomalies via the inferring capability. In addition, the engine provides a mechanism – for the first time - to uniformly link business process models represented in BPMN-2.0 with their consumed data represented in UML, in an open standard way. The engine is augmented by a BPMN-to-OWL generator to transform the instances of business process models from XML into RDF/OWL format. This will guarantee fully automated process to analyze information about process model instances, and make timely decisions.

Pulling together process models, data and standards ontologies into agile and lightweight Semantic Architecture Knowledge

Jim Kindrick, Jacobs Technology/ISG

A semantic approach to the creation of architecture knowledge that supports development of rapid and agile services for critical mission/business transformation needs. Semantics support the creation of implementable, mainstream, business service solutions that are interoperable both in process orchestration and in the sharing and understanding of data. This approach is compatible with any established architectural framework, without the weight of artifact creation, and is supportive of the federation and integration of architectures, real-time, within any enterprise. The use of standards ontologies such as FIBO or any other community domain vocabulary, joined with the lightweight architecture ontology, enables speed and understanding for decision support and solution development in any enterprise.

FIBO

OMG-EDMC Joint Working Group

Source: http://www.omgwiki.org/OMG-FDTF/doku.php

Semantic Models for Financial Reform

In response to the 2007-09 financial crisis, the U.S. congress passed the Dodd Frank Act. Financial institutions will need to implement data standards such as instrument and business entity identifiers, associated reference data and hierarchies to support the reporting requirements in a manner that facilitates analytics and supports systemic oversight.

The purpose of the joint EDMC-OMG Working group is to accelerate the development of a 'sustainable, data standards and model driven' approach to regulatory compliance. Please note that support for financial reform standards is an important application of (but not limited to) the proposed joint standard. Stakeholders from Object Management Group and EDM Council (in collaboration with other standards organizations) are contributing to the development of these standards. Initial scope is to develop and adopt of the semantic standard for both financial instruments and legal entities. This Wiki will serve as a single point of reference for working group artifacts except the vocabulary and models that will be managed in a metadata repository (details to be announced).
Latest Monthly Update

- Monthly Update slides for December 2013 My Note: Downloaded this

FIBO Foundations Request for Comments

The first formal FIBO specification, FIBO Foundations, was made available for public comments from September 2013 to 11 November. Comments received will be discussed at the December OMG Quarterly Meeting in Santa Clara, followed by a vote to proceed with the finalization process for this specification.

Please refer to this OMG FIBO Request for Comments website at http://www.omg.org/hot-topics/fibo.htm.

Full details of the OMG formal documents are listed at this link. The main documents are also listed below.

The public commenting period ended on 11 November 2013. There will be opportunities to raise further comments after the December meeting.

FIBO Foundations itself covers the basic semantic abstractions needed to support the forthcoming FIBO Business Entities specification and will be further updated to provide the semantic abstractions needed for securities, derivatives, loan etc. going forward. This initial specification also describes the technical architecture of the whole FIBO suite of standards, and describes the requirements for conformance with the specification.

Draft Specification Documents

FIBO Business Entities: Draft RFC Proposal submitted for consideration at December 2013 OMG Quarterly Meeting

- FIBO Business Entities RFC finance/2013-11-01 My Note: Downloaded this
- FIBO Business Entities OWL Files (ZIP) be-owl-20131110.zip My Note: Downloaded this

The written specification contains diagrams and tabular reports of the model content, while the OWL files are intended to be read using an OWL editor such as Protégé. My Note: Downloaded TopBraid Composer Maestro Edition (30 data trial) See Below

FIBO Foundations: RFC Submission as presented and voted on at New Brunswick, NJ Quarterly Meeting

- FIBO Foundations as issued for comment Finance/2013-09-02 My Note: Downloaded this
- FIBO-Foundations OWL Files (ZIP) fnd-owl-20130827.zip My Note: Downloaded this
- Inventory file Finance/2013-09-05 showing all the components which make up this submission and indicating which of these form a normative part of the proposed standard. My Note: Downloaded this

Other machine readable files (ODM XMI, UML XMI and VOM Project files) are available on request.

TopBraid Composer

http://www.topquadrant.com/products/TB_download.html
FIBO Technology Summit Report

The 2013 FIBO Technology Summit Report is available HERE (PDF)

Financial Industry Business Ontology (FIBO)
Technology Summit
San Francisco, CA June 5 - 6 2013

Michael Atkin, Enterprise Data Management Council
Dennis E. Wisnosky, Wizdom Systems, Inc.
David Newman, Wells Fargo

Enterprise Data Management Council
Report of workshop, October 2013
Financial Industry Business Ontology (FIBO)
Technology Summit
San Francisco, CA
June 5–6 2013

Disclaimer
Any opinions, findings, and conclusions or recommendations expressed in this material of those of the author(s) and do not necessarily reflect the views of members of the Enterprise Data Management Council, Wells Fargo Bank, or any of the organizations affiliated with the Summit participants.
Acknowledgements
This report is based upon work supported by Enterprise Data Management Council (EDMC). The organizers of the summit are deeply indebted to Eric Franzon and the staff of http://SemanticWeb.com and mediabistro (Nasdaq: MBIS) for their tireless efforts in support of the summit.

Foreword
Once upon a time, there were no standard definitions of financial terms and the financial institutions could interpret the meaning of the rules and regulations of the industry each in their own way. Everyday, new financial instruments and transaction types were invented. One day, major companies in business for many decades began to collapse and the world fell into a severe economic crisis. Because of that, many sectors of the world’s economy realized that their true financial status could not be understood. Because of that, an effort was launched by the industry to develop a Financial Industry Business Ontology (FIBO) - a common vocabulary based on international standards, that would enable companies to better communicate within and among themselves and would enable regulators to perform meaningful oversight as required by laws. Until finally data became more harmonized and transparent, Congress and the regulators were confident of the provenance of answers to their questions of the industry, and having commonality of financial data terms was a direct benefit to the financial institutions themselves and the customers in which they support.

Dennis E. Wisnosky

Executive Summary and Recommendations
The Enterprise Data Management Council, with the support of Semanticweb.com, organized a workshop called the FIBO Technology Summit on June 5–6, 2013 in San Francisco, CA USA. The goal of the Summit was to begin to build a community of the best minds in the Ontology community to focus on critical technology and collaboration needs to support the Finance Industry.

1. Operational Ontologies
2. Semantic Rules
3. Visualization
4. Scalability

More than 60 leaders from different IT and business sectors and academia brought varying perspectives to the meeting. The result was a roadmap in each of the need areas as well as a broad list of recommendations as follows:

• Organize: Create a Semantic Technology Coordination Leadership team with a fixed membership and published meeting schedule. There is a need for a team of the best minds in finance, IT and, mathematics and business to be brought together to focus on how to best use Semantic Technology to achieve the goals of FIBO.

• Fund: Identify sources and a coordination process for semantic technology funding. Literally millions of U$ are focused annually on research in Defense, Autos and Energy with specific goals established. 1 Comparative spending to solve real problems and contribute to the process of knowledge management is trivial by comparison.

• Sustain: Implement a Semantic Technology Laboratory (Center of Excellence) as a formal mechanism for the advancement of semantic technology. Arguably springing out of the discipline of Artificial Intelligence 2, for all practical purposes, Semantic Technology was incarnated by the US DoD. Its principal application has been in Healthcare and Pharma, where much research and development has been done in the development of open source software. 3 Example noted universities 4, 5, 6 have well developed Semantic Technology programs. However, there is a notable lack of dedication in any one university to the Finance Domain.
• **Link**: Publish and maintain a directory of participants and a listing of publications/resources for the advancement of semantic technology. SemanticWeb.com and other sources do well in this task. It would be useful to work with Media Bistro to expand this offering and have a track dedicated to ontology, inference—processing and risk analysis.

• **Meet**: Implement annual Semantic Technical and annual Semantic Applications in the Finance Domain Summits as checkpoints of progress. Building a research and development community of practice must be a directed effort. The building number of seminars and symposiums dedicated to this field is excellent. However, each is general in nature. The only known symposium dedicated to Semantics in Financial Services 7 was over subscribed. The FIBO Technology Summit itself had an expectation of 25 participants. There were over 60 in attendance.

• **Publish**: Provide a mechanism for participants to publish articles and research related to semantic technology implementation. The International Journal on Semantic Web and Information Systems 8 is an archived journal of original manuscripts. While this is useful, a journal dedicated to directed topics would accelerate the advancement of this technology and its adoption.

The value proposition for adopting these recommendations as the means to assure the advancement and adoption of FIBO is overwhelming. American Banker says that the cost to comply with Dodd—Frank is between U$150--U$350M/ per year/per organization – with no added value. 9 FIBO adoption will reduce this cost significantly and provide added value for both the banks and for the regulators. There are two primary reasons for this assertion. 1) An ontology allows for (2n–1), which is near linear semantic integration of data, rather than (n2 - n) integration. 10 This is because an ontology provides a canonical model by which multiple disparate database or message elements can map to a common semantic integration layer. For example, at a cost of U$200,000/database, integration of 10 data stores with an ontology (FIBO) is U$3.8M and U$18.M without an ontology. 2) Software development and maintenance time and effort is reduced by 40% to 80% according to some industry figures and case studies. 11

**Preface to the Summit**

The need for an entirely new approach to financial data management has been studied and documented by the National Science Foundation (NSF) and academics for several years. A 2010 NSF workshop 12 citing §154 of the Dodd--Frank Act mandating that the Office of Financial Research (OFR) contain a Data Center (OFR/DC) to manage data for the new office so that it could: Publish financial instrument reference data, Publish legal entity reference data, Publish data reporting standards and formats, and Collect contractual positions and transactions data among other findings concluded that: “Financial risk and information managers across the industry and regulatory community should: establish semantic models that reflect best practice in knowledge representation; establish and adopt precise data definitions based on sound ontologies for all basic financial data; and promote sound standards for all metadata management.” This finding states precisely the purpose of FIBO. A second workshop 13 Next Generation Community Financial Cyberinfrastructure for Managing Systemic Risk further defines the needs for: “A blueprint for developing community infrastructure that builds synergy among multi-disciplinary needs and opportunities and academic disciplines”. “A detailed specification of the infrastructure including datasets, annotations, ontologies, tools, metrics, ground truth, benchmarks and use cases.”

