Logical Theory Describing a Business Report

An expository paper which explains the metamodel and logic of a business report

Resource for professional accountants, regulators, analysts, other business professionals, information technology professionals, and others who endeavor to implement standard business reporting using the Standard Business Report Model[1] (SBRM)

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For more information see:
http://xbrl.squarespace.com/journal/2019/1/11/method-of-implementing-a-standard-digital-financial-report-u.html

http://xbrlsite.azurewebsites.net/2019/Framework/FrameworkEntitiesSummary.html

[1] OMG, *Standard Business Report Model* (*SBRM) Wiki*, https://omgwiki.org/SBRM/doku.php

About the Authors

Charles Hoffman, CPA, is credited as being the Father of XBRL. He started his public accounting career as an auditor with Price Waterhouse, served various roles in industry and public accounting for over 25 years, and has worked with XBRL since its introduction by the AICPA in 1998. In 2006, he received the AICPA Special Recognition Award for his pioneering role in developing XBRL. He has authored numerous publications including *XBRL for Dummies*, a number of Journal of Accountancy articles, writes a blog relating to XBRL, and contributed to a number of XBRL related technical specification and best practices documents. Currently, Charlie works as a consultant helping accounting professionals leverage XBRL for everyday tasks and software vendors build useful software.

Charlie was co-editor of the first US GAAP taxonomy, creator of the first usable XBRL taxonomy creation utility application, contributor to the XBRL 2.1 specification and the XBRL Dimensions specification, editor of the Financial Reporting Taxonomy Architecture and Financial Reporting Instance Standards, co-author of the US GAAP Taxonomy Architecture, part of the project team which created the US GAAP Taxonomy, and a major contributor to the IFRS XBRL taxonomy, and a number of other XBRL taxonomies.

Raynier van Egmond is an IT professional with more than 25 years of ICT development and design expertise in financial and manufacturing industries and research. He has been involved in the XBRL community since its inception in 1999, and he's been an active participant in development of the XBRL standard. Raynier contributed to and coauthored several parts of the XBRL specification and best-practices definitions. He managed development and deployment of XBRL solutions worldwide for the private, public, and nonprofit sector and national governments. He was the architect of the final version of the Dutch government Netherlands 2008 taxonomy and consulted as technical manager for the project responsible for quality assurance and its deployment. Most recently he has defined the Medical Protocol Markup Language using XBRL to support a proof of concept application of XBRL in the Healthcare industry. Raynier is currently the CEO of XBRL Consulting Partners LLC.

1. Introduction

The purpose of this document is to propose and then prove that a business report can be explained and therefore defined using a set of logical rules. The semantics, dynamics, mechanics, structure, mathematics, and other logic of such business reports can therefore be implemented effectively within software applications.

The logic proposed in this document has been proven against thousands of XBRL-based financial reports that have been submitted and are publically available for testing via the U.S. Securities and Exchange Commission (SEC) EDGAR system. A financial report is a specialization of the more general business report.

A general purpose financial report is a high-fidelity, high-resolution, high-quality information exchange mechanism. That mechanism has historically used the media of "paper". Over the past 50 years or so, that paper-based mechanism has given way to a new mechanism, "e-paper". By "e-paper" we mean PDF documents, HTML documents, Word documents and such. XBRL is a new media, a new mechanism for creating a general purpose financial report. XBRL is a high-fidelity, high-resolution information exchange media that allows for the creation of high-quality financial reports in machine-readable form that is also readable by humans. Since a financial report is a type of business report; understanding business reports benefits from the thorough analysis of a financial report.

A theory is a tool for understanding, explaining, and making predictions about a given subject matter. A theory is consistent if its axioms and theorems will never contradict each other. Inconsistent theories cannot have any model, as the same statement cannot be true and false on the same system. But a consistent theory forms a conceptual model which one can use to understand or describe the system. A conceptual model or framework helps to make conceptual distinctions and organize ideas. A theory is used to explain these semantics and dynamics in clear, logically coherent, consistent, and unambiguous terms which helps one understand and discuss the system.

Per a theory; a formally defined logical system can be created that is:

- **Consistent** (no theorems of the system contradict one another)
- **Valid** (no false inference from a true premise is possible)
- **Complete** (if an assertion is true, then it can be proven; i.e. all theorems exists in the system)
- **Sound** (if any assertion is a theorem of the system; then the theorem is true)
- **Fully expressed** (if an important term exists in the real world; then the term can be represented within the system)

A stakeholder is anyone that has a vested interest in a logical system. Foundational to arriving at harmony between the stakeholders of a logical system is having a common conceptual framework or axioms, theorems, and world view for thinking about and discussing the system.

Principles help you think about something thoroughly and consistently. Overcoming disagreements between stakeholders and even within groups of stakeholders is important. Agreement between stakeholder groups and within stakeholder groups contributes to harmony. Lack of agreement contributes to dissonance. Principles help in this communications process.

This document is intended to be understood by business professionals and technical professionals and enable both groups to communicate with one another about this theory effectively.

To reiterate in more detail to be sure it is clear, this logical theory is about describing, controlling, and verifying the structural, mechanical, mathematical, and logical dynamics of a business report. Structure,

mechanics, mathematics, and logic are all objective in nature and relate to the business report itself and not what goes into the business report. What goes into a business report requires judgment and tends to be unique to the business domain using the report. This document relates to the business report model, not the different business domains that put things into the model.

1.1. Metaphors, Models, and Theories

Because most business professionals and software developers are not familiar with using "formal theories" it is worth explaining what a theory is. In his book, "*Models. Behaving. Badly.*", Emanual Derman explains the differences between metaphors, models, and theories.

- A **metaphor** describes something less understandable by relating it to something more understandable.
- A **model** is a specimen that exemplifies the ideal qualities of something. Models tend to simplify. There tend to always be gaps between models and reality. Models are analogies; they tend to describe one thing relative to something else. Models need a defense or an explanation.
- A **theory** describes absolutes. Theories are the real thing. A theory describes the object of its focus. A theory does not simplify. Theories are irreducible, the foundation on which new metaphors can be built. A successful theory can become a fact. A theory describes the world and tries to describe the principles by which the world operates. A theory can be right or wrong, but it is characteristic by its intent: the discovery of essence.

There are many different ways to describe systems[2]. This document uses the approach of defining a logical theory. Theories can be expressed logically, mathematically, symbolically, or in common language; but are generally expected to follow well understood principles of logic or rational thought. Business professionals, who need to understand this logical theory, tend to have an innate understanding of logic.

1.2. Logical Theories

A **theory** describes some aspect of the world and tries to describe the principles by which that aspect of the world operates. A theory can be right or wrong, but a theory is characterized by its intent: the discovery of essence. A theory does not simplify. A theory describes absolutes. A successful theory can become a fact. A theory is a tool for contemplating something with an intent to gain insight or understanding. A theory is a formal statement of rules about some subject that describes and otherwise explains the nature of that subject.

Logic is a set of principles that form a framework for correct reasoning. Logic is a process of deducing information correctly. Logic is about the correct methods that can be used to prove a statement is true or false. Logic tells us exactly what is meant. Logic allows systems to be proven.

Logic is the process of deducing information correctly; logic is not about deducing correct information. Understanding the distinction between correct logic and correct information is important because it is important to follow the consequences of an incorrect assumption. Ideally, we want both our logic to be correct and the facts we are applying the logic to, to be correct. But the point here is that correct logic and correct information are two different things. If our logic is correct, then anything we deduce from such information will also be correct.

[2] Dr. Leo Obrst, *The Ontology Spectrum and Semantic Models*, https://slideplayer.com/slide/697642/

In logic, a **statement** is a sentence that is either true or false. You can think of statements as pieces of information that are either correct or incorrect. And therefore, statements are pieces of information that you apply logic to in order to derive other pieces of information which are also statements.

A **logical theory** is a set of logical statements that formally describes some subject or system. **Axioms**[3] are statements that describe self-evident logical principles that no one would argue with. **Theorems**[4] are logical deductions which can be proven by constructing a chain of reasoning by applying axioms and the rules of logic in the form of IF…THEN statements. **World view** is any other important assumptions which are made that determine how some logical system operates.

A **rule**, or business rule or assertion, is a true statement with respect to some model of the real world that could possibly exist given some logical theory. You cannot create rules that are true in worlds that can never exist. A rule can be a mathematical expression. A rule is a type of logical statement.

The ***Financial Report Semantics and Dynamics Theory***[5] is a logical theory that explains how the mechanical aspects of a financial report work. The *Method of Implementing a Standard Digital Financial Report Using the XBRL Syntax*[6] is an approach to creating XBRL-based reports consistent with the *Financial Report Semantics and Dynamics Theory*.

This *Logical Theory Describing a Business Report* leverages all of this past work related to the special financial reporting to define the more general business report. Implementing this model using XBRL allows one to test the proposed model to determine if the logical theory is correct based on how these business reports actually work using the empirical evidence provided by these XBRL-based financial reports.

1.3. Ontology-like Things

A financial report is a logical system. An **ontology or ontology-like thing** is a model that specifies a rich and *flexible* description of the *important relevant*

- **terms** (terminology, concepts, nomenclature);
- **relations** (relationships among and between concepts and individuals); and
- **assertions**: (axioms, theorems, sentences distinguishing concepts, refining definitions and relationships including constraints, restrictions, regular expressions); and
- **world view**: (reasoning assumptions, identity assumptions)

relevant to a particular domain or area of interest, which generally allows for some certain specific variability, and as consciously unambiguously and as completely as is necessary and practical in order to achieve a specific goal or objective or a range of goals/objectives. It enables the stakeholders of a community to agree on important common terms for capturing meaning or representing a shared understanding of and knowledge in some domain where flexibility/variability is necessary.

And so, the reason for creating an "ontology-like thing" is to make the meaning of a set of terms, relations, and assertions explicit, so that both humans and machines can have a common understanding of what those terms, relations, and assertions mean. "Instances" or "sets of facts" (a.k.a. individuals) can then be evaluated as being consistent with or inconsistent with some defined ontology-like thing

[3] Wikipedia, *Axiom*, https://en.wikipedia.org/wiki/Axiom

[4] Wikipedia, *Theorem*, https://en.wikipedia.org/wiki/Theorem

[5] Charles Hoffman, CPA and Rene van Egmond, *Financial Report Semantics and Dynamics Theory*, http://xbrl.squarespace.com/fin-report-sem-dyn-theory/

[6] Charles Hoffman, CPA and Rene van Egmond, *Method of Implementing a Standard Digital Financial Report Using the XBRL Syntax*, http://xbrlsite.azurewebsites.net/2019/Library/MethodForImplementingStandardFinancialReportUsingXBRL.pdf

created by that community. The level of accuracy, precision, fidelity, and resolution expressively encoded within some ontology-like thing depends on the application or applications being created that leverage that ontology-like thing.

An **ontological commitment** is an agreement by a community to use some ontology-like thing in a manner that is consistent with the theory of how some domain operates, represented by that ontology-like thing. **The commitment is made in order to achieve some specific goal or goals established by the community sharing the ontology-like thing**.

Ultimately, the information represented in an ontology-like thing must be represented in machine-readable form.

1.4. Agnostic as to technical syntax

Syntax can be thought of as "how you say something". Semantics can be thought of as "the meaning or logic behind what you said".

XBRL is one of many different technical syntax which can be used to express a business report digitally in machine-readable form. Technical syntaxes come and go and are influenced by fads, trends, arbitrary preferences, politics, and standards. While XBRL is used to verify this logical theory because of the public availability of XBRL-based public company financial reports; this logical theory is and should be agnostic as to technical syntax.

As such, a representation of information in a business report and the meaning conveyed by that information by a representation of that information in XBRL, a representation of a report in RDF+OWL+SHACL, a representation of a report using RDFa, a representation of a report using the JSON-LD, a representation of a business report in HTML or other human readable print-type format are each 100% equivalent in terms of meaning conveyed and the individual facts of such a report would be understood the same.

1.7. Power of machine-readable business rules

The Merriam-Webster dictionary defines anarchy as "a situation of confusion and wild behavior in which the people in a country, group, organization, etc., are not controlled by rules or laws." Business rules prevent information anarchy.

Business rules guide, control, suggest, or influence behavior. Business rules cause things to happen, prevent things from happening, or suggest that it might be a good idea if something did or did not happen. Business rules help shape judgment, help make decisions, help evaluate, help shape behavior, and help reach conclusions.

Business rules arise from the best practices of knowledgeable business professionals. A business rule is a rule that describes, defines, guides, controls, suggests, influences or otherwise constrains some aspect of knowledge or structure within some problem domain.

Don't make the mistake of thinking that business rules are completely inflexible and that you cannot break rules. Sure, maybe there are some rules that can never be broken. Maybe there are some rules that you can break. It helps to think of breaking rules as penalties in a football game. The point is that the guidance, control, suggestions, and influence offered by business rules is a choice of business professionals. The meaning of a business rule is separate from the level of enforcement someone might apply to the rule.

It is expected that machine-readable business rules can and will be created to enable software applications to enforce the axioms and theorems articulated by this theory.

1.8. Controlling variability

Financial reports are not forms. As such variability needs to be supported and controlled in this special type of business report. Other business reporting use cases might have similar or less variability.

XBRL was intentionally designed to handle the variability of financial reporting. A financial report is not a ridged form. Information reported might not be uniform. But that is not to say the information does not follow patterns and is arbitrary and random. For example, various intermediate concepts (subtotals) might be used to summarize basic concepts. XBRL offers flexibility where flexibility is necessary. XBRL allows for the controled reconfiguration of the model of a financial report within statutory and regulatory requirements.

