1. Understanding Mechanics of an SEC-type XBRL-based Digital Financial Report

The purpose of this section is to summarize the metamodel, logic, and mechanics of an SEC-style XBRL-based financial report created by public companies which submit their reports to the U.S. Securities and Exchange Commission (SEC).

1.1. Introduction

Section 6 of the SEC EDGAR Filer Manual[1] (EFM), the "Tagging Instructions" makes the following statement:

> "This approach, though admittedly technical, is intended to provide information that is independent of the various commercially available software applications that filers may use to create their XBRL documents."

The EFM section on Interactive Data is written for a *technical audience*. This document is written for accounting professionals or other business professionals who want to understand SEC-style XBRL-based digital financial reports.

This section builds on your understanding of knowledge engineering ideas[2], the conceptual model of an XBRL-based digital financial report[3], logical rules about how financial statements work[4], mathematics, the basic mechanics of a digital financial report, and expands these ideas to include specifically what is required to create an XBRL-based public company financial report which would be submitted to the SEC.

The vast majority of XBRL-based public company financial filings filed with the U.S. Securities and Exchange Commission are consistent with the mechanics and logic described in this section. Some are not. The primary reason for inconsistency is the lack of rules that describe what such a report should look like when submitted to the SEC and also used to verify that a digital financial report is consistent with that description which would include these mechanics.

1.2. Summary of the Basic Mechanics of a Digital Financial Report

The following provides a summary overview of the foundational terminology used to describe machine-readable XBRL-based public company digital financial reports that are submitted to the SEC and the basic mechanics of such reports. This builds on the conceptual model of an XBRL-based digital financial report[5]. Not every XBRL-

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[1] EDGAR Filer Manual (Version 29), http://www.sec.gov/info/edgar/edgarfm-vol2-v29.pdf

[2] Charles Hoffman, CPA, *Artificial Intelligence and Knowledge Engineering in a Nutshell*, http://xbrlsite.azurewebsites.net/2019/Library/KnowledgeEngineeringInNutShell.pdf

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

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

[5] *Introduction to the Conceptual Model of an XBRL-based Digital Financial Report*, http://xbrlsite.azurewebsites.net/2017/IntelligentDigitalFinancialReporting/Part02_Chapter05.1_IntroductionToTheConceptualModelOfDigitalFinancialReport.pdf

based report is of the SEC style; however, every SEC style report fits into the fundamental conceptual model of an XBRL-based digital financial report.

Having a consistent understanding of these key terms is important for accounting professionals, information technology professionals creating software for accounting professionals, and knowledge management professionals to communicate effectively.

1.3. Types/Classes of Objects

A type or class is a set or category of objects that have one or more distinguishing features in common which differentiates the type or class from other types or classes.

The following is a brief summary of the types or classes of every XBRL-based digital financial report. Please see the conceptual model introduction for detailed explanations of these object categories:

- **Economic entity**: Economic entity or accounting entity which creates a report. Another term for this is reporting entity.

- **Report**: A report is created by an economic entity.

- **Component**: A report is made up of pieces. The pieces of a report are called a report fragment[6] or component. A component contains or groups together a set of facts.

- **Fact**: A fact is reported and can be organized into components and described by characteristics. Another term for fact is data point.

- **Characteristic**: Characteristics describe and distinguish facts contained within a component from other facts. (Another term for characteristic is Aspect[7].)

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

- **Block**: A block is a part[8] of a component; a component is made up of one to many blocks. A Disclosure is made up of one or more Blocks.

- **Part-whole[9] relation**: A whole-part relations is something composed exactly of their parts and nothing else or more where the parts add up to the whole.

- **Is-a relation**: An is-a relation describes some list but the list does not add up mathematically.

- **Properties**: Each economic entity, report, component, characteristic, fact, block, and relation has a finite set of properties.

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[6] The US GAAP Taxonomy Architecture uses the term report fragment, http://xbrl.us/Documents/SECOFM-USGAAPT-Architecture-20080428.pdf

[7] The XBRL Abstract Model 2.0 uses the term Aspect, http://www.xbrl.org/Specification/abstractmodel-primary/PWD-2012-06-06/abstractmodel-primary-pwd-2012-06-06.html

[8] A block is a sub-set of a component. For example, the disclosure Funding Status of Defined Benefit Plans is made up of two roll forwards, a roll up, and a hierarchy each of which is a block of the component, see http://www.xbrlsite.com/2013/ReportingTemplates/2013-05-15/Library/730000-003-FundingStatusOfDefinedBenefitPlans/Template.jpg

[9] Toward Understanding Whole-Part Relations, http://xbrl.squarespace.com/journal/2015/1/20/toward-understanding-whole-part-relations.html

- **Slot**: A Slot is simply the idea of an allotted place where something can be logically and sensibly placed in a fragment of a financial report, or Block.
- **Disclosure**: A Disclosure is simply a set of facts that is disclosed. A Disclosure is made up of one or more Blocks.
- **Topic**: A Topic is simply a set of Disclosures that are grouped together for some specific reason.
- **Exemplar**: An Exemplar is an example of a Disclosure from some other existing financial report.
- **Template**: A Template is a starting point or sample used to create a complete Disclosure.

The Securities and Exchange Commission (SEC) adds some additional types/classes to this set of types/classes that all digital financial reports possess:

- **Sort category**: The sort category is used to distinguish between different types of networks. Possible values are: Document, Statement, Disclosure, and Schedule.
- **Level**: The level indicates the tagging level of information in a report. Valid tagging levels are: Level 1 Note Text Block, Level 2 Policy Text Block, Level 3 Disclosure Text Block, and Level 4 Disclosure Detail.
- **Current balance sheet date**: The date of the current period balance sheet.
- **Current income statement period**: The period of the current year-to-date income statement.
- **Fiscal year**: The year part of the fiscal year of the report.
- **Fiscal period**: Indicates whether the financial report relates to Q1, Q2, Q3, of FY.
- **Entity of focus**: Indicates the economic entity of focus.
- **Entity filer category**: Indicates the category of the filer which can be one of: Large Accelerated Filer, Accelerated Filer, Smaller Reporting Accelerated Filer, Non-accelerated Filer, Smaller Reporting Company.

