Logical Theory Describing Financial Report

http://www.xbrlsite.com/2020/Theory/

A logical conceptualization of the mechanical, mathematical, structural, and logical aspects of general purpose and special purpose financial reports for the purpose of representing such reports digitally using XBRL and other technical syntaxes

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By

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About the Author:

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.

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Introduction

A financial report is a man-made logical system that can be explained using a logical theory.

A system is a cohesive conglomeration of interrelated and interdependent parts that is either natural or man-made[1]. When a system is working right, it creates a virtuous cycle. A pattern is any form of correlation between the states of elements within a system. A theory is a tool that can be used to describe a system. A theory essentially describes the patterns within a system.

A theory enables a community of stakeholders trying to achieve a specific goal or objective or a range of goals/objectives to agree on a shared understanding of some universe of discourse.

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 are consistent. A statement in a theory cannot be both true and false within the same system. A consistent theory forms a logical conceptualization which one can use to understand or describe a system. A logical conceptualization helps to make conceptual distinctions and organize ideas.

A stakeholder is anyone that has a vested interest in a system. Foundational to arriving at harmony between the stakeholders of a system is having a common logical conceptualization for thinking about and discussing the system.

The conscious, diligent, and explicit formulation of the *Logical Theory Describing Financial Report* that is proposed in this document is useful because most accountants and those interpreting financial reports both take the meaning conveyed by such financial report for granted and generally don't think the underlying formalism for financial reports when they interpret the information in such reports. This theory brings this meaning into consciousness.

The information presented in this document will also help software engineers building software applications for the creation and consumption of information from financial reports to understand the mechanics and dynamics of such reports. It is believed that this understanding will lead to easier to use software applications. This is important as the financial report transitions from a paper-based

[1] Charles Hoffman, CPA, *Systems Theory: Method to my Madness*, http://xbrl.squarespace.com/journal/2019/12/29/systems-theory-method-to-my-madness.html

document read by humans to digital, structured, machine-readable information formats which can be read by both humans and machines such as computer software applications.

The information outlined in this theory was gleaned from many years of creating and testing XBRL instances and XBRL taxonomies in order to figure out how to make use of XBRL and providing input to technology experts creating the XBRL technical specifications. The initial version, *Financial Report Semantic and Dynamics Theory*[2], written by Rene van Egmond and myself is the foundation upon which this logical theory is built.

Of particular value in creating this logical theory was the experience gained while creating the US GAAP Taxonomy Architecture, creating the US GAAP XBRL Taxonomy, creating XBRL-based public company financial reports that would be submitted to the Securities and Exchange Commission (SEC), and analyzing the many thousands of publicly available XBRL-based financial reports created by public companies and submitted to the SEC.

It is believed that outlining this information explicitly will enable a transfer of knowledge and experience to those people less skilled in using XBRL because it provides a framework that captures the experience of those that have had the opportunity to experiment with XBRL. This knowledge transfer is achieved by articulating a set of rules that are expressed in lay person terminology. The rules are easy to understand by business professionals such as accountants who will likely readily relate to and must eventually agree with the stated logic in order for consistent machine representations of digital financial reports. Furthermore, the rules are expressed in a form which technical professionals creating software can make use.

1.1. Metaphors, Models, and Theories

Because most accountants and software engineers 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

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

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.

The financial report of an economic entity is not the entity; it is a faithful representation of information about the economic entity. Financial reports are an invention of humans, they are not natural. As such financial reports need to be explained. This is a new way of explaining a financial report.

1.2. Documenting the Logical Theory

This document articulates a 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. Logic is thinking according to a set of consistent and coherence rules.

This theory can be implemented within a robust model which is understandable by computer software. However, explaining the actual implementation of that computer readable model is in software is not in the scope for this document. For more details about this logical conceptualization, please see the website for this resource which you can find here:

http://www.xbrlsite.com/2020/Theory/

1.3. Not a theory of financial reporting

It is the role of standards setters like the FASB and IASB to establish frameworks for financial reporting schemes. This theory in no way proposes anything related to defining a financial reporting scheme. This theory describes a logical conceptualization of the mechanical aspects of the financial report itself.

This theory does not specify which financial reporting scheme to use, how financial information is reported, what financial information should or should not be reported, how to measure what is reported, what is or is not material, or any other principle related to the practice of financial reporting or accounting.

This theory relates to the mechanics of a report and internal truths that should hold for any financial report. This theory relates only to the mechanics of a financial report, not the judgment necessary to properly create a financial report for an economic entity.

1. Financial Reports are Logical Systems

A financial report is a logical system. Financial reports represent information that resulted from economic phenomena in words and numbers. A financial report is a faithful representation of a set of claims made by an economic entity about the financial position and financial performance of an economic entity. As pointed out by the Financial Accounting Foundation (FAF), "That information must be clear, concise, comparable, relevant and representationally faithful[3]." Said another way, a financial report is not arbitrary, is not random, is not illogical.

The following problem description or business use case was inspired by a similar sort of description by Harry S. Delugach, Associate Professor of Computer Science, in a presentation, *Common Logic Standards Development*, (page 7). Fundamentally, a financial statement serves this purpose:

> Two economic entities, A and B, each have information about their financial position and financial performance. They must communicate their information to an investor who is making investment decisions which will make use of the combined information so as to draw some conclusions. All three parties (economic entity A, economic entity B, investor) are using a common set of basic logical principles (facts, statements, deductive reasoning, etc.), common financial reporting standard terms and associations between terms (terms, associations, structures, assertions for a reporting scheme US GAAP, IFRS, IPSAS, etc.), and a common world view so they should be able to communicate this information fully, so that any inferences which, say, the investor draws from economic entity A's information should also be derivable by economic entity A itself using common basic logical principles, common financial reporting standards (terms, associations, structures, rules), and common world view; and vice versa; and similarly for the investor and economic entity B.

[3] Financial Accounting Foundation, Accounting Standards, https://www.accountingfoundation.org/jsp/Foundation/Page/FAFSectionPage&cid=1351027541272

This problem/use case has been effectively solved for hundreds of years via the use of paper-based and human readable general-purpose financial statements. Today there is a new opportunity. That new opportunity is to automate aspects of this process using machine-readable financial information.

To be crystal clear, financial statements I am describing are not, should not, and need not be forms. Rather, financial reporting schemes used to create the financial statements I am describing intentionally allow variability in how economic entities provide the quantitative and qualitative information about the economic entity.

This specific use case is clearly articulated in the conceptual frameworks of both US GAAP[4] and IFRS[5] and really cannot be disputed. Those less familiar with financial reporting may find my exploration of FASB's SFAC 6 *Elements of Financial Statements*[6] helpful.

Finally, it is worth pointing out that financial reporting schemes have five things in common that can be leveraged in the communication of financial statement information and are unique to financial reporting schemes:

- *First*, at the foundation of every financial reporting scheme is the double-entry accounting model[7]. Simply stated, that model is: **DEBITS = CREDITS**. It is a mathematical model. (If you don't understand this model, this video is helpful[8]!)
- *Second*, building on the double-entry accounting model is the accounting equation[9]: **Assets = Liabilities + Equity**.
- *Third*, every financial reporting scheme defines a core set of interrelated elements of a financial statement that are fundamentally grounded in some form of the accounting equation. For example, the Financial Accounting Standards Board (FASB) defines these ten interrelated elements of a financial statement in

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[4] Financial Accounting Standards Board (FASB), *Statement of Financial Reporting Concepts No. 6, Elements of a Financial Statement*, https://www.fasb.org/pdf/con6.pdf

[5] International Accounting Standards Board (IASB), *Conceptual Framework for Financial Reporting*, March 2018, https://www.ifrs.org/issued-standards/list-of-standards/conceptual-framework/

[6] Charles Hoffman, CPA, *Impediments to Creating Properly Functioning XBRL-based Reports (SFAC 6)*, http://xbrlsite.azurewebsites.net/2020/core/master-sfac6/Documentation.pdf

[7] David P. Ellerman, *The Mathematics of Double Entry Bookkeeping*, Mathematics Magazine, http://www.ellerman.org/wp-content/uploads/2012/12/DEB-Math-Mag.CV_.pdf

[8] YouTube, *2016 Debit Credit Theory Accounting Rap Song from O'Neill High School*, https://www.youtube.com/watch?v=PHanSCcMb_I

[9] Wikipedia, *Accounting Equation*, https://en.wikipedia.org/wiki/Accounting_equation

SFAC 6[10]: Assets, Liabilities, Equity, Comprehensive Income, Investments by Owners, Distributions to Owners, Revenues, Expenses, Gains, Losses. Then, additional elements are defined based on that core set.

- *Fourth*, every financial reporting scheme has what is called "articulation". Articulation is the notion that the elements of a financial statement are interrelated and therefore depend on one another and so the four core statements; the balance sheet, the income statement, the changes in equity and the cash flow statement are all mathematically interrelated. Articulation is explained very methodically by the FASB in SFAC 6[11].
- *Fifth*, every financial report has inherent variability that is the result of explicitly allowing intermediate components of a financial report (i.e. subtotals) to be combined in appropriate but perhaps different ways depending on the needs of the reporting economic entity. Again, this is explained in detail within SFAC 6[12].

These five special characteristics of a financial reporting scheme and therefore of a financial statement created using such a financial reporting scheme offers benefits above and beyond the general communication of words and numbers.

Whether one agrees with how financial reporting is practiced today is not a part of the discussion of this document. This document (a) is focused on the mechanical aspects and dynamics of the reports themselves and (b) is not proposing adjustments as to how financial reporting schemes should work.

2. Explanation of a Logical Theory in Simple Terms

In order to understand a logical theory, we must first explain the terms we will be using to describe that logical theory. This section provides that explanation in simple terms that is approachable to business professionals. Technical professionals implementing software applications have other methods of describing formalisms of such logical systems such as UML and OWL.

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[10] Financial Accounting Standards Board (FASB), Statement of Financial Reporting Concepts No. 6, Elements of a Financial Statement, page 23, https://www.fasb.org/pdf/con6.pdf

[11] ibid, page 21 – 22, "Interrelation of Elements-Articulation"

[12] ibid, page 47, paragraph 77.

2.1. Simple Explanation

A system[13] is a cohesive conglomeration of interrelated and interdependent parts that is either natural or man-made.

A logical system can be explained by a logical theory. A logical theory is an abstract conceptualization[14] of specific details of some domain. The logical theory provides a way of thinking about a domain by means of deductive reasoning to derive logical consequences of the theory.

A **logical theory** enables a community of stakeholders trying to achieve a specific goal or objective or a range of goals/objectives to agree on important statements used for capturing meaning or representing a shared understanding of and knowledge in some universe of discourse.

A logical theory is made up of a set of *models*, *structures*, *terms*, *associations*, *rules*, and *facts*. In very simple terms,

- **Logical theory**: A *logical theory* is a set of models that are consistent with and permissible per that logical theory.
- **Model**: A *model*[15] is a set of structures that are consistent with and permissible interpretations of that model.
- **Structure**: A *structure* is a set of statements which describe the structure.
- **Statement**: A statement is a proposition, claim, assertion, belief, idea, or fact about or related to the universe of discourse to which the logical theory relates. There are four broad categories of statements:
    - **Terms**: Terms are statements that define ideas used by the logical theory such as "assets", "liabilities", "equity", and "balance sheet".
    - **Associations**: Associations are statements that describe permissible interrelationships between the terms such as "assets is part-of the balance sheet" or "operating expenses is a type-of expense" or "assets = liabilities + equity" or "an asset is a 'debit' and is 'as of' a specific point in time and is always a monetary numeric value".
    - **Rules**: Rules are statements that describe what tend to be IF…THEN…ELSE types of relationships such as "IF the

[13] Wikipedia, *Systems Theory*, https://en.wikipedia.org/wiki/Systems_theory

[14] Wikipedia, *Conceptual Model*, https://en.wikipedia.org/wiki/Conceptual_model

[15] Wikipedia, *Model Theory*, https://en.wikipedia.org/wiki/Model_theory

economic entity is a not-for-profit THEN net assets = assets - liabilities; ELSE assets = liabilities + equity".

- **Facts**: Facts are statements about the numbers and words that are provided by an economic entity within a business report. For example, the financial report, a type of business report, might state "assets for the consolidated legal entity Microsoft as of June 20, 2017 was $241,086,000,000 expressed in US dollars and rounded to the nearest millions of dollars.

Fundamentally, a logical theory is a set of statements. Those statements can be represented in machine-readable form. Once in machine-readable form, those statements can be interrogated using software applications. To the extent that this can be done effectively; software tools can assist professional accountants and others working with those statements.

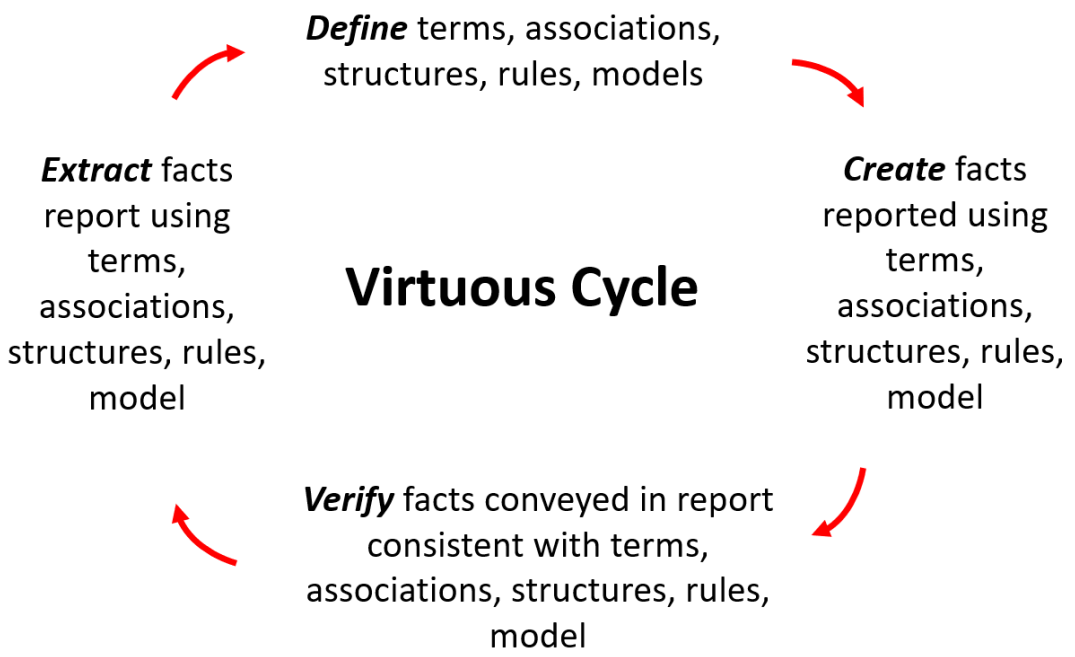
2.2. Proper Functioning Logical System

A logical theory is said to be **consistent** if there are no contradictions with respect to the statements made by the logical theory that describes the logical system (i.e. reality).

A logical theory can have high to low **precision** and high to low **coverage**. *Precision* is a measure of how precisely the information within a logical theory has been represented as contrast to reality of the logical system for the universe of discourse. *Coverage* is a measure of how completely information in a logical theory has been represented relative to the reality of the logical system for a universe of discourse.

When a logical system is consistent and it has high precision and high coverage the logical system can be considered a properly functioning logical system. When a system is working right, it creates a virtuous cycle[16].

[16] Charles Hoffman, CPA, *Virtuous Cycle*, http://xbrl.squarespace.com/journal/2020/4/29/virtuous-cycle.html



2.3. *Very Simple Example*

A very simple example of a logical system is the accounting equation. Here is a description of the accounting equation logical system in both human-readable terms and machine-readable terms using XBRL[17]:

Terms: Three simple terms are defined: Assets, Liabilities, Equity. One complex term is defined, balance sheet.

Structure: One structure is defined, the balance sheet, and identified using the term balance sheet.

Associations: The three terms Assets, Liabilities, and Equity are associated in that they are all PART-OF the structure balance sheet.

Rules: A mathematical assertion is made that "Assets = Liabilities + Equity".

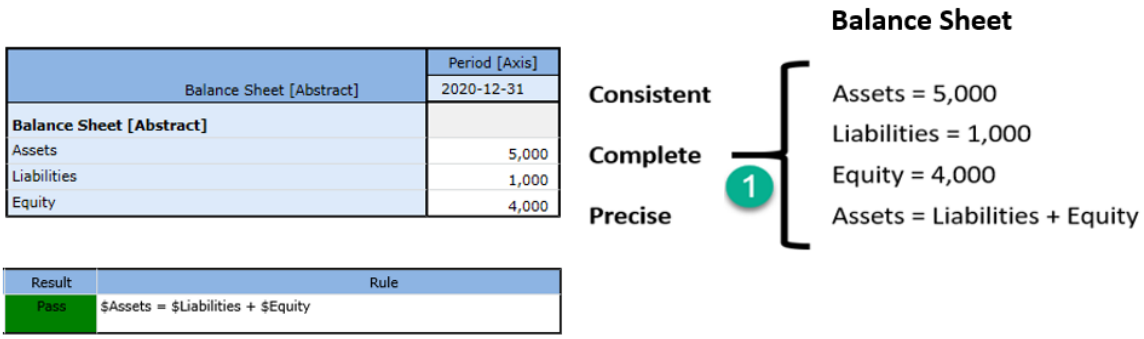
Facts: Instances of three facts are established to exercise the model: Assets of $5,000; Liabilities of $1,000; Equity of $4,000.