Business report schemes might use more or might use less variability. But anywhere flexibility is allowed, that flexibility must be controlled.

1.9. Semantic spreadsheet

Everyone understands the conceptual model of an electronic spreadsheet even though they might not understand that they are even working with a conceptual model. The “workbooks”, “worksheets”, “rows”, “columns”, and “cells” that make up such an electronic spreadsheet.

But electronic spreadsheets are presentation oriented in nature. Workbooks, worksheets, rows, columns, and cells are presentation-oriented artifacts.

Business reports can be thought of in terms of more semantic oriented spreadsheets. Rather than presentation-oriented artifacts of today’s spreadsheets, a business report uses information-oriented artifacts such as “fact”, “characteristic”, “relation”, “rule”, etc. When you add to this the inherent nature of business information as being multidimensional it becomes apparent that a digital business report has the traits of what one could call a semantic spreadsheet. Imagine the dynamic nature of a pivot table. A business report is an information-based pivot table.

It is the utility of this vision which makes it worth trying to define a logical theory which describes a business report in such a manner that the vision can actually be implemented in software.

2. Axioms for the Theory

Axioms describe self-evident logical principles that no one would argue with. Axioms deal with primitives and fundamentals. This section summarizes self-evident principles relating to a business report in the form of true statements about business reports. While it might be arguable that business reporting can be practiced in a manner where these axioms are not adhered to; it likewise could be argued that most business reports do adhere to these axioms, or certainly could.

1.1. Reports communicate information.

A report is information published by a reporting entity at some point in time for some purpose. For example, a general-purpose financial report is a report. The following is the formal definition of a report.

Report[7]: A report is information published by a reporting entity at some point in time for some purpose.

1.2. Reports contain and communicate facts.

Reports communicate facts. A fact is a single, observable, reportable piece of information. Those facts have values. Those fact values might take the form of a number, textual information, or narrative/prose.

For example, the value "1000" or "verified" might be values of a fact which are communicated within a business report.

Numeric fact values have two additional traits in order to better understand the number. First, numeric fact values have **units**. For example, the units might be US dollars or barrels of oil. Second, numeric fact values indicate the **rounding** used. For example, a number could be rounded to the nearest millions or is it accurate to the cent.

The following is the proposed formal definition of the term "fact".

Fact[8]: A fact is reported. A fact defines a single, observable, reportable piece of information contained within a business report, or fact value, contextualized for unambiguous interpretation or analysis by one or more distinguishing characteristics (properties of the fact). A fact value is one property of a fact. Every fact has exactly one fact value.

1.3. Facts reported in a report have characteristics.

Facts have characteristics. Characteristics provide information that describe facts and allows for distinguishing one fact for another fact in a report.

For example, the number "1000" might have the characteristics of being the concept "Boxes of product A in the warehouse"; for the period ended "December 31, 2018"; for the business unit XYZ.

The following is the proposed formal definition of the term "characteristic".

[7] Report, http://xbrlsite.azurewebsites.net/2019/Framework/Details/Report.html
[8] Fact, http://xbrlsite.azurewebsites.net/2019/Framework/Details/Fact.html

Characteristic[9]: A characteristic describes a fact (a characteristic is a property of a fact). A characteristic or distinguishing aspect provides information necessary to describe a fact or distinguish one fact from another fact. A fact may have one or many distinguishing characteristics.

Synonyms for characteristic include “aspect” and “dimension”.

1.4. Fact sets are sets of facts within a report which tend to go together.

A **fact set** is a set of facts which go together (tend to be cohesive and share a certain common nature) for some specific purpose within a report.

Fact set[10]: A fact set is a set of facts which go together (tend to be cohesive and share a certain common nature) for some specific purpose within a report. Synonyms for fact set includes “block”.

1.5. Reports have fragments.

A full report can be broken down into report fragments of the full report. A fragment is a set of facts sets.

For example, a “list of products” is a fragment of a business report and is made up of a specific set of facts.

The following is the proposed formal definition of the term “fragment”.

Fragment[11]: A fragment is a set of one to many fact sets which go together some specific purpose within a report.

1.6. Facts reported within reports are organized into fragments.

While business reports communicate facts, those facts never exist on their own; they are always organized into fragments. Facts are not organized into fragments; rather they are organized with other facts generally for some specific purpose and the fragment is a result. A fragment could be made up of only one fact.

For example, the fact “planes that have landed today” might exist in the airport activity summary information fragment. It might also exist within another different fragment. It might also be organized as a separate fragment which contains only the single fact.

Facts are organized into fact sets; fact sets are organized into fragments.

1.7. Common characteristics of business facts exist.

Some common characteristics that describe business facts include:

- Reporting entity (which entity issued the reported facts; for example, Microsoft or Google, a department, a person, etc.).
- Calendar period (to which period of time does the fact relate)

[9] Aspect, http://xbrlsite.azurewebsites.net/2019/Framework/Details/Aspect.html
[10] Fact Set, http://xbrlsite.azurewebsites.net/2019/Framework/Details/FactSet.html
[11] Fragment, http://xbrlsite.azurewebsites.net/2019/Framework/Details/Fragment.html

- Concept (what business concept describes the reported fact; for example, "airplanes which have landed")
- Report date (what is the date on which the report was issued which contains the reported information)
- Reporting scenario (what is the scenario of the reported fact; for example, "actual" or "projected")

Not all business facts have all of these characteristics, but these are common characteristics. Other characteristics exist; the list is simply to provide an example of common characteristics. Not all reporting entities which report business information use these precise terms, however they use some term which basically means in essence what is outlined on the list above.

1.8. Facts may have comments.

Facts may have comments which provide additional descriptive information about the fact. Comments may take the form of footnotes, meaning an additional piece of information printed at the bottom of a page of a business report.

The following is the proposed formal definition of the term "comment".

Comment[12]: A comment provides additional descriptive information about a fact. Synonyms for comment include "parenthetical explanation" and "footnote".

1.9. Characteristics of a fact may be related.

Characteristics which describe a business fact can be related. A relation is how one thing in a business report is or can be related to some other thing in a business report. These relations are often called business rules. There are three primary types of relations which are:

- **Whole-part**: something composed exactly of their parts and nothing else; the sum of the parts is equal to the whole. For more information see: http://plato.stanford.edu/entries/mereology/
- **Is-a**: descriptive and differentiates one type or class of thing from some different type or class of thing; but the things do not add up to a whole.
- **Computational business rule**: Other types of computational business rules can exist such as "Beginning balance + Changes = Ending Balance" (roll forward) or "Originally stated balance + Adjustments = Restated balance".

Whole-part relations can be specialized into more specific variants. The following is a summary of subclasses of whole-part types of relations that may, or may not, be applicable to business reporting but are provided to help understand the notion of whole-part relations. Other subclasses of whole-part relations may exist which better serve business reporting.

- **Component-integral object:** Indicates that a component contains some integral object. For example, the component handle is part of the integral object cup; wheels are a component part of a car; a refrigerator is a component of a kitchen.
- **Member-collection**: Indicates that some member is part of some collection. For example, a ship is part of a fleet. Or, a subsidiary is part of an economic entity.
- **Portion-mass:** Indicates that some portion is part of some mass. For example, a slice is part of a pie.

[12] Parenthetical Explanation, http://xbrlsite.azurewebsites.net/2019/Framework/Details/ParentheticalExplanation.html

- **Stuff-object:** Indicates that some "stuff" is part of some object. For example, steel is part of a car.
- **Feature-activity:** Indicates that some feature is part of some activity. For example, the feature "paying" is part of the activity "shopping".
- **Place-area:** Indicates that some physical place is part of some area. For example, the place "Everglades" is part of the area "Florida".

Further, the following general statements are true about things:

- Everything is part of some whole.
- Every whole thing is the fusion of its proper parts.
- Whole things are disjointed from other whole things.

Another way to look at this is to consider the notion of sets as defined by set theory. A set is simply a collection of distinct objects. Is-a or type relations describe distinct sets. Whole-part relations explain the type of aggregation, if any, for the members of the set.

1.10. Facts may be stocks or flows.

Facts may be either stocks or flows.

- **Stock**[13]: A fact as of a point in time. For example, the current number of producing oil wells as of some point in time is a stock.
- **Flow**[14]: A fact that represents a change between two points in time or for a period of time. For example, the number of new producing oil wells during some period of time is a flow.

1.11. Facts may be related.

Business report facts may, or may not, be related. The sections below articulate the spectrum of possibilities. Related facts within a business report are called **fact sets**.

For example, the parts “Producing oil wells” and “Nonproducing oil wells” are related to the whole “Total producing and nonproducing oil wells” and the sum of the parts adds up to the whole.

1.1.1. Facts can relate to one another mathematically.

Business facts can relate to other business facts mathematically. For example,

- **Roll up**[15]: Fact A + Fact B + Fact C = Fact D (a total)
- **Roll forward**[16]: Beginning balance (stock) + changes (flow) = Ending balance (stock)
- **Variance**: Amount (actual scenario) – Amount (projected scenario) = variance
- **Adjustment**: Originally stated balance + adjustments = restated balance
- **Complex computation**: Total oil produced / Number of wells = Total production per well

1.1.2. Facts can have an arbitrary non-mathematical relation to another fact.

Facts can have an arbitrary non-mathematical relation to other facts. For example; production oil wells, type of oil produced, and production manager of oil well are arbitrary facts that are related to one

[13] Stock, http://xbrlsite.azurewebsites.net/2019/Framework/Details/Stock.html
[14] Flow, http://xbrlsite.azurewebsites.net/2019/Framework/Details/Flow.html
[15] Roll Up, http://xbrlsite.azurewebsites.net/2019/Framework/Details/RollUp.html
[16] Roll Forward, http://xbrlsite.azurewebsites.net/2019/Framework/Details/RollForward.html

another in that they all relate to oil wells but the relationship is not mathematical. Facts with these arbitrary non-mathematical relations are still fact sets.

1.1.3. Facts may not relate to any other reported fact.

Facts need not have a relation to any other business facts; they are unrelated. As such, a fact set can have only one member. But all facts must exist within some fact set.

1.12. Reports may have core facts that are related to other core facts that are universal to all reporting entities.

While not all business reports have all facts in common, and different categories of reporting entities can have more or less in common, there are some core relationships which may be universal to all reporting entities. These facts can be thought of as "key stones" or "corner stones" facts which hold a business report together or provide somewhat of a "skeleton" for a business report.

That said, not every reporting entity has exactly the same key stone relations; rather, reporting entities can be grouped into categories.

The importance of these key stone facts and relations is that they form a foundation for a continuity, consistency, and comparability framework. The presence of this category of facts might provide us with information about the specific types of fragments that are reported and the relations between fragments that must hold true if they are reported.

1.13. Reports have a flow.

A report has a flow, or an ordering or sequencing of the fragments which make up the report.

Reporting entities creating reports have flexibility as to this flow.

The flow of a report can impact meaning in some cases, less so or not at all in other cases.

1.14. Reports, fragments, facts, characteristics, comments, and relations have specific known properties.

Each of these primitives or fundamental parts of a business report have properties. For example, a report fragment might have a name or other such properties.

The following is the proposed formal definition of the term "property".

Property: A property is a trait, quality, feature, attribute, or peculiarity which is used to define its possessor and is therefore dependent on the possessor. A property belongs to something. For example, the color of a ball belongs to and is therefore is dependent on (it is a property of) the ball.

1.15. Concepts reported within a report can be grouped into useful sets or classes.

The sets or classes or types of concepts have four important properties:

- Concept is required to be reported.
- Concept may redefine or replace.
- New concept may be created for the class.

- New subclasses may be created for concept within the class.

1.16. Concepts and classes of concepts are related to other concepts or classes of concepts in specific, identifiable ways.

Concepts can be related to other concepts in very specific ways. One way to understand the general ways concepts might be related is to leverage what is known about other schemes used to represent relations between concepts.

The following is a summary of the specific ways a class of concepts can be related to some other class of concepts using general functionality provided by OWL 2 DL. The OWL 2 DL functionality has been created consistently with another approach to representing relations between information such as UML.

- **Element-class**: Define a class. Equivalent to owl:Class, rdfs:Class and rdfs:type. The element A is a defined to be class B.
- **Class-subClassOf**: Explain that one class is a subclass of another class. Equivalent to rdfs:subClassOf. Class A is a specialization of Class P. Ability to organize classes into a hierarchy of general-special terms. Similar to SKOS notion of broader terms versus narrower terms.
- **Class-equivalentClass**: Explain that one class is exactly equivalent to another class. Equivalent to owl:equivalentClass. Class A and class B have the exact same members.
- **Class-sameAs**: Explain that one class is exactly equivalent to another class. Equivalent to owl:sameAs. Class A and class B are the exact same real-world thing.
- **Class-differentFrom**: Explain that one class is different from some other class. Equivalent to owl:differentFrom. Class A and class B are the NOT the same real-world thing.
- **Class-disjointWith**: Set theory notion of disjoint. Equivalent to owl:disjointWith. Things belonging to one class A cannot also belong to some other class B.
- **Class-complementOf**: Set theory notion of complement. Equivalent to owl:complementOf. Things that are members of one class A are all the things that do not belong to the other class B.
- **Class-inverseOf**: Set theory notion of inverse. Equivalent to owl:inverseOf. A relationship of type X between A and B implies a relationship of type Y between B and A.
- **Class-unionOf**: Set theory notion of union. Equivalent to owl:unionOf. The members of set C include all the members of set A and all the members of set B.
- **Class-intersectionOf**: Set theory notion of intersection. Equivalent to owl:intersectionOf. The members of set C include all the members of set A that are also members of set B.

