

Financial Report Semantics and Dynamics Theory

An expository paper which explains the business logic of a financial report and
defines a conceptual model of such reports

*Resource for professional accountants, regulators, financial analysts, other
business professionals, and IT professionals working with semantic,
structured, model-based digital financial reports that leverage the XBRL
medium*

Version: June 26, 2017 (Revised)

Authors:

*Charles Hoffman, CPA (charles.hoffman@me.com)
Raynier van Egmond, M.Sc (raynier@xbrlcp.com)*

Contributors:

*Thomas A. Egan, CPA (thomas.egan.sg@gmail.com)
Thomas McKinney, CPA (thomas.mckinney.cpa@outlook.com)*

*For more information see:
<http://xbrl.squarespace.com/fin-report-sem-dyn-theory/>*

About the Authors

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

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

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



1. Introduction

The purpose of this document is to propose and then prove that a defined set of semantics and dynamics or mechanics exists for a financial report, verify the correctness of these semantics and dynamics against publically available XBRL-based public company financial reports submitted to the SEC, and then to explain these semantics and dynamics in clear, logically coherent, consistent, and unambiguous terms in the form of a theory.

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

A "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 conceptual framework or world view for thinking about and discussing the system.

The conscious and explicit formulation of the *Financial Report Semantics and Dynamics Theory* that we propose in this document is useful because most accountants and those interpreting financial statements both take these financial report semantics and dynamics for granted and generally don't think of about an underlying formalism for financial reports when they interpret the information in such reports. The *Financial Report Semantics and Dynamics Theory* brings these semantics and dynamics back into consciousness. Further, the lack of such model forces accountants to employ the model of the technical syntax should the financial report model not exist to be employed. Also, lack of conscious coordination of the things and relations between the things which make up a financial report will cause inconsistent interpretations and most certainly arbitrary interpretation which are in the interest of no one.

The information presented in this document will also help software vendors building software applications for the creation and consumption of financial reports to understand these semantics and dynamics. 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 document to a semantic, structured, model-based, digital format 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 taxonomies in order to figure out how to make use of XBRL and providing input to technology experts creating the XBRL technical specifications.

Of particular value was the experience gained while creating the US GAAP Taxonomy Architecture, creating the US GAAP XBRL Taxonomy, creating XBRL-based public company financial filings that would be submitted to the SEC, and analyzing the many thousands of publically available XBRL-based financial filings created by public companies and submitted to the SEC.

As the verification section or partial proof provided with this theory shows, this theory is supported by not a sample SEC XBRL financial filings (10-Q and 10-K); but rather by nearly all of the approximately 8,098 filings submitted to the SEC during the period for which SEC filings were analyzed.

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 users such as professional accountants who will likely readily relate to and must eventually agree with the stated semantics in order for consistent machine representations of financial reports. Furthermore, the rules are expressed in a form which technical people creating software can make use of.

1.1. Metaphors, Models, and Theories

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

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

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.

This theory can be implemented within a robust model which is understandable by computer software. However, expressing that computer readable model is not in the scope for this document. For information on modeling this theory see the *“Conceptual Model of a Digital Financial Report”* which can be found here:

<http://xbrl.squarespace.com/conceptual-model/>

1.2. Not a theory of financial reporting

It is the role of the FASB, IASB, and others to establish frameworks for financial reporting schemes. This theory in no way proposes anything related to the profession of financial reporting. The theory explains the semantics and dynamics of a financial report.

This theory does not specify which financial reporting framework to use, how financial information is reported, what financial information should 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. The financial reporting conceptual framework articulated by the FASB and IASB is leveraged by this theory to this end. 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.



1.3. Financial reporting conceptual framework

Financial reporting has a conceptual framework. The FASB outlines this conceptual framework in CON 1 – 7. The FASB has updated this conceptual framework through Statements of Financial Accounting Concepts (SFACs). This conceptual framework is explained in intermediate accounting text books (*Intermediate Accounting, Seventh Edition*, Spiceland, Sepe, Nelson, page 19) and financial reporting research resources (*Wiley GAAP 2011, Interpretations and Applications of Generally Accepted Accounting Principles*, Bragg, page 15) This theory will leverage the US GAAP conceptual framework but it is highly likely that it is equally applicable to other financial reporting conceptual frameworks such as International Financial Reporting Standards (IFRS).

Per the FASB, the conceptual framework for financial reporting has two primary purposes. First, it serves as a foundation upon which the FASB constructs financial reporting standards that are internally sound and consistent. Second, the conceptual framework is intended to be used by the business community reporting or consuming financial information to help them better understand and apply financial reporting standards.

The conceptual framework does this by (per the FASB Special Report, *The Framework of Financial Accounting Concepts and Standards* (1998):

- Providing a set of **common premises** as a basis for discussion
- Provide **precise terminology**
- Helping to ask the **right questions**
- **Limiting areas of judgment and discretion** and excluding from consideration potential solutions that are in conflict with it
- **Imposing intellectual discipline** on what traditionally has been a subjective and ad hoc reasoning process

As we shall see, the financial reporting conceptual framework breaks financial reporting into elements and financial statement components.

1.4. Semantics and dynamics

Syntax can be thought of as “how you say something”. Semantics can be thought of as “the meaning behind what you said”. While the verification of this theory uses XBRL which is one technical syntax which can be used for the mechanical process of creating a financial report, the focus of this theory is on semantics, not any specific technical syntax.

The term dynamics is used to convey the notion that a financial report has “mechanics” or is “mechanical”. Remember, this theory in no way relates to financial reporting, it relates to the financial report. While the information expressed by a financial report is far from mechanical, the mechanism by which the information is expressed be that using printed paper or some digital technology is mechanical.

1.5. Agnostic as to technical syntax

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



As such, a representation of information in a financial report and the meaning conveyed by that information by a representation of that information in XBRL, a representation of a financial report in RDF+OWL, a representation of a financial report using the ISO/IEC standard Common Logic, a representation using the OMG standard Semantics of Business Vocabulary and Business Rules (SBVR), a representation using Description Logic, a representation of a financial report in HTML or other human readable print-type format are each 100% equivalent in terms of meaning conveyed and the individual facts of such a report would be understood the same.

1.0. Intended purpose of a digital financial report

What is the intended purpose of a digital financial report? After all, there should be some purpose if reporting entities are spending millions of dollars to articulate information using some structured syntax such as XBRL.

Is the purpose for each individual to dig their heels into the ground and insist that there is only one reality, their arbitrary reality? Or is the purpose to consciously create a coordinated, shared, commonly accepted, standard, useful view of reality to achieve a specific purpose: so that reality does appear to be objective and stable enough yet nuanced enough to be useful so that information can be used safely, reliably, predictably, repeatedly by both human and automated machine-based processes. The desired system state is one of balance or equilibrium.

Prudence dictates that using financial information from a digital financial report should not be a guessing game. It is only through conscious effort that the specific control mechanisms can be put in place to realize this intent.

1.7. Power of agreement

It is only through conscious collaboration, cooperation and coordination by the participants of the financial reporting supply chain that that XBRL-based digital financial reporting will work reliably, predictably, repeatedly, effectively, and efficiently.

This document is a collaboration, cooperation, coordination, and communications tool. It is a tool for reaching agreement.

1.8. Power of machine-readable business rules

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

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

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

Don't make the mistake of thinking that business rules are completely inflexible and that you cannot break rules. Sure, maybe there are some rules that can never be broken. Maybe there are some rules



that you can break. It helps to think of breaking rules as penalties in a football game. The point is that the guidance, control, suggestions, and influence offered by business rules is a choice of business professionals. The meaning of a business rule is separate from the level of enforcement someone might apply to the rule.

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



2. Axioms for the Theory

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

1.1. 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 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?”

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

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.

1.2. Facts reported in a financial report have characteristics

Facts have characteristics. 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.

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

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

1.3. Financial reports have components

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

For example, a “balance sheet” is a component of a financial report and is made up of a specific set of facts.



A component can be further broken down into a block. A component is composed of a set of one or more blocks. For example, an “income statement” is made up of three blocks: 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 block is convenient in order to achieve a specific objective.

The following is the proposed formal definition of the term “component”. (The term block will be defined later because in it is necessary to understand several other ideas to properly understand a block.)

Component: A component 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 component is composed of one or more blocks.

1.4. Facts reported within financial reports are organized into components

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

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

1.5. Financial report facts and components 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 components which are useful and which can be leveraged to identify facts and organize components.ⁱ

1.1.1. Financial report elements

The financial report elementsⁱⁱ articulated by the FASB are:

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

While this is not a complete set of report elements, it is useful for identifying and organizing concepts which characterize a financial fact.



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

1.1.2. Financial statement components

Financial statement componentsⁱⁱⁱ 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). For more information see: (note that a free basic subscription is available)

<https://asc.fasb.org/>

1.6. 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 practice 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 components 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.

1.7. Common characteristics of financial facts exist

Some common characteristics 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.
- 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.

1.8. 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.



1.9. 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. For more information see: <http://plato.stanford.edu/entries/mereology/>
- **Is-a:** descriptive and differentiates one type or class of thing from some different type or class of thing; but the things do not add up to a whole.
- **Computational business rule:** Other types of computational business rules can exist such as “Beginning balance + Changes = Ending Balance” (roll forward) or “Originally stated balance + Adjustments = Restated balance” or “Net income (loss) / Weighted Average Shares = Earnings Per Share”.