When you look at an XBRL-based financial filing from the perspective of the SEC, the following two statements are true: No additional new classes may be added. No additional new properties may be added to these existing types/classes.

The salient classes of things that make up a financial report fall into that finite set of distinct and identifiable classes. Each of those classes has different but specific slots or openings into which things can be added.

However, if you look at this from the perspective of your system; then you can add additional types/classes and properties. If the types/classes and properties exist in the real world, then XBRL-based financial filings can even be tested against your new types/classes and properties to make sure that such XBRL-based financial reports are logically, mechanically, and mathematically consistent with the real world. But do not expect other software applications to support types/classes and properties you have added to your specific system.

For example, I have added two additional properties to an economic entity:

- **Sector**: Industry sector of the economic entity. Example values include Commercial and Industrial, Deposit based operations, Real estate investment trust, etc.

- **Reporting style code**: Indicates the reporting style of the economic entity. The reporting style determines which set and organization of fundamental accounting concept continuity cross check relations should be used.

My systems maintain all the metadata for these, and other, types/classes and properties that I have added to my system for US GAAP[10] and IFRS[11]. This breaks nothing in other systems which stick with the XBRL standard but exclude real world information such as the fundamental accounting concept continuity cross checks. However, every system is responsible for making sure XBRL-based financial reports are consistent with what is expected in the real world[12].

1.4. Public Company Digital Financial Report Details

This section provides and overview of a financial report (report). A report is created by an economic entity. The report is created at some point in time (report creation date). The report is for a fiscal year, for a fiscal period, it has a current balance sheet date, it has a current year-to-date income statement period, the report has one or more report components, the report components contain facts which are reported. Some reported facts exist in more than one report component (i.e. intersections between report components).

1.4.1. Economic entity

An economic entity or accounting entity or reporting entity creates a financial report. An economic entity always has the following properties:

- Entity registrant name (dei:EntityRegistrantName)

- Entity central index key (CIK) (dei:EntityCentralIndexKey)

- Standard industry classification (SIC) (assigned by SEC EDGAR system)

- Current fiscal year end (dei:CurrentFiscalYearEndDate)

- Current reporting status (dei:EntityCurrentReportingStatus)

- Voluntary filer status (dei:EntityVoluntaryFilers)

- Entity filer category (dei:EntityFilerCategory)

- Well known seasoned issuer (dei:EntityWellKnownSeasonedIssuer)

- Public float (dei:EntityPublicFloat) (required for 10-K only)

Economic entities may have additional information, but every public company which submits a digital financial report to the SEC has the information above. The SIC is

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[10] US GAAP Financial Reporting Scheme, http://xbrlsite.azurewebsites.net/2020/reporting-scheme/us-gaap/documentation/Home.html

[11] IFRS Financial Reporting Scheme, http://xbrlsite.azurewebsites.net/2020/reporting-scheme/ifrs/documentation/Home.html

[12] *Auditing XBRL-based Financial Reports*, http://xbrlsite.azurewebsites.net/2017/IntelligentDigitalFinancialReporting/Part03_Chapter06.7_Auditing.pdf

assigned to an entity but does not appear in the report itself. The public float fact is required only for 10-K report documents.

Economic entities may be broken down into smaller units which is discussed in a subsequent section of this document.

> HINT: In an SEC XBRL-based financial report, the entity identifier of the context is identical for every context within the document. The entity identifier must be equal to the CIK number provided in the fact dei:EntityCentralIndexKey.

1.4.2. Report document

An economic entity creates a report. An economic entity can create one or many reports. This document covers only financial reports (financial information from a 10-K or 10-Q document). A report document always has the following properties:

- Document type (dei:DocumentType)
- Document period end date (dei:DocumentPeriodEndDate)
- Amendment flag (dei:AmendmentFlag)
- Report fiscal year focus (dei:DocumentFiscalYearFocus)
- Report fiscal period focus (dei:DocumentFiscalPeriodFocus)

1.4.3. Report creation date

Each report document has a creation date. The creation date is the acceptance date which is assigned when the report document is accepted by the EDGAR system. If a prior period adjustment is reported for an accounting error or change in accounting principle, then the *Report Date [Axis]* (us-gaap:CreationDateAxis) articulates the report creation date of prior period information.

> HINT: All reported facts have the same report creation date unless a prior period adjustment is reported using the Report Date [Axis] which indicates that some information in a prior report is being adjusted to be some new value.

1.4.4. Report periods (fiscal year, fiscal period, current balance sheet date, current income statement period)

Every report is for a fiscal year (e.g. 2013, 2014), is for some fiscal period of that fiscal year (e.g. Q1, Q2, Q3, FY).

Every report has a current balance sheet date. There are three places where the current balance sheet date is reported and all three must be consistent:

- The value of the reported fact with the concept dei:DocumentPeriodEndDate is the current balance sheet date.
- The value of the endDate context which is used on the reported fact with the concept dei:DocumentPeriodEndDate.
- The actual calendar period characteristic value which is used for the balance sheet concepts report fragment.

Note that all three of these occurrences of the current balance sheet date must be consistent.

Every report has a current year-to-date income statement period. The current balance sheet date is also the end date of the current year-to-date income statement period. There are two places where the start date of the current year-to-date income statement period must be consistent:

- The value of the startDate context which is used on the reported fact with the concept dei:DocumentPeriodEndDate.

- The actual calendar period characteristic value which is used for the income statement concepts report fragment.

Note that the current year-to-date cash flow statement period is the same as the current year-to-date income statement period.

1.5. *Report components*

A report is made up of report components. All reported facts are reported within one or more report components or report fragments.

> HINT: Reported facts are never "free-floating", they always exist within one or more report components. While it is the case that a fact can be used apart from the report component or components to which it is a member, it is the responsibility of the user of the fact to also bring the appropriate characteristics which describe that reported fact.