The regulatory community in response to Section 719(b) of the Dodd--Frank Act which requires the SEC and the CFTC (collectively the “Commissions”) to jointly study the “the feasibility of requiring the derivatives industry to adopt standardized computer-readable algorithmic descriptions which may be used to describe complex and standardized financial derivatives,” has come to similar conclusions 14 - that there is both the need, and that it is technically feasible, to describe financial contracts algorithmically (in this case Derivatives).

Further the Basel Committee on Banking Supervision in June 2013 issued for comment a paper entitled Supervisory Framework for Measuring and Controlling Large Exposures. 15 Their conclusion is startlingly similar to that of the NSF in other words: “A need to Reengineer the Global Financial System”. According to the Basel Committee, this would entail:
• “A simplified and replicable method of calculating exposure to risk that can be universally applied to sources of transactions that are reconcilable to accounting records
• Global identification standards for legal entities, products and financial events to facilitate the aggregation and comparison of risk exposure data within and between financial institutions and across the industry
• A ‘Big Data’ framework that is able to provide regulators and others with complete and accurate real-time information relating to the global financial system” This needs statement is summarized by the Basel Committee as “an intelligent semantic network for systemic risk analysis.”

This is the very essence of FIBO. Work done to date by companies with broad commercial interests (Google, Facebook, Linkedin, IBM (Watson), others) shows that this goal can be achieved. In addition, work in the academic research community (Duke, Oxford, others) has shown that there is great potential for both combining results and providing focus.

In late 2012, the question within the Council became how to bring these worlds together in a cooperative environment. The conversation began with the goal being construction of a roadmap of short term, mid term and long term requirements in technology areas deemed crucial to the success of FIBO. These technologies were described broadly as:

1. There is a need for a mechanism for the generation of Operational Ontologies from Business Conceptual Ontologies.
2. There is a need for a mechanism for generation of business rules/axioms for analytics (i.e. how to convert regulatory requirements into rule statements).
3. There is a need to be able to demonstrate the business value of FIBO and of the content of the data discoverable through both the FIBO Conceptual Ontology and the various FIBO Operational Ontologies as they evolve.
4. There is a need to be able to automatically convert a picture into an Ontology. This picture may be of a concept, a question, or a statement such as a rule.
5. There is a need to be able to link FIBO in all of its aspects to other Ontologies from other industries and disciplines that may not seem to be related to FIBO. That is, there is a need for Shared Semantics at the massive scale of the financial system.

A search was conducted to identify the people and the companies who are known to be leaders in each of these areas without regard for their relations to the financial community. The list yielded only a little over 100 people. This shows the still nascent level of this technology. It was decided to hold a “by invitation only” event to attract these selected individuals. Finally, the discussions turned to the most efficient practical venue. For the past nine Junes, the Semantic Technology & Business Conference has been held in the San Francisco Bay Area. There could be no better choice than tagging on to this event where the majority of these 100 or so practitioners would already have convened. The team at SemanticWeb.com (a Mediatbistro property; Nasdaq: MBIS) readily consented to this idea.

The plan was fleshed out as a hypothesis and is displayed in Appendix A – FIBO Technology Summit Hypothesis and Technology Areas.

Letters of invitation (Appendix B) were personally emailed to perspective participants. Appendix A was attached to the invite letter and each recipient was asked to take issue with the hypothesis. There were no issues reported.

A link in the letter directed the invitees to register and to self select two of the five technology areas for their participation. As results were received, it became clear that the technologists invited had little interest in technology area three so the decision was made to combine areas three and four.

A leader and a scribe were drafted to manage each of the four technology areas. An agenda was established which ran two technology sessions in parallel with time before and after each session for joint deliberation. The final organization of the Summit is the subject of the next section.

https://semanticommunity.info/Data_Science/Data_Science_for_FIBO
Updated: Thu, 23 May 2019 01:32:49 GMT
Powered by mindtouch™
Organization of the Summit

The Summit was organized for the second afternoon and the third morning of SemTechBiz 2013 on June 4--5, 2013 with an evening cocktail event. The sessions began with a well reasoned charge from EDMC Managing Director, Michael Atkin – Appendix C. Mr. Atkin chronicled the history of IT application in the Finance Industry that he has witnessed. He outlined the problems facing the industry today and challenged the experts to collectively work on solutions. The established agenda was:

<table>
<thead>
<tr>
<th>Day 1</th>
<th>Topic</th>
<th>Speaker</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 4th</td>
<td>1:00 pm</td>
<td>Keynote: Business Case for FIBO</td>
<td>Michael Atkin (EDM Council)</td>
</tr>
<tr>
<td></td>
<td>1:30 pm</td>
<td>General Session: FIBO Operational Ontology</td>
<td>David Geelong (Wells Fargo)</td>
</tr>
<tr>
<td></td>
<td>2:00 pm</td>
<td>General Session: Critical Challenges and FIBO Roadmap</td>
<td>Dennis Wisnosky (EDMC Council)</td>
</tr>
<tr>
<td></td>
<td>2:30 pm</td>
<td>Break</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2:45 pm</td>
<td>Breakout Sessions Session 1: From Business Conceptual to Operational Ontologies</td>
<td>Elisa Kendall (Thematix)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Session 2: Executable Semantic Rules</td>
<td>Benjamin Grosol</td>
</tr>
<tr>
<td></td>
<td>4:45 pm</td>
<td>General Session: Breakout session summaries and guidance</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Day 2</th>
<th>Topic</th>
<th>Speaker</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 5th</td>
<td>General Session: Summary on Day Two</td>
<td>Dennis Wisnosky, David Newman</td>
<td>Franciscan C-D</td>
</tr>
<tr>
<td>8:00 am</td>
<td>Breakout Sessions Session 3: Visual Representation of Semantic Content</td>
<td>Steve Ray (Carnegie Mellon)</td>
<td>Franciscan C</td>
</tr>
<tr>
<td></td>
<td>Session 4: Shared Semantics and Scale for Analytics</td>
<td>Dave McComb (Semantic Arts)</td>
<td></td>
</tr>
<tr>
<td>9:30 am</td>
<td>Break</td>
<td></td>
<td>Franciscan C</td>
</tr>
<tr>
<td>11:00 am</td>
<td>General Session: Results, Conclusions, Open Issues, Next Steps</td>
<td>Dennis Wisnosky, David Newman, Michael Atkin</td>
<td>Franciscan C</td>
</tr>
</tbody>
</table>

Clear and concise goals were presented to the attendees:
1. Create a sustainable mechanism for ongoing collaboration and coordination among the leaders in the semantic community.
2. Solve the core technical challenges required to ensure the adoption of semantic technology and inference-based processing.
Current State/Gap Analysis: What is the current state of research and development for each of the technical challenges we’ve defined?

Deliverables and Roadmap: What is the “end game” as well as the “incremental milestones” (with target timescales) for each of these technical challenges?

Technical: What are the most important technical capabilities that must be developed to support adoption and implementation?

Operational: What are the core issues, obstacles and constraints that we need to overcome in order to advance this technology?

3. Provide a clearinghouse for coordinated funding and project visibility as well as a formal research exchange mechanism in support of semantic technology implementation.

Because of the goals of comparing and integrating findings from the four sessions, a common report-out format was provided for the lead and the scribe of each session.

The Working Sessions

The Preface to the Summit section of this report discussed the overwhelming demand for the ability to discover and understand the meaning of financial data within financial institutions as now stipulated by laws and regulations. What has been the private sector response to this requirement?

Arguably, Semantic Web technology began serious development in the mid 1990’s sponsored by the US Department of Defense (DoD) Defense Advanced Research Projects Agency (DARPA). Much of this work was classified and its use by the DoD and its contractors continues to be mainly in what is referred to as the Dark World. Migrating to the private sector, Semantic Technology has been utilized internally by the largest IT firms for nearly two decades and within the last five years introduced as product options (IBM, Oracle, TIBCO). In large firms that make their market on the web, Semantic Technology has been hidden behind product offerings (Google, Facebook, LinkedIn, Apple). Much of this capability was through acquisition (Google – Applied Semantics 2003, Metaweb 2010), Apple (Siri 2010), Microsoft (Powerset).