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

- **Component-integral object:** Indicates that a component contains some integral object. For example, the component handle is part of the integral object cup; wheels are a component part of a car; a refrigerator is a component of a kitchen.
- **Member-collection:** Indicates that some member is part of some collection. For example a ship is part of a fleet. Or, a subsidiary is part of an economic entity.
- **Portion-mass:** Indicates that some portion is part of some mass. For example a slice is part of a pie.
- **Stuff-object:** Indicates that some "stuff" is part of some object. For example steel is part of a car.
- **Feature-activity:** Indicates that some feature is part of some activity. For example the feature "paying" is part of the activity "shopping".
- **Place-area:** Indicates that some physical place is part of some area. For example the place "Everglades" is part of the area "Florida".

Further, the following general statements are true about things:

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

For example, the business segments of a reporting entity along with any consolidation eliminations can be identified, articulated, and aggregated to the consolidated entity.

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.

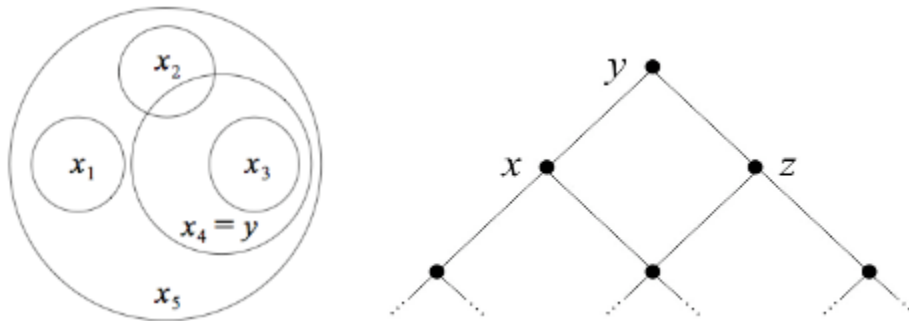
Complete flat set is a “flat” (meaning no sub-relations) and complete list of the values of a characteristic. For example, a list of the 15 directors of an entity is a complete, flat list of a company’s directors.



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
 - o United States
 - o Canada
- Europe
 - o United Kingdom
 - o Germany
 - o Spain

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.



1.10. 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.

1.1.1. 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
- **Complex computation:** 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.



1.1.2. 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.

1.1.3. 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.

1.1.4. 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.

1.1.5. 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:

	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:

	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



1.11. 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 components 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:

- $\text{Assets} = \text{Liabilities and Equity}$
- $\text{Assets} = \text{Current Assets} + \text{Noncurrent Assets}$ (classified balance sheet)
- $\text{Equity} = \text{Equity Attributable to Parent} + \text{Equity Attributable to Noncontrolling Interest}$
- $\text{Liabilities} = \text{Current Liabilities} + \text{Noncurrent Liabilities}$ (classified balance sheet)
- $\text{Liabilities and Equity} = \text{Liabilities} + \text{Commitments and Contingencies} + \text{Temporary Equity} + \text{Equity}$
- $\text{Liabilities} = \text{Liabilities and Equity} - (\text{Commitments and Contingencies} + \text{Temporary Equity} + \text{Equity})$
- $\text{Current Assets} = \text{Assets} - \text{Noncurrent Assets}$ (classified balance sheet)
- $\text{Current Liabilities} = \text{Liabilities} - \text{Noncurrent Liabilities}$ (classified balance sheet)
- $\text{Noncurrent Assets} = \text{Assets} - \text{Current Assets}$ (classified balance sheet)
- $\text{Noncurrent Liabilities} = \text{Liabilities} - \text{Current Liabilities}$ (classified balance sheet)
- $\text{Gross Profit} = \text{Revenues} - \text{Cost Of Revenue}$ (Multi-step approach)
- $\text{Operating Income (Loss)} = \text{Gross Profit} - \text{Operating Expenses} + \text{Other Operating Income}$ (Multi-step approach)
- $\text{Income (Loss) from Continuing Operations Before Equity Method Investments} = \text{Operating Income (Loss)} + \text{Nonoperating Income (Loss)} - \text{Interest And Debt Expense}$
- $\text{Income (Loss) from Continuing Operations Before Tax} = \text{Income (Loss) from Continuing Operations Before Equity Method Investments} + \text{Income (Loss) from Equity Method Investments}$
- $\text{Income (Loss) from Continuing Operations after Tax} = \text{Income (Loss) from Continuing Operations Before Tax} - \text{Income Tax Expense (Benefit)}$
- $\text{Net Income (Loss)} = \text{Income (Loss) from Continuing Operations After Tax} + \text{Income (Loss) from Discontinued Operations, Net of Tax} + \text{Extraordinary Items, Gain (Loss)}$
- $\text{Net Income (Loss)} = \text{Net Income (Loss) Attributable to Parent} + \text{Net Income (Loss) Attributable to Noncontrolling Interest}$
- $\text{Net Income (Loss) Available to Common Stockholders, Basic} = \text{Net Income (Loss) Attributable to Parent} - \text{Preferred Stock Dividends and Other Adjustments}$
- $\text{Comprehensive Income (Loss)} = \text{Comprehensive Income (Loss) Attributable to Parent} + \text{Comprehensive Income (Loss) Attributable to Noncontrolling Interest}$
- $\text{Comprehensive Income (Loss)} = \text{Net Income (Loss)} + \text{Other Comprehensive Income (Loss)}$



- 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 components that are reported and the relations between components 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 components. 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.



1.12. 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 components of a financial report is the report flow model.

1.13. 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.

1.14. 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.

1.15. 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).

1.16. 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.

1.17. Financial report components, 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.

1.18. 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
 - o Commercial and industrial (standard approach)
 - o Interest based revenues
 - o Insurance based revenues
 - o Securities based revenues
 - o REIT (real estate investment trust)
 - o Utility
- Balance sheets can be
 - o Classified and report current and noncurrent assets and liabilities
 - o Classified and report current assets, fixed assets, and other than fixed assets; current and noncurrent liabilities
 - o Unclassified
 - o Report using liquidity based reporting
 - o Regulated utilities report total capitalization on their balance sheet as a line item
- Income statements can be
 - o Multi-step and report gross profit
 - o Single-step and do not report gross profit
- Income statements can
 - o Explicitly report operating income (loss)
 - o Do not report operating income (loss)
- Income (loss) from equity method investments can be reported on the income statement
 - o As part of revenues
 - o As part of cost of revenues
 - o As part of nonoperating income (loss)
 - o Before taxes as a separate line item
 - o Between income (loss) from continuing operations before and after taxes
- Cash flow statements can report net cash flow as
 - o Including exchange gains (losses)
 - o 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. For more information see:
<http://www.xbrlsite.com/2015/fro/us-gaap/html/ReportFrames/index.html>

1.19. 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

For more information on classes please see, <http://www.xbrlsite.com/2015/fro/us-gaap/html/Classes/>.

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

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

The following is a summary of the specific ways a class of concepts can be related to some other class of concepts using general functionality provided by OWL 2 DL. The OWL 2 DL functionality has been created consistently with another approach to representing relations between information which is SROIQ Description Logic. Both OWL 2 DL and SROIQ Description Logic are global standard approaches to safely and precisely representing relations.

- **Element-class:** Define a class. Equivalent to owl:Class, rdfs:Class and rdfs:type. The element A is defined to be class B. (Example, the taxonomy element us-gaap:Assets (which is an individual) is defined as being the class fro:Assets)
- **Class-subClassOf:** Explain that one class is a subclass of another class. Equivalent to rdfs:subClassOf. Class A is a specialization of Class P. Ability to organize classes into a hierarchy of general-special terms. Similar to SKOS notion of broader terms versus narrower terms.
- **Class-equivalentClass:** Explain that one class is exactly equivalent to another class. Equivalent to owl:equivalentClass. Class A and class B have the exact same members. (Example, class LiabilitiesAndPartnerCapital and the class LiabilitiesAndStockHolderEquity are both equivalent to LiabilitiesAndEquity.)
- **Class-sameAs:** Explain that one class is exactly equivalent to another class. Equivalent to owl:sameAs. Class A and class B are the exact same real world thing. (Example, the class Equity and the class NetAssets are exactly the same thing.)



- **Class-differentFrom:** Explain that one class is different from some other class. Equivalent to owl:differentFrom. Class A and class B are the NOT the same real world thing. (Example, the class Assets and the class NetAssets are NOT the same thing.)
- **Class-disjointWith:** Set theory notion of disjoint. Equivalent to owl:disjointWith. Things belonging to one class A cannot also belong to some other class B. (Example, a member of the Person class set of things can never be a member of the Country class set of things.)
- **Class-complementOf:** Set theory notion of complement. Equivalent to owl:complementOf. Things that are members of one class A are all the things that do not belong to the other class B (Example, a member of the class of LivingThings set of things is the entire set of things that do not belong to the DeadThings set of things.)
- **Class-inverseOf:** Set theory notion of inverse. Equivalent to owl:inverseOf. A relationship of type X between A and B implies a relationship of type Y between B and A. (Example, IF starsIn inverseOf hasStar; AND IF MenInBlack hasStar WillSmith; THEN WillSmith starsIn MenInBlack)
- **Class-unionOf:** Set theory notion of union. Equivalent to owl:unionOf. The members of set C include all the members of set A and all the members of set B.
- **Class-intersectionOf:** Set theory notion of intersection. Equivalent to owl:intersectionOf. The members of set C include all the members of set A that are also members of set B.

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

For more information on set theory, please see [https://en.wikipedia.org/wiki/Set_\(mathematics\)](https://en.wikipedia.org/wiki/Set_(mathematics)).

1.21. 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.

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

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

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 component which shares the same information model (member arrangement pattern plus concept arrangement pattern).