Model: All of the terms, associations, assertions, structures, and facts describe the model. We created only one model, or permissible interpretation, of the logical theory. (As accountants know, if you reverse the equation using the rules of math to "Equity = Assets -

[17] Charles Hoffman, *Accounting Equation*, http://xbrlsite.azurewebsites.net/2020/master/ae/

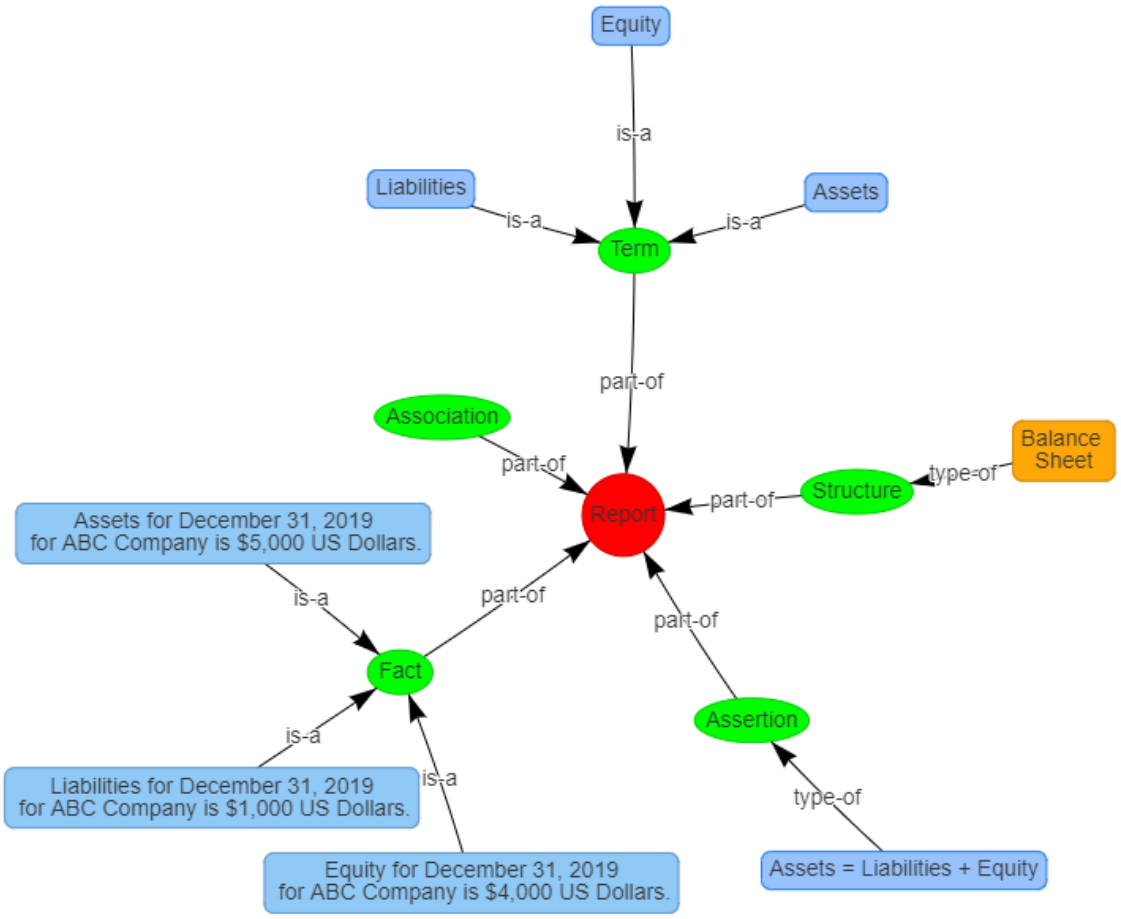
Liabilities" and change the term "Equity" to "Net Assets"; then you get another permissible interpretation or model.)

Because this is a very simple example with only a few statements it is easy to get your head around this system and see that it is consistent, complete, and precise. As expected you see three facts described by three terms which are related to one structure and the one rule is consistent with expectation:



As the size of the logical system increases it becomes increasingly more challenging to verify that the logical system is properly function using manual processes. But, covering the impediments to a properly functioning logical system are beyond our scope here[18]. Essentially, the models, terms, structures, rules, and facts form a directed acyclic graph such as:

[18] Charles Hoffman, CPA, *Impediments to Creating Properly Functioning XBRL-based Reports*, http://xbrlsite.azurewebsites.net/2020/core/master-ae/Documentation.pdf



While a typical financial report is significantly larger (i.e. the Microsoft 2017 10-K is made up of 194 structures) every financial report works the same as this very simple example but just has more pieces.

2.4. Principles

The following is a set of rather obvious principles which those stakeholders would likely tend to agree with:

1. All formats which convey financial statement information, be they human-readable or machine-readable, must convey the same meaning.
2. As stated by the FAF, "That information must be clear, concise, comparable, relevant and representationally faithful." Financial information should be faithfully represented.
3. Defect free or a near zero defect report is useful; a defective financial report is not particularly useful.

4. Prudence dictates that using information from an XBRL-based report should not be a guessing game.
5. Rules prevent anarchy.
6. The only way to achieve a meaningful exchange of information without disputes is with the prior existence of and agreement as to a standard set of technical syntax rules, business logic rules, and workflow rules.
7. Explicitly stated information or reliably derived information is preferable to implicit information. Derived and implied are not the same things.
8. Reports can be guaranteed to be defect free using automated processes to the extent that machine-readable rules exist to guide that report automation process.
9. When possible to effectively create, machine-based automated processes tend to be more desirable than human-based manual processes because machine processes are more reliable, cost less, and are less susceptible to manipulation.
10. Complexity cannot be removed from a system, however such complexity can be moved.

3. Logical Description Narrative

The purpose of this resource is to provide and bring into conscious awareness a common sharable logical conceptualization[19] of the basic underlying model of a financial report that is understandable to professional accountants and technical professionals.

Key *terms* in this logical conceptualization are highlighted in bold the first time they are used and are referenced to additional information[20]. The logical *associations* between terms are documented in this diagram[21]. The *rules* of this conceptualization are documented in the

[19] *Enhanced Description of an Ontology-like Thing*, http://xbrl.squarespace.com/journal/2019/7/19/enhanced-description-of-ontology-like-thing.html

[20] *Charles Hoffman, CPA, Logical Theory Describing Financial Reports*, http://www.xbrlsite.com/2020/Theory/

[21] Associations, http://www.xbrlsite.com/2020/Theory/Associations.html

form of axioms[22]. This conceptualization has been tested[23] using numerous reporting schemes of XBRL-based financial reports[24] by four different commercial software vendors[25].

The logical conceptualization of a financial report is explained separate from the logical conceptualization of a business report. A financial report is a specialization of the more general business report. This helps one recognize that this logical conceptualization also works for general business reporting.

A business report can be explained using three core models[26]: **logical theory** model, **business report** model, and **multidimensional model**. The logical theory model we have described. The multidimensional model is explained as part of the basic business report model. A basic logical conceptualization is provided for those that desire a high-level understanding of the logical conceptualization of a business report. A more detailed conceptualization of a business report is provided in a separate section for those that desire those additional details.

3.1. Basic Logical Conceptualization of a Business Report

A business report is a logical system. This narrative explains the structures, terms, associations, rules, and facts that comprise that logical system we work with called a business report.

A **scalar** is a fact which has no distinguishing characteristics; it stands on its own. For example, the value of the fact pi is a scalar, the fact value of pi never changes; it always has the same value for everyone. (Pi or π is the ratio of a circle's circumference to its diameter and always has the value of equal to 3.14).

Fact Value
3.14

[22] Axioms, http://www.xbrlsite.com/2020/Theory/Axioms.html

[23] *Comparison of Renderings for Concept Arrangement Patterns*, http://xbrlsite.azurewebsites.net/2019/Prototype/conformance-suite/Production/ComparisonOfConceptArrangementPatternRenderings.pdf

[24] Profiles, http://xbrlsite.azurewebsites.net/2018/Library/Profiles-2018-10-22.pdf

[25] Digital Financial Report Conformance Suite, http://xbrlsite.azurewebsites.net/2019/Prototype/conformance-suite/Production/index.xml

[26] *Four Core Models Used to Describe a Financial Report*, http://xbrl.squarespace.com/journal/2019/9/25/four-core-models-used-to-describe-a-financial-report.html

A business **report**[27] communicates information in the form of numbers and words. A **fact**[28] defines a single, observable, reportable piece of information contained within a business report and has a **fact value**[29] contextualized for unambiguous interpretation or analysis by one or more distinguishing aspects. For example, below are two facts with the values of "2,000" and "1,000". However, the two facts above are not contextualized, the facts have no aspects.

Fact Value
2,000
1,000

An **aspect**[30] (a.k.a. characteristic) describes a fact. An aspect is a property of a fact which provides information necessary to describe the fact or distinguish one fact from another fact within a report. For example, below you see the concept aspect of the numbers "2,000" and "1,000" which relates to the concepts "Revenues" and "Net income" respectively:

Concept Aspect	Fact Value
Revenues	2,000
Net income	1,000

To more fully describe a fact, you need more than just one aspect. A fact must always provide three **core aspects**[31]: *reporting entity* that reported the fact, *calendar period* of the reported fact, and the *concept* that describes the reported fact. Below you see two facts which are characterized by three core aspects which are used to differentiate the two facts from one another.

Reporting Entity Aspect	Calendar Period Aspect	Concept Aspect	Fact Value
ABC Company	Jan 1, 2019 to Dec 31, 2019	Revenues	2,000
ABC Company	Jan 1, 2019 to Dec 31, 2019	Net income	1,000

In addition to the core aspects that you always must use, creators of reports can also provide additional **noncore aspects**[32]. A noncore

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27 Report, http://www.xbrlsite.com/2020/Theory/Terms/Report.html
28 Fact, http://www.xbrlsite.com/2020/Theory/Terms/Fact.html
29 Fact Value, http://www.xbrlsite.com/2020/Theory/Terms/FactValue.html
30 Aspect, http://www.xbrlsite.com/2020/Theory/Terms/Aspect.html
31 Core Aspect, http://www.xbrlsite.com/2020/Theory/Terms/CoreAspect.html
32 Noncore Aspect, http://www.xbrlsite.com/2020/Theory/Terms/NoncoreAspect.html

aspect is simply some additional aspect that is created to further distinguish facts beyond the capabilities of the three core aspects. Below you see the noncore aspect "Legal Entity Aspect" has been added to the two facts we have been working with:

Reporting Entity Aspect	Legal Entity Aspect	Calendar Period Aspect	Concept Aspect	Fact Value
ABC Company	Consolidated entity	Jan 1, 2019 to Dec 31, 2019	Revenues	2,000
ABC Company	Consolidated entity	Jan 1, 2019 to Dec 31, 2019	Net income	1,000

Fact values can be **numeric**[33] or **nonnumeric**[34]. Numeric fact values require additional information to describe the units of the numeric fact and the rounding that is used to report the numeric fact. **Units**[35] and **rounding**[36] are properties of the fact value that provide information necessary to describe numeric fact values. Below you see that the units of "US Dollars" and that the rounding of the fact value is "Thousands of dollars":

Reporting Entity Aspect	Legal Entity Aspect	Calendar Period Aspect	Concept Aspect	Fact Value	Units	Rounding
ABC Company	Consolidated entity	Jan 1, 2019 to Dec 31, 2019	Revenues	2,000	US Dollars	Thousands of dollars
ABC Company	Consolidated entity	Jan 1, 2019 to Dec 31, 2019	Net income	1,000	US Dollars	Thousands of dollars

To summarize where we are thus far and to be crystal clear; below you see one fact. That single fact is characterized by a set of four aspects. The numeric fact value is described as having units of "US Dollars" and that the fact value is rounded to the nearest "Thousands of dollars".

Reporting Entity Aspect	Legal Entity Aspect	Calendar Period Aspect	Concept Aspect	Fact Value	Units	Rounding
ABC Company	Consolidated entity	Jan 1, 2019 to Dec 31, 2019	Revenues	2,000	US Dollars	Thousands of dollars

A **fact set**[37] is a set of facts which go together (tend to be cohesive and share a certain common nature) for some specific purpose within a business report. Synonyms for fact set are block and fact table. Below you see three facts that make up a fact set that are used to describe the

[33] Numeric Fact Value, http://www.xbrlsite.com/2020/Theory/Terms/NumericFactValue.html
[34] Nonnumeric Fact Value, http://www.xbrlsite.com/2020/Theory/Terms/NonnumericFactValue.html
[35] Units, http://www.xbrlsite.com/2020/Theory/Terms/Units.html
[36] Rounding, http://www.xbrlsite.com/2020/Theory/Terms/Rounding.html
[37] Fact Set, http://www.xbrlsite.com/2020/Theory/Terms/FactSet.html

breakdown of revenues by geographic area. Those three facts make up a fact set.

Reporting Entity Aspect	Legal Entity Aspect	Geographic Area Aspect	Calendar Period Aspect	Concept Aspect	Fact Value	Units	Rounding
ABC Company	Consolidated entity	All Geographic Areas Combined	Jan 1, 2019 to Dec 31, 2019	Revenues	2,000	US Dollars	Thousands of dollars
ABC Company	Consolidated entity	North America	Jan 1, 2019 to Dec 31, 2019	Revenues	1,000	US Dollars	Thousands of dollars
ABC Company	Consolidated entity	South America	Jan 1, 2019 to Dec 31, 2019	Revenues	1,000	US Dollars	Thousands of dollars

Rules[38] guide, control, suggest, or influence behavior. 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. Rules help shape judgment, help make decisions, help evaluate, help shape behavior.

Don't make the mistake of thinking that 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 rules are a choice of business professionals. The meaning of a rule is separate from the level of enforcement someone might apply to the rule.

A rule states a fact about the world, the logical system. A synonym for rule is assertion.

So, considering our fact set below we know that the value "2,000" is for the concept "Revenues", for the period "Jan 1, 2019 to Dec 31, 2019", relates to the legal entity "Consolidated entity", of the reporting entity "ABC Company" and is the total of all "Geographic Areas". "North America" and "South America" are part of the *whole* "All Geographic Areas Combined". A rule that expresses that relationship might be expressed as:

"All Geographic Areas Combined = North America + South America".

Rules both describe and can be used to verify that reported facts are consistent with the provided description provided by the rule. There are many different types of rules including mathematical, structural, mechanical, logical, and accounting related rules.

[38] Rule, http://www.xbrlsite.com/2020/Theory/Terms/Rule.html

Reporting Entity Aspect	Legal Entity Aspect	Geographic Area Aspect	Calendar Period Aspect	Concept Aspect	Fact Value	Units	Rounding
ABC Company	Consolidated entity	All Geographic Areas Combined	Jan 1, 2019 to Dec 31, 2019	Revenues	2,000	US Dollars	Thousands of dollars
ABC Company	Consolidated entity	North America	Jan 1, 2019 to Dec 31, 2019	Revenues	1,000	US Dollars	Thousands of dollars
ABC Company	Consolidated entity	South America	Jan 1, 2019 to Dec 31, 2019	Revenues	1,000	US Dollars	Thousands of dollars

Grain[39] is the level of depth of information or granularity. For example, the lowest level of granularity is the actual transaction, event, circumstance, or other phenomenon represented as the actual transaction within an accounting system. The highest level of granularity is the summarized information that is represented as a line item of perhaps a financial statement, say the income statement. Other levels of granularity can exist between the highest and lowest levels.

Considering the fact set you see below the fact outlined in red is one level of granularity as contrast to the other two facts that are outlined in green which provides the same information as is provided by the fact outlined in red, but at a different level of granularity.

Reporting Entity Aspect	Legal Entity Aspect	Geographic Area Aspect	Calendar Period Aspect	Concept Aspect	Fact Value	Units	Rounding
ABC Company	Consolidated entity	All Geographic Areas Combined	Jan 1, 2019 to Dec 31, 2019	Revenues	2,000	US Dollars	Thousands of dollars
ABC Company	Consolidated entity	North America	Jan 1, 2019 to Dec 31, 2019	Revenues	1,000	US Dollars	Thousands of dollars
ABC Company	Consolidated entity	South America	Jan 1, 2019 to Dec 31, 2019	Revenues	1,000	US Dollars	Thousands of dollars

The facts in a fact set forms a **fragment**[40] of the report. A report can have one or many fragments. A fragment is a type of *structure*. For example, a "balance sheet" is a structure or the "long term debt maturities" disclosure is a structure.