Startups, many of which are listed in Appendix A, have focused on a particular technology and in some cases on a particular market. The academic community, with only a few exceptions (RPI, Stanford, MIT, National University of Ireland, Galway) is largely made up of individuals with specific research agendas. These few exceptions also concentrate on more narrow areas of research. Stanford University publishes the most widely supported products under the Protégé name. As a practical matter, only the FIBO work done by the EDMC has begun migration through the OMG standards process to support the financial industry. 19

These FIBO Technology Summit working sessions were designed as classical brainstorming activities applying the standard rules of brainstorming:

---

**Current State Assessment**

- What is the current state of research and development?
  - Topic 1
  - Topic 2
  - Topic 3
  - Topic 4
  - Topic 5

**Obstacles and Constraints**

- What are the core issues, obstacles and constraints we need to overcome?
  - Issue 1
  - Issue 2
  - Issue 3
  - Issue 4
  - Issue 5
  - Issue 6

**Technical Capability Requirements**

- What are the most important technical capabilities that must be developed?
  - Topic A
  - Topic B
  - Topic C
  - Topic D
  - Topic E
  - Topic F

**Deliverables and Timeframes**

- Deliverable 1
- Deliverable 2
- Deliverable 3

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https://semanticommunity.info/Data_Science/Data_Science_for_FIBO
Updated: Thu, 23 May 2019 01:32:49 GMT
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1. There are no dumb ideas
2. Don’t criticize other people’s ideas
3. Build on other people’s ideas
4. Reverse the thought of “quality over quantity”
5. One conversation at a time
6. Stay focused

Following a brief introduction by the Council to vector the discussion, each Technical Area lead and Scribe met with their group for intense and lively discourse keeping in mind that:

1. FIBO will be a family of heavily annotated ontologies, each built according to the same rules and standards - EDMC, OMG and others will publish these rules and standards.
2. FIBO must be able to link to other domain ontologies that don’t obey these rules and standards - Real Estate, Insurance, Health Care and more.
3. FIBO will have many stakeholders and, we hope, far more users from Government, industry and academia – all view points must be considered.
4. Each technology area may consider topics that overlap into other areas – rules, for example, is a consideration in each of the other three technology areas.
5. There is a growing demand for FIBO – considering that while no ontology is ever finished, the use of each can begin with a single triple.

The sections below show the further definition of each challenge, the build-up, the report-out and discussion.

**Work Session Definition Challenge One**

There is a need to generate operational ontologies from conceptual ontologies in RDF/OWL

1. The current process of building, verifying and converting the relevant parts of a conceptual ontology to an operational ontology is manual and arduous.
2. The manual approach is not scalable and needs to be automated.
3. Software to represent and generate operational ontologies is needed.
4. Software (such as the Ontology Pitfall Scanner) to evaluate the correctness/validity of the ontology is needed.

Facilitator: Elisa Kendall, Thematix Partners, LLC  Scribe: Patrick Greenfield, Wells Fargo

Work Session Build-up – In the FIBO Financial Industry Domain, the FIBO Conceptual Ontology (FIBO-CO) is intended to be a canonical model of the primary business terms (Concept) used in the industry and how each is related. FIBO--CO is, of course, specified at a high level of abstraction, but is represented as an OWL- compliant, logically consistent ontology that has been modularized to foster extension and reuse. Operational usage may include additional ontologies that extend, reuse, or abstract partitions from the FIBO--CO, and will likely be specific to a particular organization’s way of managing a business unit or a business process. Derivatives will be covered as a high-level category of financial product in the FIBO-CO, for example. But the conceptual knowledge defining Credit Default Swaps, a type of Derivative, might be required only in the operational ontologies for specific organizations or applications, and so only those would reuse the relevant FIBO-CO modules. Over time, one might expect there to evolve industry operational best practices with respect to reuse of specific partitions of FIBO-CO for given applications that themselves could become reference models in the FIBO family. Thus FIBO Business Conceptual and Operational Ontologies are two sides of the same coin as shown in the figure below 20.
While both FIBO Conceptual Ontologies and FIBO Operational Ontologies are being built today, doing this is extremely labor intensive. There exist neither the rules nor the tools to build either in such a way that there is a seamless path from a conceptual ontology to an operational ontology or even to link the two automatically where they intersect, as is shown in the next figure.

There are many examples of Conceptual Ontologies and of other Concept Models serving as the source of operating models 21 22 23. And, in our everyday world:

• A Flight Plan to flying the AC
• The map of the entire US to a route map for particular trip
• Storyboarding the movie to making the movie
• A block diagram to a schematic diagram

The Conceptual Ontology is the model of all that is possible or may be possible in the reality described by the model. In this sense, there is only a single Conceptual Model for a single reality.
This model is ‘extended’ by various and many operational models.

For example, Operational Ontologies may be equivalent to business units or contracts or instruments, etc., depending upon how the particular financial institution operates. These Operational Ontologies are linked to the Conceptual Ontologies typically through subclass relationships. For example, the Conceptual Ontology might contain a node labeled “Derivatives”. A particular Operational ontology might be linked to this node through Credit Default Swaps – a subclass or a type of Derivative. The essence of this challenge is to discuss mechanisms for building and maintaining this alignment.

Given the goals and this starting point, about 30 experts led by Elisa Kendall had a very lively discussion. Their report-out, in the standard format is below.
There are many ways to build and to maintain ontologies. The main purpose of the FIBO Foundations Ontology, as an OMG standard, is to lay the groundwork for success by establishing a common vocabulary and a common process for FIBO as it evolves to serve its many constituents. While the Council has an excellent start, the purpose of this session was to lay the set the stage for this growth. This was accomplished.

Current State Assessment clearly shows the infant nature of the ability to satisfy this technical need. The community is transitioning from highly idiosyncratic, mostly home grown methodologies. These ontologies are not based upon standards, tend to be understood by only the few SMEs who built them and are not thus extensible themselves, or able to be linked to other models. It is also clear that this technology need area overlaps greatly the other three, especially rules. This overlap includes rules for how to ensure that the intersecting concepts (Classes and properties, Definitions, Namespaces, Annotations) have the same meaning in both the conceptual ontology and the operational ontologies, and an ontology of business rules that will enable operational ontologies to be executed.

**Technical Capability Requirements** revolve primarily around the need for tools to build and to manage ontologies. This is a highly collaborative environment. The very strength of a graph database, that for all practical purposes, it is infinitely extensible, is also its greatest weakness. There is a need to document guidance on how to understand the constraints that must be followed, so as to not break an existing ontology, and how to automatically map between ontologies. That is, from a technical perspective - how to make extensions that work. There is a need for a process to ensure validation of ontologies and software to guarantee that this has happened before an ontology is published.

**Obstacles and Constraints** fall into 3 categories:
1) the need to agree and prioritize use cases that will have a critical mass of intellectual support and funding,
2) approaches to building and testing ontologies that are both sufficiently flexible to handle all use cases and sufficiently rigid that they ensure that construction and testing rules are obeyed,
3) the fact that ontologies and standards that are logically companions to FIBO such as address and country code are not yet mature themselves.

Category 1 should be in the purview of FIBO developers and practitioners to simply agree on the most significant problem areas and to redirect the minds of people and funding.

Category 2 demands that the attention of disciplines such as mathematics, knowledge management and traditional software development be redirected to semantic technology.

Category 3 calls for building FIBO in the open and asking for the cooperation of many standards bodies and SMEs from other disciplines.

**Near Term, Actionable Deliverables and Timeframes** were identified to begin the process of achieving the goals of this technology area - There is a need to generate operational ontologies from conceptual ontologies in RDF/OWL. Each is currently underway and on schedule within OMG-DMC FIBO Foundations and FIBO-BE standards process.

**Work Session Definition Challenge Two**
There is a need to convert requirements (e.g. regulatory rules) into executable semantic rule statements
1. We need an efficient mechanism to turn government regulations into a standards--based rules language.
2. Are tools such as the Rules Interchange Framework (RIF) or the Web Ontology Language (OWL) sufficient?
3. There is a need for regulations to be written in a restricted natural language.
4. There is a need to extract semantic content from text (e.g. the terms and conditions associated with legal documents and financial instrument contracts).

Facilitator: Benjamin Grosof, Benjamin Grosof & Associates Scribe: Elie Abi--Lahoud, University College Cork

Work Session Build up – In this technology area – laws, regulations and policies are synonymous with rules. The FIBO nirvana is complete and unambiguous understanding of Financial laws, Regulations and Policies, i.e. rules.

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The double benefits of this are that the financial institutions will know precisely how to manage their business processes to be in compliance, and the regulators will know precisely who is compliant and who is not. An additional benefit is that the cost of compliance with a potential new law, regulation or policy can be computed in advance of publication. This is because the benefit of a reduction in risk to the cost of change can be actually computed.

Rules are the air of the financial industry. Rules are of three types:
- Data Rules
- Structural Rules
- Operative Rules

Data rules are constraints on vocabulary. That is, they describe what is allowable domain content – what content can be in the FIBO. What are the primary concepts within that content and what are the relationships between those concepts. They are defined by a modeling language and organized by an ontology. Rules ensure that the meaning of concepts and their usage are agreed upon – their semantics are understood. Rules allow for cases where different concepts might be used to mean the same thing, or have overlapping meaning under certain circumstances – a contract may have the same meaning as an instrument in some cases, for example. Soldiers and Sailors and Airman are all Service Members. This is provable in a given domain and perhaps only within a particular context in a given domain. The FIBO - CO is intended to provide the domain vocabulary for financial contracts at an abstract level. The various FIBO Operational Ontologies will be specific to contracts, instruments, processes, organizations, etc. as described in the technology area 1 discussion.

How these vocabularies can be people readable and machine readable at the same time depends upon structural and operational rules.