1.23. An 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.

The following is an example of a set of US GAAP disclosures provided by public companies which report to the SEC:

List of all disclosures: <http://www.xbrlsite.com/2015/fro/us-gaap/html/Disclosures/Detail/index.html>

The following is one specific disclosure which is contained within that set of US GAAP disclosures:

<http://www.xbrlsite.com/2015/fro/us-gaap/html/Disclosures/Detail/Disclosure-517.html>

It is important to understand that a disclosure is different from a disclosure note. A disclosure note is a presentational artifact which is used by economic entity to organize *where* something is disclosed. A disclosure is a representational artifact, not a presentational artifact. A disclosure is *what* information which is required to be disclosed or which an economic entity chooses to disclose.

It is important to note that every disclosure in the set of US GAAP disclosures has been given a distinct name which makes the disclosure identifiable by a computer process. If a disclosure is missing, a new disclosure can be added using a different name. If an economic entity discloses information in a unique manner, then a new disclosure can be added to the list.

1.24. 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.



For an example of exemplars, please see:

<http://www.xbrlsite.com/LinkedData/Exemplars/Exemplars3.aspx?DisclosureObjectName=InventoryNetRollUp>

1.25. 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.

1.26. 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.

1.27. 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.



3. Theorems as deduced from the axioms

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

1.1. Facts of a 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.

1.2. Components of a financial report should be uniquely identifiable

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

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

1.3. 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.

1.4. Components and facts of a financial report are comparable to the extent that the components 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 component "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.

1.5. 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.

1.6. Blocks of a financial report should be uniquely identifiable

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

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

1.7. Blocks of a financial report are associated with a specific disclosure

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

1.8. 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 exists, 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.
- **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.



4. Ethics or worldview of financial reporting

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.

1.2. 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.

1.3. 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.

1.4. 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.

1.5. 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 uses 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.

1.6. 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.

1.7. 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.



1.8. 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.

1.9. Facts reported within a component may be illogical without the existence of other facts

Facts reported within a component 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.

1.10. 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.

1.11. 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.

[CSH: This section needs a lot of additional work. The two important points that must be made are the notions of decidability and closed world assumption. For more detailed information, please see this document: <http://www.cs.man.ac.uk/~horrocks/Publications/download/2003/HoPH03a.pdf>]

1.12. A finite set of known classes and relation patterns ensures decidability

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 components
- Component which contains or group sets of facts
- Characteristics which describe and distinguish facts contained within a component
- Blocks which are parts of a component (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, component, 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 (component or block):** A disclosure is in essence a set of facts which must be disclosed. A set of facts is represented as a component. To add a new disclosure, a reporting entity simply creates a new component and/or block. The added component **MUST** be one of the existing relations patterns (i.e. no new patterns can be added). That newly created component 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 “component”. 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.



1.13. 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.

1.14. 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.

1.15. 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.



5. General ethics/worldview

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

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.

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

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

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



When attorneys argue a case one of the first things they do is try and agree on the facts, the items about the case which are not in dispute. When an interpretation is agreed to by both attorneys, that interpretation becomes a fact. If both parties in a case agree on some set of facts it can be said that both attorneys have knowledge of the facts, generally both parties agree when there is evidence which can be used to justify that knowledge. Everything else which cannot be agreed becomes an opinion which is then argued in the case. Evidence is provided but the parties don't agree on the evidence or they can dispute evidence with different interpretations of facts.

1.2. There is a difference between standard and arbitrary.

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

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

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

1.3. 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.

1.4. There is a difference between objective and subjective.

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

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

Again, computers are machines. Computers have no intelligence until they are instructed by humans. Computers only appear smart when humans create standards and agree to do things in a similar



manner in order to achieve some higher purpose. It is easy to agree on things that tend to be objective. It is harder to agree where there is subjectivity. It is impossible to get a machine to exercise judgment. A machine such as a computer can only mimic what humans tell the machine to do via machine-readable information.

1.5. There is a difference between explicit and implicit.

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

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

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

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

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

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

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



6. Conceptual Model Articulated by Financial Report Semantics and Dynamics Theory

The next section summarizes many of the axioms, theorems, and ethics in a narrative that summarizes the *Financial Report Semantics and Dynamics Theory* in a more readable form using basic examples. This section forms a conceptual model of a financial report. This narrative is intended to be as terse and precise as possible.

1.1. Financial report semantics

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

Fact Value
2000
1000

Facts reported in a financial report have characteristics. Here are two fact values and their characteristic “concept” and the values for each concept characteristic; “Revenues” and “Net income (loss)” which describe the facts:

Concept	Fact Value
Revenues	2000
Net income (loss)	1000

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

Reporting entity	Legal entity	Period	Concept	Fact Value
ABC Company	Consolidated entity	January 1, 2011 to December 31, 2011	Revenues	2000
ABC Company	Consolidated entity	January 1, 2011 to December 31, 2011	Net income (loss)	1000

Financial reports have components. Facts reported within financial reports are organized into components. Here is a set of facts, or fact table, that go together to make up the income statement component (only a portion of all the facts are shown):

Reporting entity	Legal entity	Period	Concept	Fact Value
ABC Company	Consolidated entity	January 1, 2011 to December 31, 2011	Revenues	2000
ABC Company	Consolidated entity	January 1, 2010 to December 31, 2010	Revenues	2500
ABC Company	Consolidated entity	January 1, 2009 to December 31, 2009	Revenues	2300
ABC Company	Consolidated entity	January 1, 2011 to December 31, 2011	Cost of revenues	1800
ABC Company	Consolidated entity	January 1, 2010 to December 31, 2010	Cost of revenues	1700
ABC Company	Consolidated entity	January 1, 2009 to December 31, 2009	Cost of revenues	1600
ABC Company	Consolidated entity	January 1, 2011 to December 31, 2011	Gross profit	200
ABC Company	Consolidated entity	January 1, 2010 to December 31, 2010	Gross profit	800

A set of facts and other information can be used to generate a rendering of the information described by the facts, characteristics, for the component. For example, below is a rendering of an income statement:



Component → **CONSOLIDATED STATEMENTS OF INCOME**
(In millions, except per share amounts)

Year Ended December 31,

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

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

Component: (Network and Table)			
Network	105 - Statement - CONSOLIDATED STATEMENTS OF INCOME		
Table	Statement [Table]		
Reporting Entity [Axis]	0001288776 http://www.sec.gov/CIK		
Legal Entity [Axis]	Entity [Domain]		
	Period [Axis]		
Statement [Line Items]	2010-01-01/2010-12-31	2009-01-01/2009-12-31	2008-01-01/2008-12-31
Revenues	29,321,000,000	23,651,000,000	21,796,000,000
Costs and expenses:			
Cost of revenues (including stock-based compensation expense of \$41, \$47, \$67)	10,417,000,000	8,844,000,000	8,622,000,000
Research and development (including stock-based compensation expense of \$732, \$725, \$861)	3,762,000,000	2,843,000,000	2,793,000,000
Sales and marketing (including stock-based compensation expense of \$206, \$231, \$261)	2,799,000,000	1,984,000,000	1,946,000,000
General and administrative (including stock-based compensation expense of \$141, \$161, \$187)	1,962,000,000	1,668,000,000	1,803,000,000
Total costs and expenses	18,940,000,000	15,339,000,000	15,164,000,000
Income from operations	10,381,000,000	8,312,000,000	6,632,000,000
Impairment of equity investments	0	0	(1,095,000,000)
Interest and other income, net	415,000,000	69,000,000	316,000,000
Income before income taxes	10,796,000,000	8,381,000,000	5,853,000,000
Provision for income taxes	2,291,000,000	1,861,000,000	1,626,000,000
Net income	8,505,000,000	6,520,000,000	4,227,000,000
Net income per share of Class A and Class B common stock:			
Basic	26.69	20.62	13.46
Diluted	26.31	20.41	13.31

An income statement is a financial statement component articulated by the financial reporting conceptual framework. Financial report facts and components can be organized leveraging the financial reporting conceptual framework.

The income statement is a fragment of a financial report. The report fragment of an income statement shown above is one component of the financial report which contains two blocks. The component and



the blocks can be seen using the model structure of the income statement fragment of a financial report:

Label	Report Element Class	Period	Balance
Statement [Table]	[Table]	For Period	
Legal Entity [Axis]	[Axis]	For Period	
Entity [Domain]	[Member]	For Period	
Statement [Line Items]	[LineItems]	For Period	
Revenues	[Concept] Monetary	For Period	Credit
Costs and expenses:	[Abstract]	For Period	
Cost of revenues (including stock-based compensation expense of \$41, \$47, \$67)	[Concept] Monetary	For Period	Debit
Research and development (including stock-based compensation expense of \$732, \$725, \$861)	[Concept] Monetary	For Period	Debit
Sales and marketing (including stock-based compensation expense of \$206, \$231, \$261)	[Concept] Monetary	For Period	Debit
General and administrative (including stock-based compensation expense of \$141, \$161, \$187)	[Concept] Monetary	For Period	Debit
Total costs and expenses	[Concept] Monetary	For Period	Debit
Income from operations	[Concept] Monetary	For Period	Credit
Impairment of equity investments	[Concept] Monetary	For Period	Debit
Interest and other income, net	[Concept] Monetary	For Period	Credit
Income before income taxes	[Concept] Monetary	For Period	Credit
Provision for income taxes	[Concept] Monetary	For Period	Debit
Net income	[Concept] Monetary	For Period	Credit
Net income per share of Class A and Class B common stock:	[Abstract]	For Period	
Basic	[Concept] Per Share	For Period	
Diluted	[Concept] Per Share	For Period	

The first block is the roll up of “Net income”. Thus, the concept arrangement pattern is a Roll Up. The second block is information about the “Net income per share of Class A and Class B common stock” which is a concept arrangement pattern of Hierarchy. Both blocks share the member arrangement pattern which states that the WHOLE legal entity is being shown.