The following is a high-level overview of the sequence or ordering of report components within a report as prescribed by the SEC (see EFM section 6.7.12):

- **Report**
  - Document and Entity Information
    - Document information
    - Entity information
    - Entity listing information
  - Statements
    - Statements
    - Statement related Parenthetical (after each individual statement)
  - Notes (Level 1 Note Text Blocks)
    - Each Level 1 Note Text Block
  - Policies (Level 2 Policy Text Blocks)
    - Each Level 2 Policy Text Block
  - Disclosures (Level 3 Disclosure Text Blocks)
    - Each Level 3 Disclosure Text Block
  - Disclosures (Detail)
    - Each Level 4 Disclosure Detail

HINT: For some reason, the EFM example does not include document and entity information. Most public companies (virtually all really) provide this information in the first report component.

The statements of a financial report are consistently the following reporting styles:

- Statement of financial position or balance sheet
    - o Classified
    - o Unclassified
    - o Liquidation basis
    - o Regulated public utility (includes capitalization)
- Statement of income and comprehensive income (combined)
    - o Statement of financial condition or income statement (separate)
    - o Statement of comprehensive income (separate)
- Statement of cash flows
- Statement of changes in equity

Parenthetical details/disclosures can be provided for any statement.

The disclosures of a company vary based on the transactions, events, circumstances, and other phenomenon of each individual economic entity which is creating a financial report. However, every economic entity must disclose the following information:

- Nature of business/operations (this is a best practice)
- Basis of presentation/reporting
- Significant accounting policies
- Revenue recognition policy

HINT: It can be hard to understand that each of these four disclosures is required or at least common practice. These are the US GAAP XBRL Taxonomy concepts used to represent these disclosures:

Nature of business	Basis of reporting	Significant accounting policies	Consolidation	Revenue recognition policy
us-gaap: NatureOfOperations	us-gaap: BasisOfAccounting	us-gaap: SignificantAccounting PoliciesTextBlock	us-gaap: Consolidation PolicyTextBlock	us-gaap: RevenueRecognition PolicyTextBlock
us-gaap: BusinessDescriptionAndBasisOfPresentation TextBlock		us-gaap: SignificantAccounting PoliciesTextBlock	us-gaap: Consolidation PolicyTextBlock	us-gaap: RevenueRecognition PolicyTextBlock
us-gaap: OrganizationConsolidationAndPresentationOfFinancialStatementsDisclosureAndSignificantAccountingPolicies TextBlock				us-gaap: RevenueRecognition PolicyTextBlock
us-gaap: OrganizationConsolidationBasisOfPresentationBusinessDescriptionAndAccountingPolicies TextBlock				us-gaap: RevenueRecognition PolicyTextBlock

Economic entities might call these by slightly different terms but those four disclosures are essentially required in every financial report.

> HINT: It is unclear if the nature of business is a required disclosure. It is certainly a best practice and a common practice to disclose.

If certain line items show up on the primary financial statements, additional disclosures are expected to exist. If certain disclosures exist, then other disclosures must also possibly exist. These are the reporting checklist rules.

1.6. Reported facts

Finally, we get to the essence of what a report does which is to report facts.

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 or aspects. A fact value is one property of a fact. Every fact has exactly one fact value. The set of characteristics or aspects which describes the fact is also a property of the fact.

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

> HINT: An all too common mistake which public companies make is that a fact is reported and it is represented with characteristics which have nothing to do with the reported fact.

1.7. Unique structural aspects of an XBRL-based financial report submitted to the SEC

The following structural pieces are used to organize the contents of an XBRL-based digital financial report. These structural pieces are used to represent the structure (model structure) of a digital financial report.

1.7.1. Sort Code, Type, Title and Level

Networks have no specific semantics other than to separate a digital financial report into pieces. At times the pieces are desired. At other times the pieces are required in order to avoid conflicts in the relations between report elements.

While XBRL networks have one label (role definition), the SEC breaks that one label into three parts (EFM section 6.7.12): {SortCode} - {Type} - {Title}

- **SortCode**: Alphanumeric value which is used to sequence networks.

- **Type**: Describes the type of network and must be one of the following values: Document, Statement, Disclosure, Schedule
- **Title**: Describes what the network contains.

The following are the rules related to the ordering and content of networks which are contained in a report:

1. Document and entity information is generally the first network(s).

2. Each primary financial statement (and statement related parenthetical information immediately following the statement); the order of the statements must match human readable versions provided to the SEC.

3. Level 1 Text Blocks (note level text blocks) which contain information for each note follow immediately after each statement, one note per network.

4. Level 2 Text Blocks (policy level text blocks) must follow immediately after the note text blocks.

5. Level 3 Text Blocks (disclosures level text blocks) must follow immediately after the policy text blocks.

6. Level 4 Disclosure Detail (disclosure detail level) must follow immediately after the disclosure level text blocks)

The following example is provided in the EFM (EFM section 6.7.12):

Example link:definition Text	Type of Facts in Presentation Links			
	Each Footnote as a Text Block	Each Accounting Policy as a Text Block	Each Table in a Footnote as a Text Block	Individual Values or Narratives
01 - Statement - Statement of Income				Yes
02 - Statement - Balance Sheet				Yes
03 - Statement - Balance Sheet (Parenthetical)				Yes
04 - Statement - Cash Flows				Yes
05 - Statement - Changes in Equity				Yes
06 - Statement - Comprehensive Income				Yes
07 - Disclosure - Accounting Policies	Yes			
08 - Disclosure - Inventories	Yes			
09 - Disclosure - Earnings per Share	Yes			
10 - Disclosure - Unearned Revenue	Yes			
11 - Disclosure - Equity	Yes			
12 - Disclosure - Accounting Policies, by Policy		Yes		
13 - Disclosure - Inventories (Tables)			Yes	
14 - Disclosure - Unearned Revenue (Tables)			Yes	
15 - Disclosure - Equity, Share Repurchases (Table)			Yes	
16 - Disclosure - Equity, Dividends (Table)			Yes	
17 - Disclosure - Inventories (Detail)				Yes
18 - Disclosure - Unearned, by Component (Detail)				Yes
19 - Disclosure - Unearned, by Segment (Detail)				Yes
20 - Disclosure - Equity, Share Repurchases (Detail)				Yes
21 - Disclosure - Equity, Dividends (Detail)				Yes

1.8. Reporting Styles and Fundamental Accounting Concept Continuity Cross Check Relations

Each public company creating a financial report uses some specifically identifiable reporting styleto represent the information which makes up their primary financial statements. Each reporting style has specific relations between some set of fundamental accounting concept relations which make up that reporting style. This information must be consistent throughout the entire financial report. The fundamental accounting concept continuity cross check relations explain these relations.