**Figure Structural and Operational Rules**

Structural and Operational rules are also part of the vocabulary of the domain. Structural Rules are equivalent to laws and regulations: “A subsidiary of a bank or savings association shall complete a separate loan/application register. The subsidiary shall submit the register, directly or through its parent, to the agency that supervises its parent”.25 “The Board may waive the application of §206.4(a) of this part to a bank if the primary Federal supervisor of the bank advises the Board that the bank is not reasonably able to obtain necessary services, including payment-related services and placement of funds, without incurring exposure to a correspondent in excess of the otherwise applicable limit.”26 Structural rules establish clearly what is allowed and not allowed to occur within a domain. The issue over time becomes interpretation of these rules. Rules expressed by an ontology are unambiguous. They are interpreted in a precise and unique way and are applied in the context of the business by the operational rules. Operational rules (operative rules) describe when and how the structural rules should be applied. In the actual structural rule on waivers above, an operational rule might be, “Determine if the bank is reasonably able to obtain necessary services”. “If yes, do not grant a waiver.”

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Today people make these determinations. When these behavioral rules are expressed in an ontology, however, they will be machine readable and executable. For this to be a reality, the processes of the domain must be described in a people readable and machine readable (executable) model, and realized in a Business Process Management System (BPMS) or similar applications or services.

There are many choices in BPMS's. Most use the OMG Business Process Model and Notation (BPMN) standard for representation purposes. Recently at least six vendors in the Business Process Modeling (BPM) space have shown the ability to interchange business process models with no loss of data or standard visualization.

A BPMN ontology was developed by the US DoD and is currently working its way through the OMG standards process. In the meantime, it has been proven that a Business Process Model using this ontology can be executed and can invoke behavioral rules in real time.

The desired scenario is to support automatic and unambiguous interpretation of finance domain laws regulations and policies so that they are both machine readable and people readable. The BPM community has been moving in this direction for decades. The rules community has been doing the same. The rapid emergence of Services Oriented Architecture (SOA) orchestrated in the cloud makes this realization both possible and necessary.

Consider, for example that the regulators must aggregate data from many, many sources and understand the meaning of this data according to the rules of Dodd-Frank. An executable Business Process Model invoking a business rules engine efficiently and effectively could provide this capability.

Given the goals and this starting point about 30 experts led by Benjamin Grosof had a very lively discussion. Their report-out, in the standard format is below.
Business rules management, decision support, and rule-related technologies are represented by a mature technology field and community for decades, with products from large companies as well as open source projects in use for many years. During this session it became clear that there is no agreement on a best approach to interpreting rules that are at least partially encoded in an ontology, or on any one specific execution strategy. There was agreement on the necessity, and that most likely any practical capability will require multiple approaches.

**Current State Assessment** – Rules engines fall into three primary categories: Declarative Logic Programs, First Order Logic and its subsets and supersets, and Common Logic (which is also a classic first order logic). There are advantages and disadvantages for each of these categories, and there are both proprietary and open source choices. It was agreed that Rulelog best meets the long term requirements for FIBO, but that Rulelog is early in commercialization. Clearly, decisions going forward must be made collaboratively and keeping in mind the evolving work of W3C on the Rules Interchange Format (RIF), the RuleML community, and the OMG on the Semantics of Business Vocabulary and Business Rules (SBVR) and a number of other standards in the rules space, such as the Production Rule Representation (PRR) standard and emerging work in decision management, all of which have or will have interaction patterns with RDF/OWL.

**Technical Capability Requirements** – Expressive power must be sufficient to handle exceptions and change. Rules engines must allow defeasibility, i.e., have the ability to handle a hierarchy of rules no matter their form. They must be scalable computationally and have the ability to evolve as knowledge changes within its own domain and as it is linked to other domains. They must support cost-efficient Knowledge Acquisition (authoring) methods for known knowledge and knowledge interchange and translation. They must also fit within the enterprise software/data environment and have an implementation/maintenance path consistent with well accepted commercial software and best practices.

**Obstacles and Constraints** - Legacy (rule) systems are expressively limited, because they use subsets of logic programs (LP). Production rules dominant in the business rules sector are often poorly built semantically (though some vendors, including IBM, TIBCO, and Fair Isaac are beginning to support the use of OWL ontologies to provide the vocabulary to be used as the basis for rule development). Business rules are often temporal and probabilistic – for example regulations nearly always have waivers and constraints. They are not rigid and deterministic which are much easier computationally. Thinking of, and coding, rules as triples is not common practice. Natural Language Processing (NLP) for real-time automated knowledge acquisition has severe issues with accuracy and computational scalability.

**Near Term, Actionable Deliverables and Timeframes** - It was suggested to establish a Proof of Concept (PoC) by expressing RegW rules in RuleLog and align the result with FIBO concepts. Use SBVR to capture interpretation of
RegW - to generate a shared vocabulary and as a middle step between the original text and RuleLog, then to align the SBVR shared vocabulary with FIBO concepts. Flora--2 now published as open source could be used for this purpose.

**Work Session Definition Challenge Three**

There is a need to visually represent all forms of semantic content

1. Visual representations of ontologies for both technical and non-technical users are needed to support analytical understanding and deliver business value.
2. There is a need to generate RDF/OWL from visual motifs that is rigorous enough to support reasoning.
3. What is the best way to generate visual representations of the content returned from semantic queries?

Facilitator: Steve Ray, Carnegie Mellon Scribe: Mark Temple--Raston, Citi

Work Session Build up – This is partial list of the many, many visualization tools which was presented to the team.

- CropCircles
- GoBar
- GrOWL
- IsAViz
- Jambalaya
- OntoGraf
- OntoSphere
- OntoViz
- OWLViz
- TGVizTab
- TopBraid Composer

Visualization of FIBO and its reference to instance data must consider the needs of:

- Ontologists
- Business Users
  - Bankers
  - Regulators
  - Service Providers of software
  - Service Providers of consulting
  - Trade Associations
  - Standards Bodies
- SMEs

This is a wide and diverse audience with many many different views including:

- For Developing
- For Authoring
- For Validating
- For Discovery
- For Reference
- For Analysis

Different viewers will see the same data in different ways. This famous illustration known to have first appeared in the late 1800’s, makes this clear. Is it a young woman or an old woman? The brain can see either or both. Both are different views of exactly the same data.
Given the goals and this starting point, about 30 experts led by Stephen Ray had a very lively discussion. Their report--out, in the standard format is below.

**Figure Challenge 3**
The dichotomy of this technology challenge is that its solutions seem so obvious, but they are not. The “Observer effect” is well known in IT, the physical sciences and to Star Trek aficionados. This is the phenomenon of looking at how the data evolves, and how such changes affect the data. With business data, this often happens with the practice of round tripping. That is, the observer ‘corrects’ the data in the visualization tool that is connected in real time to the actual data store. Precautions must be taken to manage this practice while, at the same time, allowing extreme access and flexibility to visualization of ontologies and their referenced instance data.

Current State Assessment – Visualization falls into the general category of Human Interface research. The list of tools resulting from this work seems to be nearly endless, including: CropCircles, GoBar, GrOWL, IsAViz, Jambalaya, OntoGraf, OntoSphere, OntoViz, OWLViz, TGvizTab, TopQuadrant - TopBraid Composer, KeyLines, Franz - Gruff, Adaptive, Gephi, Cytoscape, E6Towl, Knowledge Explorer, Quantum4D, Enterprise Architect, Magic Draw UML + the Visual Ontology Modeler, Knodelel, Visio, PowerPoint, Excel, Jalapeno, JS Plum, Tableaux, Centrifuge, IDEF Tools, RDF Gravity, Information Lens, Simile, Neon, KD Viz and others. The challenge becomes both understanding the underlying logic of a particular tool and the fact that most use their own proprietary data structure. The preference for FIBO is tools based upon open standards and available as open source. At least 20 visualization tools are free or nearly so. At least seven tools are dedicated to reading RDF triple stores and another 17 are Protégé visualization plug-ins.

Technical Capability Requirements – There must be a common understanding of visualization usage:

- Must be useful to business
- Must be intuitive
  - Query generators are not usually useful visualization engines
  - Can be used by “non-geeks” - Models and tools are data rich but usually not intuitive to use
- Must be designed for the specific audience. What capabilities do they need, what is their tolerance for a “technical” user interface?
- Must have “help resources” to support the delivery of value (not just limited to print)
- Must be able to be managed by SMEs

A value proposition of semantics is having flexibility in support of ad hoc query capabilities. Visualization capabilities need to be as flexible as an ontology to allow for scenario-based modeling with the capability to:

- Manage the flexibility of the query
- Manage all links and relationships
- Prioritize the importance of components
- Understand the perspective in which the user wants to understand content

It would be useful to have a library of useful queries

- Ensure that useful queries can be reused
- Provide a catalogue of both use cases and queries based on use cases
- Provide guidance on what tools are useful for which “use case” (and use case type)
- Provide a Usability Matrix (what tools are useful for what application)
- Provide standard views

Visualization Layout must be very flexible

- Must have the capability to ensure that the “relative position” of concepts on a page correspond to their location within an ontology
- Must have the ability to scope/discriminate based on “priorities” and “dimensions”
- Must have layout capabilities to make the visualization diagram useful in terms of continuity and orientation

A strong dashboard functionality that is needed

- Based on views/profiles
- Incorporating alerts and triggers
- With automated generation of “inferences” – even if not specified by the user
- Must have ability to perform (view from) root cause perspective (i.e. for a stress test or living will)

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Obstacles and Constraints - Include the need for additional focus and funding theme common to each challenge. The very variety of tools provides meaningful choices, but the inability to exchange data causes rework and unnecessary expense. The lack of a common iconography for the meaning of shapes and colors exacerbates this problem because users must often relearn what the pictures mean. There must be consideration to “entitlement control” and the protection of sensitive data. It must be assured that a user or a hacker cannot reverse engineer marketplace intelligence from a visualization tool. There is concern about the lack of how visualization tools relate to the raw data, i.e., when a bank sends data and a regulator incorporates this data into a visualization tool, it must not change the meaning of the data.