Note that the type of relations above are very low level and can be used in combination to represent many different types of relationships. It is not the case that business professionals would ever be exposed to this low-level. Rather, they will likely work with higher-level relationships which are composites of the above low-level parts.

1.17. Facts can be reported at different levels of granularity.

Facts reported within some report fragment can be reported at different levels of granularity. **Grain**[17] is the level of depth of information or granularity.

[17] Grain, http://xbrlsite.azurewebsites.net/2019/Framework/Details/Grain.html

1.18. Concept arrangement pattern is the organization of concepts within a fact set of a report.

As stated, concepts can be related mathematically or non-mathematically and can have sets of one. These relationship patterns can be organized into groups which are referred to as concept arrangement patterns[18].

- **Set**[19]: Facts are related non-mathematically.
- **Roll up**: Fact A + Fact B + Fact C = Fact D (a total)
- **Roll forward**: Beginning balance (stock) + changes (flow) = Ending balance (stock)
- **Variance**: Amount (actual scenario) – Amount (projected scenario) = variance
- **Adjustment**: Originally stated balance + adjustments = restated balance
- **Complex computation**: Total oil produced / Number of wells = Total production per well
- **Text block**: A single fact is reported so that there are no relations.

1.19. A block is defined as the set of facts of a fragment that are part of the same concept arrangement pattern.

Recall that a fragment is defined as a part of a full report. Every fragment can be broken down into exactly one or many blocks. Therefore, a fragment is made up of some set of one or more blocks.

A **block** is a set of facts which exist within the same report fragment and share the same concept arrangement pattern. A block is a fact set.

The following is the proposed formal definition of the term “block”.

Block: A block is part of a report fragment, a fact set, which shares the same concept arrangement pattern. Synonyms for block include “fact set”.

1.20. An exemplar is an example of a speific report fragment which exists in some other report.

An **exemplar**[20] is defined as an example of some specific report fragment which exists within some business report.

1.21. A template is an example of a specific report fragment which is provided to begin the process of creating that specific report fragment.

A **template**[21] is defined a representation of a specific report fragment which is used in the process of creating a business report.

[18] Concept Arrangement Pattern, http://xbrlsite.azurewebsites.net/2019/Framework/Details/ConceptArrangementPattern.html
[19] Set, http://xbrlsite.azurewebsites.net/2019/Framework/Details/Set.html
[20] Exemplar, http://xbrlsite.azurewebsites.net/2019/Framework/Details/Exemplar.html
[21] Template, http://xbrlsite.azurewebsites.net/2019/Framework/Details/Template.html

1.22. A slot is a location within a block where it makes logical sense to add information to the block.

A **slot** is simply the idea of an allotted place where something can be logically and sensibly placed in the block. Consider the block below which represents the fragment of a business report which represents the specific fragment which is a roll up within the business report.

Property, Plant and Equipment, by Component [Line Items]	Period [Axis]	
	2010-12-31	2009-12-31
Property, Plant and Equipment, by Component [Roll Up]		
Land	1,000,000	1,000,000
Machinery and equipment, gross	2,000,000	2,000,000
Furniture and fixtures, gross	6,000,000	6,000,000
Accumulated depreciation	(1,000,000)	(1,000,000)
Property, plant and equipment, net	8,000,000	8,000,000

It makes no logical sense to add a second grand total to the block above which is a roll up. A roll up has only one total. You cannot add a second total to a roll up as a roll up has only one total. It would not make logical sense to add a second total to a roll up. It does make sense to add an entirely new period characteristic to the roll up. A slot simply distinguishes where information can and where information cannot be added to a block using the rules of logic and information articulated by this theory.

1.23. Rules guide, control, sugget, or influence behavior.

Business rules represent a relation within a business report.

The Merriam-Webster dictionary defines anarchy as “a situation of confusion and wild behavior in which the people in a country, group, organization, etc., are not controlled by rules or laws.” Business rules are intended to prevent information anarchy.

Business rules[22] guide, control, suggest, or influence behavior. Business rules cause things to happen, prevent things from happening, or suggest that it might be a good idea if something did or did not happen. Business rules help shape judgment, help make decisions, help evaluate, help shape behavior, and help reach conclusions.

Business rules arise from the best practices of knowledgeable business professionals. A business rule is a rule that describes, defines, guides, controls, suggests, influences or otherwise constrains some aspect of knowledge or structure within some problem domain.

Don't make the mistake of thinking that business rules are completely inflexible and that you cannot break rules. Sure, maybe there are some rules that can never be broken. Maybe there are some rules that you can break. It helps to think of breaking rules as penalties in a football game. The point is that the guidance, control, suggestions, and influence offered by business rules is a choice of business professionals. The meaning of a business rule is separate from the level of enforcement someone might apply to the rule.

[22] Rule, http://xbrlsite.azurewebsites.net/2019/Framework/Details/Rule.html

Business rules can exist in human-readable and machine-readable form. Assertion is a synonym for business rule.

1.24. Fact sets are descrbied by an information model description.

Fact sets are described by an information model definition.

A human readable rendering can be created by leveraging the fact set, the information model description, business rules, and common reporting practices.

1.25. An information model description is made up of report elements.

An information model definition is made up of report elements[23]. The categories or types of report elements include:

- Network
- Table (hypercube)
- Axis (Dimension)
- Member
- Line Items
- Concepts
- Abstracts

Each category of report elements is related to other categories of report elements in specific ways.

[23] Report Element, http://xbrlsite.azurewebsites.net/2019/Framework/Details/ReportElement.html

3. Theorems as deduced from the axioms

Theorems are deductions which can be proven by constructing a chain of reasoning by applying axioms in the form of IF…THEN statements. This section summarizes deductions derived from the axioms in the preceding section in the form of true statements which relate to financial reports.

1.1. Facts of a report should be uniquely identifiable.

If a report is made up of facts then report facts should be uniquely identifiable in order to differentiate facts so that such facts can be effectively queried.

Facts of a report should be uniquely identifiable. No two report facts are exactly the same (i.e. there are no duplicate facts).

1.2. Fragments of a report should be uniquely identifiable.

If a report is made up of fragments then report fragments should be uniquely identifiable in order to differentiate fragments such that individual fragments can be queried.

Fragments of a report should be uniquely identifiable. No two business report fragments are exactly the same (i.e. there are no duplicate fragments). Reporting duplicate fragments is akin to reporting duplicate facts.

1.3. Blocks of a report should be uniquely identifiable.

If a report is made up of fragments and fragments are made up of blocks; then report blocks should be uniquely identifiable in order to differentiate blocks.

Blocks of a report should be uniquely identifiable. No two report blocks are exactly the same (i.e. there are no duplicate blocks).

4. Ethics or worldview of business reporting

Ethics is the worldview of a business report. While axioms are irrefutable facts which form a foundation, which describes a business report and theorems build on those axioms by deduction and therefore both axioms and theorems are objective; the ethics or worldview which describes a business report can be more subjective. Observation, experience, introspection, and intuition determine the worldview; not tightly reasoned arguments. This section summarizes the worldview, or ethics, of a business report.

1.1. A report makes the closed world assumption.

There are two perspectives which can be adopted when evaluating information in some knowledgebase: *open world assumption* and *closed world assumption*. In the open world assumption, a statement cannot be assumed true on the basis of a failure to prove the statement. On a World Wide Web scale this is a useful assumption; however, a consequence of this is that an inability to reach a conclusion (i.e. not decidable). In the closed world assumption, the opposite stance is taken: a statement is true when its negation cannot be proven; a consequence of this is that it is always decidable. In other applications this is the most appropriate approach. So, each application can choose

to make the open world assumption or the closed world assumption based on its needs. Relational database applications tend to use the closed world assumption.

A business reports makes the closed world assumption.

1.2. Reports are a true and fair representation of the reporting entities information.

The objective of a report is to provide a true and fair representation of the reporting entity which issued the report.

- **Reliability** is about getting consistent results each time an activity is repeated.
- **Accuracy** is about identifying the correct target. Accuracy relates to correctness in all details; conformity or correspondence to fact or given quality, condition; deviating within acceptable limits from a standard. Accuracy means with no loss of resolution or fidelity of what the sender wishes to communicate and no introduction of false knowledge or misinterpretation of communicated information.
- **Precision** is the closeness of repeated measurements to one another. Precision involves choosing the right equipment and using that equipment properly. Precise readings are not necessarily accurate. A faulty piece of equipment or incorrectly used equipment may give precise readings (all repeated values are close together) but inaccurate (not correct) results.
- **Fidelity** relates to the exactness or loyal adherence facts and details with which something is copied or reproduced. Fidelity relates to the faithful representation of the facts and circumstances represented within a financial report properly reflect, without distortion, reality. High fidelity is when the reproduction (a financial report) with little distortion, provides a result very similar to the original (reality of economic entity and environment in which economic entity operates).
- **Integrity** is the quality or condition of being whole or undivided; completeness, entireness, unbroken state, uncorrupt. Integrity means that not only is each piece of a financial report correct but all the pieces of the financial report fit together correctly, all things considered.
- **Resolution** relates to the amount of detail that you can see. The greater the resolution, the greater the clarity.
- **Completeness** relates to having all necessary or normal parts, components, elements, or steps; entire.
- **Correctness** relates to freedom from error; in accordance with fact or truth; right, proper. Consistency relates to being compatible or in agreement with itself or with some group; coherent, uniform, steady. Holding true in a group, compatible, not contradictory.
- **Consistency** relates to compatibility or how in agreement with itself or with some group; coherent, uniform, steady; holding true in a group, compatible rather than contradictory.

In their book *Blown to Bits*[24], Philip Evans and Thomas S. Wurster point out the new economics of information. In the past, you could have reach or richness, but typically not both at the same time. The internet completely changed this economic equation. **Reach** is access to information. **Richness** relates to quantity, timeliness, accuracy and variety (fidelity, resolution) of information. Word of mouth tends to be the richest information, but the reach can be lower. Books have excellent reach, but less richness. With XBRL you can have excellent reach and richness.

[24] Philip Evans and Thomas S. Wurster, *Blown to Bits*, https://www.amazon.com/Blown-Bits-Economics-Information-Transforms/dp/087584877X

1.3. Reports have traits which impact their quality.

The following list expresses the traits of a quality business report.

- **All business report formats convey the same meaning**: A business report can be articulated using paper and pencil, Microsoft Word, PDF, HTML, XBRL, RDF, JSON, JSON-LD, or other format. While the format may change, the message communicated, the story you tell, should not change. Each format should communicate the same message, regardless of the medium used to convey that message. Any representation in any form should be a faithful representation of the business information reported by the reporting entity.
- **Information fidelity and integrity**: A business report foots, cross casts, and otherwise "ticks and ties". A business report is internally consistent.
- **Justifiable/defensible report characteristics**: Facts reported and the characteristics which describe those reported facts should be both justifiable and defensible by an entity reporting such facts.
- **Logical representations indicated by understandable renderings**: Human readable renderings of facts; characteristics that describe facts; comments which further describe such facts; and other such representation structures should make sense and be both consistent with other similar representation structures. While there may be differences of opinion as to how to format or present such information; there should be significantly less or no dispute about the logic of a machine readable representation itself.
- **Unambiguous business meaning**: A business report should be unambiguous to an informed reader. The business meaning of a report should be clear to the creator of the report and likewise clear to the users of that report. Both the creator and users should walk away with the same message or story.

1.4. Reports may be expressed using different medium.

Reports may be expressed using different medium. For example,

- Paper and pencil, printed versions of electronic or digital, or photo static copies
- Electronic including HTML, PDF, word processor format, etc. Electronic business reports cannot be interpreted by machines such as computers.
- Digital including XBRL, within a database or within some software application. Digital business reports may be interpreted by machines such as computers but also by humans with the assistance of computer software which understands.
- The ISO standard Z Notation, the ISO/IEC standard Common Logic, the OMG standard Semantics of Business Vocabulary and Business Rules (SBVR), the W3C standard RDF/OWL 2 DL, SROIQ Description Logic, JSON, JSON-LD are all probable approaches to representing business report information.

The medium used to express a business report MUST NOT change the meaning of the report.

1.5. A conclusion must always be reachable as to the correctness or incorrectness of the mechanical aspects of a report.

Consider the following scenario:

> Two entities, A and B, each have some knowledge about the business information of their entities. They must communicate their knowledge about that business information to a third party who is making decisions which will make use of the combined business information of company A and B so as to draw some conclusions. All three parties are using a common set of basic logical principles (induction, deduction) so they should be able to communicate this information fully, so that any inferences which the third party draws from company A's input

should also be derivable by company A itself using basic logical principles and vice versa; and similarly for the third party and company B.

A notion critical to a digital business report is that of decidability. *Decidable* means that no interpretations that are not satisfied (unsatisfied or inconsistent) by at least one interpretation of the information in the knowledgebase exists. If a representation of information is not decidable then the represented information is ambiguous because you cannot determine if the information is inconsistent or simply unsatisfied which means that a conclusion cannot be reached.

If any ambiguity exists, a meaningful exchange of information between the creator of the information and the consumer of information has not occurred. For something like a business report a conclusion must be reachable as to the consistency of mechanics of reported information to expectations.

A critical distinction to understanding is the distinction between the *mechanical aspects* of a business report and the *subjective or judgmental aspects* of a business report. A conclusion about the correctness or incorrectness of the mechanical aspects in no way suggests or implies that a computer will ever be able to determine the overall appropriateness of a business report. Such determination involves judgment and is subjective in nature. The mechanics of a report are governed by the rules of logic alone. It is always the case that a determination can be made as to the correctness or incorrectness of the mechanics of a business report.