1.8.1. Reporting styles

Reporting styles[13] are determined by the preferences and policies of public companies, the different reporting practices of different industry sectors or accounting activities of an entity, and common practices.

Of the approximately 7,000 public companies which report to the SEC; 80% of those companies use one of about 12 different reporting styles. 90% of public companies use one of about 23 reporting styles. All public companies fit into approximately between 100 and 250 different reporting styles[14].

1.8.2. Fundamental accounting concepts relations

Reporting styles have high-level fundamental accounting concepts[15] that are associated with each other and these associations never change. An economic entity may change their reporting style.

At the highest level is the accounting equation[16]: Assets = Liabilities and Equity. At the next level SFAC 6 defines the elements of a financial statement[17]. After that, US GAAP defines other high-level financial concepts relative to those higher-level financial concepts.

These high-level fundamental concepts 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 accounting entities report each of these accounting concepts; if a concept is not reported it can be logically derived leveraging information that was reported and known business rules which describe relations between these key concepts.

The following is the set of fundamental accounting concept relations for the most common reporting style, used by about 2,000 public companies:

BS1	Equity = Equity Attributable to Parent + Equity Attributable to Noncontrolling Interest
BS2	Assets = Liabilities and Equity
BS3	Assets = Current Assets + Noncurrent Assets
BS4	Liabilities = Current Liabilities + Noncurrent Liabilities
BS5	Liabilities and Equity = Liabilities + Commitments and Contingencies + Temporary Equity + Redeemable

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[13] Reporting styles, http://xbrlsite.azurewebsites.net/2020/reporting-scheme/us-gaap/documentation/ReportingStyles.html

[14] Note that currently public companies that are funds or trusts are excluded. I am considering whether to include or exclude two other accounting activities: REITs and securities based revenues.

[15] Fundamental accounting concepts, http://xbrlsite.azurewebsites.net/2020/reporting-scheme/us-gaap/documentation/FundamentalAccountingConcepts.html

[16] Accounting equation, http://xbrlsite.azurewebsites.net/2019/core/master-ae/

[17] SFAC 6, http://xbrlsite.azurewebsites.net/2019/core/core-sfac6/

	Noncontrolling Interest + Equity
IS1	Gross Profit = Revenues - Cost Of Revenue
IS2	Operating Income (Loss) = Gross Profit - Operating Expenses + Other Operating Income
IS4	Income (Loss) from Continuing Operations Before Tax = Operating Income (Loss) - Interest And Debt Expense + Nonoperating Income (Loss)
IS5	Income (Loss) from Continuing Operations after Tax = Income (Loss) from Continuing Operations Before Tax - Income Tax Expense (Benefit)
IS6	Net Income (Loss) = Income (Loss) from Continuing Operations After Tax + Income (Loss) from Discontinued Operations, Net of Tax + Extraordinary Items, Gain (Loss)
IS7	Net Income (Loss) = Net Income (Loss) Attributable to Parent + Net Income (Loss) Attributable to Noncontrolling Interest
IS8	Net Income (Loss) Available to Common Stockholders, Basic = Net Income (Loss) Attributable to Parent - Preferred Stock Dividends and Other Adjustments
IS9	Comprehensive Income (Loss) = Comprehensive Income (Loss) Attributable to Parent + Comprehensive Income (Loss) Attributable to Noncontrolling Interest
IS10	Comprehensive Income (Loss) = Net Income (Loss) + Other Comprehensive Income (Loss)
CF1	Net Cash Flow = Net Cash Flows, Operating + Net Cash Flows, Investing + Net Cash Flows, Financing + Exchange Gains (Losses)
CF2	Net Cash Flows, Continuing = Net Cash Flows, Operating, Continuing + Net Cash Flows, Investing, Continuing + Net Cash Flows, Financing, Continuing
CF3	Net Cash Flows, Discontinued = Net Cash Flows, Operating, Discontinued + Net Cash Flows, Investing, Discontinued + Net Cash Flows, Financing, Discontinued
CF4	Net Cash Flows, Operating = Net Cash Flows, Operating, Continuing + Net Cash Flows, Operating, Discontinued
CF5	Net Cash Flows, Investing = Net Cash Flows, Investing, Continuing + Net Cash Flows, Investing, Discontinued
CF6	Net Cash Flows, Financing = Net Cash Flows, Financing, Continuing + Net Cash Flows, Financing, Discontinued

Microsoft, Apple, and Google all use this reporting style. Remember that the statement that these relations must be true have nothing to do with whether an economic entity is required to report a concept. For example, many economic entities do not report "Noncurrent assets". However, just because that line item is not explicitly reported does not invalidate the relationship. Noncurrent assets can be easily derived using the rules of logic by taking values which were reported. So, the value can be derived by using the rules of math to change the equation "Assets = Current assets = Noncurrent assets" to "Noncurrent assets = Assets – Current assets". If both "Assets" and "Current assets" are reported; the value for "Noncurrent assets" is easily derived.

> HINT: These fundamental relations truly never change. If it is the case that they seem to change, it is because some subtle difference or nuance exists. If that is the case, then a new reporting style is created to handle that subtlety or nuance. The process of adding reporting styles can continue until a set of fundamental accounting concept relations exists for each public company and the relations do not change.

That is all the details we will go into here for the reporting styles and fundamental accounting concept relations. Please see the section which digs down into more detail if you need additional information on these topics.

1.9. Logical, Mechanical, and Mathematical Structural Relations of Disclosures

This section covers the logical, mechanical, and mathematical structural relations that exist for disclosures and between disclosures[18]. These relations are in no way subjective, related to the application of accounting rules that require judgement. These relations are completely objective and subject to the rules of logic, the

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[18] Disclosure Mechanics for Microsoft,
http://xbrlsite.azurewebsites.net/2017/Prototypes/Microsoft2017/Disclosure%20Mechanics%20and%20Reporting%20Checklist.html

mechanical rules articulated by the SEC or other such authorities, or the rules of mathematics to with which all accounting related rules must comply.