Near Term, Actionable Deliverables and Timeframes were identified that can primarily be accomplished by both literature research including those identified in footnotes 30 and 31 and by a survey that could be conducted on among EDMC members.
1: Build a Catalog of Use Cases
2: Perform Usability Study on what types of tools and how are they used, and who are the users and what capabilities do they need
3: Study and report on what tools work well with other tools
4: Build a Catalog of Visualization Tools including a feature matrix

Work Session Definition Challenge Four
There is a need for shared semantics and analytics at the massive scale of the financial system

1. We need mechanisms to better share ontologies and to integrate controlled vocabularies.
2. We need the ability to better leverage predictive analytics with semantically obtained graph structures.
3. We need to be able to support semantic processing and inference-based reasoning at the massive scale associated with the financial system.

Facilitator: Dave McComb, Semantic Arts Scribe: Mike Ucshold, Semantic Arts

Work Session Build up – In his excellent kick off to the SemTechBiz Conference, “Semantic Technology, Ready for Prime Time”, David McComb used the path to “Open-Linked Data” pioneered by Tim Berners-Lee to answer this question. 47

Figure Path to Open-Linked Data

FIBO will be deployed into the ecosphere of “Linked Open Data”. Therefore, where FIBO intersects with data is more the responsibility of an organization in the development of related domain applications, FIBO will link to that data, not replicate that data. For example, given that geospatial information is accessible in an existing ontology 48, one could use that together with FIBO to represent bank branch locations. Therefore, there is no reason to make this ontology part
of FIBO. Instead it will be linked to FIBO. The above picture from a 2006, describes the evolution and the benefits of linked open data. The path to today was through .pdf and other open license file formats that allowed files to exchanged easily. Then structured data could be exchanged through proprietary file formats with proprietary software such Excel. Open File formats such as Comma Separated Values (CSV) allowed data to be exchanged without proprietary software. Open Standards such as RDF, OWL and SPARQL from the W3C that operate through Universal Resource Identifiers and URLs – or Cool URIs, a term coined by Berners-Lee, were the next step to being able to link data – provided that certain rules are obeyed. 49

1. Use URIs as names for things.
2. Use HTTP URIs so that people can look up those names.
3. When someone looks up a URI, provide useful information, using the standards (RDF*, SPARQL).
4. Include links to other URIs so that they can discover more things.

In 2010, Berners–Lee added his star rating system that is depicted in the figure above on the path to Linked Open Data.

**Figure Tinker Toys for Linked Open Data**

In his talk, David McComb likened Linked Open Data to children’s “Tinker Toys”. 50 Tinker Toys 51 have only sticks and spools. One stick (Predicate) and two spools (Subject and Object) can be combined to make a simple toy. This would be the equivalent of a single RDF Expression: Dennis is a person. The spools are nodes in an RDF graph.

**Figure Tinker Toys for Linked Open Data Literals**

Spools can be URIs to locations in the Web, or of other various types, including specific values (Literals). Dennis Lives in Naperville.

Figure Extending this Tinker Toy metaphor to the web of things exactly makes the case for this challenge to seek ways to obey the rules of Open Linked Data, or perhaps create new rules applicable to the deterministic domain finance.
In this example below, data describing Wall Street Bank in the yellow box at the top of the picture is contained in its ontology and linked at the time of a SPARQL query to answer questions about ownership hierarchy and counterparty exposure. 52

This data will be distributed worldwide. As Linked Open Data, subject to as yet to be decided access control, ultimately it must be possible to ask any question at any time, much as is shown in the below figure, and return an accurate response. 53
Given the goals and this starting point about 30 experts led by David McComb had a very lively discussion. Their report—out, in the standard format is below.

Figure Challenge 4

This challenge is common to the entire semantic web community. Summers and Salo in their paper “Linking Things on the Web: A Pragmatic Examination of Linked Data for Libraries, Archives and Museums” discuss the genealogy of linked data including issues and predict future directions. His thesis is the need for all data describing all things in all libraries, archives and museums to be linked. David Booth, in his paper “RDF as a universal Healthcare Exchange Language” poignantly says: “Imagine a world in which all healthcare systems speak the same language with the same meanings covering all healthcare.” He then adds: “What would it be like? “Better treatment, Better research, Lower cost”. His Goal: True semantic interoperability.

In the Financial Domain, the goal would remain true semantic interoperability, for Better Transparency, Data Provenance, Lower Cost. The conclusion of experts in these three domains is the same. Data described in RDF is the only practical approach. The question that this challenge team worked on answering is how to make this a reality.
Current State Assessment – There are a number of ontologies from which FIBO could borrow using OWL mapping constructs including exemplary ontologies and Open Ontology Repository. The Ontology Based Standards movement begun in 2009, continues to gain traction. The biggest issue is dealing with change management. A variety of roll-back and roll-forward approaches exist. Protégé has a Changes Tab and a Version Log Generator. WebProtege 60 version 2.0 is supported by various case studies for how to manage ontology development and maintenance. Nevertheless, It is agreed that this is the most critical consideration in the evolution of the Semantic Web.

The science of reasoning across many different ontologies is evolving rapidly. OFR is concerned with Risk/Contagion analytics. Work in related fields could be applied in the Finance Domain for these analytics. US DoD integrates OWL and Baysian reasoning into PR−OWL (probabilistic OWL) that could be relevant to the Finance Domain. Lessons can be learned from the use of real−time Complex Event Processing and Predictive Analytics for real time operational risk management in DoD and Homeland Security. BioTech and Pharma have also pioneered this technology. In the Finance Domain references also exist for risk management ontologies. Problems to be overcome are primarily scale and complexity of data management.

Technical Capability Requirements – Annotations available as URLs are required to easily link to references and to other ontologies. Robust versioning rules must be developed and automated to satisfy the need to distinguish stable versioned concepts from those with a lot of churn. Proxies are useful to point to real concepts, however, there is a need for automated back mapping links to determine what concepts are semantically grounded to 'me'. An appropriate modularity and sourcing. Infrastructure for metadata would enable dynamic compositibility by extract portions of a larger ontology.

There are many approaches and a reasonable amount of controversy on the subject of semantic reasoning at very large scale data store, especially in real time. Clearly research is required over a reasonable number of financial domain use cases such as: Systemic risk and Stress testing with various risk thresholds. Exposing all data stores with SPARQL endpoints is a first step. Ultimately, real-time configurable algorithms based on probabilistic OWL, most likely executing in a Hybrid Cloud will be necessary for reasonably predictive analytics. The reason for this is that instance data will be temporal and resident in the systems of 2nd and 3rd parties such as partners and regulators.

Obstacles and Constraints – Processing time is typically named the number one obstacle. However, increasingly real world experiments have shown that new approaches make this to be a specious argument even in the traditional sense with a single processing node. The semantic web of open linked data totally changes this paradigm. Searches over this web are simply not practical with relational data stores largely because the data could not be found. The constraint then becomes how fast a search can be accomplished. There are many architectures that may be employed. Most likely the successful architecture will be a hybrid cloud that permits federated searches over structured and unstructured data some of which is indexed and some of which is not. For proof of the ability to overcome these obstacles and constraints, funding must be applied to several proof of concept use cases using anonymized real data of serious importance to the regulators.

Near Term, Actionable Deliverables and Timeframes - FIBO must be delivered with at least a minimal infrastructure that practitioners can use both to search and extend FIBO. Example of such an infrastructures include: OOR.net, Protege and Watson. FIBOpedia would be a useful name for this service. Establish a Proof of Concept sanctioned by OFR with a regulator. For example; CFTC has established Swap Data Repositories (SDRs) that are required to gather interest rate and credit index swap trades from their customers and aggregate and report this data quarterly. “The commission now receives data on thousands of swaps each day. So far, however, none of our computer programs loads this data without crashing,” said Scott O’Malia, a CFTC Commissioner earlier this year. FIBO could solve this problem.

Finally, it was suggested that the Council respond to and NSF−OFR “Dear Colleague” letter that was published in May 2013 asking for concept papers in support of, Financial Research and Analysis and Management (CIFRAM). The
Council submitted a paper in July, “Combining Four Ontologies to aggregate Instance data in support of, Financial Research and Analysis and Management (CIFRAM)”. The figure below depicts this concept.

**Figure Combining Four Ontologies to Aggregate Instance Data**

![Combining Four Ontologies](image)

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**Sessions Summary**

FIBO is a model. Mankind has built models for thousands of years. Their purpose has always been the same – to improve our understanding of our world. With this understanding comes the ability to manage at least certain parts of our world. That is, it should be possible to manage those domains constructed by people.

Prior to this workshop, the organizers postulated five technology challenges which later became four:

1. Operational Ontologies
2. Semantic Rules
3. Visualization
4. Scalability

For four hours each, many of the brightest minds in the semantic web discipline contemplated the way forward in each of these technology areas as has been presented in the above sections.