An **information structure definition**[41] is a structure which is created to describe each fragment of a report. The following pieces, or **report elements**[42], are commonly used to construct the information structure

[39] Grain, http://www.xbrlsite.com/2020/Theory/Terms/Grain.html

[40] Fragment, http://www.xbrlsite.com/2020/Theory/Terms/Fragment.html

[41] Information Structure Definition, http://www.xbrlsite.com/2020/Theory/Terms/InformationModelDefinition.html

[42] Report Element, http://www.xbrlsite.com/2020/Theory/Terms/ReportElement.html

description: **Network**[43], **Table** (a.k.a. Hypercube)[44], **Axis** (a.k.a. Dimension)[45], **Member**[46], **Line Items** (a.k.a. Primary Items)[47], **Abstract**[48], and **Concept**[49].

Below you see the information structure definition of the structure of a fragment of a report, in this case one fact set which is used to describe the components of inventory:

#	Label	Report Element Class	Period Type	Balance	Name
1	**Inventory, by Compoment [Table]**	[Table]			gaap:InventoryByCompomentTable
2	**Legal Entity [Axis]**	[Axis]			frm:LegalEntityAxis
3	Consolidated Entity [Member]	[Member]			frm:ConsolidatedEntityMember
4	**Inventory, by Component [Line Items]**	[Line Items]			gaap:InventoryByComponentLineItems
5	Inventory, by Component [Roll Up]	[Abstract]			gaap:InventoryByComponentRollUp
6	Finished Goods	[Concept] Monetary	As Of	Debit	gaap:FinishedGoods
7	Work in Progress	[Concept] Monetary	As Of	Debit	gaap:WorkInProgress
8	Raw Material	[Concept] Monetary	As Of	Debit	gaap:RawMaterial
9	Inventory	[Concept] Monetary	As Of	Debit	gaap:Inventory

Something is important to point out. We mentioned that in XBRL you have core aspects and noncore aspects. In the typical software applications created today, the core aspects reporting entity and calendar period are commonly not represented in the information structure definition that is typically created by software applications. The graphic above shows that sort of representation.

Below you see a truer information structure definition which includes the reporting entity and the calendar period. Also, per the US GAAP XBRL Taxonomy, the IFRS XBRL Taxonomy the term "[Axis]" is used as a synonym of "Aspect". Axis and aspect are synonyms and mean exactly the same thing. Also "Period" and "Calendar Period" are exactly the same thing.

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[43] Network, http://www.xbrlsite.com/2020/Theory/Terms/Network.html

[44] Table, http://www.xbrlsite.com/2020/Theory/Terms/Table.html

[45] Axis, http://www.xbrlsite.com/2020/Theory/Terms/Axis.html

[46] Member, http://www.xbrlsite.com/2020/Theory/Terms/Member.html

[47] Line Items, http://www.xbrlsite.com/2020/Theory/Terms/LineItems.html

[48] Abstract, http://www.xbrlsite.com/2020/Theory/Terms/Abstract.html

[49] Concept, http://www.xbrlsite.com/2020/Theory/Terms/Concept.html

#	Label	Report Element Class	Period Type	Balance	Name
1	**Inventory, by Compoment [Table]**	[Table]			gaap:InventoryByCompomentTable
2	**Reporting Entity [Axis]**	[Axis]			xbrl:ReportingEntityAxis
3	http://regulator.gov/id#1234567890	[Member]			http://regulator.gov/id#1234567890
4	**Period [Axis]**	[Axis]			xbrl:PeriodAxis
5	12/31/2010	[Member]			12/31/2010
6	12/31/2009	[Member]			12/31/2009
7	**Legal Entity [Axis]**	[Axis]			frm:LegalEntityAxis
8	Consolidated Entity [Member]	[Member]			frm:ConsolidatedEntityMember
9	**Inventory, by Component [Line Items]**	[Line Items]			gaap:InventoryByComponentLineItems
10	Inventory, by Component [Roll Up]	[Abstract]			gaap:InventoryByComponentRollUp
11	Finished Goods	[Concept] Monetary	As Of	Debit	gaap:FinishedGoods
12	Work in Progress	[Concept] Monetary	As Of	Debit	gaap:WorkInProgress
13	Raw Material	[Concept] Monetary	As Of	Debit	gaap:RawMaterial
14	Inventory	[Concept] Monetary	As Of	Debit	gaap:Inventory

Another part of the information structure definition is the **mathematical rules**[50] that are used in this case to describe and verify the roll up relations of the concepts that are a part of the information structure definition. Here is the roll up relations (a.k.a. associations) that are part of this information structure definition.

#	Label	Report Element Class	Weight	Balance	Name
1	Inventory	[Concept] Monetary			gaap:Inventory
2	Finished Goods	[Concept] Monetary	+1	Debit	gaap:FinishedGoods
3	Work in Progress	[Concept] Monetary	+1	Debit	gaap:WorkInProgress
4	Raw Material	[Concept] Monetary	+1	Debit	gaap:RawMaterial

Another part of the information structure definition is the facts within the fact set themselves. Here is the fact set within a **fact table**[51] representation for the facts that go with the information structure definition provided above.

#	Reporting Entity [Aspect]	Period [Aspect]	Concept [Aspect]	Legal Entity [Aspect]	Fact Value	Unit	Rounding
1	http://regulator.gov/id#1234567890	12/31/2010	Finished Goods	Consolidated Entity [Member]	600,000	USD	Thousands
2	http://regulator.gov/id#1234567890	12/31/2009	Finished Goods	Consolidated Entity [Member]	600,000	USD	Thousands
3	http://regulator.gov/id#1234567890	12/31/2010	Work in Progress	Consolidated Entity [Member]	300,000	USD	Thousands
4	http://regulator.gov/id#1234567890	12/31/2009	Work in Progress	Consolidated Entity [Member]	300,000	USD	Thousands
5	http://regulator.gov/id#1234567890	12/31/2010	Raw Material	Consolidated Entity [Member]	100,000	USD	Thousands
6	http://regulator.gov/id#1234567890	12/31/2009	Raw Material	Consolidated Entity [Member]	100,000	USD	Thousands
7	http://regulator.gov/id#1234567890	12/31/2010	Inventory	Consolidated Entity [Member]	1,000,000	USD	Thousands
8	http://regulator.gov/id#1234567890	12/31/2009	Inventory	Consolidated Entity [Member]	1,000,000	USD	Thousands

A software application takes the information structure definition structure, the information structure definition rules provided, the facts that are included within the fact set, and known best practices for rendering a business report that are coded into the software application in some manner, other commonly understood information, and then generates a human-readable rendering of the reported information for a fragment or fact set of a report.

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[50] Mathematical Rule, http://www.xbrlsite.com/2020/Theory/Terms/MathematicalRule.html

[51] Fact Table, http://www.xbrlsite.com/2020/Theory/Terms/FactTable.html

The following is the **rendering**[52] of the inventory components disclosure that we are working with above:

Reporting Entity [Aspect]	http://regulator.gov/id#1234567890	
Legal Entity [Aspect]	Consolidated Entity [Member]	
	Period [Aspect]	
Concept [Aspect]	12/31/2020	12/31/2019
Inventory, by Component [Roll Up]		
Finished Goods	600,000	600,000
Work in Progress	300,000	300,000
Raw Material	100,000	100,000
Inventory	1,000,000	1,000,000

Different software applications might provide slightly different renderings using the same input information[53]. Here is the same rendering provided by a second software application:

Component: (Network and Table)	
Network	JG - Schedule - **Inventory, by Component**
Table	Inventory, by Compoment [Table]

Reporting Entity [Axis]	1234567890 http://regulator.gov/id	
Reporting Scenario [Axis]	Actual [Member]	
Report Date [Axis]	Reported as of March 18, 2011 [Member]	
Legal Entity [Axis]	Consolidated Entity [Member]	
Unit [Axis]	USD	
	Period [Axis]	
Inventory, by Component [Line Items]	2010-12-31	2009-12-31
Inventory, by Component [Roll Up]		
Finished Goods	600	600
Work in Progress	300	300
Raw Material	100	100
Inventory	1,000	1,000

Here is what the *information structure definition* might look like in a software application:

[52] Rendering, http://www.xbrlsite.com/2020/Theory/Terms/Rendering.html

[53] *Comparison of Renderings for Concept Arrangement Patterns*, http://xbrlsite.azurewebsites.net/2019/Prototype/conformance-suite/Production/ComparisonOfConceptArrangementPatternRenderings.pdf

Label	Report Element Class	Period	Balance	Preferred Label Role	Name
Inventory, by Compoment [Table]	[Table]			Standard Label	gaap:InventoryByCompomentTable
Legal Entity [Axis]	[Axis]			Standard Label	frm:LegalEntityAxis
Consolidated Entity [Member]	[Member]			Standard Label	frm:ConsolidatedEntityMember
Inventory, by Component [Line Items]	[LineItems]			Standard Label	gaap:InventoryByComponentLineItems
Inventory, by Component [Roll Up]	[Abstract]			Standard Label	gaap:InventoryByComponentRollUp
Finished Goods	[Concept] Monetary	As Of	Debit	Standard Label	gaap:FinishedGoods
Work in Progress	[Concept] Monetary	As Of	Debit	Standard Label	gaap:WorkInProgress
Raw Material	[Concept] Monetary	As Of	Debit	Standard Label	gaap:RawMaterial
Inventory	[Concept] Monetary	As Of	Debit	Standard Label	gaap:Inventory

Here is what the roll up *mathematical rule* relations representation might look like in that software application:

Label	Report Element Class	Balance	Weight	Name
Inventory, by Compoment [Table]	[Table]		0	gaap:InventoryByCompomentTable
Inventory	[Concept] Monetary	Debit	0	gaap:Inventory
Finished Goods	[Concept] Monetary	Debit	1	gaap:FinishedGoods
Work in Progress	[Concept] Monetary	Debit	1	gaap:WorkInProgress
Raw Material	[Concept] Monetary	Debit	1	gaap:RawMaterial

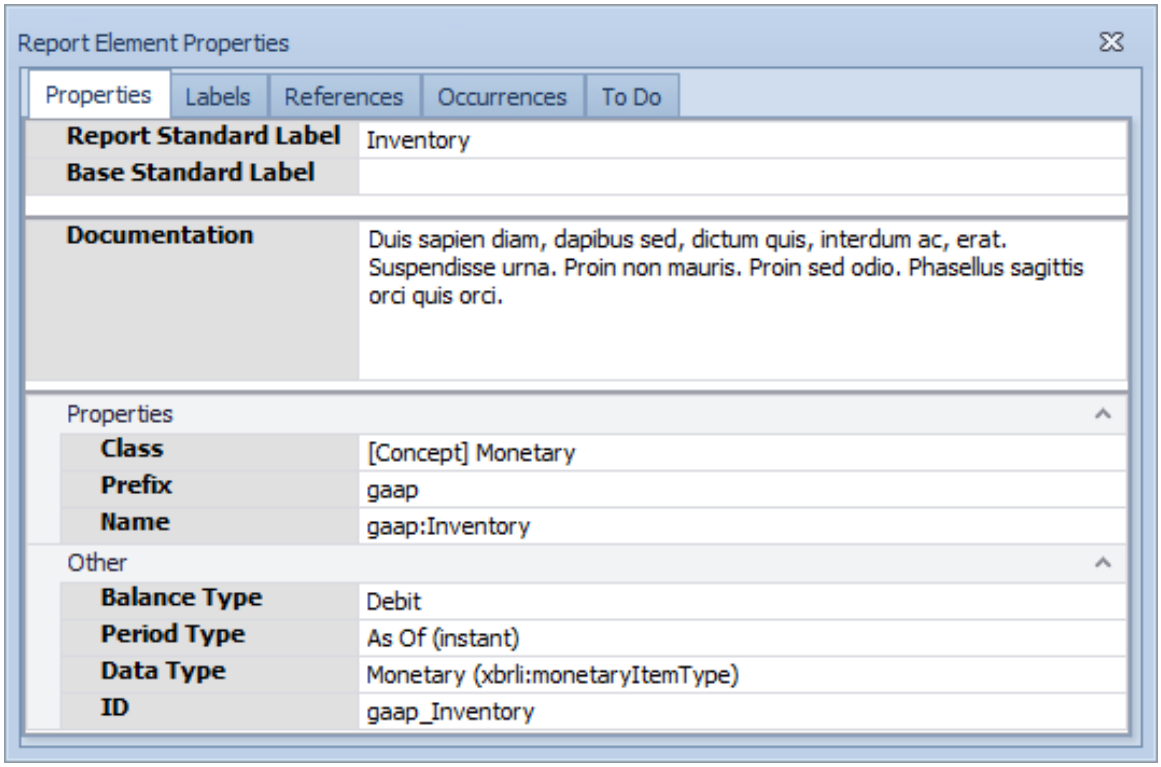
Software applications use the rule relations that describe or explain the relations to verify that reported facts are consistent with that explanation. Here is a software application interface for *verifying* that the reported facts are consistent with the *mathematical rules* that explain the relations between the facts:

Label	Rendered Value	Op	Reported Value	Calculated Value	Balance	Result	Name
Inventory, by Component [Line Items]							gaap:InventoryByComponentLineItems
Inventory, by Component [Roll Up]							gaap:InventoryByComponentRollUp
Finished Goods	600	+	600		Debit		gaap:FinishedGoods
Work in Progress	300	+	300		Debit		gaap:WorkInProgress
Raw Material	100	+	100		Debit		gaap:RawMaterial
Inventory	1,000		1,000	1,000	Debit	Verified	gaap:Inventory

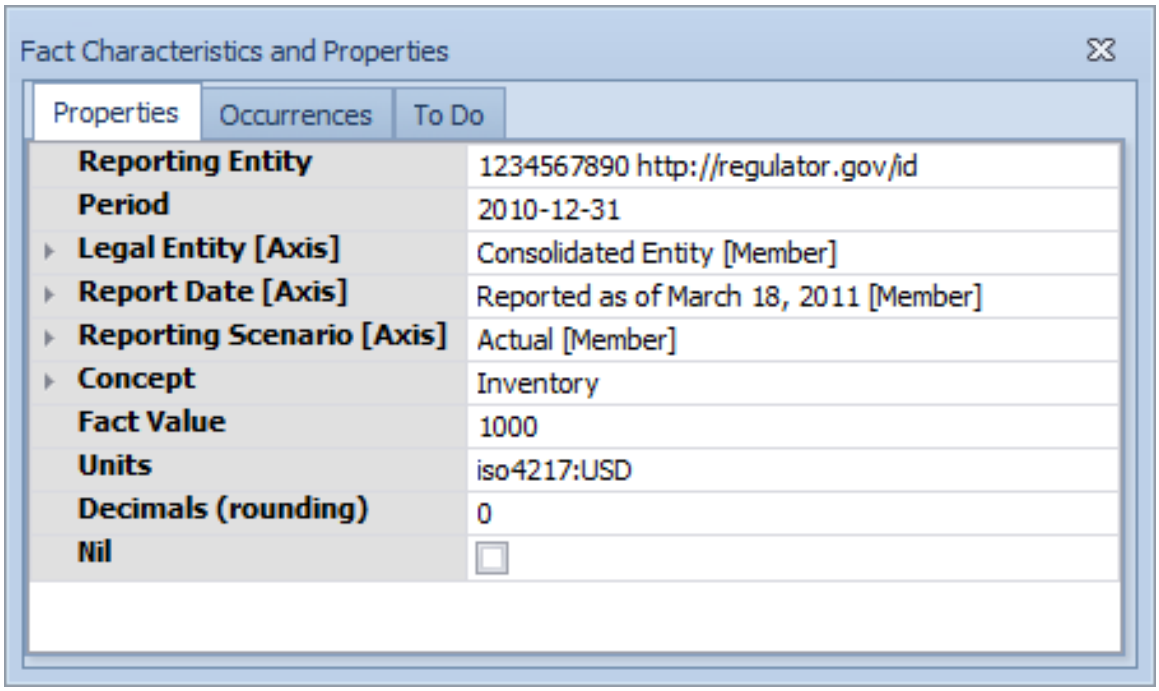
Label	Rendered Value	Op	Reported Value	Calculated Value	Balance	Result	Name
Inventory, by Component [Line Items]							gaap:InventoryByComponentLineItems
Inventory, by Component [Roll Up]							gaap:InventoryByComponentRollUp
Finished Goods	600	+	600		Debit		gaap:FinishedGoods
Work in Progress	300	+	300		Debit		gaap:WorkInProgress
Raw Material	100	+	100		Debit		gaap:RawMaterial
Inventory	1,000		1,000	1,000	Debit	Verified	gaap:Inventory

Alternatively, note that the renderings provided as examples of this fact set contains two green cells which confirm that mathematical relation for the roll up total is consistent with the explanation provided by the rules. If the facts provided were inconsistent with the rule then the software might indicate, say in the color orange, that the information is inconsistent with what is expected.