Industries and reporting entities with certain activities have different reporting practices/styles and therefore use the financial reporting conceptual framework differently. Below you see two income statements of two different economic entities which are in two different industries, thus have two different reporting styles. The reporting style on the left is one style used by commercial and industrial companies. The reporting style on the right is that of an economic entity which uses interest-based revenues. Note the differences and similarities in the line items of the normalized information which have been reported:

Reporting Entity [Axis]	0000789019 http://www.sec.gov	Reporting Entity [Axis]	0000072971 http://www.sec.gov
Income Statement [Line Items]	2010-07-01/2011-06-30	Income Statement [Line Items]	2010-01-01/2010-12-31
Net Income (Loss) [Roll Up]		Net Income (Loss) [Roll Up]	
Income (Loss) from Continuing Operations After Tax [Roll Up]		Income (Loss) from Continuing Operations After Tax [Roll Up]	
Income (Loss) from Continuing Operations Before Tax [Roll Up]		Income (Loss) from Continuing Operations Before Tax [Roll Up]	
Operating Income (Loss) [Roll Up]		Interest Income (Expense), After Provision for Losses [Roll Up]	
Gross Profit [Roll Up]		Interest Income (Expense), Net [Roll Up]	
Revenues	69,943,000,000	Interest and Dividend Income, Operating	52,796,000,000
Cost of Revenue	15,577,000,000	Interest Expense, Operating	8,039,000,000
Gross Profit	54,366,000,000	Interest Income (Expense), Operating, Net	44,757,000,000
Operating Expenses	27,205,000,000	Provision for Loan, Lease, and Other Losses	15,753,000,000
Operating Income (Loss)	27,161,000,000	Interest Income (Expense) After Provision for Losses	29,004,000,000
Nonoperating Income (Loss) Plus Interest and Debt Expense Plus Income (Loss) from Equity Method Investments	910,000,000	Noninterest Income	40,453,000,000
Income (Loss) from Continuing Operations Before Tax	28,071,000,000	Noninterest Expense	50,456,000,000
Income Tax Expense (Benefit)	4,921,000,000	Income (Loss) from Continuing Operations Before Tax	19,001,000,000
Income (Loss) from Continuing Operations After Tax	23,150,000,000	Income Tax Expense (Benefit)	6,338,000,000
Income (Loss) from Discontinued Operations, Net of Tax	0	Income (Loss) from Continuing Operations After Tax	12,663,000,000
Extraordinary Items of Income (Expense), Net of Tax	0	Income (Loss) from Discontinued Operations, Net of Tax	0
Net Income (Loss)	23,150,000,000	Net Income (Loss)	12,663,000,000



Common characteristics of financial facts exist such as reporting entity, legal entity, report date, reporting scenario, concept, period, etc.

Financial facts may have parenthetical explanations.

You can experiment with a financial report here using a dynamic financial report viewing application:

<https://edgardashboard.xbrlcloud.com/flex/viewer/XBRLViewer.html#instance=http://www.sec.gov/Archives/edgar/data/789019/000119312516662209/msft-20160630.xml>

1.2. Financial report dynamics

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

- Whole-part,
- Is-a,

Characteristics could have no relation to one another.

Financial facts may be related. Types of numeric relationships include a

- roll up ($a + b + c = \text{total}$),
- roll forward (beginning balance + changes = ending balance),
- adjustment (originally stated balance + adjustment = restated balance),
- variance (for example, actual – budgeted = variance),
- other more complex computations

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

- hierarchy (or list, set, collection) is a group of concepts,

Financial facts have fidelity. Financial reports have integrity.

Financial report components may have core facts and relations common to all reporting entities such as

- Balance sheets report assets, liabilities and equity, equity, and balance sheets balance. Assets, liabilities and equity, and equity each foot.
- Income statements report net income (loss), and they foot.
- Cash flow statements report net cash flow and they foot.
- Beginning cash plus net cash flow reconciles to ending cash on the cash flow statement
- Cash per the cash flow statement agrees with cash per the balance sheet.

Financial reports have flow. Flow is an ordering or sequencing of components.

Reporting entities which create financial reports can be categorized into industries and/or activities. Different industries and activities may report different facts, different characteristics, or have different components.

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

1.3. Financial report component example

The following is an example of a component of a financial report expressed using various formats and in various software applications. The component is the income statement disclosure. The component has two blocks: (1) a roll up of net income and (2) a hierarchy provides concepts related to net income per share.



This is the **SEC page for this specific filing**:

<https://www.sec.gov/Archives/edgar/data/1288776/000119312511032930/0001193125-11-032930-index.htm>

This is the **HTML version of that filing**, a direct link to the income statement within that document:

https://www.sec.gov/Archives/edgar/data/1288776/000119312511032930/d10k.htm#tx120214_102

This is the **SEC interactive data viewer link**:

https://www.sec.gov/cgi-bin/viewer?action=view&cik=1288776&accession_number=0001193125-11-032930&xbrl_type=v

This is the **XBRL instance** from which the information in the rendering below comes:

<https://www.sec.gov/Archives/edgar/data/1288776/000119312511032930/goog-20101231.xml>

This is a **publicly available link** to that same report (provided by SECXBRL.info):

http://cellstore-manager.28.io/rendering/http://secxbrl.28.io:80/v1/_queries/public/api/spreadsheet-for-component?token=c3049752-4d35-43da-82a2-f89f1b06f7a4&aid=0001193125-11-032930&format=json§ion=http%3A%2F%2Fwww.google.com%2Ftaxonomy%2Frole%2FStatementOfIncomeAlternative&hypercube=us-gaap%3AStatementTable&profile-name=sec&eliminate=true&validate=true&language=en-US

This is a publicly available link to the latest Google 10-K provided by XBRL Cloud (for some reason, the 2010 10-K is not available publicly):

<https://edgardashboard.xbrlcloud.com/flex/viewer/XBRLViewer.html#instance=http://www.sec.gov/Archives/edgar/data/1288776/000128877615000008/goog-20141231.xml>



1.1.1. SEC HTML filing

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

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

1.1.2. SEC Interactive Data Viewer

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



1.1.3. XBRL Viewer (Firefox add on)

105 - Statement - CONSOLIDATED STATEMENTS OF INCOME

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

LEGAL ENTITY [AXIS]: ENTITY [DOMAIN]


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

1.1.4. XBRL Cloud Viewer

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



1.1.5. I-Metrix (Edgar Online)

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

1.1.6. Magnify (CoreFiling)

	0000388776		
	Year ended 31-Dec-2010	Year ended 31-Dec-2009	Year ended 31-Dec-2008
Income Statement [Abstract]			
Statement [Table]			
Statement [Line Items]			
Revenues	\$29,321,000,000	\$23,651,000,000	\$21,796,000,000
Costs and expenses:			
Cost of revenues (including stock-based compensation expense of...	\$10,417,000,000	\$8,844,000,000	\$8,622,000,000
Research and development (including stock-based compensation e...	\$3,762,000,000	\$2,843,000,000	\$2,793,000,000
Sales and marketing (including stock-based compensation expense...	\$2,799,000,000	\$1,984,000,000	\$1,946,000,000
General and administrative (including stock-based compensation ex...	\$1,962,000,000	\$1,668,000,000	\$1,803,000,000
Total costs and expenses	\$18,940,000,000	\$15,339,000,000	\$15,164,000,000
Income from operations	\$10,381,000,000	\$8,312,000,000	\$6,632,000,000
Impairment of equity investments	\$0	\$0	\$(1,095,000,000)
Interest and other income, net	\$415,000,000	\$69,000,000	\$316,000,000
Income before income taxes	\$10,796,000,000	\$8,381,000,000	\$5,853,000,000
Provision for income taxes	\$2,291,000,000	\$1,861,000,000	\$1,626,000,000
Net income	\$8,505,000,000	\$6,520,000,000	\$4,227,000,000
Net income per share of Class A and Class B common stock:			
Basic	\$26.69	\$20.62	\$13.46
Diluted	\$26.31	\$20.41	\$13.31



1.1.7. CalcBench

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

1.1.8. SECXBRL.info

Component: (Network and Table)			
Network	105 - Statement - CONSOLIDATED STATEMENTS OF INCOME (http://www.google.com/taxonomy/role/StatementOfIncomeAlternative)		
Table	Statement [Table]		
Reporting Entity [Axis]	GOOGLE INC. (1288776)		
Legal Entity [Axis]	Default Legal Entity [Member]		
Archive [Axis]	0001193125-11-032930		
Archive Fiscal Period Focus [Axis]	FY		
Archive Fiscal Year Focus [Axis]	2010		
Statement [Line Items]	Period [Axis]		
	From January 1, 2008 to December 31, 2008	From January 1, 2009 to December 31, 2009	From January 1, 2010 to December 31, 2010
Revenues	21,796,000,000	23,651,000,000	29,321,000,000
Costs and expenses:			
Cost of revenues (including stock-based compensation expense of \$41, \$47, \$67)	8,622,000,000	8,844,000,000	10,417,000,000
Research and development (including stock-based compensation expense of \$732, \$725, \$861)	2,793,000,000	2,843,000,000	3,762,000,000
Sales and marketing (including stock-based compensation expense of \$206, \$231, \$261)	1,946,000,000	1,984,000,000	2,799,000,000
General and administrative (including stock-based compensation expense of \$141, \$161, \$187)	1,803,000,000	1,668,000,000	1,962,000,000
Total costs and expenses	15,164,000,000	15,339,000,000	18,940,000,000
Income from operations	6,632,000,000	8,312,000,000	10,381,000,000
Impairment of equity investments	1,095,000,000	0	0
Interest and other income, net	316,000,000	69,000,000	415,000,000
Income before income taxes	5,853,000,000	8,381,000,000	10,796,000,000
Provision for income taxes	1,626,000,000	1,861,000,000	2,291,000,000
Net income	4,227,000,000	6,520,000,000	8,505,000,000
Net income per share of Class A and Class B common stock:			
Basic	13.46	20.62	26.69
Diluted	13.31	20.41	26.31