Common themes emerged across the four areas. These themes are consistent with the principles of ontologies:

FIBO is a model of the financial industry. This model is built with certain primitive constructs familiar and agreed to by principles working in the industry – it is people readable. Within this model are the rules under which this industry operates. With these rules it is possible to find the answer to any question about the state of the industry or any participant in the industry – it is machine readable. These answers must be displayed in a form familiar to the person or to the machine asking the question. There should be no limit to the size of the model. The model must dynamically configure itself without breaking the rules by which it is constructed. The ultimate goal of the model is that it is executable. Because it is executable, it can automate operations within the industry in a way that is consistent with governing laws, regulations and policies. The model is the infrastructure of the industry.

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**Footnotes**

[71] Footnotes

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The Obama industry has the goal of 1 Million electric vehicles by 2015. Firm goals and firm dates could be set for Risk Data Aggregation, as an example in the Finance Industry.

http://www.ibiblio.org/hhalpin/homep.../html/airedux/

Stanford Center for Biomedical Informatics Research

Texas A&M Ontological Semantic Technology Laboratory

Rensselaer Institute for Data Exploration and Applications (IDEA)

http://ncor.us

Demystifying Financial Services Semantics Conference: March 13, 2012

http://www.ijswis.org/IJSWIS.pdf


http://ontolog.cim3.net/cgi-bin/wiki.pl?LeoObrst, and others. Most researchers have the cost for data integration at >>$200,000/data store.

MPHASIS (HP) presentation material


https://wiki.umiacs.umd.edu/clip/ngf...SF-NextGen.pdf

Amazon has more than 12,000 publications that appear from a search of Books -- “Semantic Web”. Thirty of these publications are preorders from August 2013 to April 2014. Clearly, there is intense and growing interest and many opinions of the meaning of meaning.


An approach to conceptual ontology integration with an ontology ...

From a Conceptual Ontology to the TELOS Operational System ...


Title 12: Banks and Banking PART 203—HOME MORTGAGE DISCLOSURE (REGULATION C)

Title 12: Banks and Banking PART 206—LIMITATIONS ON INTERBANK LIABILITIES (REGULATION F)
David Newman in many presentations of proof of concept Operational Ontology using Allegrograph and Gruff from Franz, Inc.

Dennis E. Wisnosky EDM Council.
Appendix A FIBO Technology Summit Hypothesis and Technology Areas

FIBO Technology Summit
Concept outline
HYPOTHESIS

1. FIBO is in a Unique Position

a. FIBO represents ontology of the contract within the financial industry. This common language is an essential requisite for regulatory oversight as well as efficient operational management within financial institutions. FIBO is unique and relevant.

b. We are standing at the intersection of two critical use cases: one for classification of financial concepts based on basic elements and how they legally relate to one another; the other for inference-based processing combining the common language of the contract with structured business rules/axioms to foster relationships and perform complex analytics. This represents a high visibility and important use case combination.

c. FIBO has been constructed as an open source project based on collaboration among a large and diverse group of professionals. FIBO could be viewed as one of the largest collaborative development projects within either the financial industry or among the semantics community. This is a model that can be leveraged for the future.

d. FIBO is at a relatively advanced stage. The EDM Council, OMG, financial institutions and semantic technology companies have invested multiple person-years in its development. The financial community has embraced the importance of the activity and is devoting resources to ensure that FIBO accurately reflects their business reality. The semantic community and OMG are coalescing around this mechanism as an important demonstration of semantic viability. This activity is well beyond the conceptual stage but is not yet complete.

2. FIBO is at an Important Juncture

a. FIBO Foundations and FIBO-Business Entities represent the first of a suite of standards for expressing the contractual basis of the financial industry. The first set of standards is scheduled to be released September 2013. The timing is ideal.

b. We are standing at the precipice of a number of technical implementation issues … the migration from modified UML to RDF/OWL … the conversion from business conceptual to operational ontologies … the development of a standard methodology for developing, extending and integrating FIBO into production environments … visual design of ontologies … visual representations of semantic queries, … ability to scale semantic systems to reflect the massive quantities of data flowing across the global financial ecosystem … ability to converge semantic processing with predictive analytics in order to better monitor emerging institutional and systemic financial risks … the practical application of the OMG time/date standard … and the techniques for semantic alignment (shared semantics) across domains.

3. The Maturity of FIBO has Significant Implications
a. The development of a common contractual language for the financial industry holds great potential in support of financial stability analysis. It is an essential pre-requisite for complex analysis and it represents an important step forward for the financial industry as well as the global regulatory community.

b. The application of semantic technologies (inference-based processing) to the complex analytical challenges of systemic risk represents a milestone for the regulatory community (and the public at large). Without this capability, it is hard to imagine how those responsible for financial stability will accomplish their objective.

c. The collective activities around FIBO present a unique opportunity for the semantic technology, regulatory, financial industry and academic communities to align on a common objective.

THE FIBO TECHNOLOGY SUMMIT

1. The current FIBO ecosystem includes traditional solution providers (IBM, Oracle, Teradata, etc.), niche semantic players (Revelytx, Franz, Cambridge Semantics, Thematix, Adaptive, Yarc Data, FirstRain, etc.), financial institutions, market authorities and regulators. The traditional solution providers lack the incentive to disrupt their existing business models in order to realize the full potential of semantics. The niche players lack the resources to invest in the future of uncertain business opportunities. Financial institutions, market authorities and regulators are unfamiliar with and adverse to what they see as risk in adopting ontologies and semantic processing. A change in this dynamic is necessary in order for both FIBO and semantic technology to escape from their restrictive “zones of proximal development.”

2. Our proposal is to invite the leading minds in the semantic and ontology communities to come together and work collaboratively (using FIBO as the mechanism) to realize the promise of combining both the “ontology of the contract” and semantic technology toward a higher purpose. As part of the experience we will provide exposure to all known technical deficiencies to the collective technology leadership for their consideration. The FIBO Technical Summit can be a vital mechanism to bring these diverse resources together toward a common objective – and (in the process) help the practice of knowledge management take a giant step forward.

Technical Issues/Challenges for FIBO Summit

The Enterprise Data Management Council (EDMC) has been developing the Financial Industry Business Ontology (FIBO) for several years with Communities of Interests (CoI) self chosen from its members. FIBO Business Entity (FIBO BE) and FIBO Foundation will be published in 2013 as Object Management Group (OMG) standards along with at least one referenced Operational Ontology. As a result of these efforts, the business need and the potential of FIBO is generally understood. As the basic science and underlying tooling has evolved, it has also become clear that there is a critical need for significant advances for FIBO to be developed and utilized at the scale required in the Financial Industry in at least the five critical areas outlined below.

6. There is a need for a mechanism for the generation of Operational Ontologies from Business Conceptual Ontologies. A business Conceptual Ontology is an annotated high level graph that shows and logically links all legal entities, processes, instruments, etc. in the Financial Industry. It is like a roadmap of the industry. It is intended for this Conceptual Ontology to be readable and understood by executives working in the industry. He or she should be able to easily see his or her role in their business and how their business is connected to other roles and businesses. From the FIBO Conceptual Ontology it must be possible to generate W3C standard RDF/OWL data stores. These data stores are the seeds of industry best practice Operational Ontologies. These Ontologies must be people readable, machine readable and executable. Currently the process of building, verifying and converting the relevant parts of the Conceptual Ontology to an Operational Ontology is essentially manual and arduous. The process is not scalable to the needs of the industry. There is a need for software to substantially automate this process.

7. There is a need for a mechanism for generation of business rules/axioms for analytics (i.e. how to convert regulatory requirements into rule statements). Regulations are often written in language that can have several interpretations. The effect of regulations on the Industry and on the Regulators themselves is often not known for years. A regulation described as Ontology has a clear and unambiguous meaning. However, this process is manual and dependent on the individuals with knowledge of the both law, and the Semantic Web. We must find an efficient way to turn regulations
into W3C compliant OWL through the Rules Interchange Framework (RIF). There are many approaches as to how to do this. If we could start from scratch, regulations would be written in a Controlled Natural Language (CNL) and then a CNL machine would generate the ontology of the regulations. This should be the long-term goal. The near-term goal is to use a computer to parse regulations, and then hand the results to the regulation writers and ask them if the computers says what they meant to say in the regulation. There is a need for software that incrementally moves the Government and the Industry toward a clear and unambiguous understanding of regulations.

8. There is a need to be able to demonstrate the business value of FIBO and of the content of the data discoverable through both the FIBO Conceptual Ontology and the various FIBO Operational Ontologies as they evolve. This includes:

   a. Representation of ontologies to non-technical users (to enable their participation in the development process)
   b. Presentation of ontologies to business audiences in forms, symbols and terms typical of the Industry
   c. Presentation of the data contained within Ontologies such as:
      i. Spreadsheet representation
      ii. Graphic representation as business facing diagrams
      iii. Use of Open Source Business Intelligence Engines

There is a need for Semantic Web software that is friendly to non-technical users and also adheres to W3C and OMG technical standards.

9. There is a need to be able to automatically convert a picture into an Ontology. This picture may be of a concept, a question, or a statement such as a rule.

   a. Visual design of ontologies including network graphs
   b. Visualization of the results of SPARQL queries
   c. Rigorous representation of business rules (e.g. using “R”)

Semantic Web technologies have evolved from mathematics and logic. To this extent Ontologies are the natural providence of engineers and scientists. There is a need for software that converts pictures into Ontologies sufficiently rigorous to support reasoning.