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



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



This same information is provided for each and every fact set that makes up a business report. Facts could be used in multiple fact sets. The

facts used in fact sets must be consistent within a fact set and between the individual fact sets that make up a report.

3.2. Basic Logical Conceptualization of a Financial Report

Keeping in mind that a financial report is a special type of business report I will not explain additional logical related to financial reports but is not applicable to general business reports. Every financial report is a business report; but it is not the case that every business report is a financial report.

Financial reporting schemes have five patterns in common that can be leveraged in the communication of financial report information and are unique to financial reporting schemes and therefore to all financial reports:

First, at the foundation of every financial reporting scheme is the double-entry accounting model[54]. Simply stated, that model is: **DEBITS = CREDITS**. The double-entry accounting model is a mathematical model. (If you don't understand this double-entry accounting, this video is helpful[55]!)

Second, building on the double-entry accounting model is the accounting equation[56]: **Assets = Liabilities + Equity**. Assets, a debit, is always equal to the sum of Liabilities (a credit) plus Equity (a credit). This is essentially a second layer building on the first layer.

Third, every financial reporting scheme defines a core set of interrelated elements of a financial statement that are fundamentally grounded in some form of the accounting equation. For example, the Financial Accounting Standards Board (FASB) defines these ten interrelated elements of a financial statement in SFAC 6[57]; Assets, Liabilities, Equity, Comprehensive Income, Investments by Owners, Distributions to Owners, Revenues, Expenses, Gains, Losses. Then, additional elements are defined based on that core set. As is explained next, the interrelations of these elements are intentional.

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[54] David P. Ellerman, *The Mathematics of Double Entry Bookkeeping*, Mathematics Magazine, http://www.ellerman.org/wp-content/uploads/2012/12/DEB-Math-Mag.CV_.pdf

[55] YouTube, *2016 Debit Credit Theory Accounting Rap Song from O'Neill High School*, https://www.youtube.com/watch?v=PHanSCcMb_I

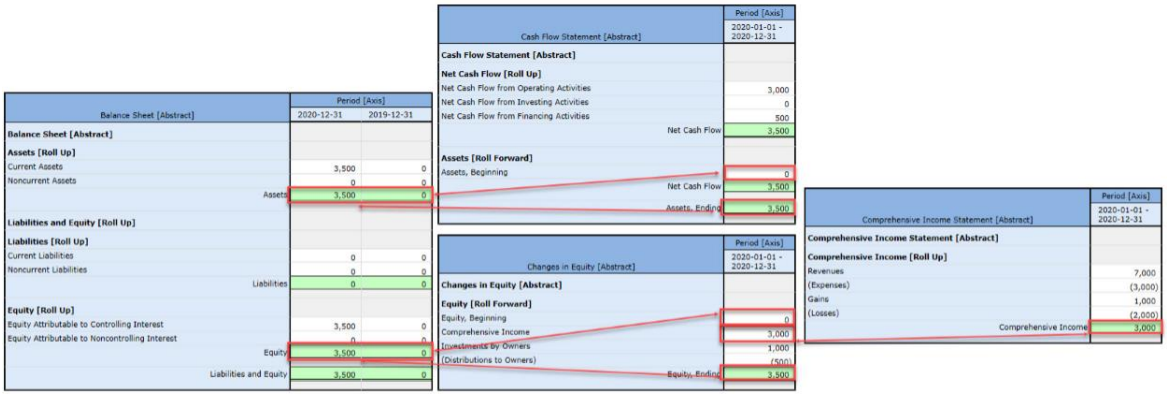
[56] Wikipedia, *Accounting Equation*, https://en.wikipedia.org/wiki/Accounting_equation

[57] ibid, page 23.

Here is a comparison of the core set of interrelated elements defined by five different financial reporting schemes[58].

Reporting Scheme	US GAAP issued by FASB	IFRS issued by IASB	FRF for SMEs issued by AICPA	IPSAS issued by IPSASB	GAS issued by GASB
Assets	Assets	Assets	Assets	Assets; Other Resources	Assets and Deferred Inflow of Resources
Liabilities	Liabilities	Liabilities	Liabilities	Liabilities; Other Obligations	Liabilities and Deferred Outflow of Resources
Equity or Net Assets	Equity (or Net Assets)	Equity (or Net Assets)	Equity (or Net Assets)	Net Financial Position	Net Position
Comprehensive Income	Comprehensive Income	Income and Expenses	Net income	Surplus or Deficit	Change in Net Position
Investments by Owners	Investments by Owners	Contributions from Holders of Equity Claims	Investments by Owners	Ownership Contributions	Increase in Net Position (Implied)
Distributions to Owners	Distributions to Owners	Distributions to Holders of Equity Claims	Distributions to Owners	Ownership Distributions	Decrease in Net Position (Implied)
Revenues	Revenues	Income	Revenues	Revenues	Inflow of Resources
Expenses	Expenses	Expenses	Expenses	Expenses	Outflow of Resources
Gains	Gains		Gains		
Losses	Losses		Losses		

Fourth, every financial reporting scheme has a characteristic that is referred to as "articulation". Articulation is the notion that the elements of a financial statement are interrelated and therefore depend on one another and so the four core financial statements; the balance sheet, the income statement, the statement of changes in equity and the cash flow statement are all mathematically interrelated to one another. Articulation is explained very methodically by the FASB in SFAC 6[59]. The graphic below shows the interrelated nature, the articulation, of the core four financial statements:



Fifth, every financial report has inherent variability that is the result of explicitly allowing intermediate components of a financial report (i.e. subtotals) to be combined in appropriate but perhaps different ways

[58] Charles Hoffman, CPA, *Comparison of Elements of Financial Statements*, http://xbrlsite.azurewebsites.net/2019/core/ElementsOfFinancialStatements.pdf

[59] ibid, page 21 – 22, "Interrelation of Elements-Articulation"

depending on the needs of the reporting economic entity. Again, this is explained by the FASB in detail within SFAC 6[60].

There are a multitude of other patterns within financial reports that can be leveraged. For example, some financial reporting schemes require that each of the four primary financial statements be present within a set of financial statements in some form: balance sheet, income statement, statement of changes in equity, statement of cash flows. Disclosure notes such as the basis of reporting and nature of the economic entity providing the financial report. These additional patterns which tend to be unique per financial reporting scheme are beyond the scope of this basic explanation of the logical conceptualization of a financial report.

A financial **reporting scheme**[61] is a formal specification for how financial reports are to be created and the underlying accounting rules and is usually created by a standards setter or regulator. For example, US GAAP, IFRS, and IPSAS are all financial reporting schemes. Financial reports are not forms. Financial reporting schemes allow for a certain amount of flexibility and variability when reporting certain specific disclosures or subtotals contained within a disclosure.

3.3. Advanced Details for Logical Conceptualization of a Business Report

In this section we will provide additional details related to more advanced aspects of the logical conceptualization of a business report.

A full business report can be broken down into one or many fragments. A **fragment**[62] is a set of one to many *fact sets* which go together for some specific purpose within a report. For example, a balance sheet is a fragment of a business report that is made up of two fact sets: a roll up of assets and a roll up of liabilities and equity. A fragment can be represented by one or more structures. Fragments can be categorized by type including: **Document**, **Statement**, **Disclosure**, and **Schedule**.

Each fact set has a concept arrangement pattern property. A **concept arrangement pattern**[63] specifies the nature of the relationship

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[60] ibid, page 47, paragraph 77.

[61] Reporting Scheme, http://xbrlsite.azurewebsites.net/2018/Library/ReportingSchemes-2018-12-30.pdf

[62] Fragment, http://www.xbrlsite.com/2020/Theory/Terms/Fragment.html

[63] Concept Arrangement Pattern, http://www.xbrlsite.com/2020/Theory/Terms/ConceptArrangementPattern.html

between the members of the concept aspect within the set of [Line Items] (a.k.a. Primary Items) of an information structure definition.

A **set**[64] is a type of concept arrangement pattern where concepts have no mathematical relations between each other within the fact set. Essentially, a set is a flat list of concepts. A synonym for set is hierarchy.

A **roll up**[65] is a type of concept arrangement pattern which represents a basic roll up type mathematical relationship: Fact A + Fact B + Fact C = Fact D (a set of items and a total of those items).

A **roll forward**[66] is a type of concept arrangement pattern which represents a basic roll forward mathematical relation between a stock and the flows that impact that stock over a specific period of time: Beginning balance (a stock) + change1 (a flow) + change2 (a flow) + change3 (a flow) = Ending balance (a stock). The beginning and ending balances are two different instances in time (stocks) and the changes (flows) are between those two instances.

An **adjustment**[67] is a type of concept arrangement pattern which represents a basic mathematical reconciliation between an originally stated value and a restated value usually due to a correction or error: Originally stated balance + adjustment1 + adjustment2 + adjustment3 = restated balance. The originally stated balance and restated balance are the same concept as of the same instant in time that are differentiated by the date those facts are reported. The adjustments are the changes that reconcile the originally stated to the restated balance.

A **variance**[68] is a type of concept arrangement pattern which represents a mathematical difference between two reporting scenarios: Amount (projected scenario) + Amount(variance) = Amount (actual scenario).

An **arithmetic**[69] (a.k.a. complex computation) is a type of concept arrangement pattern which represents any arbitrary mathematical relationship between a set of numeric facts. An arithmetic pattern is comprised of some flat set of numeric concepts and a rule that represents the mathematical relation between that set of concepts.

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64 Set, http://www.xbrlsite.com/2020/Theory/Terms/Set.html

65 Roll Up, http://www.xbrlsite.com/2020/Theory/Terms/RollUp.html

66 Roll Forward, http://www.xbrlsite.com/2020/Theory/Terms/RollForward.html

67 Adjustment, http://www.xbrlsite.com/2020/Theory/Terms/Adjustment.html

68 Variance, http://www.xbrlsite.com/2020/Theory/Terms/Variance.html

69 Arithmetic, http://www.xbrlsite.com/2020/Theory/Terms/Arithmetic.html

A **roll forward info**[70] is a type of concept arrangement pattern which represents a non-mathematical relation of information about a roll forward.

A **text block**[71] is a type of concept arrangement pattern which represents a non-mathematical relationship in the form of prose. A text block concept arrangement pattern is comprised of exactly one concept. There are three sub classes or type of text blocks: **Level 1 Note Text Block**[72], **Level 2 Policy Text Block**[73], and **Level 3 Disclosure Text Block**[74].

And so, the concept arrangement patterns specify the patterns of the arrangement of the concepts within a set of [Line Items]. It is also the case that additional noncore dimensions can be added to a structure defined via a hypercube and each of these structures can be explained dimensionally[75]. Each of those dimensions have members; and the members likewise have arrangement patterns.

Each fact set has a member arrangement pattern property. A **member arrangement pattern**[76] expresses the relations between members within an aspect other than the concept aspect (which is explained by the concept arrangement pattern).

The members of an axis might be related mathematically. **Member aggregation**[77] is a type of member arrangement pattern where the members of an axis roll up the same as the roll up concept arrangement pattern. **Member flat**[78] list is a type of member aggregation pattern where the members form a flat list. **Member nonaggregating**[79] is a

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[70] Roll Forward Info, http://www.xbrlsite.com/2020/Theory/Terms/RollForwardinfo.html

[71] Text Block, http://www.xbrlsite.com/2020/Theory/Terms/TextBlock.html

[72] Level 1 Note Text Block, http://www.xbrlsite.com/2020/Theory/Terms/Level1NoteTextBlock.html

[73] Level 2 Policy Text Block, http://www.xbrlsite.com/2020/Theory/Terms/Level2PolicyTextBlock.html

[74] Level 3 Disclosure Text Block, http://www.xbrlsite.com/2020/Theory/Terms/Level3DisclosureTextBlock.html

[75] Hypercubes, http://xbrlsite.azurewebsites.net/2017/IntelligentDigitalFinancialReporting/Part01_Chapter02.8_Hypercubes.pdf

[76] Member Arrangement Pattern, http://www.xbrlsite.com/2020/Theory/Terms/MemberArrangementPattern.html

[77] Member Aggregation, http://www.xbrlsite.com/2020/Theory/Terms/MemberAggregation.html

[78] Member Flat List, http://www.xbrlsite.com/2020/Theory/Terms/MemberFlatList.html

[79] Member Nonaggregating, http://www.xbrlsite.com/2020/Theory/Terms/MemberNonaggregation.html

type of member arrangement pattern where the members of an axis are not related mathematically but simply are used to differentiate reported facts.

Reported facts could need additional arbitrary descriptive information. A **parenthetical explanation**[80] provides additional descriptive information about a fact. A synonym for parenthetical information is comment.

A **disclosure**[81] is a set of one to many fact sets or a set of one to many fragments which form an accounting disclosure that is either required by statutory or regulatory rules or provided at the discretion of a reporting entity. A **template**[82] is a representation of a possible disclosure that can be used as a prototype in the process of creating a report. An **exemplar**[83] is a representation of a disclosure from an existing report of some economic entity that can be leveraged in the process of creating a report.

Because variability exists in the allowed possible approaches that economic entities represent their financial disclosures, different economic entities have different reporting styles, or reporting models. A **reporting style**[84] is a set of relations, consistency crosscheck rules, mapping rules, and impute rules that are used to check fundamental accounting concept relations for a specific type of report or style of reporting. For example, a classified balance sheet and an order of liquidity balance sheet are two different reporting styles, two different models, for creating a balance sheet.

A **consistency crosscheck rule**[85] is a type of rule that tests the relations of fundamental accounting concept relations within a report against a specified reporting style to make sure there are no inconsistencies or contradictions between reported facts within a report.

An **impute rule**[86] (a.k.a. derivation rule) is a type of rule that explains how to logically derive a fact that have not been explicitly reported

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[80] Parenthetical Explanation, http://www.xbrlsite.com/2020/Theory/Terms/ParentheticalExplanation.html

[81] Disclosure, http://www.xbrlsite.com/2020/Theory/Terms/Disclosure.html

[82] Template, http://www.xbrlsite.com/2020/Theory/Terms/Template.html

[83] Exemplar, http://www.xbrlsite.com/2020/Theory/Details/Exemplar.html

[84] Reporting Style, http://www.xbrlsite.com/2020/Theory/Terms/ReportingStyle.html

[85] Consistency Crosscheck Rule, http://www.xbrlsite.com/2020/Theory/Terms/ConsistencyCrosscheckRule.html

[86] Impute Rule, http://www.xbrlsite.com/2020/Terms/Details/ImputeTypeRule.html

based on other facts that have been explicitly reported or which have been logically derived from other reported information. For example, an economic entity might not explicitly report the line item "Noncurrent assets"; but does report "Assets" and "Current assets". Given the impute rule "Assets = Current assets + Noncurrent assets"; the fact value for Noncurrent assets can be reliably derived logically using the other two reported facts and the impute rule.

A **mapping rule**[87] is a type of rule that explains how a base reporting scheme taxonomy concept reported by an economic entity relates to a fundamental accounting concept. For example, the notion of "Cost of Revenue" could be reported using the concept "Cost of Revenue", or "Cost of Goods and Services Sold", or "Cost of Goods Sold", or "Cost of Services Sold", etc. Basically, mapping rules enable information to be extracted from a report reliably.

A **disclosure mechanics rule**[88] is a type of rule that describes the structural and mechanical representation of a disclosure against a specification or prototype of that disclosure. For example, every disclosure that has the property of concept arrangement pattern of "roll up" must always have a total. A disclosure mechanics rule would specify the concept that would be used to represent that total. A specific disclosure, such as "inventory components roll up" would be required to use a specific concept such as "Inventory, Net" to represent that total. A disclosure mechanics rule would specify that concept. Other concepts might be used as alternatives to some specific total concept to represent a disclosure. For example, "Utilities Inventory, Net" might be used as an alternative to "Inventory, Net". A disclosure mechanics rule would specify each permissible alternative. Every Level 4 Disclosure Detail representation has some complementary Level 3 Disclosure Text Block representation. A disclosure mechanics rule would specify that association.

A **type-subtype or class rule**[89] is a type of rule that expresses an allowed or a disallowed relation between two reporting scheme concepts for some reporting style. For example, the concept "Operating Expense (indirect operating expense)" would never be part of "Cost of Revenue (direct operating expense)", a type or class rule would be used to explicitly disallow this relation. Alternatively, explicitly allowed relations are also expressed using type or class rules. An example of a type-

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87 Mapping Rule, http://www.xbrlsite.com/2020/Terms/Details/MappingTypeRule.html

88 Disclosure Mechanics Rule, http://www.xbrlsite.com/2020/Theory/Terms/DisclosureMechanicsRule.html

89 Type or Class Rule, http://www.xbrlsite.com/2020/Theory/Terms/TypeClassRule.html

subtype rule is "wider-narrower" associations. For example, a wider-narrower rule might specify that "Product Sales" and "Services Sales" are narrower concepts related to the wider concept "Sales".