> HINT: The FASB and SEC must follow the rules of logic and mathematics which come from a higher authority.

1.9.1.Relations between text blocks and detail

The SEC requires different levels of information to be reported using Level 1 Text Blocks (note level), Level 2 Text Blocks (policy level), Level 3 Text Blocks (disclosure level) and Level 4 Detail (disclosure level).

There are relations between text blocks and relations between text blocks and detailed information. The following is a summary of these relations:

- **Level 1 Note Text Blocks represent each note**: Each note provided by a reporting entity is represented by one Level 1 Note Text Block.

- **Level 2 Policy Text Blocks represent each policy**: One of the Level 1 Note Text Blocks contains the significant accounting policies of an economic entity. Those significant accounting policies are detailed in one set of Level 2 Policy Text Blocks which represent the individual policies.

- **Level 3 Disclosure Text Blocks provide details of specific Level 1 Note Text Blocks**: There is a relation between a Level 3 Disclosure Text Block and a Level 1 Note Text Block. Said another way, some set of Level 3 Disclosure Text Blocks go with some Level 1 Note Text Block.

- **Level 4 Disclosure Detail disclosures relate to Level 3 Disclosure Text Block**: Each Level 3 Disclosure Text Block has one or more Level 4 Disclosure Detail which provides equivalent information.

Level 1 Note Text Blocks tend to be presentation oriented. As such Level 1 Note Text Blocks are presentation oriented, and because professional accountants have a lot of latitude in terms of where information is presented, there tends to be variability in which Level 1 Note Text Blocks are used by public companies. Basically, there are a lot of different places, all of which are logical, that a specific disclosure might be presented.

However, there is far more consistency between a Level 3 Disclosure Text Block and a Level 4 Disclosure Detail representation and these relations must be respected. Inconsistencies between the Level 3 Disclosure Text Blocks and Level 4 Disclosure Detail representations tend to be errors.

> HINT: The SEC, for some reason, does not require text blocks for the primary financial statements or document and entity information. If they did, the 100% of the contents of a financial report would be provided in similar form to the HTML version of the financial report. As such, it would make a lot of sense to provide text blocks for the primary financial statements.

1.9.2.Example analysis of Level 3 Disclosure Text Block and Level 4 Disclosure Detail

The following provides an example of a Level 3 Disclosure Text Block and a Level 4 Disclosure Detail that should be consistent. Consider the disclosure related to the

reconciliation of the statutory income tax rate to the effective income tax rate provided by Microsoft Corporation[19] examined below.

Shown is the Level 3 Disclosure Text Block for this disclosure, represented by Microsoft using this concept:

us-gaap:ScheduleOfEffectiveIncomeTaxRateReconciliationTableTextBlock

Also shown is the Level 4 Disclosure Detail for this disclosure is represented by a roll up which has this concept as the roll up's total concept:

us-gaap:EffectiveIncomeTaxRateContinuingOperations

Would you expect that that disclosure would always be represented by these two concepts? Well actually, the answer is "NO" because a reporting entity has two options as to how to represent this disclosure. Microsoft reports the tax rate reconciliation using the percentage, an allowed alternative is to provide the disclosure using the amount[20]. In that case, the Level 4 Disclosure Detail concept would be:

us-gaap:IncomeTaxExpenseBenefit

Level 3 Disclosure Text Block:

Level 4 Disclosure Detail:

An analysis of this disclosure for all public companies provides the following results as shown in this graphic:

#1 shows that 47% of public companies report the text block plus the detailed concept related to reporting the percentage. #2 shows that 29% report the text block plus the amount. #4 shows that 9% of public companies report neither the text block nor the detailed concept indicating that they don't report this disclosure at all. That means that 87% of public companies are completely consistent with the current expectation.

However, #3 which shows a detailed disclosure but no text block; and #6 which shows a text block but no detailed disclosure is inconsistent with expectation. The reasons for the inconsistencies is unknown at this time.

1.9.3.Disclosure Mechanics Rules in Natural Language

The Disclosure Mechanics rules verify that the report fragments of an XBRL-based financial report follows the rules specified by US GAAP, the FASB, the SEC, logic, the rules of mathematics, logical structure, and so forth. These rules are represented in machine-readable form using the XBRL technical syntax. These rules can be converted to human readable natural language. Here is a sample of the Disclosure Mechanics rules for the components of inventory disclosure:

Explanation	Log Messages
This disclosure:	
- MUST be represented by a network with the SEC Category: cm:DisclosureType	
- MUST be represented as a **Level 4 Disclosure Detail** with the concept arrangement pattern: cm:RollUp	
- cm:RollUp REQUIRES total: us-gaap:InventoryNet	
- Or by the allowed alternative concept: us-gaap:PublicUtilitiesInventory	
- Or by the allowed alternative concept: us-gaap:AirlineRelatedInventory	
- Or by the allowed alternative concept: us-gaap:RetailRelatedInventory	
- Or by the allowed alternative concept: us-gaap:EnergyRelatedInventory	
- Or by the allowed alternative concept: us-gaap:AgriculturalRelatedInventory	
- MUST be represented as using the **Level 3 Disclosure Text Block**: us-gaap:ScheduleOfInventoryCurrentTableTextBlock	
- Or by the allowed alternative concept: us-gaap:ScheduleOfUtilityInventoryTextBlock	
- requires the policy to be reported using the **Level 2 Policy Text Block**: us-gaap:InventoryPolicyTextBlock	
- Or by the allowed alternative concept: us-gaap:InventoryMajorClassesPolicy	
- Or by the allowed alternative concept: us-gaap:InventorySuppliesPolicy	
- Or by the allowed alternative concept: us-gaap:InventoryWorkInProcessPolicy	
- Or by the allowed alternative concept: us-gaap:InventoryFinishedGoodsPolicy	
- requires the note to be reported using the **Level 1 Note Text Block**: us-gaap:InventoryDisclosureTextBlock	

> HINT: These rules follow how public companies are making use of the US GAAP XBRL Taxonomy. The US GAAP XBRL Taxonomy can be adjusted to make it work more consistent with the expectations of the financial reporting supply chain.