To be clear, decidability must only be reachable as to the mechanical correctness or incorrectness, the consistency, with the things and relations between things which make up the structure of a business report.

5. General ethics/worldview

A 19th century mathematician was once said to have quipped that solving a math problem was a question of "notions, not notations." What he meant was that the problem was not the syntax of the notations, the problem was the ideas people were using because there was a lack of clear, common understanding between parties related to the ideas.

Effective communication is important and using the same terminology and understanding ones perspective are key to effective communication. If we have a shared foundational logical model and a common methodology, we have the chance to automate the exchange and meaningful reuse of information, even across standards.

Agreed upon standard interpretations are critical to making a system work safely, reliably, predictably, and in a manner which can be repeated over and over without error. Philosophical or theoretical debates, trying to satisfy all arbitrary options, trying to meet every unimportant negligible situation, confusing what is objective and what is subjective, confusing policies with requirements and with choices only make something which could be sophisticated but simple into something which is complex, confusing, and can never be made to work.

Some people might believe that there is one absolute reality and that reality is their reality and that everything about their reality is important and they can compromise on nothing. Some people insist that everything involves judgment and that nothing is in any way subjective. But this is to miss the point.

The point being: a shared view of reality which is clearly interpretable and understood to achieve the purpose of meaningfully exchanging information so that time is reduced, costs are reduced, and information quality improves provides a benefit. The goal is to reach agreement so that the benefits can be realized.

The goal is to arrive at some equilibrium, to balance the duality, to recognize that there is no singular objective reality but in spite of that, **if we create a common enough shared reality to achieve some specific and agreed upon working purpose machines can be made to do useful work**.

To make reality of the business reporting domain appear to be objective and stable in certain specific and agreed upon ways in order to fulfil some higher purpose. The purpose is to enable a machine to read and interpret certain basic information such that manual human work can be effectively eliminated and that higher-level interpretations are then possible.

To get a distributed system to work, conscious cooperation and collaboration is necessary. It is with and through this cooperation and collaboration that the control mechanisms can be established. None of this happens by accident. It takes intension, conscious effort, discipline, rigor, skillful execution, resolve, and persistence. The result does not need to be complex; the system can be sophisticated and also simple and elegant.

1.1. Computers are dumb beasts.

Important to understanding how to get computers to do what you want is understanding how computers actually work. The strengths of computers and the obstacles that get in the way of using

computers were summarized well by Andrew D. Spear[25]; here is his list with some modifications made by me:

Fundamental strengths/capabilities of computers:

- **store** tremendous amounts of information reliably and efficiently
- **retrieve** tremendous amounts of information reliably and efficiently
- **process** stored information reliably and efficiently, mechanically repeating the same process over and over
- make information **instantly accessible** to individuals and more importantly other machine-based processes anywhere on the planet in real time

Major obstacles to harnessing the power of computers:

- **business professional idiosyncrasies**; different business professionals use different terminologies to refer to exactly the same thing
- **information technology idiosyncrasies**; information technology professionals use different technology options, techniques, and formats to encode and store exactly the same information
- **inconsistent domain understanding** of and technology's limitations in expressing interconnections within a domain of knowledge
- **computers are dumb beasts**; computers don't understand themselves, the programs they run, or the information that they work with

Keep in mind that the information business professionals are trying to store and make use of is becoming more complex than what they have been storing in relational databases or spreadsheets for the past 50 years. For example, a business report is complex information that is very difficult to store in a relational database and query across millions of such reports efficiently.

1.2. Best practices exist.

A best practice is a method or technique that has been generally accepted as superior to any other known alternatives because it produces results that are superior to those achieved by other means or because it has become a standard way of doing things.

Best practices exist and are preferable to approaches which provide an inferior result.

1.3. There is a difference between a fact, the interpretation of a fact, knowledge, and an opinion

There is a difference between a fact, the interpretation of a fact, knowledge, and an opinion. The following are informal descriptions of these terms to help understand the differences:

- **Fact**: a thing that is indisputably the case or situation
- **Interpretation**: the action of explaining the meaning of some fact or set of facts
- **Knowledge**: believe in some fact or facts which can be justified using evidence, justified true belief
- **Opinion**: a view or judgment formed about something, not necessarily based on fact or knowledge

When attorneys argue a case one of the first things they do is try and agree on the facts, the items about the case which are not in dispute. When an interpretation is agreed to by both attorneys, that interpretation becomes a fact. If both parties in a case agree on some set of facts it can be said that

[25] Andrew D. Spear in his document, Ontology for the Twenty First Century: An Introduction with Recommendations, page 4

both attorneys have knowledge of the facts, generally both parties agree when there is evidence which can be used to justify that knowledge. Everything else which cannot be agreed becomes an opinion which is then argued in the case. Evidence is provided but the parties don't agree on the evidence or they can dispute evidence with different interpretations of facts.

1.4. There is a difference between standard and arbitrary.

Sometimes it is a useful thing to create a shared reality to achieve a specific purpose: To arrive at a shared common enough view such that most of our working purposes, so that reality does appear to be objective and stable.

- **Standard**: used or accepted as normal; something established by authority, custom, convention, law, regulation, or general consent as a model or example
- **Arbitrary**: based on random choice or personal whim, rather than any reason or system; depending on individual discretion (as of a judge) and not fixed by law; not standard

Computers are dumb machines. Computers only appear smart when humans create standards and agree to do things in a similar manner in order to achieve some higher purpose.

1.5. There is a difference between an important nuance and an unimportant negligible distinction.

In the process of agreeing, it is important to understand the difference between what is important and what is unimportant:

- **Nuance**: a subtle difference in or shade of meaning, expression, or sound; a subtle distinction or variation
- **Subtle**: so delicate or precise as to be difficult to analyze or describe; hard to notice or see; not obvious
- **Negligible**: so small or unimportant as to be not worth considering; insignificant; so small or unimportant or of so little consequence as to warrant little or no attention

Nuances and subtle differences are important things that matter. Negligible things are unimportant and do not matter. The difference between what is a nuance or a subtle difference and what is negligible many times takes judgment.

1.6. There is a difference between objective and subjective.

There is a difference between something that is objective and something that is subjective.

- **Objective**: not influenced by personal feelings or opinions in considering and representing facts; based on facts rather than feelings or opinions: not influenced by feelings
- **Subjective**: based on or influenced by personal feelings, tastes, or opinions; based on feelings or opinions rather than facts; relating to the way a person experiences things in his or her own mind
- **Judgment**: the ability to make considered decisions or come to sensible conclusions; an opinion or decision that is based on careful thought

Again, computers are machines. Computers have no intelligence until they are instructed by humans. Computers only appear smart when humans create standards and agree to do things in a similar manner in order to achieve some higher purpose. It is easy to agree on things that tend to be objective. It is harder to agree where there is subjectivity. It is impossible to get a machine to exercise judgment. A machine such as a computer can only mimic what humans tell the machine to do via machine-readable information.

1.7. There is a difference between explicit and implicit.

In the process of agreeing, it is important to understand the difference between what is important and what is unimportant in the process of agreeing. It is likewise important to understand the difference between telling a machine something and requiring the machine to figure something out:

- **Explicit**: stated clearly and in detail, leaving no room for confusion or doubt; very clear and complete; leaving no doubt about the meaning
- **Implicit**: implied though not plainly expressed; understood though not clearly or directly stated
- **Ambiguous**: open to more than one interpretation; having a double meaning; able to be understood in more than one way; having more than one possible meaning; not expressed or understood clearly
- **Impute**: assign (a value) to something by inference from the value of the products or processes to which it contributes

Machines do well with information which is explicitly provided. When information is not explicitly provided, software developers either make a choice or have to figure out ways to allow a business professional making use of the software to make a choice. Every choice a business professional is required to make adds complexity to the system. Having too many choices makes a system difficult to use. "Flexibility" independently is neither a feature nor a bug. Flexibility is a feature when the business user needs the flexibility. Flexibility is a bug if it requires a choice the business professional does not need to be making.

Complexity can never be removed from a system. However, complexity can be moved; it can be absorbed by software and hidden from business professionals making use of software. It is easy to build something that is complex. It is harder and takes work to build something that is simple. Simple and simplistic are not the same thing. Simple and elegant is the ultimate form of sophistication.

1.8. There is a difference a requirement and a policy.

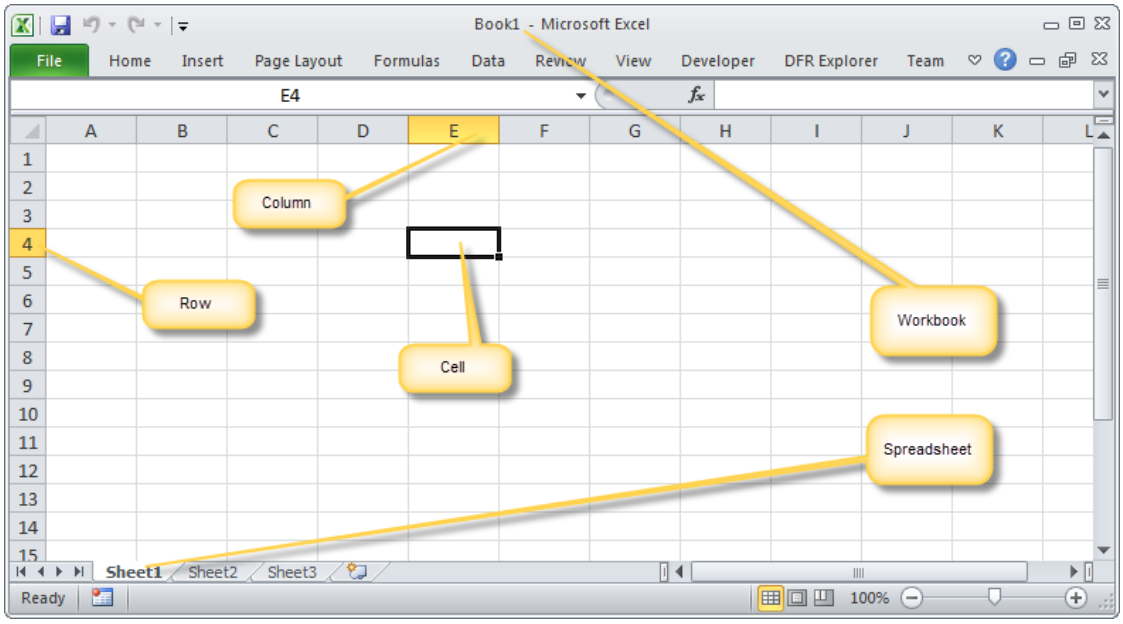
Sometimes things are required, other times things are a choice. Yet in other times setting some policy eliminates certain options which could have been previously considered.

- **Policy**: a course or principle of action adopted or proposed by a government, party, business, or individual; definite course or method of action selected from among alternatives and in light of given conditions to guide and determine present and future decisions
- **Requirement**: a thing that is needed or wanted; something that is essential or that must be done
- **Choice**: an act of selecting or making a decision when faced with two or more possibilities; the act of choosing: the act of picking or deciding between two or more possibilities
- **Option**: a thing that is or may be chosen; the opportunity or ability to choose something or to choose between two or more things

6. Conceptual Model Articulated by Logical Theory

The next section summarizes many of the axioms, theorems, and ethics in a narrative that summarizes the logical theory in a more readable form using basic examples. This section provides a narrative which helps business professionals and information technology professionals understand and discuss the conceptual model and logic of a business report. This narrative is intended to be as terse and precise as possible.

Business professionals are familiar with the notion of a conceptual model even though they might not realize it. An electronic spreadsheet, for example, has a conceptual model. An electronic spreadsheet has workbooks, spreadsheets, rows, columns, and cells. These terms are taken from the paper spreadsheets upon with the electronic spreadsheet is based. These terms are related to one another in specific know ways forming a model. Whether you use Microsoft Excel, Google Spreadsheets, Apple Pages, or other implementations of an electronic spreadsheet, each tends to follow the same spreadsheet meta-model.



This conceptual model can be leveraged by software engineers to create business report software which is as easy to use as current software for working with electronic spreadsheets.

Ipsum Lorem text is used in these examples[26]. A human readable version of a business report is provided with this example[27].