A **reporting checklist rule**[90] is a type of rule that describes the reportability of a statutory or regulatory disclosure required by a reporting scheme. For example, some disclosures are always required. Other disclosures are required only if a specific line item is reported. Other disclosures could be used as alternatives for some other disclosure.

A **report set**[91] is a set of one to many reports. For example, if you are comparing the reports of an economic entity for the past five years, the five reports that you use to perform that analysis are your report set. Another example of a report set is the entire set of XBRL-based reports within the SEC EDGAR system.

A **reporting entity aspect**[92] is a core aspect that distinguishes the economic entity which creates a report.

A **calendar period aspect**[93] is a core aspect that distinguishes the calendar period of a reported fact. A **stock**[94] is a type of calendar period aspect that is used to represent a fact as of a specific point in time. A synonym for stock is instant. A **flow**[95] is a type of calendar period aspect that is used to represent a fact over a period of time. A synonym for stock is duration.

A **concept aspect**[96] is a core aspect that is used to express the concept that relates to a fact. Synonyms for concept aspect include primary item and line item.

A **fragment arrangement pattern**[97] is the relationship between fragments or the order or sequence of fragments within a report.

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[90] Reporting Checklist Rule, http://www.xbrlsite.com/2020/Theory/Terms/ReportingChecklistRule.html

[91] Report Set, http://www.xbrlsite.com/2020/Theory/Terms/ReportSet.html

[92] Reporting Entity Aspect, http://www.xbrlsite.com/2020/Theory/Terms/ReportingEntityAspect.html

[93] Calendar Period Aspect, http://www.xbrlsite.com/2020/Theory/Terms/CalendarPeriodAspect.html

[94] Stock, http://www.xbrlsite.com/2020/Theory/Terms/Stock.html

[95] Flow, http://www.xbrlsite.com/2020/Theory/Terms/Flow.html

[96] Concept Aspect, http://www.xbrlsite.com/2020/Theory/Terms/ConceptAspect.html

[97] Fragment Arrangement Pattern, http://www.xbrlsite.com/2020/Theory/Terms/FragmentArrangementPattern.html

Prose[98] is a type of fact value that is structure in nature (i.e. a table, an ordered list, an unordered list, paragraphs of text, or any combination of those structures).

Text[99] is a type of fact value that is nonnumeric unstructured text (i.e. not prose).

A **logical rule**[100] is a type of rule expresses logical relations between entities that make up a report.

An **accounting rule**[101] is a type of logical rule that is used to express a logical assertion specifically related to accounting rules.

A **mechanical rule**[102] is a type of logical rule that is used to express the relations between the report elements that make up a disclosure.

4. Axioms

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 financial report in the form of true statements about financial reports.

Note that these are not necessarily the actual axioms that describe the theory but rather are used to derive those actual axioms[103]. The actual axioms tend to be more detailed.

4.1. Financial reports contain and communicate facts.

Financial 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 "first-in, first out" might be values of a fact which are communicated within a financial report.

Numeric fact values have two additional traits in order to better understand the number. First, numeric fact values have units. For

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98 Prose, http://www.xbrlsite.com/2020/Theory/Terms/Prose.html

99 Text, http://www.xbrlsite.com/2020/Theory/Terms/Text.html

100 Logical Rule, http://www.xbrlsite.com/2020/Theory/Terms/LogicalRule.html

101 Accounting Rule, http://www.xbrlsite.com/2020/Theory/Terms/AccountingRule.html

102 Mechanical Rule, http://www.xbrlsite.com/2020/Theory/Terms/MechanicalRule.html

103 Axioms, http://www.xbrlsite.com/2020/Theory/Axioms/AxiomsSummary.html

example, the units might be US dollars or number of shares. Second, numeric fact values indicate the rounding used. For example, "Is the number rounded to the nearest millions or is it accurate to the cent?"

Fact: A fact is reported. A fact defines a single, observable, reportable piece of information contained within a financial 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.

4.2. Facts reported in a financial report have characteristics.

Facts have characteristics (a.k.a. aspect). Characteristics describe facts.

For example, the number "1000" might have the characteristics of being the concept "Cash and cash equivalents"; for the period ended "December 31, 2011"; for the legal entity which is a "consolidated entity", etc.

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

4.3. Financial reports have fragments.

A full financial report can be broken down into report fragments, or fragments of the full financial report. A fragment is a set of fact sets which go together for some specific purpose.

For example, a "balance sheet" is a fragment of a financial report and is made up of a specific set of fact set.

A fragment can be further broken down into a fact set. A fragment is composed of a set of one or more fact sets. For example, an "income statement" is made up of three fact sets: the income statement computation of net income (loss); a breakdown of net income (loss) into the portion attributable to parent and attributable to noncontrolling interest; and earnings per share information.

Note that the notion of a fact set is convenient in order to achieve a specific objective.

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

4.4. Financial reports have fact sets.

As stated, a fragment is defined as a part of a full report, a fragment of a full report. Every fragment can be broken down into one or many fact sets. Therefore, a fragment is made up of some set of one or more fact sets.

While financial reports communicate facts, those facts never exist on their own; they are always organized into fact sets. Facts are not organized into fragments; rather they are organized with other facts generally for some specific purpose and the fragment is a result.

Fact set: 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 financial report. A fragment is composed of one or more fact sets. (A synonym for fact set is block.)

4.5. Facts reported within financial reports are organized into fragments and fact sets.

While financial reports communicate facts, those facts never exist on their own; they are always organized into fragments and fact sets. 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 set.

For example, the fact which uses the concept "Cash and cash equivalents" might exist in the balance sheet fragment. It might also exist within the cash flow statement fragment. It might also be organized as a separate fragment which contains only the single fact with the characteristic "Cash and cash equivalents".

4.6. Financial report facts and fragments can be organized using a financial reporting conceptual framework.

The financial reporting conceptual framework for US GAAP and IFRS based financial reporting is created by the FASB and IASB, respectively. These conceptual frameworks define financial report elements and financial statement fragments which are useful and which can be leveraged to identify facts and organize fragments.

4.6.1. Financial report elements

The high-level elements of a financial statement defined by the FASB in SFAC 6 are:

- Assets

- Liabilities
- Equity
- Investments by owners
- Distributions to owners
- Revenues
- Expenses
- Gains
- Losses
- Comprehensive income

These financial report elements are 'the building blocks' with which financial statements are constructed - the classes of items that financial statements comprise. (Elements of Financial Statements. Statement of Financial Accounting Concepts No. 6 (Stamford, Conn.: FASB, 1985, par. 5.)

Other financial report elements which are not outlined by the FASB and which could exist within a financial report include:

- Policy
- Disclosure
- Document information
- Reporting entity information

4.6.2. Financial statement fragments

Financial statement fragments are defined by the FASB as:

- Balance sheet
- Income statement
- Comprehensive income
- Statement of changes in equity
- Cash flow statement
- Related disclosures

Related disclosures can be further broken down into categories, for example:

- Organization
- Consolidation related disclosures
- Basis of reporting and presentation of financial statements
- Significant accounting policies
- Financial statement accounts related disclosures
- Broad transactions categories related disclosures

These categorizations are used by the FASB Accounting Standards Codification (ASC)[104]. For more information see: (note that a free basic subscription is available)

4.7. Industries and reporting entities with certain activities have different reporting practices and therefore use the financial reporting conceptual framework differently.

Reporting entities that belong to different industries and that have different activities may have different financial reporting practices. However, all reporting entities and all types of activities fit within the financial reporting conceptual framework under which they are reporting.

It is practiced that a corporation reports "Stockholders' equity" and partnerships report "Partner capital" and that sole proprietors report "Owner's equity"; however, all three are "Equity" as defined by the financial reporting conceptual framework. Another term for equity is "Net assets".

In this case "equity" is a concept and "Stockholders' equity", "Partner capital", "Owner's equity, and "Net assets" are simply different preferred labels which might be used in different situations to describe the concept "equity".

In practice a financial institution creates an unclassified balance sheet and general commercial and industrial companies create a classified balance sheet; but both types of reporting entities provide balance sheets.

While different industries and activities use fragments of the financial reporting framework differently, that does not change the financial reporting framework or change the fact that a financial reporting conceptual framework exists. The different reporting styles employed by economic entities are identifiable.

4.8. Common aspects of financial facts exist.

Some common aspects that describe financial facts include:

- **Reporting entity** (which accounting or economic entity issued the reported fact; for example, Microsoft or Google). A reporting entity could be a consolidated entity, a parent holding company, a group (IFRS), or consolidated accounts.

[104] FASB, *Accounting Standards Codification (ASC)*, https://asc.fasb.org/

- **Legal entity** (to which legal entity does the reported fact relate; for example, consolidated entity or parent holding company). Groups or consolidated entities are not legal entities. They are accounting creations only. The holding company is the legal entity and what is actually invested in unless subsidiaries are also listed.
- **Report date** (what is the date on which the report was issued which contains the reported fact; for example, the audit report date or the filing date)
- **Reporting scenario** (under which scenario was a fact reported; for example, actual, budgeted, etc.)
- **Concept** or line item (what financial reporting concept describes the reported fact; for example, Cash and cash equivalents, Assets, Net Income (Loss), etc.)
- **Calendar period** (to which period of time does the fact relate; for example, which year or, current period, prior period, etc.)
- **Fiscal period** (to which fiscal period does the fact relate; for example, quarter 1, quarter 2, quarter 3, fiscal year). Another term for these is reporting period or budget period. The primary point here is that a calendar period and a fiscal period are two different things.
- **Business segment** (to which business segment does the fact relate; for example, the consolidated entity, consolidation eliminations, subsidiaries or other business segment)
- **Geographic area** (to which geographic area does the fact relate; for example, all geographic areas combined, Europe, Asia)

Not all financial 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 financial information use these precise terms, however they use some term which basically means in essence what is outlined on the list above.

4.9. Financial facts may have parenthetical explanations.

Financial facts may have parenthetical explanations which provide additional descriptive information about the fact. Parenthetical explanations may take the form of footnotes, meaning an additional piece of information printed at the bottom of a page of a financial report or with the line item of a financial report. The term footnote as used here is not the same thing as a disclosure note.

The following is the proposed formal definition of the term "parenthetical explanation".

Parenthetical explanation: A parenthetical explanation provides additional descriptive information about a fact.

4.10. Characteristics of a financial fact may be related

Characteristics which describe a financial fact can be related. A relation is how one thing in a financial report is or can be related to some other thing in a financial 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[105].
- **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.
- **Property-of**: A property-of association specifies that a term has a specific quality, trait, or attribute.

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. The following are a few basic examples.

Partial sets are values of characteristics which do not comprise the full spectrum of possible options. For example, "United States" and "Spain" is a partial set of countries. The complete set of countries would be just that, a complete list of all countries.

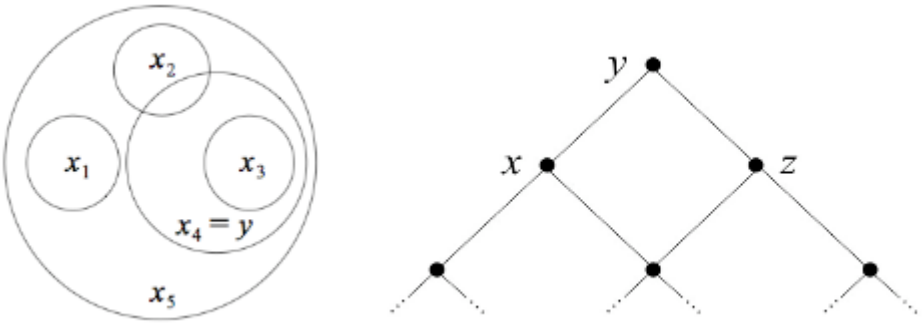
Complete flat set is a "flat" (meaning no sub-relations) and complete list of the values of a characteristic. For example, a list of the 15 directors of an entity is a complete, flat list of a company's directors.

Complete hierarchical set is similar to a complete flat set in that it is complete; however, sub relations exist. For example, this is a complete, hierarchical list of the **locations of customers of a company**, by region and by country:

- North America
  - United States
  - Canada
- Europe
  - United Kingdom
  - Germany
  - Spain

[105] Stanford University, *Mereology*, http://plato.stanford.edu/entries/mereology/

Complex sets round out the set of possibilities and are a complete set of possible options with a complex relationships structure. The permutations of combinations are endless and potentially infinitely complex. As such, such relations should be avoided as it would be impossible for machines to process such complexity.



4.11. Financial report facts may be related.

Financial report facts may, or may not be related. The sections below articulate the spectrum of possibilities.

For example, the parts "Petty cash", "Cash", and "Cash equivalents" are related to the whole "Cash and cash equivalents" and the sum of the parts adds up to the whole.

4.11.1. Facts can relate to one another numerically

Financial facts can relate to one another numerically. For example,

- **Roll up**: Fact A + Fact B + Fact C = Fact D (a total)
- **Roll forward**: Beginning balance + changes = Ending balance
- **Adjustment**: Originally stated balance + adjustments = restated balance
- **Variance**: Actual amount – Budgeted amount = variance
- **Arithmetic**: Net income / Weighted average shares = earnings per share

A roll up-type relation can also exist across characteristics other than the concept. For example, Revenues for geographic area A + Revenues for geographic area B + Revenues for geographic area C = Revenues for all geographic areas. This is similar to a roll up as described above.

4.11.2. Facts can have a non-numerical relation to another fact

Facts can have a non-numerical relation to other facts. For example; inventory policy, revenue recognition policy, and depreciation method all relate to one another in that they are all policies.

4.11.3. Facts may not relate to any other financial fact

Facts need not have a relation to any other financial facts; they are unrelated. For example, a subsequent event does not have to be related to any other financial fact.

4.11.4. Facts have fidelity

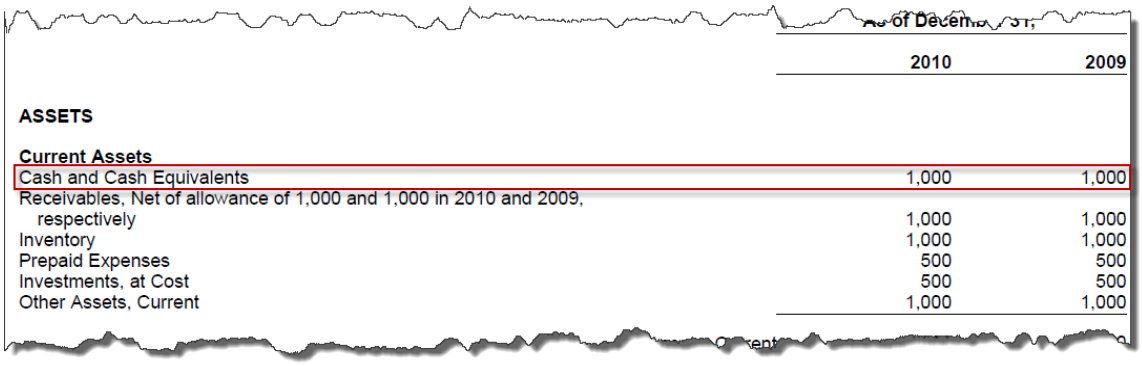
Financial reports are detailed, complex logical information. Financial reports have accuracy in reporting details, a characteristic of exactness to reported facts. There exists an exactness in a fact or with a given quality, condition, or event. A financial report articulates the financial condition and financial position of an economic entity. Any representation of that financial condition and financial position, in whatever form be it human-readable or machine-readable should be a faithful representation of that information.

4.11.5. Financial reports have integrity

While an individual fact of a financial report has fidelity; the financial report viewed as a whole likewise has fidelity. This holistic fidelity constitutes integrity.

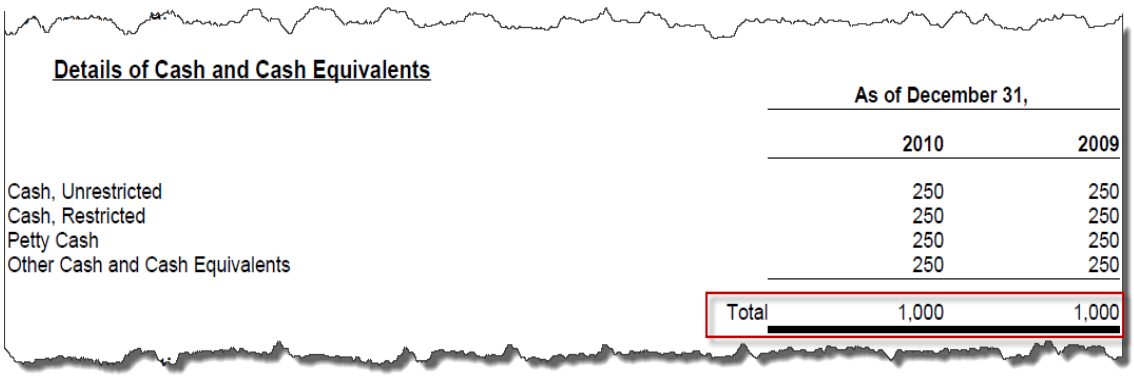
For example, the concept "Cash and cash equivalents" can exist on the balance sheet in aggregate and also in the disclosures where the aggregate amount is disaggregated, providing a detailed listing of that aggregate. This aggregate value on the balance sheet and disaggregation within a disclosure is shown below.