10. There is a need to be able to link FIBO in all of its aspects to other Ontologies from other industries and disciplines that may not seem to be related to FIBO. That is, there is a need for Shared Semantics at the massive scale of the financial system. This includes:

    a. Ability to link to external ontologies and extend FIBO as concepts are developed
    b. Mechanism to share ontologies and integrate controlled vocabularies
    c. Automated insertion of code (automated enhancements)
    d. Ability to converge predictive algorithms with semantically processed data
    e. Leveraging semantics and graph patterns with analytics (tools)

Software to build ontologies, test the mathematical correctness of ontologies such as the OntOlogy Pitfall Scanner, known as OOPS, massively scale semantic platforms and maintain the ontologies (FIBOs) is a universal problem that must have at least a v1.0 solution.

Appendix B Sample Letter of Invitation

I am writing to you to extend a personal invitation to participate in an exclusive event being held in conjunction with this year’s Semantic Technology & Business Conference (SemTechBiz) in San Francisco. The details of this event are outlined in the attachment.

Perhaps you are aware that the Enterprise Data Management Council (EDMC) started several years ago to develop a Financial Industry Business Ontology (FIBO). The majority of the Western world’s financial institutions, and many of their
suppliers are members of the Council. Beginning with the challenge of Sarbanes–Oxley, Basel III, and reinforced by the Dodd–Frank Act, it has become clear to the technical community in these organizations that relying on methods of the last century to comply with new requirements is simply cost prohibitive. In fact, American Banker says that the cost to comply is between US$150–US$350M/per year/per organization – with no added value.

FIBO is well on its way to changing this. By the end of this year, OMG will publish two of many FIBO standards that will serve as the beginning of a common vocabulary for the banks and for the regulators.

But, more must be done faster. SemanticWeb.com (Media–Bistro) has generously offered to share their venue for SemTechBiz 2013 with the EDMC for a no cost to the invitees to the FIBO Technology Summit. This event will be the afternoon of 4 June and the morning of 5 June in the San Francisco Hilton where the Conference is being held.

If you choose to attend SemTechBiz, you must register and pay the fee. But, the FIBO Technology Workshop will cost you nothing but work. You and a select number of other notables in this field are being asked to look at these five FIBO needs below and detailed in the attachment. Pick out the 2 of them that interest you the most.

11. There is a need for a mechanism for the generation of Operational Ontologies from Business Conceptual Ontologies.

12. There is a need for a mechanism for generation of business rules/axioms for analytics (i.e. how to convert regulatory requirements into rule statements).

13. There is a need to be able to demonstrate the business value of FIBO and of the content of the data discoverable through both the FIBO Conceptual Ontology and the various FIBO Operational Ontologies as they evolve.

14. There is a need to be able to automatically convert a picture into an Ontology. This picture may be of a concept, a question, or a statement such as a rule.

15. There is a need to be able to link FIBO in all of its aspects to other Ontologies from other industries and disciplines that may not seem to be related to FIBO. That is, there is a need for Shared Semantics at the massive scale of the financial system.

At the event, on the 4th, after an introduction to FIBO and a charge to the assembled, teams will be formed in these areas to go off and to consider: 1) Where does technology exist that could be immediately applied? 2) What developments are ‘just around the corner’ that FIBO could use? 3) What are the true longer term research needs? Each team will be asked to report their findings in detail on the 5th. We are expecting words and a roadmap that the Council can use as a true research agenda – focused on FIBO, but useful to the Semantic Technology community at large.

Please consider this event and these areas. Then go to https://www.eiseverywhere.com/semte...egoryid=496939.

There you can register for the FIBOTechnologyWorkshop. You will see a drop down that opens up the link to this invitee only FIBO Technology Summit which is free to you. You can indicate in which technology area you would like to participate and you can also register for the entire symposium. Hope to see you there.

Appendix C Michael Atkin Charge to the Assembly

1. I am the chair of the Data and Technology Committee and charged with helping the OFR define the pathway forward from a data perspective. And they understand the importance of data comparability. They understand that without data standards (i.e. identifiers, language of the financial contract and classification) – they won’t be able to provide oversight over the unruly financial industry. I sit on the Financial Stability Board’s Public Sector Advisory Group helping to implement a legal entity identification standard. So you need to fix this data problem. The second is that the banks have to implement an aligned data infrastructure. This includes identifiers, metadata, naming conventions and harmonized data definitions. This is the infrastructure mandate for data management. All around the financial industry from the
financial institutions themselves to the regulators that oversee them to the data vendors that serve them — the objectives of transparency, financial stability and cross-asset market surveillance are tailor made for the promise of precise language, based in contractual reality, combined with executable business rules, integrated with other taxonomies, aligned with messaging and managed via inference processing. We don’t really understand data as meaning. We don’t really understand that this is not a data processing or IT problem. We don’t have aligned data glossaries across business units. At the moment, data management is on the agenda of every financial institution. It covers all known financial instruments. It covers business entities and the roles they play in financial processes. The semantic community.

2. FIBO Technology Summit – Opening Remarks Michael Atkin, Managing Director, EDM Council June 4, 2013

3. I spent the majority of my professional life as the scribe, analyst, advocate, facilitator and therapist for the information industry. I started with the traditional publishers and then moved on to my engagement in the financial information industry. I watched the business of information evolve through lots of IT revolutions … from microfiche to Boolean search to CD-ROM to videotext to client server architecture to the Internet and beyond.

4. At the baseline of everything was the concept of data tagging -- as the key to search, retrieval and data value. I saw the evolution from SGML (which gave rise to the database industry). I witnessed the separation of content from form with the development of HTML. And now we are standing at the forefront of capturing meaning with formal ontologies and using inference-- based processing to perform complex analysis.

5. I have been both a witness to (and an organizer of) the information industry for the better part of 30 years. It is my clear opinion that this development – and by that I mean the tagging of meaning and semantic processing is the most important development I have witnessed. It is about the representation of knowledge. It is about complex analytical processing. It is about the science of meaning. It is about the next phase of innovation for the information industry.

6. Let me see if I can put all of this into perspective for you. Because my goal is to enlist you into our journey. I know (with absolute certainty) that we are standing at a breakthrough moment and I’m fortunate enough to have a front row seat in many of these discussions. Some of you may know that I run the EDM Council and have been preaching the gospel and advising financial institutions around the world on the data mandate for many years – and now they care. And they care at the top of the house. And they care enough to deal with the huge task of changing how their organizations operate. And they care enough to usher in a whole new infrastructure across their organizations and across the world. This is truly a big deal.

7. I am a member of the US Treasury’s Financial Research Advisory Committee. This is the mechanism created by the new Office of Financial Research to implement data standards and conduct research about systemic risk. I am the chair of the Data and Technology Committee and charged with helping the OFR define the pathway forward from a data perspective. And they understand the importance of data comparability. They understand that without data standards (i.e. identifiers, language of the financial contract and classification) – they won’t be able to provide oversight over the unruly financial industry. And they are starting to understand the importance of semantic processing as the pathway through the analytical minefield of interconnected global risk.

8. I am a member of the Technical Advisory Committee of the Commodity Futures Trading Commission. They are sitting in the midst of a data wildfire – and they know it. They need to facilitate transparency in the derivatives market. They need to understand how these bespoke contracts actually work. They need to standardize product identification. They need to classify these instruments so they can be aggregated and linked. They need to align data meaning with messaging standards. They need to validate and normalize data across exchanges and across geography. And they need to support complex analytics based on ad-hoc scenarios and on-demand – when threats to financial stability begin to emerge. It’s the penultimate use case for both ontologies (the language part) and inference processing (the technology part).

9. I sit on the Financial Stability Board’s Public Sector Advisory Group helping to implement a legal entity identification standard. This standard is only the first step. The real goal is for reporting about ownership structures, control relationships and intercompany linkages. And the light is beginning to shine – not just on the importance of the identifier,
but on the role of ontologies about ownership and control and in understanding the nature of (what David Newman describes as) transitive exposure. This is about understanding who finances whom, who owns whom, who guarantees whom, who is obligated to whom – what happens under what conditions and ultimately “do I get paid before you do” in the advent of another financial crisis. This (of course) is the focus of FIBO for business entities – the first standard that we are releasing in partnership with the OMG.

10. And this story continues. We are right now working with the Bank of England to align their liquidity reporting requirements to FIBO – so that there is clarity in reporting and an ability to do comparative analysis. We are right now working with some of the largest banks in the world to align their data repositories in order to do consistent aggregation - so that they can perform the range of stress tests now being mandated by the Federal Reserve. We are right now working with Fannie Mae and the housing regulators to align data … to integrate it into the MISMO XML messaging schema … and to help them unravel the dynamics of the mortgage–backed securities market.

11. But most importantly, we are right now gearing up to address the most important new objective within this wonderful new Age of Transparency. Earlier this year, the Basel Committee on Banking Supervision released a very important document – affectionately known as the Basel Risk Data Aggregation Principles (or Basel RDA).

This document is the result of an evolutionary process. The evolution began just after the 2008 crisis as the global market authorities started documenting what went wrong and what we need to fix as a result. In 2009 the SEC and CFTC jointly released a study specifying that the only way through the minefield of complexity was to specify these complex financial instruments based on the underlying facts that define them. And that the financial industry should partner with government and academia to implement this “algorithmic capability” (that’s the term they used). This is their important study known to DC policy wonks as Section 719(b) of the Dodd–Frank Act.