1.1. Business report semantics

A report communicates **facts**. Facts have values. Here are the values of two facts:

[26] You can download and use this example implemented using XBRL, http://xbrlsite.azurewebsites.net/2018/Prototypes/LoremIpsum/LoremIpsum-WithFiveLabelsNoErrors.zip

[27] Human readable example, http://xbrlsite.azurewebsites.net/2018/Prototypes/LoremIpsum/evidence-package/contents/index.html#Rendering-Fragment01-Implied.html

Fact Value
200
200

Facts reported in a report have characteristics. Here are two fact values and their **characteristic** "concept" and the values for each concept characteristic is "Nunc mattis aliquam" which describe the facts:

Concept	Fact Value
Nunc mattis aliquam	200
Nunc mattis aliquam	200

The facts can still not be distinguished from one another. Here are the same two facts now adding the period characteristic:

Period [Axis]	Concept	Fact Value
2018-12-31	Nunc mattis aliquam	200
2017-12-31	Nunc mattis aliquam	200

Here is a complete set of characteristics which describe two facts:

#	Reporting Entity [Axis]	Period [Axis]	Concept	Fact Value	Unit	Rounding
1	30810137d58f76b84afd (http://standards.iso.org/iso/17442)	2018-12-31	Nunc mattis aliquam	200	USD	INF
2	30810137d58f76b84afd (http://standards.iso.org/iso/17442)	2017-12-31	Nunc mattis aliquam	200	USD	INF

Reports have **fact sets**. Facts reported within reports are organized into fact sets. Here is a set of facts, or fact table, that go together to make up a fact set:

#	Reporting Entity [Axis]	Period [Axis]	Concept	Fact Value	Unit	Rounding
1	30810137d58f76b84afd (http://standards.iso.org/iso/17442)	2018-12-31	Nunc mattis aliquam	200	USD	INF
2	30810137d58f76b84afd (http://standards.iso.org/iso/17442)	2017-12-31	Nunc mattis aliquam	200	USD	INF
3	30810137d58f76b84afd (http://standards.iso.org/iso/17442)	2018-12-31	Est aliquet ante	200	USD	INF
4	30810137d58f76b84afd (http://standards.iso.org/iso/17442)	2017-12-31	Est aliquet ante	100	USD	INF
5	30810137d58f76b84afd (http://standards.iso.org/iso/17442)	2018-12-31	Etiam	1000	USD	INF
6	30810137d58f76b84afd (http://standards.iso.org/iso/17442)	2017-12-31	Etiam	1000	USD	INF
7	30810137d58f76b84afd (http://standards.iso.org/iso/17442)	2018-12-31	Eu eleifend augue	600	USD	INF
8	30810137d58f76b84afd (http://standards.iso.org/iso/17442)	2017-12-31	Eu eleifend augue	700	USD	INF

The organization of facts is described using a model **structure** (whole-part, is-a) and **business rules** (mathematical) **relations**:

#	Label	Report Element Class	Period Type	Balance	Name
1	**Fragment 11 [Table]**				(Implied)
2	*Etiam [Roll Up]*	[Abstract]			basic:EtiamRollUp
3	Eu eleifend augue	[Concept] Monetary	As Of		basic:EuEleifendAugue
4	Est aliquet ante	[Concept] Monetary	As Of		basic:EstAliquetAnte
5	Nunc mattis aliquam	[Concept] Monetary	As Of		basic:NuncMattisAliquam
6	Etiam	[Concept] Monetary	As Of		basic:Etiam

A set of facts, information model definition, and other commonly understood information about business reports can be used to generate a rendering of the information described by the facts, characteristics, for the fragment. For example, below is a static rendering of a fragment:

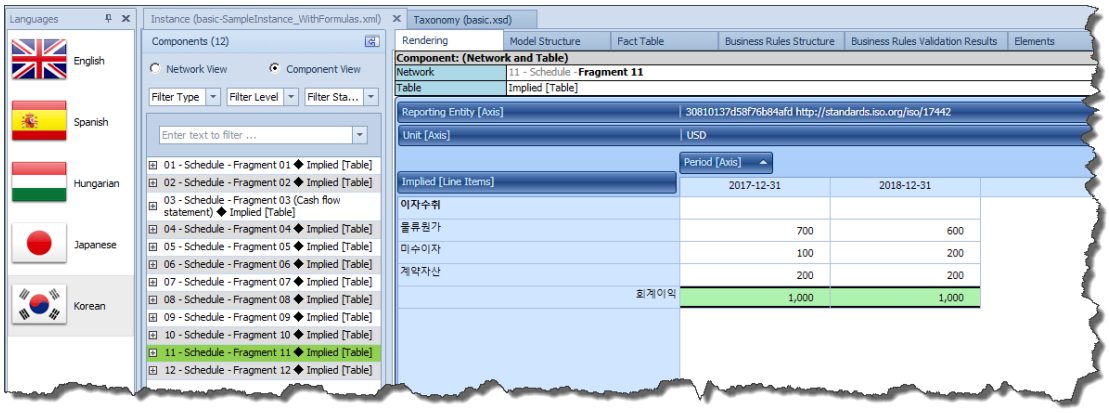
Etiam [Roll Up]	Period [Axis]	
	2018-12-31	2017-12-31
Etiam [Roll Up]		
Eu eleifend augue	600	700
Est aliquet ante	200	100
Nunc mattis aliquam	200	200
Etiam	1,000	1,000

But that rendering does not need to be static; the rendering could be something like a pivot table which is dynamic and can be reconfigured by the user of an application. For example, the user of this application prefers to see the periods descending LEFT to RIGHT as opposed to the static rendering above showing the periods RIGHT to LEFT and in ascending order.

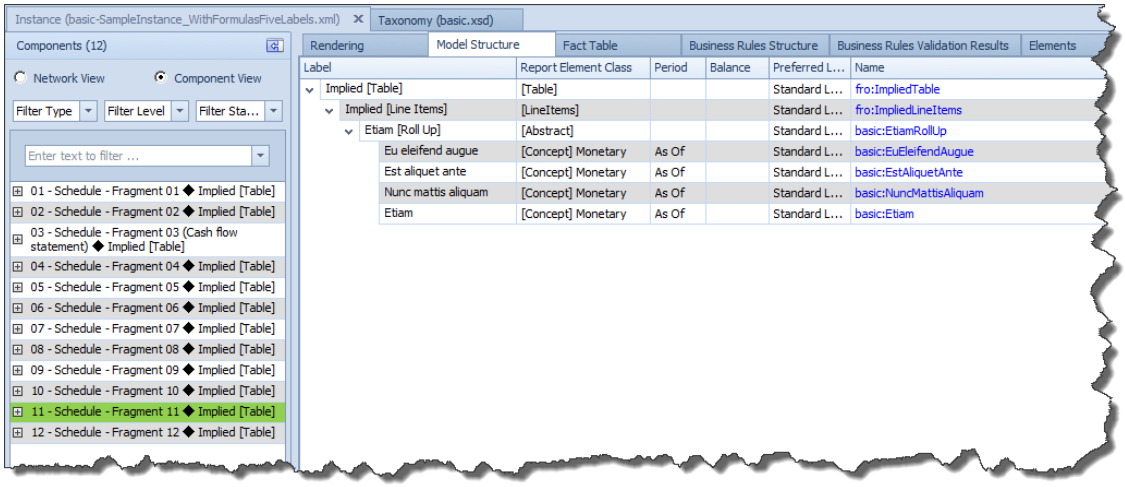
Component: (Network and Table)	
Network	11 - Schedule - **Fragment 11**
Table	Implied [Table]

Reporting Entity [Axis]	30810137d58f76b84afd http://standards.iso.org/iso/17442	
Unit [Axis]	USD	
	Period [Axis]	
Implied [Line Items]	2017-12-31	2018-12-31
Etiam [Roll Up]		
Eu eleifend augue	700	600
Est aliquet ante	100	200
Nunc mattis aliquam	200	200
Etiam	1.000	1.000

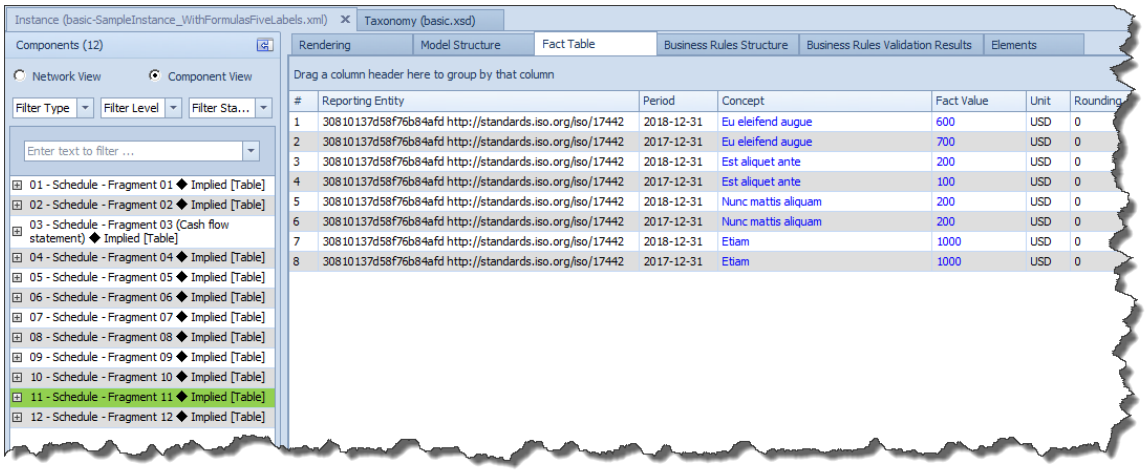
A report can contain many **fragments**. A fragment is a set of facts, or a **fact set**. Each fact set follows the same logical patterns. These logical patterns can be leveraged to create software which is approachable to business professionals and which information technology professionals can leverage to provide software features to software users. Below you see a rendering of one fact set within a set of 12 fact sets, information can be shown in five different languages:



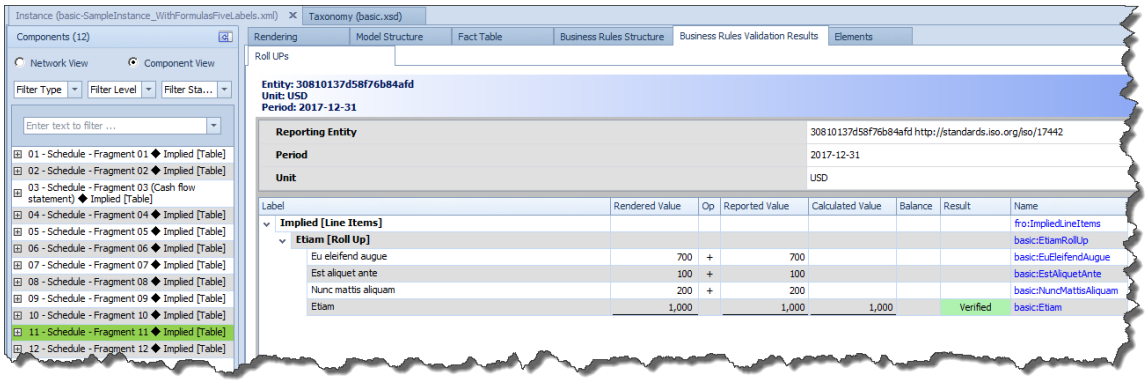
There are different views of each fact set. Seen above is a dynamic **rendering** of a fragment. Another view of a fragment is the **model structure** of the fragment which is shown below.



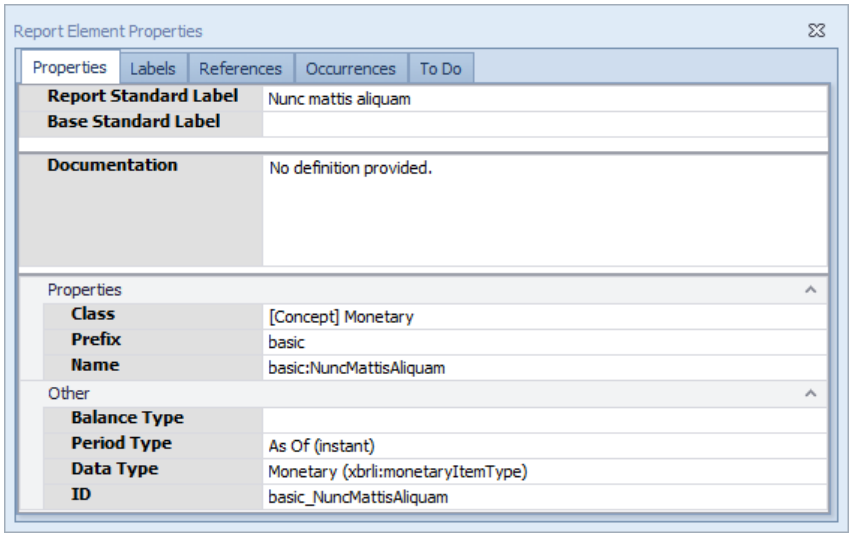
All of the facts of a fact set can be viewed in the form of the **fact table** which shows the set of facts which make up the fragment:



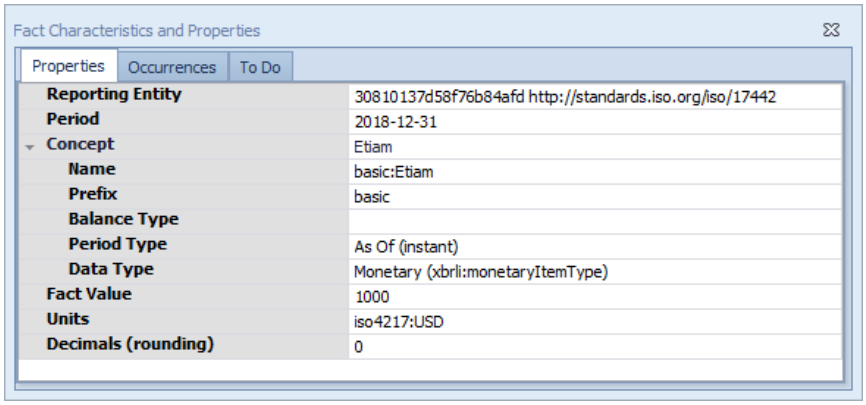
All **business rules** related to a fact set should be observable:



Information about the **properties** of each **report element** which makes up the model structure should be accessible to the user of the business report:



Information about the **properties** of each **fact** which is represented within the report should be accessible to the user of the business report:



A **template** is nothing more than a standalone example of some report fragment. An **exemplar** is just an example of some fragment that exists within some other report. Both templates and exemplars can be imported directly into a report to make representing a fragment of information easier.

Because their might be a large number of fact sets with which you might be working, **topics** are a handy way of organizing fact sets into a hierarchy.