Balance sheet:



	As of December 31,	
	2010	2009
ASSETS		
Current Assets		
Cash and Cash Equivalents	1,000	1,000
Receivables, Net of allowance of 1,000 and 1,000 in 2010 and 2009, respectively	1,000	1,000
Inventory	1,000	1,000
Prepaid Expenses	500	500
Investments, at Cost	500	500
Other Assets, Current	1,000	1,000

Disclosure:



Details of Cash and Cash Equivalents

	As of December 31,	
	2010	2009
Cash, Unrestricted	250	250
Cash, Restricted	250	250
Petty Cash	250	250
Other Cash and Cash Equivalents	250	250
Total	1,000	1,000

4.12. Financial reports have core classes and relations between classes common to all reporting entities.

While not all financial reports have all facts in common, and different industries can have more or less in common, there are some core fragments which all economic entities have. These facts can be thought of as "key stones" or "corner stones" which hold a financial report together or provide somewhat of a "skeleton" for a financial report. Note that this is not to say that all economic entities report these accounting concepts; if a concept is not reported it can be logically imputed leveraging such known relations.

That said, not every economic entity has exactly the same key stone relations; rather, economic entities can be grouped in terms of reporting style. For example, some economic entities report a classified balance sheet while others report an unclassified balance sheet. When economic entities are grouped into reporting styles, these fundamental accounting concept relations are universal to all economic entities within that group.

These fundamental accounting concepts can be articulated. For example, these are fundamental accounting concepts which are common to most commercial and industrial reporting entities in all industries and relations which exist between these concepts which can never change in the context of a specific reporting style employed by an economic entity:

- Assets = Liabilities and Equity
- Assets = Current Assets + Noncurrent Assets (classified balance sheet)
- Equity = Equity Attributable to Parent + Equity Attributable to Noncontrolling Interest
- Liabilities = Current Liabilities + Noncurrent Liabilities (classified balance sheet)

- Liabilities and Equity = Liabilities + Commitments and Contingencies + Temporary Equity + Equity
- Liabilities = Liabilities and Equity - (Commitments and Contingencies + Temporary Equity + Equity)
- Current Assets = Assets - Noncurrent Assets (classified balance sheet)
- Current Liabilities = Liabilities - Noncurrent Liabilities (classified balance sheet)
- Noncurrent Assets = Assets - Current Assets (classified balance sheet)
- Noncurrent Liabilities = Liabilities - Current Liabilities (classified balance sheet)
- Gross Profit = Revenues - Cost of Revenue (Multi-step approach)
- Operating Income (Loss) = Gross Profit - Operating Expenses + Other Operating Income (Multi-step approach)
- Income (Loss) from Continuing Operations Before Equity Method Investments = Operating Income (Loss) + Nonoperating Income (Loss) - Interest and Debt Expense
- Income (Loss) from Continuing Operations Before Tax = Income (Loss) from Continuing Operations Before Equity Method Investments + Income (Loss) from Equity Method Investments
- Income (Loss) from Continuing Operations after Tax = Income (Loss) from Continuing Operations Before Tax - Income Tax Expense (Benefit)
- Net Income (Loss) = Income (Loss) from Continuing Operations After Tax + Income (Loss) from Discontinued Operations, Net of Tax + Extraordinary Items, Gain (Loss)
- Net Income (Loss) = Net Income (Loss) Attributable to Parent + Net Income (Loss) Attributable to Noncontrolling Interest
- Net Income (Loss) Available to Common Stockholders, Basic = Net Income (Loss) Attributable to Parent - Preferred Stock Dividends and Other Adjustments
- Comprehensive Income (Loss) = Comprehensive Income (Loss) Attributable to Parent + Comprehensive Income (Loss) Attributable to Noncontrolling Interest
- Comprehensive Income (Loss) = Net Income (Loss) + Other Comprehensive Income (Loss)
- Operating Income (Loss) = Revenues - Costs and Expenses + Other Operating Income (Single-step approach)
- Costs and Expenses = Cost of Revenue + Operating Expenses (Single-step approach)
- Net Cash Flow = Net Cash Flows, Operating + Net Cash Flows, Investing + Net Cash Flows, Financing + Exchange Gains (Losses)

- Net Cash Flows, Continuing = Net Cash Flows, Operating, Continuing + Net Cash Flows, Investing, Continuing + Net Cash Flows, Financing, Continuing
- Net Cash Flows, Discontinued = Net Cash Flows, Operating, Discontinued + Net Cash Flows, Investing, Discontinued + Net Cash Flows, Financing, Discontinued
- Net Cash Flows, Operating = Net Cash Flows, Operating, Continuing + Net Cash Flows, Operating, Discontinued
- Net Cash Flows, Investing = Net Cash Flows, Investing, Continuing + Net Cash Flows, Investing, Discontinued
- Net Cash Flows, Financing = Net Cash Flows, Financing, Continuing + Net Cash Flows, Financing, Discontinued

Other truths about what facts are reported, relations between facts, computations which exist which can be leveraged. The following is a partial list of such situations:

- Balance sheets always report "Assets", "Liabilities and Equity" and "Equity"
- On the balance sheet, assets foots
- On the balance sheet, liabilities and equity foots
- On the balance sheet, equity foots
- Balance sheets balance, "Assets = Liabilities and Equity"
- Income statements always report net income (loss)
- On the income statement, net income (loss) foots
- Cash flow statements report net cash flow
- On the cash flow statement, net cash flow foots
- Net cash flow per the cash flow statement reconciles beginning and ending cash and cash equivalents
- Cash and cash equivalents per the cash flow statement and cash and cash equivalents per the balance sheet are the same fact
- Beginning and ending balances of equity per the statement of changes in equity agree with equity balances per the balance sheet

There are likely other core concepts and relations, but the above are certainly true when taking into consideration different reporting styles. It is perhaps possible for a reporting entity not to report a cash flow statement or income statement. It is less likely for a company to not report a balance sheet. But some set of reporting styles can be created to address all reporting situations and a reporting style can have a set of economic entities which is only one entity.

The importance of these cornerstone facts and relations is that they form a foundation for a 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. They are the links in the integrity foundations for financial reports.

Different industries may have different core financial report facts common within certain fragments. Thus, economic entities employ different reporting styles. While financial reports are not forms, at a high level and for specific groupings of economic entities financial reports are uniform. A set or grouping of economic entities could have one entity.

4.13. Financial reports have a flow.

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

Economic entities creating financial reports have flexibility as to this flow, for example an income statement could come before or after a balance sheet.

The flow of a report can impact meaning in some cases, less so or not at all in other cases. The sequencing or ordering of these fragments or fragments of a financial report is the report flow model.

4.14. Differing sets of detailed facts for a higher-level fact does not change the definition of the higher-level fact.

Having different detailed line items for some reported fact does not change the definition of high-level concepts such as assets, liabilities and equity, equity, net cash flow, net income (loss).

For example, if one financial report has the line item "Accounts receivable, net" and another report does not, the meaning of the aggregate concept "Current assets" is not different between the two financial reports.

4.15. Financial reports may have supporting schedules.

A financial report may have supporting schedules, or supplementary financial information, which is not considered as part of the financial statements.

4.16. Reporting entities which created financial reports can be categorized into industries/activities.

Industries and activities have unique financial reporting and accounting practices. The following is a summary of some reporting industries and the activities which a reporting entity may have:

- Commercial and Industrial (general, not classified into some other industry or activity)
- Agriculture
- Airlines
- Banking and Thrift
- Broadcasting
- Broker and Dealers of Securities
- Cable Television
- Casinos
- Contractors
- Extractive Activities
- Health Care
- Insurance
- Investment Companies
- Motion Pictures
- Mortgage Banking
- Real Estate
- Records and Music
- Regulated Entities
- Retailers
- Software

Other industries and activities exist. Many different industry classification systems exist such as SIC (Standard Industry Classification), NAIC (North American Industry Classification System), and GICS (Global Industry Classification Standard).

4.17. Financial analysts use certain common key financial ratios when analyzing financial report information.

The following is a summary of some common key ratios used:

- Return on Investment
- Return on Equity
- Return on Total Assets
- Operating Profit
- Sales to Accounts Receivable
- Sales to Inventories

- Sales to Fixed Assets
- Inventory Days
- Debtor Days
- Corporate Liquidity
- Working Capital
- Current Ratio
- Quick Ratio
- Working Capital to Sales
- Interest Cover
- Debt to Equity
- Market Capitalization
- Dividends Per Share
- Dividends Cover Payout Ratio
- Earnings Yield
- Dividends Yield
- Price to Earnings Ratio
- Market to Book Ratio
- Capital Employed
- Working Capital Days
- Assets Employed
- Profit Margin
- Asset Turnover
- Sales Margin
- Sales Turnover

Other common key ratios exist.

4.18. Financial report fragments, facts, characteristics, parenthetical explanations, and relations have specific known properties.

Each of these primitives or fundamental parts of a financial 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 (entity or thing which has the property). 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.

4.19. Financial reports may have different core facts and relations between facts based on reporting options chosen by a reporting entity and industry specific reporting practices.

The financial reports of economic entities can be grouped into high level patterns of variability. These are referred to as reporting styles. Comprehensive testing of all XBRL-based public company financial filings to the U.S Securities and Exchange Commission at this very high level revealed a very limited and specific variability most of which occurs on the income statement. This variability is not random. The following is a summary of and a near complete inventory of this variability at this high-level of a financial report:

- Entities report using some accounting industry or activity
  - Commercial and industrial (standard approach)
  - Interest based revenues
  - Insurance based revenues
  - Securities based revenues
  - REIT (real estate investment trust)
  - Utility
- Balance sheets can be
  - Classified and report current and noncurrent assets and liabilities
  - Classified and report current assets, fixed assets, and other than fixed assets; current and noncurrent liabilities
  - Unclassified
  - Report using liquidity-based reporting
  - Regulated utilities report total capitalization on their balance sheet as a line item
- Income statements can be
  - Multi-step and report gross profit
  - Single-step and do not report gross profit
- Income statements can
  - Explicitly report operating income (loss)
  - Do not report operating income (loss)
- Income (loss) from equity method investments can be reported on the income statement
  - As part of revenues
  - As part of cost of revenues
  - As part of nonoperating income (loss)
  - Before taxes as a separate line item
  - Between income (loss) from continuing operations before and after taxes

- Cash flow statements can report net cash flow as
  - Including exchange gains (losses)
  - Not including exchange gains (losses)

An analysis of the complete set of public companies which file with the U.S. Securities and Exchange Commission revealed that about 80% of all economic entities report using only 12 different reporting styles. Of the remaining 20%, 18% fit into approximately 75 reporting styles and the reporting style of 2% exists, but has not been specifically identified.

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

SFAC 6 breaks a financial statement into groups of 10 elements. These elements are 'the building blocks' with which financial statements are constructed - the classes of items that financial statements comprise. (Elements of Financial Statements. Statement of Financial Accounting Concepts No. 6 (Stamford, Conn.: FASB, 1985, par. 5.)

While the 10 elements defined by the FASB are not the necessary set of elements for defining an entire digital financial report, however they do serve as a very useful starting point. The FASB's set of elements needs to be expanded to include at least all of the fundamental accounting concepts.

The sets or classes of elements 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

4.21. 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.

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

Facts reported within some report fragment can be reported at different levels of granularity. Grain is the level of depth of information or granularity. The lowest level of granularity of a financial report is the actual transaction, circumstance, or other phenomenon. The highest level of granularity is typically the information reported within the

primary financial statements. Different levels of granularity are reported within disclosures, aggregating or disaggregating information as deemed appropriate for some specific disclosure.

4.23. 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, a fragment of a full report. Every fragment can be broken down into one or many fact sets. Therefore, a fragment is made up of some set of one or more fact sets.

A **block** is a set of facts which share the same information model. For example, an income statement is comprised of three blocks: (1) a roll up of net income (loss); (2) a roll up of the breakdown of net income (loss) into the parts attributable to the parent and to the noncontrolling interest; (3) a hierarchy which reports the earnings per share and weighted-average shares.

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

Block: A block is part of a fragment which shares the same information model (member arrangement pattern plus concept arrangement pattern). (A synonym for block is fact set.)

4.24. A disclosure is a fragment of a financial report which represents something that is disclosed.

A **disclosure** is a fragment of a financial report which represents something that is being disclosed within that report. The following is an example of a disclosure for the components of inventory.

BOEING CO | 2013 | FY | ★★★★★

Inventories at December 31 consisted of the following:

	2013	2012
Long-term contracts in progress	**$12,608**	$15,130
Commercial aircraft programs	**48,065**	40,389
Commercial spare parts, used aircraft, general stock materials and other	**7,793**	7,206
Inventory before advances and progress billings	**68,466**	62,725
Less advances and progress billings	**(25,554)**	(24,974)
Total	**$42,912**	$37,751

Disclosures can be directly mapped to accounting standards or other regulatory requirements, the accounting practices of an industry, or the policies of a specific economic entity which creates a financial report.

4.25. An exemplar is an example of a specific disclosure which exists in some other financial report.

An **exemplar** is defined as an example of some specific disclosure which exists within some financial report. For example, the components of inventory is a disclosure. The components of inventory disclosure of Boeing, Caterpillar, and Coca Cola are exemplars of the disclosure components of inventory.

4.26. A template is an exemplar which is used to begin the process of creating a disclosure.

A **template** is defined a representation of a disclosure which is used in the process of creating a financial report to pro forma that report. For example, many accounting professionals use existing financial reports as examples to begin the process of creating a new financial report. An exemplar of another economic entities report, say the components of inventory disclosure of Boeing, can be used as a template for creating a new report. The components of inventory disclosure of Boeing is selected from a list of exemplars and then imported into the financial report and then is modified to suit the needs of the economic entity creating the report. The difference between an exemplar and template is only a matter of perspective.

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

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 financial report which represents the disclosure of the components of property, plant, and equipment within a financial 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 disclosure 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.

4.28. Business rules guide, control, suggest, or influence behavior

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.

Business rules can exist in human-readable and machine-readable form.

5. Theorems as Deduced from 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.

5.1. Facts of a financial report should be uniquely identifiable.

If a financial report is made up of facts then financial facts should be uniquely identifiable in order to differentiate facts.

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

For example, a financial report would not ever need to report "Cash and cash equivalents" for the consolidated entity as of December 31, 2010 as of the same report date and the same (identical) other characteristics more than once.

5.2. Fragments of a financial report should be uniquely identifiable

If a financial report is made up of fragments then financial report fragments should be uniquely identifiable in order to differentiate fragments.

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

5.3. Different sets of detailed facts do not change the definition of higher level fact in general.

If the axiom "Differing sets of detailed facts for a higher-level fact does not change the definition of the higher-level fact" is true; then it should also be true that having different line items which detail a fact at any level should not change the definition of a fact.

For example, if the line items which make up the assets section of a balance sheet does not change the definition of the concept assets; then the line item property, plant and equipment, net should not change the definition of property, plant, and equipment, net. This same reasoning works at all levels within a financial report. Said another way, the composition of property, plant, and equipment, net such as land, furniture and fixtures, buildings, office equipment and so forth does not change the definition of the total concept property, plant, and equipment, net.

5.4. Fragments and facts of a financial report are comparable to the extent that the fragments and facts are identifiable and common.

If the characteristics of a fact within one or more financial reports are the same then the facts are comparable.

Comparability is created. Comparability can be created by two or more financial reports using the same identifiable characteristic.

For example, of the fragment "balance sheet" is identifiable in two financial reports and if the concept characteristic "assets" is identifiable; then the two financial reports can compare the assets of both balance sheets.

5.5. An information model is a combination of relation patterns.

An information model is a combination of relation patterns. An information model is a combination of the member arrangement pattern plus the concept arrangement pattern.

5.6. Fact sets of a financial report should be uniquely identifiable.

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

Fact sets of a financial report should be uniquely identifiable. No two financial report fact sets are exactly the same (i.e. there are no duplicate fact sets).

5.7. Fact sets of a financial report are associated with a specific disclosure.

If a financial report is made up of fragments and fragments are made up of fact sets; then those fact sets can be associated with a specific identifiable disclosure or part of a disclosure.

5.8. Accounting relations exist within a financial report.

If each fact or report fragment is uniquely identifiable within a financial report; then relations between those facts and report fragments can exist. If relations can exist, then accounting relations can be part of the set of relations that exist.