1.1.9. Pesseract

Component: (Network and Table)			
Network	105 - Statement CONSOLIDATED STATEMENTS OF INCOME		
Table	Statement [Table]		
Reporting Entity [Axis]	0001288776 http://www.sec.gov/CIK		
Legal Entity [Axis]	Entity [Domain]		
	Period [Axis]		
Statement [Line Items]	2010-01-01/2010-12-31	2009-01-01/2009-12-31	2008-01-01/2008-12-31
Revenues	29,321,000,000	23,651,000,000	21,796,000,000
Costs and expenses:			
Cost of revenues (including stock-based compensation expense of \$41, \$47, \$67)	10,417,000,000	8,844,000,000	8,622,000,000
Research and development (including stock-based compensation expense of \$732, \$725, \$861)	3,762,000,000	2,843,000,000	2,793,000,000
Sales and marketing (including stock-based compensation expense of \$206, \$231, \$261)	2,799,000,000	1,984,000,000	1,946,000,000
General and administrative (including stock-based compensation expense of \$141, \$161, \$187)	1,962,000,000	1,668,000,000	1,803,000,000
Total costs and expenses	18,940,000,000	15,339,000,000	15,164,000,000
Income from operations	10,381,000,000	8,312,000,000	6,632,000,000
Impairment of equity investments	0	0	(1,095,000,000)
Interest and other income, net	415,000,000	69,000,000	316,000,000
Income before income taxes	10,796,000,000	8,381,000,000	5,853,000,000
Provision for income taxes	2,291,000,000	1,861,000,000	1,626,000,000
Net income	8,505,000,000	6,520,000,000	4,227,000,000
Net income per share of Class A and Class B common stock:			
Basic	26.69	20.62	13.46
Diluted	26.31	20.41	13.31
Income Statement [Abstract]			

1.1.10. AsReported.com

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



7. Proof of Axioms, Theorems, and Therefore Theory

An important role of science is to deduce complex scientific principles from collections of generally agreed upon assumptions using principles of logic. These same principles of logic work not only in science, but also work in business. A proof^{ivv} is basically where one starts with a clearly stated and hopefully generally accepted set of hypotheses and usually with some previously proven principles.

Direct proofs, or deductive reasoning, is a direct way of proving something by using a sequence of accepted axioms and theorems, "IF A; THEN B." Indirect proofs, or inductive reasoning, is proof by contradiction. Basically an indirect proof works by considering all alternatives to B and proving them to be untrue and then therefore A must be true because all the alternatives to A are absurd. This type of proof is sometimes referred to by its Latin term *reductio ad absurdum* or "reduced to absurdity".

The following is a summary of a partial proof of the *Financial Report Semantics and Dynamics Theory*. This verification uses information from SEC XBRL financial filings to test this theory. These filings are appropriate for testing as they are publicly available and anyone can repeat these tests. Further, SEC XBRL financial filings are significantly complex to appropriately exercise this theory. Other proofs can, and should, be create for other XBRL-based financial filings such as IFRS.

This proof is considered partial because it does not test 100% of the information in this document. For example, specific whole-part relations are not tested.

The working hypothesis of this proof is that the axioms and theorems which make up this theory are all true and that the theory accurately describes the mechanical aspects of how XBRL-based digital financial reports operate. The basic idea is to show that (a) 100% of the digital financial reports provided by public companies to the US Securities and Exchange Commission follow the axioms and theorems of this theory or (b) to show the error in the digital financial report which should be corrected to follow the axioms and theorems and then, if corrected, the digital financial report would support this proof.

Finally, there is one last compelling reason why this approach is a convincing approach to proving the *Financial Report Semantics and Dynamics Theory*. The entire point, it seems to me, is to make digital financial reporting work. The point is to agree on some set of axioms and theorems, to use those axioms and theorems in the financial reporting supply chain, and successfully exchange information between standards setters such as the FASB, public companies who create financial reports, software vendors who build software which is used by business professionals, regulators who receive the financial reports, investors and analysts to make use of reported information, etc.

Basically, prudence dictates that using financial information in SEC XBRL financial filings should not be a guessing game. Rather, safe, reliable, predictable, automated reuse of reported financial information seems preferable. If these axioms and theorems are not correct and therefore the *Financial Report Semantics and Dynamics Theory* is not correct; then what are the correct axioms and theorems? If the theory needs to be adjusted for the empirical evidence it only improves the theory.

The goal is not to have a philosophical, religious, or academic debate. The goal is to effectively exchange information using automated machine-based processes. The goal is consistency between the theory, taxonomies which are created by standards bodies such as the US GAAP XBRL Taxonomy created by the FASB, financial reports created by public companies which make use of the taxonomy, systems which collect and store information such as the SEC EDGAR system, analysts and investors which query and make use of information, and other such users of the system.



1.1. Many axioms are true by definition per the XBRL technical syntax used by SEC XBRL financial filings

Many axioms are simply true by definition for SEC XBRL financial filings. For example, consider the axiom “Financial reports communicate facts”. SEC XBRL financial filings are formatted using the XBRL technical syntax. The XBRL technical syntax is enforced by the XBRL Specification and a conformance suite which software must support. As such, these facts are true and verified by automated testing of SEC XBRL financial filing upon submission. Therefore, these axioms must be true. Other axioms are true because of the fundamental nature of US GAAP. Other axioms are true due to the nature of the US GAAP Taxonomy and filer taxonomies created and used with their SEC XBRL financial filings.

The following is a summary of all axioms which make up this theory. Un-shaded axioms are true per SEC XBRL financial filings following the XBRL technical syntax. Several shaded axioms are not in scope for this proof as the test more detailed aspects of the theory and testing will be added later. The shaded and bold, section 2.13, will be the focus of this partial proof.

#	Axiom	Explanation
2.1	Financial reports communicate facts	SEC XBRL financial filings report facts as XBRL items. The XBRL specification defines the syntax and semantics of a “fact”.
2.2	Facts reported in financial reports have characteristics	In the XBRL technical syntax, characteristics take the form of context entity identifiers, context period, and additional characteristics defined using XBRL Dimensions. Facts reported as XBRL items are each associated with a context. That context articulates characterizes of the fact using various XBRL technical syntax.
2.3	Financial reports have components	SEC XBRL financial filings are supported by XBRL taxonomies. Taxonomies are organized by using networks and hypercubes (called [Table]s) by the US GAAP taxonomy both of which are articulated using the XBRL technical syntax.
2.4	Facts reported within financial reports are organized into components	Same as 2.3 above.
2.5	Financial report facts and components can be organized leveraging the financial statement conceptual framework	The US GAAP Taxonomy is mapped to the Accounting Standards Codification (ASC) published by the FASB. The ASC has CON 1-7 as its conceptual framework.
2.6	Industries and reporting entities with certain activities have different reporting practices and therefore use the financial reporting conceptual framework differently	By definition within US GAAP. Although, this proof does not go to this level of detail but rather tests for the common practices which all reporting entities in all industries and activities have. See 2.13.
2.7	Common characteristics of financial facts exist	Each of these common characteristics are defined either by the XBRL technical syntax itself (entity, period, concept) or the US GAAP Taxonomy via the creation of specific [Axis] using XBRL Dimensions.
2.8	Financial facts may have parenthetical explanations	By definition within XBRL technical syntax and SEC filing rules; XBRL footnotes are used to articulate most parenthetical information. Concept labels are used to articulate other parenthetical information. Sometimes facts are used.
2.9	Characteristics of a financial fact may be related	Not in scope for this proof.



#	Axiom	Explanation
2.10	Financial facts may be related	By definition within the US GAAP Taxonomy. Roll Up's (XBRL calculations) and Roll Forward's are specifically identified. Hierarchies are identified as relations with no XBRL calculation or other computation.
2.11	Financial facts have fidelity	By definition within US GAAP.
2.12	Financial reports have integrity	By definition within US GAAP.
2.13	Financial report components may have core facts and relations common to all reporting entities	SEE TESTING BELOW.
2.14	Financial reports have a flow	By definition of the SEC which explains how networks should be numbered, categorized, and titled.
2.15	Differing sets of detailed facts for a higher-level fact does not change the definition of the higher level fact	Not in scope for this proof.
2.16	Financial reports may have supporting schedules	By definition within US GAAP.
2.17	Reporting entities which created financial reports can be categorized into industries/activities	By definition within US GAAP. Not likely to be disputed, however the exact industries and activities may differ in some cases
2.18	Financial analysts use certain common key financial ratios when analyzing financial report information	Not in scope for this proof.

As such, the focus area of testing is axiom 2.13.

1.2. Methodology

The methodology of this proof is to look for the existence of core facts and relations common to all reporting entities within SEC XBRL financial filings. Forms 10-Q, 10-Q/A, 10-K and 10-K/A which were filed with the SEC between September 1, 2011 and December 1, 2011 were used. The number of SEC XBRL financial filings in this set amounted to 8,098 filings. The list of filings was obtained from the SEC here:

<http://www.sec.gov/Archives/edgar/monthly/>

Specifically, these two files containing pointers to these filings were used:

<http://www.sec.gov/Archives/edgar/monthly/xbrlrss-2011-10.xml>

<http://www.sec.gov/Archives/edgar/monthly/xbrlrss-2011-11.xml>



It was desirable to use automated processes and the entire set of 8,098 filings. As such, for this initial proof, automatable tests were used.