Here is another representation of these same rules in another software application. Of course, you would expect the software application above and the one below to get the same results when validating an XBRL-based public company financial report against specified Disclosure Mechanics rules.
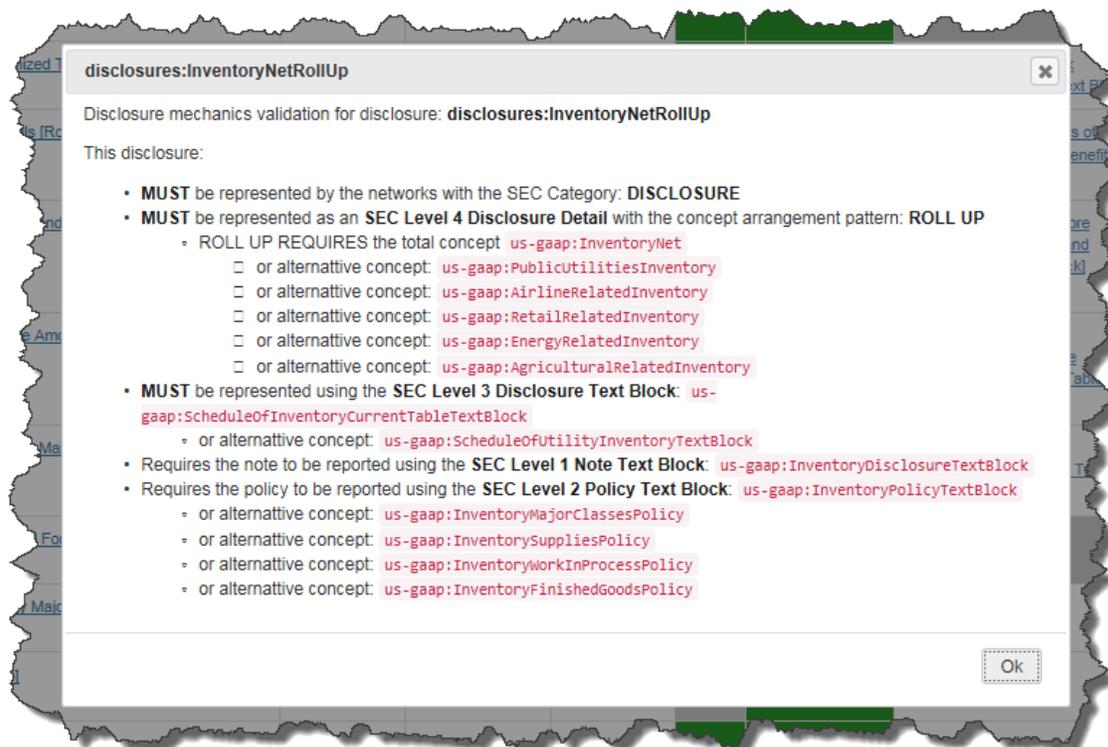
Note that while the relation between the Level 3 Disclosure Text Block and the Level 4 Disclosure Detail must be consistent; it is also the case that the relations between the pieces that make up the Level 4 Disclosure Detail are also consistent with expectation. We cover this next.

1.9.4.Relations within a Level 4 Disclosure Detail

Since text blocks are only one concept, there are no other relations related to the internal structure of a text block. However, for detailed disclosures the story is different.

Continuing with our example above related to the reconciliation of the statutory tax rate to the effective tax rate disclosure; whether the reconciliation is provided using a percentage or using an amount, what is always true is that the disclosure is a roll up. Here you see Lockheed Martin's[21] disclosure:

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[21] LOCKHEED MARTIN CORP provides this same disclosure as an amount, http://www.sec.gov/Archives/edgar/data/936468/000119312516476010/lmt-20151231.xml

Component: (Network and Table)

Network	162 - Disclosure Reconciliation of Income Tax Expense Computed Using U.S. Statutory Federal Tax Rate to Actual Income T
Table	Reconciliation Of Income Taxes [Table]

Reporting Entity [Axis]	0000936468 http://www.sec.gov/CIK		
Legal Entity [Axis]	Entity [Domain]		
	Period [Axis]		
Reconciliation Of Income Taxes [Line Items]	2015-01-01/2015-12-31	2014-01-01/2014-12-31	2013-01-01/2013-12-31
Income tax expense at the U.S. federal statutory tax rate	1,758,000,000	1,840,000,000	1,454,000,000
U.S. manufacturing deduction benefit	(126,000,000)	(127,000,000)	(100,000,000)
Tax deductible dividends	(87,000,000)	(82,000,000)	(77,000,000)
Research and development tax credit	(71,000,000)	(66,000,000)	(96,000,000)
Goodwill impairment - non-deductible portion		30,000,000	50,000,000
Other, net	(56,000,000)	49,000,000	(26,000,000)
Total income tax expense	1,418,000,000	1,644,000,000	1,205,000,000

If a roll up is provided, then you expect two things to be true: (1) XBRL calculation relations should be present for this disclosure, and (2) the roll up calculation actually rolls up correctly. (i.e. the roll up foots)

You would also expect that the detailed disclosure exist within a network with the SEC sort category of "Disclosure". Similarly, the text block should likewise exist in a network with the sort code of "Disclosure".

Finally, you would expect that the detailed disclosure be disclosed as a roll up and not as a roll forward or as a hierarchy (i.e. no XBRL calculation relations). And if the disclosure is an amount, you would expect that the amount disclosed would intersect with the income statement.

All the logical, structural, and mathematical relations information are articulated in the form of these rules represented in human readable natural language form here in the Disclosure Mechanics rules:

Explanation	Log Messages
This disclosure:	
- MUST be represented by a network with the SEC Category: cm:DisclosureType	
- MUST be represented as a **Level 4 Disclosure Detail** with the concept arrangement pattern: cm:RollUp	
- cm:RollUp REQUIRES total: us-gaap:EffectiveIncomeTaxRateContinuingOperations	
- Or by the allowed alternative concept: us-gaap:IncomeTaxExpenseBenefit	
- MUST be represented as using the **Level 3 Disclosure Text Block**: us-gaap:ScheduleOfEffectiveIncomeTaxRateReconciliationTableTextBlock	

1.10. Other Relations between Pieces of a Financial Report

Pieces of a report can be related to other pieces of a report. This is a summary of key types of relations.