In 2010, the Senior Banking Supervisors Group (these are the heads of the world’s leading central banks) released a study that defined the concept of a “risk data appetite framework” and made the strong and intractable connection between risk management and data. The story went something like this … we regulators are entrusted with a bunch of new tasks (financial stability, transparency and all that). In order to accomplish these new tasks we need comparable data across your organizations and across the industry so we can feed them into our models and run our economic scenarios. Plus we regulators are not technically capable of doing the reconciliation – so the onus is on you (the banks) to deliver aligned data. Oh and by the way – if you can’t do this, we would be very worried about your internal ability to control over your own risk. So you need to fix this data problem.

This year, the Basel Committee released the RDA principles document. This document takes the SBSG recommendations up a few notches and mandates the implementation of this control environment. The 14 RDA principles say three things about data that give me hope and get me charged up. The first is that the ability to aggregate risk is mandatory and that executive management is responsible for making sure that happens. This is the governance mandate for data management. The second is that the banks have to implement an aligned data infrastructure. This includes identifiers, metadata, naming conventions and harmonized data definitions. This is the infrastructure mandate for data management. And the final part is that the banks must have the ability to aggregate risk across business units on demand and in response to ad–hoc economic scenarios. And while the financial institutions and the regulatory authorities don’t fully understand it yet – this is the semantics mandate for the financial industry.

12. And this, the … “they don’t know it yet” part … is the essence of the challenge that lies before us. All around the financial industry from the financial institutions themselves to the regulators that oversee them to the data vendors that serve them – the objectives of transparency, financial stability and cross–asset market surveillance are tailor made for the promise of precise language, based in contractual reality, combined with executable business rules, integrated with other taxonomies, aligned with messaging and managed via inference processing.

It is an outstanding use case for ontologies and for semantic triples. It is backed with the threat of regulatory mandates. It is designed to be implemented via standards. And it is combined with the necessary governance to ensure that we don’t ignore the problem due to concerns about business case or fall victim to the unfortunate “curse of the short view” that is so prevalent among large financial institutions.
13. And so, while we have the financial industry use case with all the regulatory trimmings – we don’t have complete awareness. We don’t really understand data as meaning. We don’t really understand that this is not a data processing or IT problem. We don’t have aligned data glossaries across business units. We don’t even know how to spell metadata – let alone utter the “o” world in polite company. We live a world of reconciliation. We’re used to reconciliation. We know how to deal with operational crisis on a tactical basis. We’ve been practicing that reality since the dawn of credit.

14. But I’m undaunted. In fact, I’m excited. Data management has risen like a phoenix, crawled out of the depths of the back office and is no longer considered as the ugly stepchild of IT. At the moment, data management is on the agenda of every financial institution. In fact, it is one of the top issues on the agenda of executive management within the financial industry.

15. It is also the hot topic of the day within the regulatory community. Regulators, market authorities and agencies around the industry are waking up to the fact that they cannot accomplish their new goals of unraveling the complexity of the global financial market without comparable data and without a shared view about the “things” in our world, the “facts” about these things and about how the “relationships” among these things work in reality.

16. But we are at the beginning of the journey, not the end. Awareness is essential. Global economic crisis and tough regulatory oversight was necessary to change the orientation of this industry. But awareness and drivers are not sufficient. We have work to do. And we don’t have a huge window of time in which to operate.

17. But we do have a good start. The EDM Council has been developing the ontology of the contract as a collaborative project under the leadership of Mike Bennett for the past 5 years. This is the Financial Industry Business Ontology (or FIBO). It exists. It covers all known financial instruments. It covers business entities and the roles they play in financial processes. It covers lots of the basic concepts of risk, transactions, corporate actions, issuance, guarantee and collateral. It plays nicely in the sandbox with other ontologies and with messaging taxonomies. And it’s governed by the technical rigor of the OMG standards process.

18. We do have a standard methodology for FIBO developed and implemented under the steady hand of Dennis Wisnosky and in partnership with the OMG architecture board under the tireless dedication of people like Elisa Kendall and Pete Rivette.

19. We do have a robust illustration of an operational ontology showing the intersection of interest rate swaps, credit default obligations and legal entity relationships under the direction of the remarkable David Newman from Wells Fargo and his OTC derivatives team. We do have a metadata repository and a means of extracting FIBO in RDF/OWL thanks to Adaptive. We do have good working relationships with other stakeholders including the messaging schemas, the SemTech community, the financial institutions and the regulatory agencies in the US, UK and Europe. So we’re in a fairly good place.

20. What we need to complete this picture however – is you. The semantic community. There are some real technical challenges that need to be solved – like the four that have been teed up for this Summit. We do have to be able to deliver on the promises that we are making. And the stakeholders are seriously listening to the promises – mainly because they have real tasks to accomplish and this is the right pathway forward.

21. What I fear however is fragmentation rather than harmonization. I see lots of activity – but not a sufficient mechanism for achieving alignment among the banks, the regulators, the semantic community, academia, the ontologists and the data vendors. That’s what we hope to see emerge out of this event – the mechanism for alignment – the process for collaboration – and the means to collectively step up to the challenge.

22. We are standing at that rare moment – the perfect storm (if you will) between business objectives, regulatory mandates and data as the fundamental pillar that links these things together. It’s been a long time coming and (as Rahm Emanuel once said) – “shame on us if we waste a good crisis.” Thank you.
Appendix D Participants

Jans Aasman CEO Franz Inc.
Elie Abi-Lahoud Research Fellow University College Cork, GRCTC
Dean Allemang Principal Consultant Working Ontologist, LLC
Mark Apsey Head of Operations, Americas Nomura
Michael Atkin Managing Director EDM Council
Michael Barnett SVP, Knowledge Engineering SmartCloud, Inc.
Bryan Bell Executive Vice President Expert System USA
Mike Bennett Head of Semantics and Standards EDM Council
Sanjiv Bhatt Vice President, Banking and Capital Markets Solutions
MphasiS Dmitry Bogachev Director, Investment Architecture Ontario Teachers Pension Plan
David Booth Senior Software Architect knowmed
Jefferson Braswell Founding Partner Tahoe Blue
Stephen Buxton Director of Product Management Marklogic
Andrea Dierna Acquisitions Editor Morgan Kaufmann, an imprint of Elsevier
Anthony Dobaj Partner Project Manager FacetApp LLC
Micah Dubinko Lead Semantics Engineer Marklogic
Daniel Elenius Senior Software Engineer SRI International
Lee Feigenbaum VP Marketing & Technology Cambridge Semantics
Reginald Ford Senior Principal Engineer SRI International
Douglas Foxvog Consultant Consultant
David Frankel Sole Proprietor David Frankel Consulting
Mark Gerken Chief Scientist, Strategic Initiatives Division Intellegent Software Solutions
Patrick Greenfield Compliance Consultant Wells Fargo Securities
Benjamin Grosof President Benjamin Grosof & Associates, LLC
Tim Harsch
Matthew Horridge Software Engineer Author of WebProtege
Igor Ikonnikov Information Architect Manulife Financial
Mark Johnson Senior Program Manager SRI International
Elisa Kendall Partner Thematix Partners LLC
Mohamed Keshk Sr Semantic Architect Semantic BPMN
Venkat Krishnamurthy Product Manager YarcData
Robert Kruse President FacetApp LLC
Corey Lanum General Manager -- North America Cambridge Intelligence
Orley Lindgren Co--Founder and Director Entropy Management Limited
Bob Mark Managing Partner Black Diamond Risk Enterprises
Sean Martin CTO & Co--founder Cambridge Semantics
David McComb President Semantic Arts
Deborah McGuinness Professor of Computer Science RPI
Wesley Moore Managing Director, Compliance Controls and Infrastructure Wells Fargo
Arka Murmerjee CEO Global IDs
Blair Myers
Kiran Narsu Global Head of Financial Services YarcData
David Newman Vice President, Strategic Planning Manager Enterprise Architecture Wells Fargo Bank
John O'Rourke Director of Professional Services Franz Inc.
Ravichandra Papolu Schwab
Rick Pavlik Director, Advanced Technology Programs Intellegent Software Solutions
Dennis Pierson Senior Architect Mphasis
Steven Ray Distinguished Research Fellow Carnegie Mellon Silicon Valley
Susanne Riehemann Software Development Engineer SRI International
Pete Rivett CTO Adaptive
Terry Roach Principal CAPSICUM Business Architects
Simon Robe Consultant Semantic Arts

https://semanticommunity.info/Data_Science/Data_Science_for_FIBO
Updated: Thu, 23 May 2019 01:32:49 GMT
Powered by mindtouch
Burt Smith Managing Partner Ampirix Consulting
Brian Stein Director PricewaterhouseCoopers
Bobbin Teegarden Earthlink
Mark Temple--Raston SVP -- Global Lead for Data Management Citigroup
Michael Uschold Senior Ontology Consultant Semantic Arts
Lonnie Van Zandt Chief Architect No Magic
Amanda Vizedom Ontology Developer and Architect Independent Consultant
Lowell Vizenor Semantic Technology Practice Lead Alion Science and Technology
Marcelle Von Wendland Vice-President Fincore Ltd
Richard Wallis Technology Evangelist OCLC
Mike Warner CEO Quantum4D
Craig Weber
Dennis Wisnosky Strategic Consultant EDM Council/Wizdom Systems
Peter Yim President & CEO CIM3