SEC 10-Q and 10-K filings are appropriate for this test as the financial reports follow US GAAP, and thus follow one consistent financial reporting framework within the financial report. Therefore, reported information is predictable at the level necessary. Further, SEC XBRL financial filings are verified upon submission to be compliant with the XBRL technical specification thus satisfying that the un-shaded axioms listed above are satisfied.

These tests for core financial facts are outlined here which provides the test and the fact(s) sought by the test:

#	Test	Fact(s) sought
1	Balance sheet reports assets	us-gaap:Assets
2	Balance sheet reports liabilities and equity	us-gaap:LiabilitiesAndStockholdersEquity -or- us-gaap:LiabilitiesAndPartnersCapital
3	Balance sheet reports equity	us-gaap:StockholdersEquityIncludingPortionAttributableToNoncontrollingInterest -or- us-gaap:StockholdersEquity -or- us-gaap:PartnersCapital -or- us-gaap:PartnersCapitalIncludingPortionAttributableToNoncontrollingInterest
4	Balance sheet balances	Compute the difference between the fact found for "assets" and the fact found for "liabilities and equity"
5	Cash flow statement reports net cash flow	us-gaap:CashAndCashEquivalentsPeriodIncreaseDecrease or us-gaap:CashPeriodIncreaseDecrease
7	Income statement reports net income (loss)	us-gaap:ProfitLoss -or- us-gaap:NetIncomeLoss -or- us-gaap:NetIncomeLossAvailableToCommonStockholdersBasic -or- us-gaap:IncomeLossFromContinuingOperations -or- us-gaap:IncomeLossAttributableToParent
9	Income statement reports income (loss) from continuing operations	us-gaap:IncomeLossFromContinuingOperationsBeforeIncomeTaxesExtraordinaryItemsNoncontrollingInterest -or- us-gaap:IncomeLossFromContinuingOperationsBeforeIncomeTaxesMinorityInterestAndIncomeLossFromEquityMethodInvestments -or- us-gaap:IncomeLossFromContinuingOperationsBeforeIncomeTaxesDomestic -or- us-gaap:IncomeLossFromContinuingOperationsBeforeIncomeTaxesForeign
10	Entity name reported	dei:EntityRegistrantName



Because the US GAAP taxonomy uses a number of different concepts to articulate these facts, a number of different facts could satisfy the existence of a fact in the financial report. For example, “liabilities and equity” could be either “us-gaap:LiabilitiesAndStockholdersEquity” or “us-gaap:LiabilitiesAndPartnersCapital” per the way the US GAAP Taxonomy is modeled; either concept would satisfy the test.

Further, because ambiguities exist within the US GAAP taxonomy multiple concepts could satisfy the test. For example, “net income (loss)” could be satisfied by one of four concepts; which one an SEC filer uses cannot be determined because of this ambiguity, but one of the four will exist.

Each test sought the specified fact with the specified concept or concepts for each reporting entity, for the legal entity “consolidated entity”, for the report date specified in the report by the fact “dei:DocumentPeriodEndDate” which is required for all SEC XBRL financial filings.

Information was extracted from each SEC XBRL financial filing using a database application (Microsoft Access was used), algorithms were tuned, and values extracted were written to the database application, the results were summarized using database queries from the extracted data.

1.3. Analysis performed

The analysis performed amounted to simply reading the results of the data extracted from the SEC XBRL financial filings per the algorithms explained in the methodology above.

- Did each SEC filing have a fact for “assets”?
- Did each SEC filing have a fact for “liabilities and equity”?
- Did each SEC filing have a fact for “equity”?
- Did each SEC filing a fact for “assets” equal to a fact for “liabilities and equity”?
- Did each SEC filing have a fact for “net cash flow”?
- Did each SEC filing have a fact for “net income (loss)”?
- Did each SEC filing have a fact for “income (loss) from continuing operations”?
- Did each SEC filing have a fact for “entity registered name”?

It would be expected that each of these tests would be returned with a favorable result and that the reason for the negative result could be determined. For favorable results the value of the fact was returned to the database and stored.

1.4. Overview of results

The following is an overview of the results obtained. Note that total results for all 8,098 filings were provided with additional breakdowns for the 30 Dow industrial companies, top 100 companies by total assets and top 1,000 companies by total assets.

#	Test	All 8,098 Companies	30 Dow Industrial Companies	Top 100 Companies	Top 1,000 Companies
1	Balance sheet reports assets	100%	100%	100%	100%
2	Balance sheet reports liabilities and equity	97%	96%	99%	99%
3	Balance sheet reports equity	97%	100%	100%	99%



#	Test	All 8,098 Companies	30 Dow Industrial Companies	Top 100 Companies	Top 1,000 Companies
4	Balance sheet balances	98%	96%	99%	99%
5	Cash flow statement reports net cash flow	98%	100%	93%	98%
6	Income statement reports net income (loss)	98%	100%	98%	99%
7	Income statement reports income (loss) from continuing operations	72%	73%	76%	78%
8	Entity name reported	100%	100%	100%	100%

There are a number of possible reasons for non-positive results.

- The theory could be wrong.
- The theory needs to be tuned for specific practices of specific reporting entities and industries/activities.
- The filer could have made a mistake in their filing.

Perfect results would be 100% for each test. Test 8 is a control and known to be 100% as the entity name reported is a required fact and as expected all reports contained this fact. Test 7 is likewise a control as not all financial reports are required to contain “income (loss) from continuing operations”. As expected, the results were less than 100%.

1.5. Details of results and other observations

As 100% for each test is expected and because the success rate is so high, non-positive results could be looked at one by one to see why a favorable result was not obtained. Basically, each 1% from 100% represents about 81 SEC filings which would need to be examined manually to see why the result was not favorable.

The following is a more detailed look at the results obtained. It provides a flavor for why non-positive results existed in some cases. It highlights patterns in the non-positive results.

1.1.1. Balance sheet reports assets

A number of balance sheets existed where non-positive results were experienced due to representation approaches. For example, in the example below an SEC filer used the concept “us-gaap:AssetsCurrent” to express both current assets as well as total assets.



	June 30, 2011 (unaudited)	December 31, 2010 (audited)
ASSETS		
CURRENT ASSETS		
Cash	\$ --	\$ --
Notes receivable (Note 4)	500,000	500,000
Interest receivable	51,918	27,123
Total current assets and total assets	\$ 551,918	\$ 527,123

Or, other balance sheets had only cash and used the concept “us-gaap:CashAndCashEquivalents” rather than “us-gaap:Assets” as below:

	June 30, 2011 (Unaudited)	December 31, 2010
ASSETS		
CURRENT ASSETS:		
Cash	\$ 15,442	\$ 3,455
LIABILITIES AND STOCKHOLDERS' EQUITY (DEFICIT)		
CURRENT LIABILITIES:		
Due to Stockholders	€ 117,500	€ 117,500

Or, a small number reported nil values per the XBRL technical syntax where the value of zero exists semantically as below:

	Unaudited 6/30/2011	Audited 12/31/10
ASSETS		
CURRENT ASSETS		
Cash	\$ -	\$ -
TOTAL ASSETS	-	-
LIABILITIES AND STOCKHOLDERS' DEFICIT		
CURRENT LIABILITIES		
Accrued Liabilities	1,300	3,000
Payable to Stockholder	53,694	49,863
TOTAL CURRENT LIABILITIES	54,994	52,863
STOCKHOLDERS' DEFICIT		
Preferred Stock: Par value \$.01; 5,000,000 shares authorized; no shares issued and outstanding		
Common Stock: Par value \$.001; 25,000,000 shares authorized; 2,647,640 shares issued and outstanding	2,648	2,648
Additional paid in capital	5,160	5,160
Deficit accumulated during the development stage	(62,802)	(60,671)
TOTAL STOCKHOLDERS' DEFICIT	(54,994)	(52,863)
TOTAL LIABILITIES AND STOCKHOLDERS' DEFICIT	\$ -	\$ -

The accompanying notes are an integral part of these financial statements.

Either adjustments to the required representation techniques or adjustments to the data extraction algorithm would solve these issues.

A small number of SEC filers had amounts which did not add up due to rounding discrepancies. For example, below is the IBM balance sheet where total liabilities + total equity is off from the total by 1 (one million dollars per their scale factor).



Goodwill	25,609	25,136
Intangible assets - net	3,205	3,488
Investments and sundry assets	5,329	5,778
Total assets	113,474 ⁽¹⁾	113,452 ⁽¹⁾
Current liabilities:		
Taxes	2,363	4,216
Short-term debt	7,858	6,778
Accounts payable	7,112	7,804
Compensation and benefits	4,706	5,028
Deferred income	12,660	11,580
Other accrued expenses and liabilities	5,144	5,156
Total current liabilities	39,843	40,562
Long-term debt	21,915	21,846
Retirement and nonpension postretirement benefit obligations	16,014	15,978
Deferred income	3,641	3,666
Other liabilities	8,851	8,226
Total liabilities	90,263 ⁽¹⁾	90,279 ⁽¹⁾
IBM stockholders' equity:		
Common stock, par value \$0.20 per share, and additional paid-in capital Shares authorized: 4,687,500,000 Shares issued: 2011 - 2,175,594,604 2010 - 2,161,800,054	46,975	45,418
Retained earnings	97,334	92,532
Treasury stock - at cost Shares: 2011 - 981,316,389 2010 - 933,806,510	(104,073)	(96,161)
Accumulated other comprehensive income/(loss)	(17,109)	(18,743)
Total IBM stockholders' equity	23,127	23,046
Noncontrolling interests	84	126
Total equity	23,210 ⁽¹⁾	23,172 ⁽¹⁾
Total liabilities and equity	\$ 113,474 ⁽¹⁾	\$ 113,452 ⁽¹⁾

[1] Amounts may not add due to rounding.