The following is a set of the types of relations professional accountants would like to understand about the facts and fragments which exist within a financial report:

- **Financial report-requires disclosure**: Indicates that a financial report (full) is always required to contain a specific disclosure (hasPart). This disclosure MUST always be present. For example, a financial report for a commercial and industrial company requires a balance sheet.
- **Disclosure-requires concept**: Indicates that a disclosure (full) is required to contain a specific concept (hasPart). This concept MUST always be present for the specified disclosure. For example, a balance sheet requires the concept "Assets" and "Liabilities and Equity"
- **Disclosure-requires concept in context**: Indicates that a disclosure is required to contain a specific concept and the context of the reported fact must be in the same context of some other reported fact. (This is not right) For example, if the concept "Current Assets" is provided, then the concept "Current liabilities" must also be provided in be in the same context.
- **Disclosure-requires characteristic**: Indicates that the disclosure requires the specified characteristic (expressed as an Axis) to exist. For example, the "Segment Reporting Information, by Segment" disclosure requires the characteristic "Business segments" which is expressed using the Business Segment [Axis] of the US GAAP XBRL Taxonomy.
- **Disclosure-requires member**: Indicates that the disclosure requires the specified Member to exist. For example, the "Business segments" characteristic requires the member "All business segments" to be provided which means that showing the total of all business segments is mandatory.
- **Disclosure-allows alternative disclosure**: Indicates that an alternative disclosure can be used in place of another disclosure. For example, rather than providing an income statement and a statement of comprehensive income; a combined statement of income and comprehensive income could be provided.
- **Disclosure-requires disclosure**: Indicated that if the first disclosure exits, the second disclosure must also exist. For example, if "the estimated useful life of property plant and equipment" exists, then the "depreciation method" must also exist.
- **Concept-allows alternative concept**: Indicates that an alternative concept can be used in place of another concept. For

example, the concept "Partner capital" or "Member equity" could be used and is an alternative for the concept "Equity". (Not sure if this is necessary, the class-equivalentClass might work.)

- **LineItems-requires concept**: Indicates that the LineItems of a disclosure is required to contain a specified concept. (Not sure if this is necessary.) For example, the disclosure "Property, plant, and equipment, net by type [Roll Up]" requires the concept Property, Plant and Equipment, Net which is the total of the disclosure to exist.
- **Concept-requires policy**: If a specific line item exists, then some specific disclosure exists.
- **Concept-requires disclosure**: If a specific line item exists, then some specific disclosure must also exist.
- **Reported disclosure-requires disclosure**: Indicates that if a specific disclosure exists, then some additional disclosure must also exist. For example, if the "Property, Plant, and Equipment, net by type" exists, then the disclosure "Property, plant, and equipment estimated useful lives" must also exist.
- **Disclosure-has concept arrangement pattern**: Indicates that a disclosure is organized using the indicated concept arrangement pattern. For example, the disclosure "Property, plant, and equipment, net by type" is identified to be a "Roll Up" type concept arrangement pattern. This disclosure should never be a roll forward or hierarchy, those are different disclosures.
- **Concept arrangement pattern-requires concept**: Indicates that the concept arrangement pattern requires a specific concept. For example, the “Roll Up” of the disclosure "Property, plant, and equipment, net by type" requires the concept “Property, Plant, and Equipment, Net” as the total for the roll up.
- **Reported fact-requires reported fact in context**: Indicates that if a specified reported fact exist, then another reported fact is also required. For example, if the reported fact "Equity attributable to noncontrolling interest" is reported, then the concept "Equity attributable to parent" is required to be reported and must be in the same context. (Meaning that an economic entity cannot report equity attributable to noncontrolling interest without also reporting equity attributable to parent.
- **Reported fact-prohibits reported fact**: Indicates that if some fact is reported, some other fact must never be reported. For example, if an economic entity reported the fact "us-gaap:CashAndCashEquivalentsPeriodIncreaseDecrease", then the reported fact "us-gaap:CashPeriodIncreaseDecrease" must not be

reported. (This would make no sense because the two concepts both report "Net Cash Flow".)

- **Disclosure-equivalent text block**: Indicates that if a specific disclosure exists, then a specific text block MUST also exist. For example, if the disclosure "Property, plant and equipment, net by type" exists as indicated by the existence of a specific reported fact "us-gaap:PropertyPlantAndEquipmentNet"; then a fact which reports the equivalent text block "us-gaap:PropertyPlantAndEquipmentTableTextBlock" MUST also exist.
- **Disclosure-has prior period comparison**: Indicates that a disclosure provides prior period comparative information for the current disclosure. For example, for the "Property, plant and equipment, net by type" disclosure of the components which make up PPE, prior period information is provided.
- **Disclosure-related policy**: Indicates that a disclosure has a specific policy which is related to the disclosure.
- **Concept-related policy**: Indicates that a concept has a specific policy which is related to that concept.

6. Ethics or Worldview of Financial Report

Ethics is the worldview of a financial report. While axioms are irrefutable facts which form a foundation, which describes a financial report and theorems build on those axioms by deduction and therefore both axioms and theorems are objective; the ethics or worldview which describes a financial 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 financial report.

1.1. Financial reports are a true and fair representation of the reporting entities financial information.

The objective of a financial report is to provide a true and fair representation of the accounting entity which issued the financial report. Any representation in any form should be a faithful representation of the financial position and financial condition of the accounting entity. A financial report is a true and fair representation if it is complete, correct, consistent, accurate, has fidelity and integrity. Below are definitions of these terms.

- **Completeness**: Having all necessary or normal parts, components, elements, or steps; entire.

- **Correctness**: Free from error; in accordance with fact or truth; right, proper, accurate, just, true, exact, precise.
- **Consistency**: Compatible or in agreement with itself or with some group; coherent, uniform, steady. Holding true in a group, compatible, not contradictory.
- **Accuracy**: Correctness in all details. Conformity or correspondence to fact or given quality, condition. Precise, exact. Deviating only slightly or within acceptable limits from a standard.
- **Fidelity**: Where accuracy focuses on the details of one fact; fidelity is accuracy of all facts considered as a whole in the reproduction of something as compared to actual facts.
- **Integrity**: Holistic accuracy, accurate as a whole. The quality or condition of being whole or undivided; completeness, entireness, unbroken state, uncorrupt. Integrity is a concept of consistency of actions, values, methods, measures, principles, expectations, and outcomes.

6.1. Financial reports have traits which impact their quality.

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

- **All financial report formats convey the same message**: A financial statement can be articulated using paper and pencil, Microsoft Word, PDF, HTML, XBRL, or other format. But 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 financial position and financial condition of the accounting entity.
- **Information fidelity and integrity**: A financial statement foots, cross casts, and otherwise "ticks and ties". A financial report is internally consistent. The accountant community understands this and many times this fact disappears into unconsciousness because it is so ingrained in the minds of professional accountants. Of course, things foot and cross cast; of course, the pieces tie together. Said another way, a financial statement must be correct, complete, consistent, and accurate. Only trained accounting professionals who understand how the XBRL medium works can tell if all financial statement computations are properly articulated and verified to be correct using that medium.
- **Justifiable/defensible report characteristics**: Facts reported and the characteristics which describe those reported facts should

be both justifiable and defensible by an accounting entity reporting such facts.

- **Consistency between periods**: Generally financial information expressed within one period should be consistent with the financial information expressed within subsequent periods, where appropriate. Clearly new information will be added and information which becomes irrelevant will be removed from a financial report. Changes between report elements which existed in both periods should be justifiable/defensible as opposed to arbitrary and random.
- **Consistency with peer group**: If an economic entity chooses one approach and a peer of that economic entity chooses another report element selection choice; clearly some good reason should probably exist. This is not to say differences would not or should not occur. Rather, why the differences exist should make sense. Generally financial information between two peers should be more consistent as compared to inconsistent.
- **Logical representations indicated by understandable renderings**: Human readable renderings of facts; characteristics that describe facts; parenthetical explanations 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.
- **Unambiguous business meaning**: A financial report should be unambiguous to an informed reader. The business meaning of a financial report should be clear to the creator of the financial report and likewise clear to the users of that financial report. Both the creator and users should walk away with the same message or story. A financial report should be usable by regulators, financial institutions, analysts, investors, economists, researchers, and others to desire to make use of the information the report contains as they see fit.

6.2. Financial reports are used individually, compared across periods, and compared across reporting entities.

Financial reports are used in different ways by users including:

- **Analysis of a single financial report**: Analysis of one financial report of one reporting entity.

- **Time series analysis of reporting entity**: Two or more financial reports of the same reporting entity are compared.
- **Comparative analysis across reporting entities**: Two or more financial reports of different reporting entities are used.
- **Ratio analysis**: An analysis of a single financial report, a time series analysis, or a comparative analysis using ratios computed from facts within a report.

6.3. Disclosures are reported, notes is a presentation related notion which refers to organization of disclosures.

An economic entity has more flexibility as to in which note of its financial statement it provides a disclosure; it has less flexibility over what it must disclose.

A note is a presentation related notion, relating to how disclosures are presented in a financial report. A disclosure is what must be disclosed. The FASB and IASB specifies what must be disclosed, and less which disclosure note to use to present the disclosure within the financial report.

Disclosures are informational, they relate to information without regard to formatting or other presentational artefacts. Notes relate to organizing disclosures and are presentational in nature. Someone creating a financial report has far more latitude and discretion as to how to organize disclosures into notes than they do as to what must be disclosed.

6.4. Economic entity part definitions are inconsistent in financial reporting literature.

The parts into which a reporting economic entity can be broken down are defined inconsistently in the financial reporting literature. From FASB Accounting Standards Codifications, ASC 280 relates to the classification of assets and sometimes liabilities use the terms operating segments and reportable segments of the business. ASC 350 which relates to impairment uses the term reporting unit. ASC 860 which relates to special-purpose entities and the master glossary uses the term business. ASC 360 which relates to long-lived assets uses the term asset groups and disposal groups.

As such, the following terminology is proposed:

- Consolidated entity
- Parent holding company
- Operating segment (ASC 280)

- Reportable segment (ASC 280)
- Reporting unit (ASC 350)
- Business (ASC 805)
- Asset group (ASC 360)
- Disposal group (ASC 360)

Further, the terminology used by different reporting schemes to articulate the breakdown of the parts of an economic entity likewise tend to be inconsistent.

6.5. Financial reports may be expressed using different medium.

Financial 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 financial reports cannot be interpreted by machines such as computers.
- Digital including XBRL, within a database or within some software application. Digital financial 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 are all probable approaches to representing financial report information.

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

6.6. Financial reports may contain non-financial information, sustainability information, or other information.

A financial report is not limited to financial information. A financial report can also support disclosure of non-financial information, sustainability information, and other types of information.

6.7. Categorization of disclosures can be helpful.

Breaking a set of disclosures into some categorized list can be helpful in making use of the disclosures. For example,

- Organization related disclosures

- Consolidation related disclosures
- Basis of reporting and presentation of financial statements
- Significant accounting policies
- Financial statement accounts related disclosures
- Broad transactions categories disclosures

Although this breakdown is not required, it is helpful. Also, this list of categories is not required, although it is reasonable. There are other reasonable categorizations.

6.8. Facts reported within a fragment may be illogical without the existence of other facts.

Facts reported within a fragment or other fragment of a financial report may be illogical without the existence of other facts.

For example, reporting the date of a subsequent event without identifying the subsequent event is not logical.

6.9. Financial reporting 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.

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

Consider the following scenario:

> Two public companies, A and B, each have some knowledge about their financial position and financial condition. They must communicate their knowledge about that financial position and financial condition to a third party, an investor, who is making investment decisions which will make use of the combined

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) and common financial reporting standards (i.e. US GAAP), so they should be able to communicate this information fully, so that any inferences which, say, the investor draws from public company A's input should also be derivable by public company A itself using basic logical principles and common financial reporting standards, and vice versa; and similarly for the investor and public company B.

A notion critical to a digital financial 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 financial report a conclusion must be reachable as to the consistency of mechanics of reported information to expectations.

A notion critical to decidability is the closed world assumption. When an open world assumption is made, then a knowledgebase of information can never be decidable. Because a conclusion must always be reachable as to the mechanical consistency of a financial report against the rules of the knowledgebase, the closed world assumption is made.

A critical distinction to understanding is the distinction between the *mechanical aspects* of a financial report and the *subjective or judgmental aspects* of a financial 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 financial report. Such determination involves professional judgment and is subjective in nature. While professional accountants are concerned with what quantitative and qualitative disclosures should be provided in order to make a true and fair representation of the financial position and financial condition of an economic entity; they have no control over the mechanics of the report itself. 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 financial 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 financial report.

6.11. A finite set of known classes and relation patterns ensures decidablity

As earlier stated, a set of logical axioms and theorems are used to articulate the semantics and dynamics of a financial report which makes up this *Financial Report Semantics and Dynamics Theory*. These stated axioms and theorems are first-order logic.

First-order logic can be used to express a theory which fully and categorically describes structures of a finite domain (problem domain). This is achieved by specifying the things of the problem domain and the relations between those things. These logical rules form a conceptual model of the problem domain. This theory describes that logic.

However, no first-order theory has the strength to describe an infinite domain. Essentially what this means is that the things and the relations between things which make up a problem domain must have distinct boundaries.

This is not to say that such a system cannot be flexible. For example, a form is not flexible. A financial report is not a form. This is not to say, however, that a financial report cannot be finite.

The difference is the notion of a "slot" or "opening". A *slot* is simply a place where something can be logically, sensibly, or mathematically placed. For example, suppose you wanted to add something to a roll up. You cannot add a second total to a roll up as a roll up only has one total. What makes sense is to add another line item to the total of the roll up, somewhere in the list of existing line items. One *slot* of a roll up is a spot within the list of roll up line items, first…last…or somewhere in between.

A financial report is finite in the sense that it is made up of exactly the following structural pieces or things (which can be referred to as classes) which have different types of *slots*:

- Economic/accounting entity which creates report
- Report which contain a set of fragments
- Fragment which contains or group sets of facts

- Characteristics which describe and distinguish facts contained within a fragment
- Blocks which are parts of a fragment (sub-groups of facts)
- Relations pattern which can be either a "whole-part" type relation, an "is-a" type relation, a concept arrangement pattern, or a business rule which describes relations
- Concept characteristic-type relations which can be a "roll up", a "roll forward", an "adjustment", or a "hierarchy"
- Properties of an economic/accounting entity, report, fragment, block, fact, characteristic, or relation pattern
- Essentially, the structural pieces or things of a financial report can be grouped into classes. No new classes may be added *as specified by the system implementing this theory*. Classes may never be redefined to be something different than they are. However, subclasses can be added and identified as being associated with one of those existing classes of things. But added subclasses can only be added *as specified by the system implementing this theory*. For example,
- **Adding new economic/accounting entities**: An economic/accounting or reporting entity is created by creating a new instance of identifier.
- **Adding new report**: A new report is created by creating a new report instance.
- **Adding a new characteristic**: A new characteristic can be added, if a system allows, but the characteristic MUST be distinguished as being either a "whole-part" or "is-a" type of relation or some existing subclass of existing relations (which must be one of those two).
- **Adding new concept characteristic**: A new concept can be added to a balance sheet such as "Ultra-tangible asset", however it MUST NOT break the rules of a "roll up" because a balance sheet is a roll up. When the new concept is added, it MUST be identified as a subclass of something that exists on a balance sheet which can contain ONLY assets, liabilities, or equity.
- **Adding new disclosure (fragment or block)**: A disclosure is in essence a set of facts which must be disclosed. A set of facts is represented as a fragment. To add a new disclosure, a reporting entity simply creates a new fragment and/or block. The added fragment MUST be one of the existing relations patterns (i.e. no new patterns can be added). That newly created fragment is identified as a subclass of an existing disclosure if that is appropriate, or creates a totally new root disclosure class by creating a subclass of the class "fragment". A reporting scheme

may, or may not allow the addition of completely new disclosures; rather some schemes might require a disclosure to be a subclass of some existing disclosure for one reason or another.
- **Adding new properties**: The addition of new properties for any class is typically not allowed for general financial reporting, but might be specified by some implementations.

Again, different systems can have different rules for allowing new classes, subclasses, relations between classes, or properties.

6.12. Boundaries extended by adding new relation patterns.

New relation patterns must be consciously and formally added in a controlled and coordinated manner only by system implementers.

6.13. Boundaries extended by adding new classes or properties.

New classes and new properties must be consciously and formally added in a controlled and coordinated manner only by system implementers.

6.14. Financial reports are not forms, but they are uniform.

Per SFAS 8 issued by the FASB, page 19, QC23:

"Comparability is not uniformity. For information to be comparable, like things must look alike and different things must look different. Comparability of financial information is not enhanced by making unlike things look alike any more than it is enhanced by making like things look different."

Financial statements are not forms. And while financial statements are not forms, they are likewise not random either.

It is important to understand what the FASB means by "comparability (including consistency)". That is explained in SFAS 8 which is referenced above. Here is the pertinent section of that document: (from page 19).