1.2. Report is multidimensional.

A report is consistent with the multidimensional model[28]. In fact, the report multidimensional model has a lot in common with business intelligence (BI) multidimensional model. BI has other limitations including:

- OLAP tends to be read only, our model is read/write
- There is no global standard for OLAP, this would create a global standard
- Limited computation support, mainly roll ups
- Limited business rule support and inability to exchange business rules between implementations

[28] Oracle, *The Multidimensional Data Model*, https://docs.oracle.com/cd/B13789_01/olap.101/b10333/multimodel.htm

- Inability to transfer cubes between systems, each system is a "silo" which cannot communicate with other silos
- Inability to articulate metadata which can be shared between OLAP systems
- Focus on numeric-type information and inconsistent support for text data types
- OLAP systems tend to be internally focused within an organization and do not work well externally, for example across a supply chain
- Cube rigidity, technical professions tend to control the creation of cubes

BI terms tend to represent the technical artifacts that are used to represent real world business phenomenon. Our terms describe the business phenomenon themselves, not a technical implementation.

Further, BI dimensional model which is based on OLAP works slightly differently than our model which describes how the real world works. For example, in the real world there are numbers, text, and prose; but OLAP is focused on numbers. In the real world, financial reports provide totals and in OLAP; totals tend to be calculated rather than reported within BI data. Our model describes the real world. BI describes an implementation. Further, BI is non-standard so every implementation can use different terms and can act differently. BI software is not always interoperable across software implementations. Our multidimensional model is based on the XBRL Dimensions specification[29], a global standard.

The following is a reconciliation between our terms and BI terms:

Our Term	BI Term	Comments
Fact	Record or Row	BI is more focused numeric facts
Characteristic	Dimension	A dimension is a technical artifact used to describe a characteristic
Relation	Hierarchy	BI is limited to one type of relation, the hierarchy, which is a navigational path through information; information has many different types of relations
Grain	Grain	Same meaning
Fact Value	Measure	In BI measures are always numeric
Fact Table	Fact Table	In BI fact tables are not related to or intersect with other fact tables and total are computed not explicit; in our model intersections can exist and totals are explicit

1.3. Business report mechanics

Characteristics of a business fact may be related. Characteristics could be a

- Whole-part,
- Is-a,

Characteristics could have no relation to one another.

Business facts may be related. Types of mathematical relationships include a

- roll up (a + b + c = total),
- roll forward (beginning balance + changes = ending balance),
- adjustment (originally stated balance + adjustment = restated balance),

[29] XBRL Dimensions 1.0, http://www.xbrl.org/specification/dimensions/rec-2012-01-25/dimensions-rec-2006-09-18+corrected-errata-2012-01-25-clean.html

- variance (for example, actual – budgeted = variance),
- other more complex computations

Other types of relations may exist for non-numeric facts.

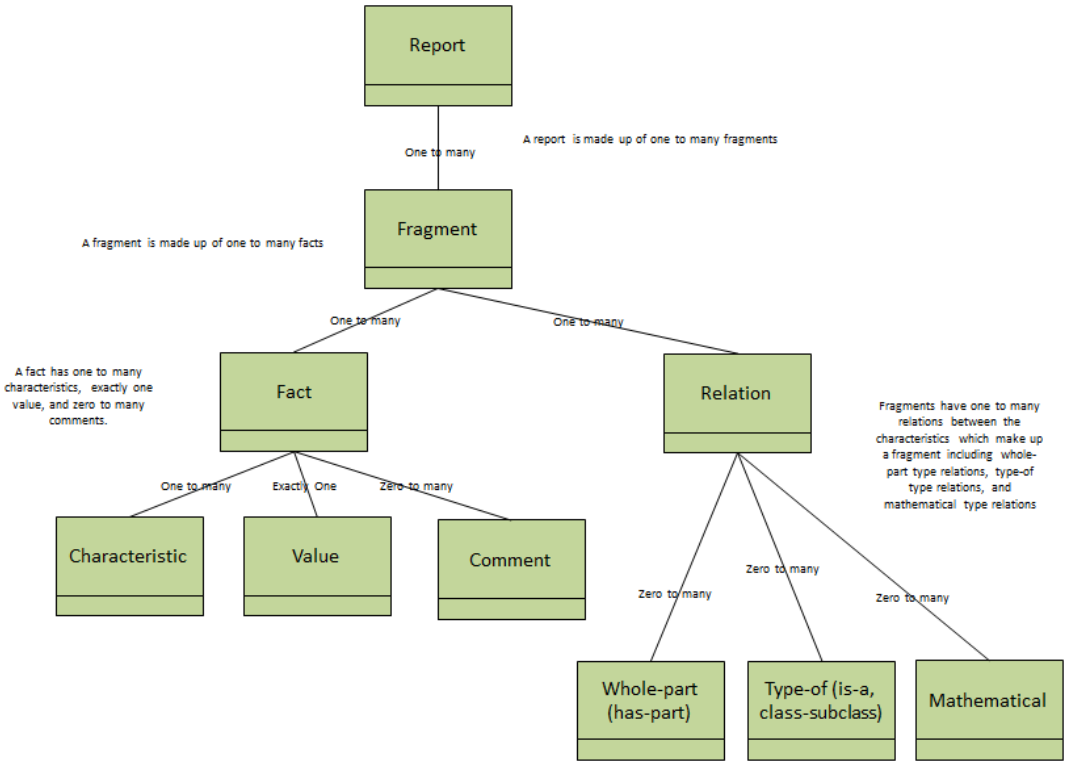
- set (or list, hierarchy, collection) is an arbitrary group of concepts,
- text block (or prose, narrative)

Business report facts have fidelity. Business reports have integrity.

Business reports have flow. Flow is an ordering or sequencing of fragments.

1.4. Pseudo UML

The following is pseudo-UML which articulates the relations between the entities that make up a business report and the relationships between those entities.



1.5. Report examples

Examples of reports can be provided by financial reporting.

A financial report is a complex type (specialization) of business report (generalization). The typical year end financial report contains several hundreds reported business facts organized into one to two hundred fragments. An analyzed set of 6,674 such reports contains approximately 500,000 fragments. Each fragment can be categrorized into concept arragment patterns such as roll up (16% of the total), roll forwards (5% of the total), sets or hierarchies (24% of the total), text blocks (54% of the total), and other concept arragnement patterns such as roll forward info (1% of the total).

The following provides 10 renderings provided by 10 difference software aplications of one fragment (the income statement) of one financial report for a reporting entity (Google). The income statement shows information for the years ended 2008, 2009, and 2010. (Be aware that some of the renderings show the years left to right; others show the years right to left.)

1.1.1. SEC HTML filing

Google Inc.
CONSOLIDATED STATEMENTS OF INCOME
(In millions, except per share amounts)

	Year Ended December 31,		
	2008	2009	2010
Revenues	$21,796	$23,651	$29,321
Costs and expenses:			
Cost of revenues (including stock-based compensation expense of $41, $47, $67)	8,622	8,844	10,417
Research and development (including stock-based compensation expense of $732, $725, $861)	2,793	2,843	3,762
Sales and marketing (including stock-based compensation expense of $206, $231, $261)	1,946	1,984	2,799
General and administrative (including stock-based compensation expense of $141, $161, $187)	1,803	1,668	1,962
Total costs and expenses	15,164	15,339	18,940
Income from operations	6,632	8,312	10,381
Impairment of equity investments	(1,095)	0	0
Interest and other income, net	316	69	415
Income before income taxes	5,853	8,381	10,796
Provision for income taxes	1,626	1,861	2,291
Net income	$ 4,227	$ 6,520	$ 8,505
Net income per share of Class A and Class B common stock:			
Basic	$ 13.46	$ 20.62	$ 26.69
Diluted	$ 13.31	$ 20.41	$ 26.31

1.1.2. SEC Interactive Data Viewer

CONSOLIDATED STATEMENTS OF INCOME (USD $) In Millions, except Per Share data	12 Months Ended		
	Dec. 31, 2010	Dec. 31, 2009	Dec. 31, 2008
Revenues	$ 29,321	$ 23,651	$ 21,796
Costs and expenses:			
Cost of revenues (including stock-based compensation expense of $41, $47, $67)	10,417	8,844	8,622
Research and development (including stock-based compensation expense of $732, $725, $861)	3,762	2,843	2,793
Sales and marketing (including stock-based compensation expense of $206, $231, $261)	2,799	1,984	1,946
General and administrative (including stock-based compensation expense of $141, $161, $187)	1,962	1,668	1,803
Total costs and expenses	18,940	15,339	15,164
Income from operations	10,381	8,312	6,632
Impairment of equity investments	0	0	(1,095)
Interest and other income, net	415	69	316
Income before income taxes	10,796	8,381	5,853
Provision for income taxes	2,291	1,861	1,626
Net income	$ 8,505	$ 6,520	$ 4,227
Net income per share of Class A and Class B common stock:			
Basic	$ 26.69	$ 20.62	$ 13.46
Diluted	$ 26.31	$ 20.41	$ 13.31

1.1.3. XBRL Viewer (Firefox add on)

105 - Statement - CONSOLIDATED STATEMENTS OF INCOME

IDENTIFIER: 0001288776 - HTTP://WWW.SEC.GOV/C

LEGAL ENTITY [AXIS]: ENTITY [DOMAIN]

(IN THOUSANDS)			DATE	12 MONTHS ENDED 2008-12-31	12 MONTHS ENDED 2009-12-31	12 MONTHS ENDED 2010-12-31
UNIT	ITEM	NOTES				
USD	REVENUES			21,796,000	23,651,000	29,321,000
	COST OF REVENUES (INCLUDING STOCK-BASED COMPENSATION EXPENSE OF $41, $47, $67)			8,622,000	8,844,000	10,417,000
	RESEARCH AND DEVELOPMENT (INCLUDING STOCK-BASED COMPENSATION EXPENSE OF $732, $725, $861)			2,793,000	2,843,000	3,762,000
	SALES AND MARKETING (INCLUDING STOCK-BASED COMPENSATION EXPENSE OF $206, $231, $261)			1,946,000	1,984,000	2,799,000
	GENERAL AND ADMINISTRATIVE (INCLUDING STOCK-BASED COMPENSATION EXPENSE OF $141, $161, $187)			1,803,000	1,668,000	1,962,000
	TOTAL COSTS AND EXPENSES			15,164,000	15,339,000	18,940,000
	INCOME FROM OPERATIONS			6,632,000	8,312,000	10,381,000
	IMPAIRMENT OF EQUITY INVESTMENTS			(1,095,000)	0	0
	INTEREST AND OTHER INCOME, NET			316,000	69,000	415,000
	INCOME BEFORE INCOME TAXES			5,853,000	8,381,000	10,796,000
	PROVISION FOR INCOME TAXES			1,626,000	1,861,000	2,291,000
	NET INCOME			4,227,000	6,520,000	8,505,000
USD/SHARES	BASIC			0.01346	0.02062	0.02669
	DILUTED			0.01331	0.02041	0.02631

1.1.4. XBRL Cloud Viewer

Reporting Entity [Axis]	0001288776 (http://www.sec.gov/CIK)		
Legal Entity [Axis]	Entity [Domain]		
	Period [Axis]		
Statement [Line Items]	2010-01-01 - 2010-12-31	2009-01-01 - 2009-12-31	2008-01-01 - 2008-12-31
Revenues	29,321,000,000	23,651,000,000	21,796,000,000
Costs and expenses:			
Cost of revenues (including stock-based compensation expense of $41, $47, $67)	10,417,000,000	8,844,000,000	8,622,000,000
Research and development (including stock-based compensation expense of $732, $725, $861)	3,762,000,000	2,843,000,000	2,793,000,000
Sales and marketing (including stock-based compensation expense of $206, $231, $261)	2,799,000,000	1,984,000,000	1,946,000,000
General and administrative (including stock-based compensation expense of $141, $161, $187)	1,962,000,000	1,668,000,000	1,803,000,000
Total costs and expenses	18,940,000,000	15,339,000,000	15,164,000,000
Income from operations	10,381,000,000	8,312,000,000	6,632,000,000
Impairment of equity investments	0	0	(1,095,000,000)
Interest and other income, net	415,000,000	69,000,000	316,000,000
Income before income taxes	10,796,000,000	8,381,000,000	5,853,000,000
Provision for income taxes	2,291,000,000	1,861,000,000	1,626,000,000
Net income	8,505,000,000	6,520,000,000	4,227,000,000
Net income per share of Class A and Class B common stock:			
Basic	26.69	20.62	13.46
Diluted	26.31	20.41	13.31

1.1.5. I-Metrix (Edgar Online)

	A	B	C	D
1	I-Metrix			
2	**Name**			
3	**Symbol**			
4	**Form**			
5	Period Dates	1/1/2010 - 12/31/2010	1/1/2009 - 12/31/2009	1/1/2008 - 12/31/2008
6	CONSOLIDATED STATEMENTS OF INCOME			
7	Revenues	$29,321,000,000	$23,651,000,000	$21,796,000,000
8	*Costs and expenses:*			
9	Cost of revenues (including stock-based compensation expense of $41, $47, $67)	$10,417,000,000	$8,844,000,000	$8,622,000,000
10	Research and development (including stock-based compensation expense of $732, $725, $861)	$3,762,000,000	$2,843,000,000	$2,793,000,000
11	Sales and marketing (including stock-based compensation expense of $206, $231, $261)	$2,799,000,000	$1,984,000,000	$1,946,000,000
12	General and administrative (including stock-based compensation expense of $141, $161, $187)	$1,962,000,000	$1,668,000,000	$1,803,000,000
13	Total costs and expenses	$18,940,000,000	$15,339,000,000	$15,164,000,000
14	Income from operations	$10,381,000,000	$8,312,000,000	$6,632,000,000
15	Impairment of equity investments	$0	$0	-$1,095,000,000
16	Interest and other income, net	$415,000,000	$69,000,000	$316,000,000
17	Income before income taxes	$10,796,000,000	$8,381,000,000	$5,853,000,000
18	Provision for income taxes	$2,291,000,000	$1,861,000,000	$1,626,000,000
19	Net income	$8,505,000,000	$6,520,000,000	$4,227,000,000
20	*Net income per share of Class A and Class B common stock:*			
21	Basic	$26.69	$20.62	$13.46
22	Diluted	$26.31	$20.41	$13.31