A small number of filers created a balance sheet using the net assets approach, which is appropriate and this is not considered a violation of the model, rather it calls for a tuning of the model to take this acceptable practice into account.

Again, either modelling approaches or algorithm adjustments would increase the positive results realized.

1.1.2. Balance sheet reports equity

A small minority of SEC filers determined that it was necessary to extend the US GAAP taxonomy for the concept “member equity” rather than using an existing concept. One of two possibilities exist which can explain this need. First, the FASB defines “equity” as a financial report element, but defines concepts for both stockholder equity and partner capital. Our view that a better approach would be to simply define “equity” and adjust the label of the concept for the type of equity a filer has. The second view could be that the concept “member equity” and other equity concepts such as “owner equity” are missing from the US GAAP taxonomy and should be added. Either of these would increase the number of positive tests thus showing that balance sheets report equity.

1.1.3. Cash flow statement reports net cash flow

A small minority of SEC filers determined, for unknown reasons, that they needed to create their own concept to express net cash flow rather than using an existing concept from the US GAAP Taxonomy. For example:

- *Ford*: us-gaap:NetCashProvidedByUsedInContinuingOperations
- *Allstate Life Insurance*: alic:CashPeriodIncreaseDecrease
- *Hartford Life Insurance*: hlic:NetIncreaseDecreaseInCash
- *Allstate Corp*: all:CashPeriodIncreaseDecrease
- *Hartford Financial Services*: hig:NetIncreaseDecreaseInCash
- *General Motors*: us-gaap:CashAndCashEquivalentsPeriodIncreaseDecrease (but did not report for consolidated entity)
- *CitiGroup*: c:CashAndDueFromBanksPeriodIncreaseDecrease



Creating these concepts as opposed to using an existing concept would seem hard to justify in this case.

1.6. Conclusion from proof

Based on the results obtained, all non-positive results obtained which were analyzed manually resulted from either (a) allowable industry practices which are different from the norm or (b) SEC filer modeling errors mostly relating to concept selection which seems hard to justify.

As such, the extraction algorithm can be more appropriately tuned to reflect specific industry practices which some filers use. Thus the positive results would increase.

The testing results without these modifications are high enough to conclude that the test was satisfied and that the predictions of the theory appear appropriate.



8. Expanded and repeat of test and implementation of *Financial Report Semantics and Dynamics Theory* in commercial software

The tests performed in the original partial proof were repeated for a set of 6,674 public company XBRL-based 10-K filings with the SEC between March 1, 2013 and February 28, 2014, generally reports for fiscal year 2013. The set was reduced to remove trusts and funds which follow different financial reporting rules. Also, certain other situations where duplicate CIK numbers conflicted were removed.

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

		LAX Model, SEC filers supported						
		Parent						
		Network	Table	Axis	Member	Lineltms	Abstract	Concept
		477,041	232,230	386,912	1,216,391	232,690	732,409	3,165,249
Child	Network	0	0	0	0	0	0	0
	Table	1,261	1	0	0	45	230,899	24
	Axis	1	386,888	0	0	3	20	0
	Member	3	0	450,091	766,221	4	72	0
	Lineltms	183	232,181	0	0	107	217	2
	Abstract	474,310	22	0	1	113,059	144,471	546
	Concept	46	26	11	137	1,222,427	1,929,257	13,346

1.1. Summary of additional verification

Information from the 2013 test set was organized and explained in two white papers. The first white paper, *Understanding Minimum Processing Steps for Effective Use of SEC XBRL Financial Filing Information*^{vii}, explains this testing in significantly more detail. The white paper, *Arriving at Digital Financial Reporting All Stars: Summary Information*^{viii}, expands on the testing results. The following table summarizes the results of this additional testing.

#	Goal or Desired State of Digital Financial Report	More information	Comments, examples, etc.	Automatable	Manual	FY 2013 (automatable tests only)	FY 2012 (automatable tests only)
1	XBRL technical syntax consistent with XBRL technical specification requirements	See		X		99.9%	99.9%
2	Consistent with requirements of EDGAR Filer automated and manual (EFM) syntax/semantics rules	See		X	X	97.9%	80.5%
3	Consistent and unambiguous report level representation or model structure	See	Tests arrangement of Network, Table, Axis, Member, Line Items, Abstracts, Concepts	X		99.9%	97.9%
4	Root entity of focus (economic entity, accounting entity) successfully and unambiguously detectable	See	If the entity of focus is not detected, unable to perform other tests	X		99.2%	98.8%
5	Current balance sheet date (document period end date) and income statement period (period context of document period end date) successfully and unambiguously detected	See		X		99.3%	99.8%
6	Fundamental accounting concept skeleton successfully and unambiguously detected and relations between concepts intact/sound	See		X		97.8%	97.9%
7	Primary financial statement roll up computations (balance sheet, income statement, statement of comprehensive income, cash flow statement) detected, intact, and foot	See	This has a dependency on discovery of fundamental accounting concepts. For example, if the concept "net cash flow" is not found, won't be able to find a roll up for net cash flow either.	X		90.1%	84.9%

Since the initial partial proof was performed, there have been three implementations of this representation model. The first was a noncommercial implementation used to gain further understanding of the representation model. The other two are commercial implementations.



The first commercial implementation was by the software vendor XBRL Cloud. The representation model was used in numerous products but is best seen in the commercial product Edgar Report Information web service^{ix}.

The second commercial implementation was by the software vendor 28msec. The representation model was used in the commercial product SECXBRL.info^x. What is particularly useful about SECXBRL.info is that using information about the 30 reporting entities which make up the DOW is free. Therefore, the implementation model can be observed or used by anyone who chooses to do so.

1.2. Repeat using enhanced commercial software implementation

Two other software vendors partially implemented aspects of the *Financial Report Semantics and Dynamics Theory* which enabled the ability to test certain aspects of these axioms and theorems across software implementations. For example, extraction of 51 fundamental accounting concepts and testing of 21 relations between those concepts was tested across four software vendors for the DOW 30 companies^{xi}.

Testing of the complete set of 10-K filings was repeated to test a commercial software implementation^{xii} of basically the same filings. The number of filings arrived at was 6,947 from using more precise commercially available means of identifying the appropriate set of public companies.

General information	Charlie's Excel Application	SECXBRL.info	XBRL Cloud	Prolifis	XBRLAnalyst
Entity Registrant Name	HOME DEPOT INC	HOME DEPOT INC	HOME DEPOT INC	HOME DEPOT INC	HOME DEPOT INC
CIK	0000354950	0000354950	0000354950	0000354950	0000354950
Entity Filer Category	Large Accelerated Filer	Large Accelerated Filer	Large Accelerated Filer	Large Accelerated Filer	Large Accelerated Filer
Trading symbol		hd	hd		hd
Fiscal Year End	--02-01	--02-01	--02-01	--02-01	--02-01
Fiscal Year Focus	2014	2014	2014	2014	2014
Fiscal Period Focus	Q1	Q1	Q1	Q1	Q1
Document Type	10-Q	10-Q	10-Q	10-Q	10-Q
Balance Sheet Date	2014-05-04	2014-05-04	2014-05-04	2014-05-04	2014-05-04
Income Statement Start Period (Year to Date)	2014-02-03	2014-02-03	2014-02-03	2014-02-03	2014-02-03
Balance Sheet	Classified				XBRLAnalyst
Current Assets (if classified balance sheet)	17,515,000,000	17,515,000,000	17,515,000,000	17,515,000,000	17,515,000,000
Noncurrent Assets (if classified balance sheet)	25,114,000,000	25,114,000,000	25,114,000,000	25,114,000,000	25,114,000,000
Assets	42,629,000,000	42,629,000,000	42,629,000,000	42,629,000,000	42,629,000,000
Current Liabilities (if classified balance sheet)	13,265,000,000	13,265,000,000	13,265,000,000	13,265,000,000	13,265,000,000
Noncurrent Liabilities (if classified balance sheet)	17,218,000,000	17,218,000,000	17,218,000,000	17,218,000,000	17,218,000,000
Liabilities	30,483,000,000	30,483,000,000	30,483,000,000	30,483,000,000	30,483,000,000
Commitments and Contingencies	0	0	0	0	0
Temporary Equity and Redeemable Noncontrolling Interest	0	0	0	0	0
Equity Attributable to Parent	12,146,000,000	12,146,000,000	12,146,000,000	12,146,000,000	12,146,000,000
Equity Attributable to Noncontrolling Interest	0	0	0	0	0
Equity	12,146,000,000	12,146,000,000	12,146,000,000	12,146,000,000	12,146,000,000
Liabilities and Equity	42,629,000,000	42,629,000,000	42,629,000,000	42,629,000,000	42,629,000,000
Income Statement	Multi-step				XBRLAnalyst
Revenues (single-step alternative)	19,687,000,000	19,687,000,000	19,687,000,000	19,687,000,000	19,687,000,000
Costs of Revenues (single-step alternative)	12,802,000,000	12,802,000,000	12,802,000,000	12,802,000,000	12,802,000,000
Operating Expenses (single-step alternative)	4,608,000,000	4,608,000,000	4,608,000,000	4,608,000,000	4,608,000,000
Costs and Expenses (single-step alternative)	17,410,000,000	17,410,000,000	17,410,000,000	17,410,000,000	17,410,000,000
Other Operating Income (Expenses) (single-step alternative)	0	0	0	0	0
Operating Income (Loss) (single-step alternative)	2,277,000,000	2,277,000,000	2,277,000,000	2,277,000,000	2,277,000,000
Revenues (multi-step alternative)	19,687,000,000	19,687,000,000	19,687,000,000	19,687,000,000	19,687,000,000
Costs of Revenue (multi-step alternative)	12,802,000,000	12,802,000,000	12,802,000,000	12,802,000,000	12,802,000,000
Gross Profit (multi-step alternative)	6,885,000,000	6,885,000,000	6,885,000,000	6,885,000,000	6,885,000,000
Operating Expenses (multi-step alternative)	4,608,000,000	4,608,000,000	4,608,000,000	4,608,000,000	4,608,000,000
Other Operating Income (Expenses) (multi-step alternative)	0	0	0	0	0
Operating Income (Loss) (multi-step alternative)	2,277,000,000	2,277,000,000	2,277,000,000	2,277,000,000	2,277,000,000
Nonoperating Income (Loss)	-91,000,000	-91,000,000	-91,000,000	-91,000,000	-91,000,000



10. Expanded proof between March 1, 2015 and March 31, 2016 using improved commercial software implementation of *Financial Report Semantics and Dynamics Theory*

This newest proof continues to include 100% of the digital financial report of public companies submitted to the SEC.