Comparability:

- QC20. Users' decisions involve choosing between alternatives, for example, selling or holding an investment, or investing in one reporting entity or another. Consequently, information about a reporting entity is more useful if it can be compared with similar information about other entities and with similar information about the same entity for another period or another date.
- QC21. Comparability is the qualitative characteristic that enables users to identify and understand similarities in, and differences among, items. Unlike the other qualitative characteristics,

comparability does not relate to a single item. A comparison requires at least two items.

- QC22. Consistency, although related to comparability, is not the same. Consistency refers to the use of the same methods for the same items, either from period to period within a reporting entity or in a single period across entities. Comparability is the goal; consistency helps to achieve that goal.
- QC23. Comparability is not uniformity. For information to be comparable, like things must look alike and different things must look different. Comparability of financial information is not enhanced by making unlike things look alike any more than it is enhanced by making like things look different.
- QC24. Some degree of comparability is likely to be attained by satisfying the fundamental qualitative characteristics. A faithful representation of a relevant economic phenomenon should naturally possess some degree of comparability with a faithful representation of a similar relevant economic phenomenon by another reporting entity.
- QC25. Although a single economic phenomenon can be faithfully represented in multiple ways, permitting alternative accounting methods for the same economic phenomenon diminishes comparability.

US GAAP is an excellent financial reporting scheme because it strikes a good balance between the ability to compare and the ability to accurately report the financial condition and financial position of an economic entity. When trying to implement "comparisons" in software, it is very important to understand the goal of comparability the financial reporting scheme enables.

Understanding the notion of reporting styles helps one understand that financial reports can be grouped into a finite set of styles that enable appropriate comparability.

7. General Ethics/Worldview

Effective communication is important and using the same terminology and understanding one's perspective are key to effective communication.

7.1. Shared goals and objectives to achieve a specific purpose.

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 financial 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.

7.2. Don't reinvent the wheel; stand on the shoulders of giants.

The approach that should be used is that of "standing on the shoulders of giants" or "discovering truth by building on previous discoveries."

Financial reporting is not a set of silos, it is an interconnected chain. System equilibrium is achieved by weaving the appropriately selected other systems based on the goals and objectives agreed to by the

stakeholders of the information exchange mechanism. Testing and a conformance suite[106] which is agreed to by system stakeholders explains how the system works to business professionals to achieve their buy in.

A logical system[107] is a type of formal system[108]. To be crystal clear what I am trying to create is a **finite model-based deductive first-order logic system**[109]. "Finite" as opposed to "infinite" because finite systems can be explained by math and logic, infinite systems cannot. "Model-based" is the means to address the necessary variability inherent in the required system. "Deductive", or rules-based, as contrast to inductive which is probability based which is not appropriate for this task. "First-order logic" because first-order logic can be safely implemented within software applications and higher order logics are unsafe. "System" because this is a system.

The point is to create a logical system that has high expressive capabilities but is also a provably safe and reliable system that is free from catastrophic failures and logical paradoxes which cause the system to completely fail to function. To avoid failure, computer science and knowledge engineering best practices seems to have concluded that the following alternatives are preferable:

- **Systems theory**: A system[110] is a cohesive conglomeration of interrelated and interdependent parts that is either natural or man-made. Systems theory explains logical systems.
- **Set theory**: Set theory is foundational to logic and mathematics. Axiomatic (Zermelo–Fraenkel) set theory[111] is preferred to naïve set theory.
- **Graph theory**: Directed acyclic graphs[112] are preferred to less powerful "trees" and graphs which contain cycles that can lead to catastrophic problems caused by those cycles.
- **Logic**: Logic is a formal communications tool. Horn logic[113] is a subset of first-order logic which is immune from logical paradoxes

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106 Conformance suite, http://xbrlsite.azurewebsites.net/2019/Prototype/conformance-suite/Production/index.xml

107 Wikipedia, *Logical Systems*, https://en.wikipedia.org/wiki/Logic#Logical_systems

108 Wikipedia, *Formal System*, https://en.wikipedia.org/wiki/Formal_system

109 Wikipedia, *First-order Logic, Deductive System*, https://en.wikipedia.org/wiki/First-order_logic#Deductive_systems

110 Wikipedia, *Systems Theory*, https://en.wikipedia.org/wiki/Systems_theory

111 Wikipedia, *Set Theory, Axiomatic Set Theory*, https://en.wikipedia.org/wiki/Set_theory#Axiomatic_set_theory

112 Wikipedia, *Directed Acyclic Graph*, https://en.wikipedia.org/wiki/Directed_acyclic_graph

113 Wikipedia, *Horn Logic*, https://en.wikipedia.org/wiki/Horn_clause

should be used as contrast to more powerful but also more problematic first order logic features. Note that deductive reasoning is leveraged for the process of creating a financial report and not inductive reasoning (i.e. machine learning)

- **Logical theory**: There are many approaches to representing "ontology-like things" in machine-readable form, a logical theory being the most powerful. (see the ontology spectrum[114])
- **Model theory**: Model theory is a way to think about flexibility. Safer finite model theory[115] is preferable to general model theory.
- **World view**: The following are common issues which appear when implementing logical systems in machine-readable form, the safest and most reliable alternatives are:
    - closed world assumption[116] which is used by relational databases is preferred to the open world assumption which can have decidability issues;
    - negation as failure[117] should be explicitly stated;
    - unique name assumption[118] should be explicitly stated;

Business professionals are (a) not capable of having precise discussions about these sorts of issues with software engineers, (b) don't care to have such technical discussions about these sorts of issues with software engineers, (c) are not interested in the theoretical or philosophical or religious debates that commonly exist related to these alternatives, (d) if the alternatives were ***appropriately articulated to a business professional***, who tend to be very practical, they would most often error on the side of safety and reliability.

As such, we have made all of the above decisions which are consistent with modern logic programming paradigms such as Prolog[119], LPS[120],

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[114] *Difference between Taxonomy, Conceptual Model, Logical Theory*, http://xbrl.squarespace.com/journal/2018/12/11/difference-between-taxonomy-conceptual-model-logical-theory.html

[115] Wikipedia, *Finite Model Theory*, https://en.wikipedia.org/wiki/Finite_model_theory

[116] Wikipedia, *Closed World Assumption*, https://en.wikipedia.org/wiki/Closed-world_assumption

[117] Wikipedia, *Negation as Failure*, https://en.wikipedia.org/wiki/Negation_as_failure

[118] Wikipedia, *Unique Name Assumption*, https://en.wikipedia.org/wiki/Unique_name_assumption

[119] Wikipedia, *Prolog*, https://en.wikipedia.org/wiki/Prolog

[120] Imperial College, Department of Computing, LPS, http://lps.doc.ic.ac.uk/

DataLog[121], Efficiently Computable Datalog[122], Why3[123], Alt-Ergo[124], HETS[125], and Answer Set Programming[126]. Business professionals can simply use this system if they desire to do so, they don't need to reinvent the wheel.

A logical system or logical theory can be made flexible precisely where they need to be flexible using model theory[127].

Model theory essentially allows for any number of permissible interpretations of the logical theory, referred to as models. There are various forms of model theory including first order model theory[128], finite model theory[129], and the consciously and intentionally very safe finite first order model theory.

It is not important to understand the specific details of model theory, although it is very helpful to have a basic understanding[130].

We need to balance power and safety. We need the most powerful but also the safest, most reliable version of system theory, graph theory, model theory, set theory, logic, etc. in order to have the most expressive system possible that is also very safe and well behaved.

All the characteristics of the logical system that I point out are "necessary" meaning that they *must exist* within the logical system. What I cannot prove is that the characteristics are "sufficient" to prove that the logical system is provably consistent, precise, and complete. Perhaps a mathematician can provide this proof. But, in my view, the empirical evidence goes a long way towards proving this logical theory. Whether it goes far enough is up to others to determine.

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121 Wikipedia, Datalog, https://en.wikipedia.org/wiki/Datalog

122 Nichola Leona et.al., *Efficiently Computable Datalog Programs*, https://www.mat.unical.it/kr2012/shy.pdf

123 Charles Hoffman, CPA, *Why3*, http://xbrl.squarespace.com/journal/2020/4/13/why3.html

124 OCamlPro, *Alt-Ergo*, https://alt-ergo.ocamlpro.com/

125 Charles Hoffman, CPA, *HETS*, http://xbrl.squarespace.com/journal/2020/4/10/hets.html

126 Charles Hoffman, CPA, *Understanding Answer Set Programming*, http://xbrl.squarespace.com/journal/2019/5/10/understanding-answer-set-programming.html

127 Wikipedia, *Model Theory*, https://en.wikipedia.org/wiki/Model_theory

128 Stanford University, *First Order Model Theory*, https://plato.stanford.edu/entries/modeltheory-fo/

129 Wikipedia, Finite Model Theory, https://en.wikipedia.org/wiki/Finite_model_theory

130 LessWrong, *Very Basic Model Theory*, https://www.lesswrong.com/posts/F6BrJFkqEhh22rFsZ/very-basic-model-theory

7.3. 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**: an arbitrary 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 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.

7.4. 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.

7.5. There is a difference between an important nuance and an unimportant negligible distinction. Professionals understand the difference.

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 professional judgment.

7.6. 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.

7.7. 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.

7.8. 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

8. Technical Information

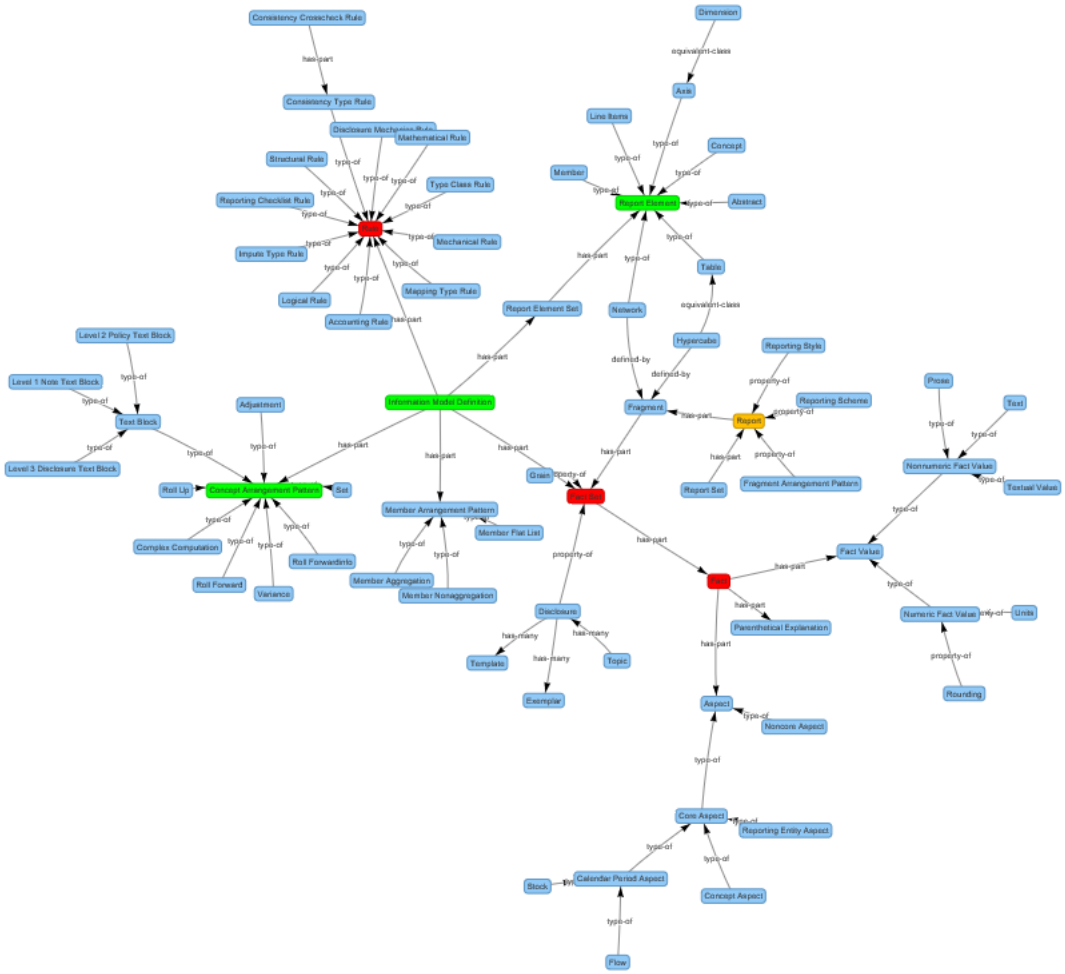
The logic described in this document can be represented using the XBRL technical syntax[131] or other physical formats including PROLOG, JSON-LD, RDF, OWL, and SHACL. Different software applications will highly likely represent artifacts in different ways based on their preferences. However, the logic and meaning conveyed by different technical formats and within different software applications should be exactly the same.

8.1. Easy to Understand Associations

Graphically, the relations between all the terms that make up a business report can be visualized as such[132]:

[131] *Examples of Describing a Financial Report Logical System Using XBRL*, http://xbrl.squarespace.com/journal/2019/9/27/examples-of-describing-a-financial-report-logical-system-usi.html

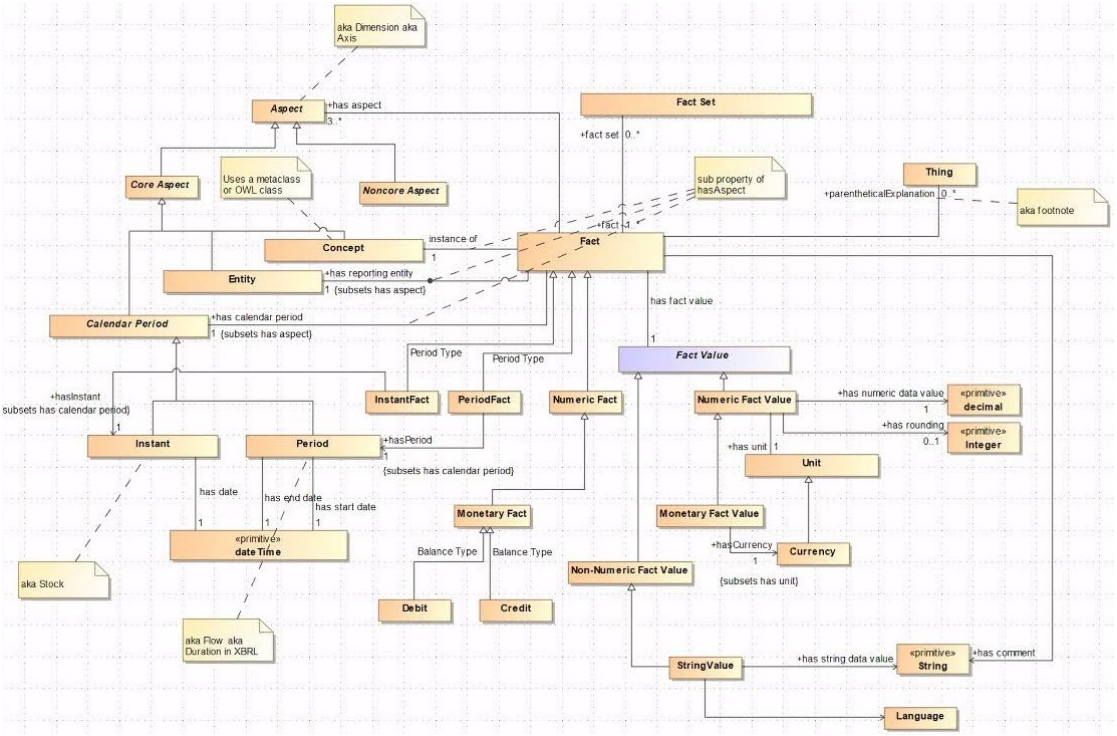
[132] Associations, http://www.xbrlsite.com/2020/Theory/Associations.html



8.2. UML Models (DRAFTS)

Draft UML models exist for the OMG Standard Business Model (SBRM) specification that explain the entities and relations of this logical conceptualization using UML. Images of those UML diagrams are currently available here[133].

[133] SBRM Draft UML Diagrams, https://photos.app.goo.gl/BwDSHQ1G9KMGqGKC6



This logical theory will be updated to reflect the final version of the OMG Standard Business Report Model (SBRM).

8.3. Implementation Examples

The web page *Mastering XBRL-based Digital Financial Reporting*[134] has a plethora of examples that demonstrate the use of this logical theory.

8.4. Exchanging Information

Once you understand how to create a report perhaps the next thing you might think about is exchanging reports. The document *Special Theory of Machine-based Automated Communication of Semantic Information of Financial Statements*[135] covers this topic.

[134] Charles Hoffman, CPA, Mastering XBRL-based Digital Financial Reporting, http://xbrlsite.azurewebsites.net/2020/master/

[135] Charles Hoffman, CPA, *Special Theory of Machine-based Automated Communication of Semantic Information of Financial Statements*, http://xbrlsite.azurewebsites.net/2019/Library/SpecialTheoryOfSemanticCommunicationOfFinancialInformation.pdf