1.1.6. Magnify (CoreFiling)

105 - Statement - CONSOLIDATED STATEMENTS OF INCOME

	Year ended 31-Dec-2010	Year ended 31-Dec-2009	Year ended 31-Dec-2008
Income Statement [Abstract]			
Statement [Table]			
Statement [Line Items]			
Revenues	$29,321,000,000	$23,651,000,000	$21,796,000,000
Costs and expenses:			
Cost of revenues (including stock-based compensation expense of...	$10,417,000,000	$8,844,000,000	$8,622,000,000
Research and development (including stock-based compensation e...	$3,762,000,000	$2,843,000,000	$2,793,000,000
Sales and marketing (including stock-based compensation expense...	$2,799,000,000	$1,984,000,000	$1,946,000,000
General and administrative (including stock-based compensation ex...	$1,962,000,000	$1,668,000,000	$1,803,000,000
Total costs and expenses	$18,940,000,000	$15,339,000,000	$15,164,000,000
Income from operations	$10,381,000,000	$8,312,000,000	$6,632,000,000
Impairment of equity investments	$0	$0	$(1,095,000,000)
Interest and other income, net	$415,000,000	$69,000,000	$316,000,000
Income before income taxes	$10,796,000,000	$8,381,000,000	$5,853,000,000
Provision for income taxes	$2,291,000,000	$1,861,000,000	$1,626,000,000
Net income	$8,505,000,000	$6,520,000,000	$4,227,000,000
Net income per share of Class A and Class B common stock:			
Basic	$26.69	$20.62	$13.46
Diluted	$26.31	$20.41	$13.31

1.1.7. CalcBench

VIEW IN SPREADSHEET

CONSOLIDATED STATEMENTS OF INCOME - Annual →Switch to Quarterly View

EXPORT →Log in to post comments, and save data.

	Y 2010 (1/1 - 1/1/2011) <-Y	Y 2009 (1/1 - 1/1/2010) X <-Y | Y->	% chg YoY	Y 2008 (1/1 - 1/1/2009) X <-Y | Y->	% chg YoY
	Compare:More Recent Y Prev Y Compare To Company:	Compare:More Recent Y Prev Y Compare To Company:		Compare:More Recent Y Prev Y Compare To Company:	
Revenues	$29,321,000,000	$23,650,563,000	23.98%	$21,795,550,000	8.51%
Costs and expenses:					
Cost of revenues (including stock-based compensation expense of $41, $47, $67)	$10,417,000,000	$8,844,115,000	17.78%	$8,621,506,000	2.58%
Research and development (including stock-based compensation expense of $732, $725, $861)	$3,762,000,000	$2,843,027,000	32.32%	$2,793,192,000	1.78%
Sales and marketing (including stock-based compensation expense of $206, $231, $261)	$2,799,000,000	$1,983,941,000	41.08%	$1,946,244,000	1.94%
General and administrative (including stock-based compensation expense of $141, $161, $187)	$1,962,000,000	$1,667,294,000	17.68%	$1,802,639,000	(7.51%)
Total costs and expenses	$18,940,000,000	$15,338,377,000	23.48%	$15,163,581,000	1.15%
Income from operations	$10,381,000,000	$8,312,186,000	24.89%	$6,631,969,000	25.34%
Operating Margin %	*35.40%*	*35.15%*		*30.43%*	
Impairment of equity investments	$0	$0		$1,094,757,000	(100.00%)
Nonoperating Income (Expense)	$415,000,000	$69,000,000	501.45%	$316,000,000	(78.16%)
Income before income taxes	$10,796,000,000	$8,381,189,000	28.81%	$5,853,596,000	43.18%
Provision for income taxes	$2,291,000,000	$1,860,741,000	23.12%	$1,626,738,000	14.38%
Net income	$8,505,000,000	$6,520,448,000	30.44%	$4,226,858,000	54.26%
Net Income Margin %	*29.01%*	*27.57%*		*19.39%*	
Net income per share of Class A and Class B common stock:					
Basic	26.69	20.62	29.44%	13.46	53.19%
Diluted	26.31	20.41	28.91%	13.31	53.34%

1.1.8. SECXBRL.info

Component: (Network and Table)	
Network	105 - Statement - CONSOLIDATED STATEMENTS OF INCOME (http://www.google.com/taxonomy/role/StatementOfIncomeAlternative)
Table	Statement [Table]

Reporting Entity [Axis]	GOOGLE INC. (1288776)
Legal Entity [Axis]	Default Legal Entity [Member]
Archive [Axis]	0001193125-11-032930
Archive Fiscal Period Focus [Axis]	FY
Archive Fiscal Year Focus [Axis]	2010

Statement [Line Items]	Period [Axis]		
	From January 1, 2008 to December 31, 2008	From January 1, 2009 to December 31, 2009	From January 1, 2010 to December 31, 2010
Revenues	21,796,000,000	23,651,000,000	29,321,000,000
Costs and expenses:			
Cost of revenues (including stock-based compensation expense of $41, $47, $67)	8,622,000,000	8,844,000,000	10,417,000,000
Research and development (including stock-based compensation expense of $732, $725, $861)	2,793,000,000	2,843,000,000	3,762,000,000
Sales and marketing (including stock-based compensation expense of $206, $231, $261)	1,946,000,000	1,984,000,000	2,799,000,000
General and administrative (including stock-based compensation expense of $141, $161, $187)	1,803,000,000	1,668,000,000	1,962,000,000
Total costs and expenses	15,164,000,000	15,339,000,000	18,940,000,000
Income from operations	6,632,000,000	8,312,000,000	10,381,000,000
Impairment of equity investments	1,095,000,000	0	0
Interest and other income, net	316,000,000	69,000,000	415,000,000
Income before income taxes	5,853,000,000	8,381,000,000	10,796,000,000
Provision for income taxes	1,626,000,000	1,861,000,000	2,291,000,000
Net income	4,227,000,000	6,520,000,000	8,505,000,000
Net income per share of Class A and Class B common stock:			
Basic	13.46	20.62	26.69
Diluted	13.31	20.41	26.31

1.1.9. Pesseract

Component: (Network and Table)	
Network	105 - Statement - **CONSOLIDATED STATEMENTS OF INCOME**
Table	Statement [Table]

Reporting Entity [Axis]	0001288776 http://www.sec.gov/CIK		
Legal Entity [Axis]	Entity [Domain]		
	Period [Axis]		
Statement [Line Items]	2010-01-01/2010-12-31	2009-01-01/2009-12-31	2008-01-01/2008-12-31
Revenues	29,321,000,000	23,651,000,000	21,796,000,000
Costs and expenses:			
Cost of revenues (including stock-based compensation expense of $41, $47, $67)	10,417,000,000	8,844,000,000	8,622,000,000
Research and development (including stock-based compensation expense of $732, $725, $861)	3,762,000,000	2,843,000,000	2,793,000,000
Sales and marketing (including stock-based compensation expense of $206, $231, $261)	2,799,000,000	1,984,000,000	1,946,000,000
General and administrative (including stock-based compensation expense of $141, $161, $187)	1,962,000,000	1,668,000,000	1,803,000,000
Total costs and expenses	18,940,000,000	15,339,000,000	15,164,000,000
Income from operations	10,381,000,000	8,312,000,000	6,632,000,000
Impairment of equity investments	0	0	(1,095,000,000)
Interest and other income, net	415,000,000	69,000,000	316,000,000
Income before income taxes	10,796,000,000	8,381,000,000	5,853,000,000
Provision for income taxes	2,291,000,000	1,861,000,000	1,626,000,000
Net income	8,505,000,000	6,520,000,000	4,227,000,000
Net income per share of Class A and Class B common stock:			
Basic	26.69	20.62	13.46
Diluted	26.31	20.41	13.31
Income Statement [Abstract]			

1.1.10. AsReported.com

AS REPORTED			
GOOGLE INC. CONSOLIDATED STATEMENT OF INCOME	12 MOS 12-31-10	12 MOS 12-31-08	12 MOS 12-31-09
Revenue	29,321,000	21,796,000	23,651,000
Cost And Expenses			
Cost Of Revenue	10,417,000	8,622,000	8,844,000
Research And Development	3,762,000	2,793,000	2,843,000
Sales And Marketing	2,799,000	1,946,000	1,984,000
General And Administrative	1,962,000	1,803,000	1,668,000
Total Cost And Expenses	18,940,000	15,164,000	15,339,000
Income From Operations	10,381,000	6,632,000	8,312,000
Impairment Of Equity Investments	0	1,095,000	0
Interest And Other Income, Net	415,000	316,000	69,000
Income Before Tax	10,796,000	5,853,000	8,381,000
Provision For Income Tax	2,291,000	1,626,000	1,861,000
Net Income	8,505,000	4,227,000	6,520,000
Net Income Per Share Of Class A And Class B Common Stock			
Basic	26.69	13.46	20.62
Diluted	26.31	13.31	20.41

7. Proof of Axioms, Theorems, and Therefore Theory

A test was performed on a set of 6,674 public company XBRL-based 10-K financial filings with the SEC between April 1, 2013 and March 31, 2014. The set remove trusts and funds which follow unique financial reporting rules. These reports provided 8,532,275 facts, and average of 1,278 facts per report.

The purpose of the test was to prove that every XBRL-based financial report, all of which are specializations of the more general business report, fit into the axioms, theorems, and world view and therefore prove the theory which documents the logical conceptual model of business reports represented in this theory.

Because this test involves working with an actual implementation of this conceptual model within some specific syntax, in this case the XBRL technical syntax which is what the SEC uses, the analysis gets into some technical implementation details. Explaining all these details is beyond the scope of this document. However, we will point out that the following report elements were used to implement this model: Network, Table (hypercube), Axis (dimension), Member, LineItems (primary items), Abstract, and Concept.

One of the most interesting results was the ability to quantify the relations between the individual categories of the model structure for this complete set of filings which is shown in the following graphic: (RED shows illegal relations, GREEN shows expected relations, YELLOW shows unexpected but unambiguous relations, ORANGE shows incorrect and potentially ambiguous relations)

		2014 10-Ks LAX Model, SEC filers supported						
		Parent						
		Network	Table	Axis	Member	LineItems	Abstract	Concept
		495,825	211,910	406,005	1,324,898	211,995	742,468	3,245,302
Child	Network	0	0	0	0	0	0	0
	Table	682	0	0	0	5	211,212	11
	Axis	0	405,998	0	0	0	7	0
	Member	4	0	475,280	849,583	2	29	0
	LineItems	41	211,712	0	0	90	152	0
	Abstract	493,480	168	0	3	100,789	147,603	425
	Concept	12	19	1	118	1,205,587	2,028,610	10,955

1.1. Summary of additional verification

The following table summarizes the results of testing of the XBRL-based financial reports which was performed. Note that the testing goes beyond the general nature of a business report and includes some financial report specific testing. This financial report related testing was included in order to provide a sense of additional testing which might need to be provided to test business reports to make sure the information provided within the business report was of the necessary quality. The columns FY 2014, FY 2013, and FY 2012 are percentages of the automated tests which were proven to be correct per the testing performed. Note that this testing was performed for three successive years. The column “Automatable” marked with an “X” indicates if a portion of the testing is automatable. The column “Manual” marked with an “X” indicates if a portion of the testing must be performed manually.

#	Goal or Desired State of Digital Financial Report (which is a type of business report)	Automatable	Manual	FY 2014	FY 2013	FY 2012
1	**XBRL syntax**: XBRL technical syntax consistent with XBRL technical specification requirements	X		99.9%	99.9%	99.8%
2	**EFM**: Consistent with requirements of EDGAR Filer automated and manual (EFM) syntax/semantics rules	X	X	81.9%	Unknown	80.5%
3	**Model structure**: Consistent and unambiguous report level representation or model structure	X		99.9%	99.9%	97.9%
4	**Root economic entity discovery**: Root entity of focus (economic entity, accounting entity) successfully and unambiguously detectable	X		99.5%	99.2%	98.8%
5	**Key dates**: Current balance sheet date (document period end date) and income statement period (period context of document period end date) successfully and unambiguously detected	X		99.3%	98.6%	Unknown
6	**FAC relations**: Fundamental accounting concept skeleton successfully and unambiguously detected and relations between concepts consistent with expectation.	X		98.7%	97.8%	97.9%
7	**Statement roll ups**: Primary financial statement roll up computations (balance sheet, income statement, statement of comprehensive income, cash flow statement) detected, intact, and foot	X		92.0%	90.1%	84.9%
8	**Statement discovery**: Primary financial statements successfully discovered	X	X	88.7%	87.8%	Unknown
9	**Statement computations**: Primary financial statements foot and roll forward (cash flow statement, statement of changes in equity) appropriately	X		92.0%	90.5%	84.9%
10	**True and fair representation**: True and fair representation of financial information of economic entity		X	Unknown	Unknown	Unknown

Since the initial partial proof was performed in 2012 using a non-commercial implementation, there have been one additional commercial implementations and one commercial quality working proof of concept of this representation model.