1.10.1. Economic entity and parts of economic entity

An economic entity or accounting entity creates a financial report. That economic entity could be broken out into numerous different pieces of the economic entity. To use the information within a financial report, you need to discover the root economic entity. Software has to be able to identify that root economic entity if the information represented within the report is done so per SEC guidelines. From that root economic entity, information about other parts of the economic entity can then be obtained.

To make this point clear we use the following example pointed out in the *Wiley GAAP 2011, Interpretations and Applications of Generally Accepted Accounting Principles*, Bragg, page 46:

The Parent Holding Company						
Owns subsidiaries, land and headquarters building that they all use						
Subsidiary 1 *Division a* *Business i*	Subsidiary 2 *Business iv*	Subsidiary 3 *Business v* *2 Product Lines*	Subsidiary 4 *2 Similar Businesses* Business vi	Subsidiary 5 2 Similar Businesses *Business viii*	Subsidiary 6 *Business ix*	Subsidiary 7 *2 Nonsimilar Businesses* Business x
Asset Group (a)	Asset Group (d) with Primary Asset	Asset Group (e) and Disposal Group (f)	Asset Group (g)	Asset Group (i)	Asset Group (j)	Asset Group (k) Reporting Unit (6)
Reporting Unit (1) *Division b*	Reporting Unit (2)	Reporting Unit (3)	Reporting Unit (4)	Reporting Unit (5)		Business xi
Business ii / Business iii			Business vii			Asset Group (l) Reporting Unit (7)
Asset Group (b) / Asset Group (c)			Asset Group (h)			
Operating Segment A		Operating Segment B	Operating Segment C	Operating Segment D		Operating Segment E
Reportable Segment I			Reportable Segment II	Reportable Segment III		Reportable Segment IV

For example, an economic entity can be broken down by business segment and/or by geographic area.

1.10.2. Current balance sheet date and other balance sheet dates

Financial reports contain information for the current balance sheet date but also for prior balance sheet dates and perhaps balance sheets of some sub-part of the economic entity reporting. Software analyzing a financial report must be able to discover the current balance sheet date. From the current balance sheet date, other "as of" dates can be determined such as the prior period balance sheet information. Software is able to identify the current balance sheet date if the information represented within the report is done so per SEC guidelines.

1.10.3. Current year-to-date income statement period and other periods

Financial reports contain information for the current year-to-date income statement period but also for prior income statements, other periods, and information for sub-parts of the economic entity. As such, software making use of a financial report needs to be able to discover the current year-to-date income statement period. That same period is used on the cash flow statement.

From the current year-to-date income statement period, other periods can be determined. Software has to be able to identify the current year-to-date income sheet date if the information represented within the report is done so per SEC guidelines.

1.10.4. Primary financial statement line items and line item breakdowns

The primary financial statement line items tend to be a high-level summary of the information in a financial report. The primary financial statements can be seen as the first layer of a financial report.

The disclosures are used to disaggregate and otherwise provide details for the line items of a primary financial statement. The details could be a roll up of the

components of some primary financial report line item or a roll forward of a line item or some other form of detail.

For example, the line item "Inventory, Net" might be on a balance sheet and the components of inventory are detailed in a disclosure. When represented correctly, software can navigate between the primary financial statement and the disaggregation in the disclosures.

Some disclosures do not physically tie to the primary financial statements. For example, information about subsequent events does not tie to the primary financial statements.

1.10.5. Primary financial statement roll ups

Every balance sheet is a roll up of assets and of liabilities and equity; therefore every balance sheet should have business rules describing these roll up relations. Every income statement is a roll up of net income (loss) and therefore every income statement should have business rules describing those roll up relations. Every cash flow statement is a roll forward of the changes in cash and cash equivalents balances; that roll forward contains a roll up of net cash flow; and therefore every cash flow statement must provide business rules which describes those roll up relations.

Although business rules for roll forwards are not required by the SEC, roll forward relations must be articulated correctly. This is a rule of mathematics.

Although business rules for member aggregations are not required by the SEC, member aggregation relations must be articulated correctly. This is a rule of mathematics.

1.10.6. Reporting units

Every financial report has some base reporting units which it uses. For the vast majority of public company financial reports filed to the SEC that base reporting units are US Dollars. However, not all economic entities report using US Dollars. As such, the reporting units must be determined and it may even need to be discovered if more than one reporting units are used in the report.

1.11. Workflow and Process Related to Financial Reports

There is a workflow and/or process related to submitting, having the reports accepted by the EDGAR system, and so forth. We don't want to get into this workflow/process in detail. However, the following workflow or process related items are important to note.

1.11.1. Amended reports

An economic entity may submit a report to the SEC EDGAR system, have that report become available publicly, and then amend the submitted report; replacing it with an amended report. Amended reports are easy for humans to deal with, but databases need to properly handle the amended information relative to the initially submitted information in queries. At times there could be multiple report amendments.

For XBRL-based financial filings submitted to the SEC, when an amended report is submitted, a different document type is used. Rather than 10-K, the document becomes a 10-K/A. Rather than a 10-Q, the document becomes a 10-Q/A. The

amended flag value is switched from false to true. If the amended flag is true, indicating an amended report, an amendment description is provided.

When a report is amended, applications querying information should generally ignore the original submission and use the amended submission instead.

1.12. Consequences of Implementation Choices

Choices have consequences. This is not to say that any specific choice is good or bad. Rather, every choice has a set of positive and a set of negative consequences. The perspective, positions, and risks of the stakeholder looking at the choice determine if the choice was positive or negative.

At times choices can tend to be unconscious because the set of consequences of the choice is unconscious. If one does not realize that they have a choice or is unaware of the complete set of positive and negative consequences, they might have picked some unknown or misunderstood alternative had better information been available.

The FASB and SEC made implementation choices when they implemented XBRL-based financial filings for public companies in the SEC's EDGAR system. Understanding the consequences of these choices helps professional accountants and other stakeholders and constituents better understand how the system operates and why the choices that are made are important and have ramifications.

1.12.1. Consequences of using non-unique and non-explicit tables

The US GAAP XBRL Taxonomy and the SEC both choose to allow non-unique [Table]s and non-explicit [Table]s to be used[22] within XBRL-based public company financial reports.