The results of testing are provided here:

<http://www.xbrlsite.com/2016/Library/FundamentalAccountingConceptRelations/FundamentalAccountingConcepts.html>

This graphic provides a summary of results over three years. Again, note that both positive results and even errors prove the axioms and theorems of this theory. All inconsistencies with this testing were manually observed and verified to be inconsistencies. This is not to say the testing mechanism and business rules used are perfect. They are not. However, as the XBRL-based public company financial reports improve, as the testing software improves, and as corrections are made to the US GAAP XBRL Taxonomy; it is expected that equilibrium will be achieved and this theory will be proven by 100% of XBRL-based public company financial reports.

March 3, 2014 (FY 2013 10-Ks)						March 31, 2015 (FY 2014 10-Ks)						March 31, 2016 (Last 10-K or 10-Q)						
Generator	Filings Count	Filings With No Errors	Sum Errors (all filings)	Average Errors per Filing	Percent Without Error	Generator	Filings Count	Filings With No Errors	Sum Errors (all filings)	Average Errors per Filing	Percent Without Error	Generator	Filings Count	Filings With No Errors	Sum Errors (all filings)	Average Errors per Filing	Percent Without Error	
Compliance Xpressware	92	35	93	1.0	36%	Trintech	1	1	0	0	100%	Merrill	459	444	15	0	97%	
P3 Data Systems	184	65	206	1.1	35%	SAP Disclosure Management	4	3	1	31	75%	Centent (was Rivet)	198	186	20	11	94%	
DataTracks	136	47	150	1.1	35%	RR Donnelley	947	687	376	4	73%	DataTracks	378	354	33	1	94%	
NeoClarus	105	36	136	1.3	34%	Compliance Xpressware	83	55	43	5	66%	RR Donnelley	898	827	85	1	91%	
Et-Editor	440	129	501	1.1	29%	P3 Data Systems	199	131	107	5	66%	P3 Data Systems	79	72	7	1	91%	
QXinteractive	181	53	245	1.4	29%	DataTracks	400	247	246	6	62%	Compliance Xpressware	63	57	8	1	90%	
GoFiler	523	153	700	1.3	29%	CompSci	413	254	237	6	62%	SAP Disclosure Management	7	6	1	1	86%	
Et-XBRL	166	49	189	1.1	29%	Et-XBRL	331	203	196	6	61%	Et-XBRL	335	287	74	2	89%	
RR Donnelley/Edgar Online	1,092	308	1,274	1.2	28%	Unknown	34	20	25	7	59%	Thunderdome	212	177	44	2	83%	
Novaworks	256	71	356	1.4	28%	Rivet	230	135	161	7	59%	Fujitsu	10	8	2	2	80%	
CompSci	431	116	547	1.3	27%	Workiva (WebFilings)	1,925	1,090	1,315	7	57%	CompSci	186	147	57	3	79%	
Advanced Computer Innovations	360	88	521	1.4	24%	Merrill	476	263	297	6	55%	IBM Cognos	66	51	21	3	77%	
Workiva (WebFilings)	1,463	355	2,037	1.4	24%	Accelus	196	106	135	7	54%	Workiva (WebFilings)	2,103	1,624	665	3	77%	
Rivet	270	54	366	1.4	20%	NeoClarus	93	49	85	9	53%	EDGARfilings PROFILE	143	109	46	3	76%	
Unknown	32	6	55	1.7	19%	Novaworks Software	551	285	455	8	52%	Unknown	8	6	2	3	75%	
Fujitsu Interstage XWand	29	5	40	1.4	17%	Oracle	2	1	2	1.0	50%	Novaworks Software	641	470	284	4	73%	
SAP Disclosure Management	6	1	11	1.8	17%	GoXBRL	269	132	233	9	49%	GoXBRL	262	184	133	5	70%	
Thomson Reuters (now Accelus)	255	42	348	1.4	16%	QXI	156	75	131	8	48%	QXI	110	74	62	6	67%	
Merrill	508	83	843	1.7	16%	IBM Cognos	100	47	92	9	47%	Denhamer	6	4	5	8	67%	
SmartXBRL	8	1	23	2.9	13%	Advanced Computer Innovations	323	143	310	1.0	44%	S2 Filings	60	40	28	5	67%	
Oracle	0	0	0	0	0%	SmartXBRL	5	2	5	1.0	40%	NeoClarus	75	50	45	6	67%	
Thunderdome	0	0	0	0	0%	Thunderdome	0	0	0	0	0%	Advanced Computer Innovations	278	185	174	6	67%	
EDGARfilings PROFILE	0	0	0	0	0%	EDGARfilings PROFILE	0	0	0	0	0%	SmartXBRL	6	3	4	7	50%	
IBM Cognos	135	16	279	2.1	12%	Fujitsu	13	5	11	8	38%	Oracle	1	0	1	1	0%	
	6,674	1,711	8,920	1.3			6,751	3,934	4,463	7			6,584	5,365	1,816	1	9	
Percent of all filings conforming to all FAC relations						Percent of all filings conforming to all FAC relations						Percent of all filings conforming to all FAC relations						
				25.6%							58.3%							81.5%
Total filings NOT conforming	4,963					Total filings NOT conforming	2,817					Total filings NOT conforming	1,219					
Total tests	146,828	100.00%				Total tests	148,522	100.00%				Total tests	144,848	100.00%				
Total inconsistent	8,920	6.08%				Total inconsistent	4,463	3.00%				Total inconsistent	1,816	1.25%				
Total consistent	137,908	93.92%				Total consistent	144,059	97.00%				Total consistent	143,032	98.75%				

Note that additional details and insights are summarized in the document *Digital Financial Reporting Principles* which can be obtained here:

<http://xbrlsite.azurewebsites.net/2016/Library/DigitalFinancialReportingPrinciples-2016-04-15.pdf>



11. Future work

The first results of testing our *Financial Report Semantics and Dynamics Theory* shows that the theory can successfully predict certain semantics and dynamics of a financial report. While admittedly the first rules regarding semantics and dynamics for financial statements were simple; they do indicate that the principle of defining rules for financial statement analysis and verification work.

The next steps in the development of the *Financial Report Semantics and Dynamics Theory* is to define more granular rules for financial statement semantics and dynamics that enable interpretation and verification of reported values in the various components of the financial statements.

The tool for expressing the semantics and dynamics of financial statements is that of patterns of financial reporting structures or shapes. These encapsulate the structure, semantics and mechanical behavior of such structures/shapes of financial information reporting and they can be used to develop software applications that support creation of financial statements and business reports by following a model-based approach.

The model-based approach will at all times maintain the internal consistency, mechanics, and semantic validity of the defined information by applying the *Financial Report Semantics and Dynamics Theory*.



ⁱ For more information on the conceptual framework see:

<http://digitalfinancialreporting.wikispaces.com/Conceptual+Framework>

ⁱⁱ For more information on financial report elements see:

<http://digitalfinancialreporting.wikispaces.com/Elements+of+Financial+Statement>

ⁱⁱⁱ For more information on financial statement components see:

<http://digitalfinancialreporting.wikispaces.com/financial+statement+components>

^{iv} *Book of Proof*, <http://www.people.vcu.edu/~rhammack/BookOfProof/>

^v *Proof theory & Philosophy*, Greg Restall, <http://consequently.org/papers/ptp.pdf>

^{vi} For more information see, <http://xbrl.squarespace.com/journal/2014/12/10/example-of-expressing-semantics-using-xbrl-definition-relati.html>

^{vii} See, <http://www.xbrlsite.com/2014/Library/UnderstandingMinimumProcessSteps-2014-02-14.pdf>

^{viii} See, http://www.xbrlsite.com/2014/Library/AnalysisSummary_ArrivingAtDigitalFinancialReportingAllStars.pdf

^{ix} XBRL Cloud API, <https://www.xbrlcloud.com/home/edgar-report-information/eridev.html>

^x SECXBRL.info API, <http://app.secxbri.info/api>

^{xi} For a summary of testing see, <http://xbrl.squarespace.com/journal/2014/9/3/business-professionals-what-does-sec-xbrl-financial-filings.html>

^{xii} See, <http://www.xbrlsite.com/2014/Library/SummaryInformationAboutConformanceWithFundamentalAccountingConceptRelations.pdf>

^{xiii} See current results here, <http://www.xbrlsite.com/2014/Protototype/DisclosureAnalysis/Index.html>