The first commercial implementation was by the software vendor XBRL Cloud.

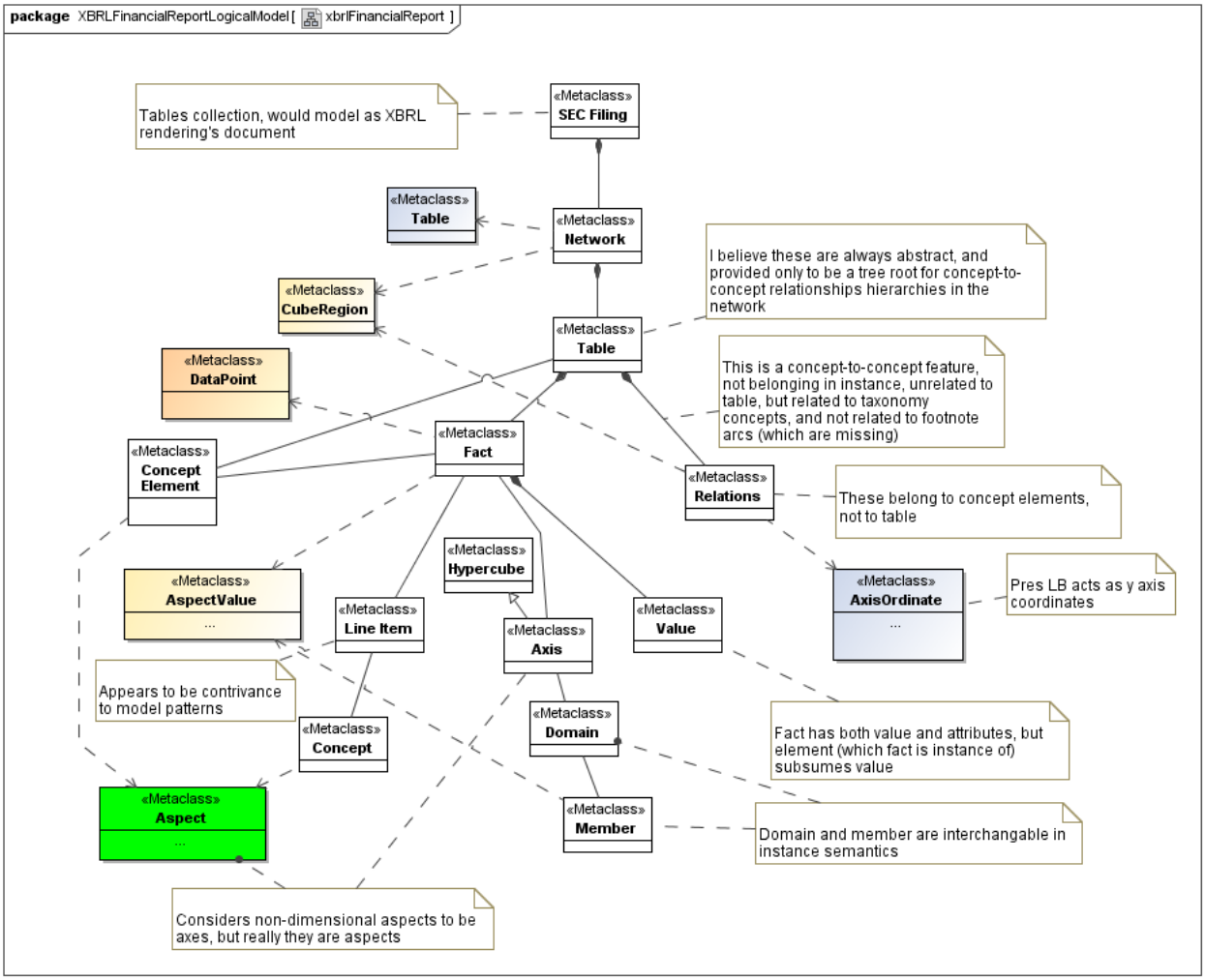
The second commercial quality implementation was created by a software engineer that is creating a commercial product but the product has yet to be released. This can best be called a working proof of concept.

8. UML Diagram of Model Implemented in XBRL

The following diagrams are intended to be helpful in understanding how to implement the business report model using XBRL.

1.2. XBRL international models

The *XBRL Abstract Model 2.0*[30] which was created by XBRL International provides a UML diagram relating to the primary model elements of a Financial Report Logical Model. The following is a screen shot of that diagram:



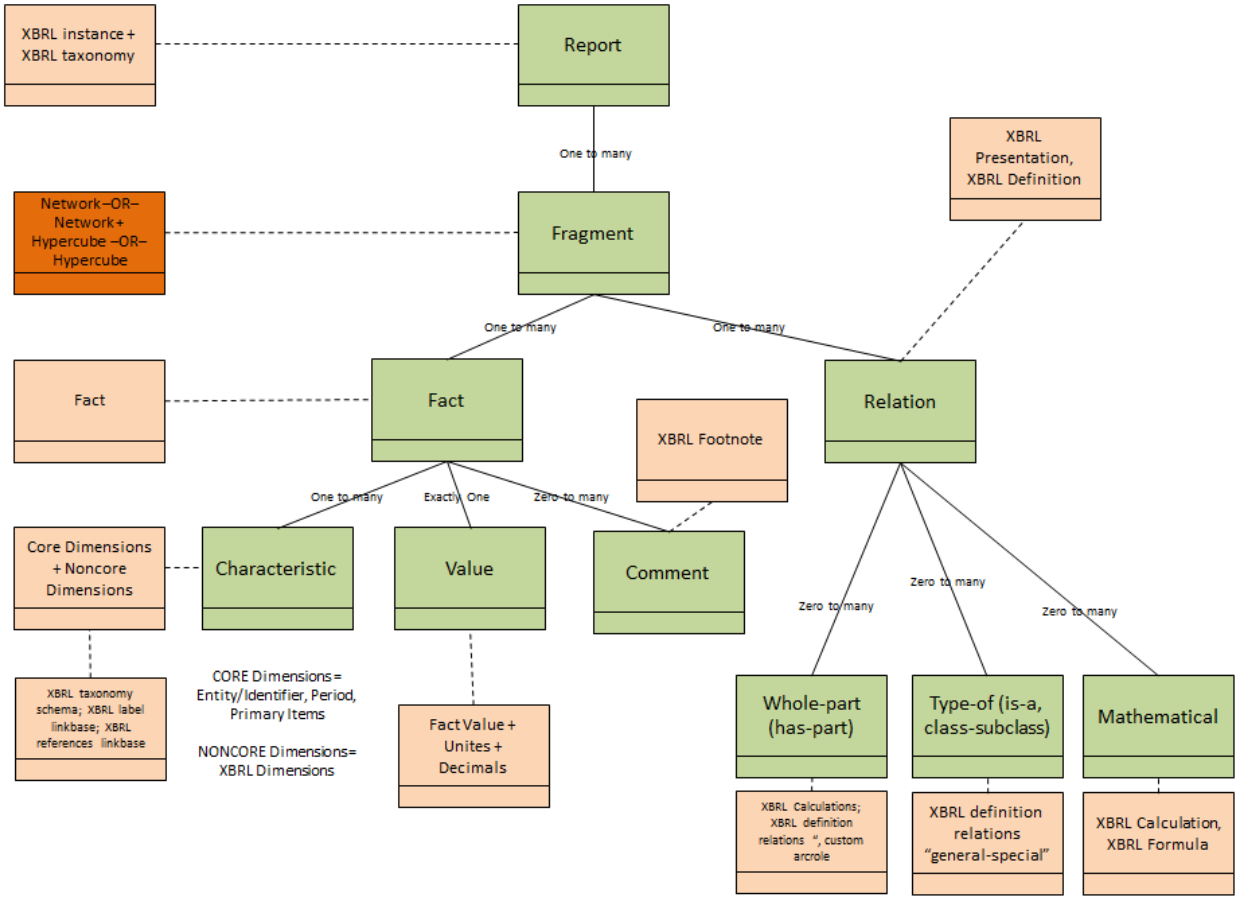
This "logical diagram" is a step in the right directin, however this model contains too many unnecessary technical implementation details and is not understandable by a business professional.

XBRL International also provides the *Open Information Model 1.0*[31] but no helpful graphical representations were provided to help understand the model.

[30] XBRL International, *XBRL Abstract Model 2.0*, 6.1 Financial Report, http://www.xbrl.org/specification/abstractmodel-primary/pwd-2012-06-06/abstractmodel-primary-pwd-2012-06-06.html

1.3. Pseudo UML + XBRL implementation information

The following is a summary of the pseudo UML model of a business report in GREEN plus implementation information related to XBRL shown in ORANGE:



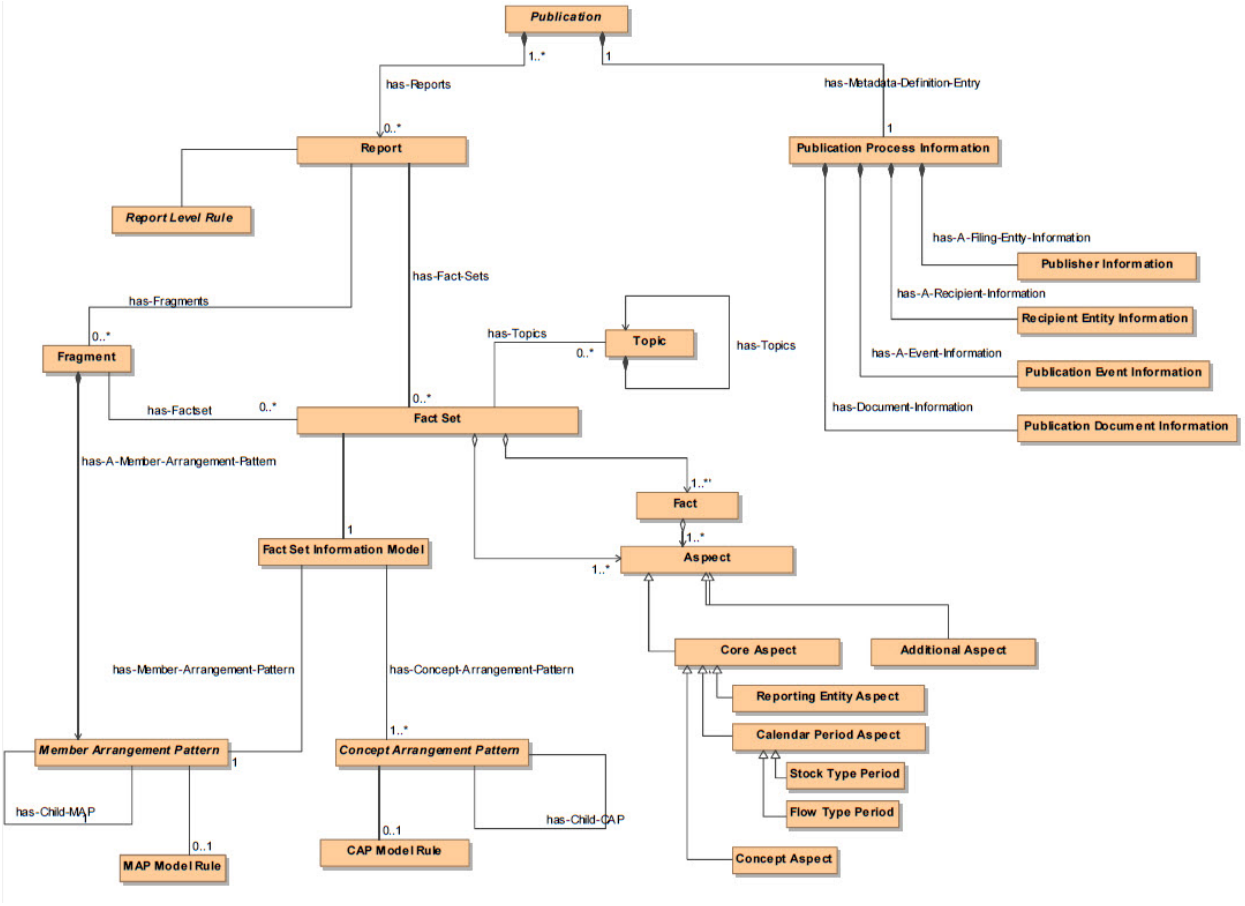
Note that everything is rather straight forward. There is one issue related to the use of Networks and Hypercubes. A complete discussion of the issue is beyond the scope of this document. The summary is that there are three approaches to implementing fragments: (1) Networks have meaning, hypercubes have no meaning; (2) Hypercubes have meaning and Networks have no meaning; (3) both Networks and Hypercubes are necessary to identify the meaning of a Fragment.

1.4. OMG Standard Business Report Metamodel DRAFT

The following is a draft Standard Business Report Model (SBRM) that was created by the OMG Standard Business Reporting Model working group[32]:

[31] XBRL International, Open Information Model 1.0, https://specifications.xbrl.org/work-product-index-open-information-model-open-information-model.html

[32] OMG, *Standard Business Report Model*, https://omgwiki.org/SBRM/doku.php



9. Future work

This testing was initially contemplated for financial reports. The result was a consciously undestood chain of capabilities that a financial report must have, proved by explicly information provided by software applications, which indicated if a fincial report has been correctly created[33].

That same line of thinking should be used to understand the capabilities of software necessary to prove that a general business report has been created with the proper level of quality. Further investigation is necessary in this area.

[33] Charles Hoffman, CPA, *Chain of Capabilities Necessary to Automate Accounting Processes*, http://xbrlsite.azurewebsites.net/2018/Library/ChainOfCapabilities.pdf