A consequence of non-unique and non-explicit tables being used is that in order to identify a report fragment of a report you must use both the Network and [Table] (be that [Table] explicitly defined by a financial report creator or an implied [Table]) in order to uniquely identify any report fragment within an XBRL-based public company filing to the SEC. And because a report fragment cannot be uniquely identified, querying report fragments of a report is more difficult for analysts and investors using information from the report.

Said another way, because the [Table] named *us-gaap:StatementTable* could be used to represent a balance sheet, and income statement, a cash flow statement, or literally any other component in an XBRL-based digital financial report; the name of the table is insufficient to uniquely identify a report fragment[23].

For example, Microsoft uses *us-gaap:StatementTable* to represent their balance sheet, income statement, and cash flow statement (among other uses). As such, the network is necessary to differentiate the report fragment because each [Table] is not unique. Further, the Network identifier of the balance sheet, income statement, and cash flow statement is not standardized across reporting entities.

Network	Table
103 - Statement - INCOME STATEMENTS	us-gaap:StatementTable
106 - Statement - BALANCE SHEETS	us-gaap:StatementTable

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[22] The precise terms are that the currently [Table]s are polymorphic (have more than one meaning rather than isomorphic (have one single meaning).

[23] Look at reports filed by Microsoft as an example of how the report element us-gaap:StatementTable can be used to report pretty much any [Table].

| 108 - Statement - CASH FLOWS STATEMENTS | us-gaap:StatementTable |
| 118 - Disclosure - GOODWILL Roll Forward | us-gaap:StatementTable |

Contrast the above to what this might look like if unique and explicit [Table]s were used by public companies to explicitly identify the nature of report fragments:

Network	Table
103 - Statement - INCOME STATEMENTS	us-gaap:IncomeStatementTable
106 - Statement - BALANCE SHEETS	us-gaap:BalanceSheetTable
108 - Statement - CASH FLOWS STATEMENTS	us-gaap:CashFlowStatementTable
118 - Disclosure - GOODWILL Roll Forward	us-gaap:GoodwillRollForwardTable

The [Table]s above are not in the US GAAP XBRL Taxonomy, rather they were created to make a point. Suppose those [Table]s did exist in the US GAAP XBRL Taxonomy and suppose that every public company used those report elements to identify the nature of specific report fragments. Suppose an investor wanted to locate the balance sheet of every public company. The query would be as simple as looking for the [Table] *us-gaap:BalanceSheetTable*.

The balance sheet is only provided as an example. This situation exists for every disclosure of every financial report of every public company.

And so an alternative to the design choice of non-unique and non-explicit [Table]s would be to have unique and explicit [Table]s which would make querying information easier for analysts and investors who use reported information.

This is not to say that querying information is impossible. The current approach only makes using reported information slightly harder. It is still quite possible to query information using prototype theory[24]. Prototype theory allows the nature of report fragments to be discovered by examining the pieces that make up the report fragment. For example, a balance sheet can be identified because it will always contain assets, it will always contain liabilities and equity, and it will always have the sort category of "Statement". But the prototypes that define the nature of a report fragment which will likely be queried must be created for prototype theory to be used to query report fragments.

Finally, identifying the nature of each individual report fragment and providing an explicit identifier for that report fragment is a non-trivial task. Even with machine-readable XBRL-based digital financial reports of public companies being available today, the task is still non-trivial. Prior to the existence of XBRL-based public company financial reports the effort to create such identifiers would even take more effort. This is, perhaps, the reason the US GAAP XBRL Taxonomy did not create unique [Table]s for each financial report disclosure.

1.12.2. Consequences of not employing explicit concept type/class relations

The US GAAP XBRL Taxonomy does not make type/class relations crystal clear. Generally XBRL calculation relations can make these type/class relations clearer; but often XBRL calculation relations do not exist and XBRL presentation relations must be relied on to make important decisions about the relations between concepts such as WHOLE/PART relations or decisions related to the SEC rule to "used the narrowest concept".

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[24] *Understanding Prototype Theory and How it Can be Useful in Analyzing and Creating SEC XBRL Filings*, http://www.xbrlsite.com/2013/Library/UnderstandingPrototypeTheory.pdf

There are two salient consequences of not employing explicit concept type/class relations in public company XBRL-based financial reports to the SEC or in the US GAAP XBRL Taxonomy.

The first consequence is that reporting entities make mistakes when using concepts relative to other concepts such as WHOLE/PART type relations because the public companies are unaware of the relations or the relations articulated are ambiguous or otherwise difficult to understand. Further, software vendors cannot build the proper testing mechanisms to assist creators of XBRL-based financial reports use proper WHOLE/PART relations when they represent information within their XBRL-based digital financial reports. Confused reporting entities and inadequate software applications lead to errors which can clearly be seen in such reports[25].

The second consequence is that because no mechanism exists to explicitly provided to define type/class and sub-type/subclass relations, when extension concepts are created by an economic entity there is no way for the entity to indicate what concept from the US GAAP XBRL Taxonomy they are extending.

A mechanism for creating machine-readable and human-readable type/class and sub-type/subclass information already exists in XBRL[26]. That mechanism is XBRL definition relations.

1.12.3. Consequences of not requiring explicit business rules for roll forwards and member aggregations

The US GAAP XBRL Taxonomy makes use of XBRL calculation relations. The SEC allows XBRL calculation relations to be provided with XBRL-based financial reports provided by public companies. However, other common mathematical relations are not provided for such as roll forwards and member aggregations. XBRL Formula provides a very adequate means of conveying such relations.

One common mathematical relationship in public company XBRL-based financial filings is a roll up. Balance sheets are roll ups, as are income statements and cash flow statements have roll ups also. While most public companies provide the XBRL calculation relations required to represent and verify the consistency of these relations, a few do not.

Another common mathematical relation which also exists in public company XBRL-based financial filings is roll forwards. A roll forward reconciles a beginning balance to an ending balance by showing the changes between the beginning and ending balances. (e.g. Beginning balance + Additions – Subtractions = Ending balance) A cash flow statement, a statement of changes in equity, and a change in benefit obligation are all examples of roll forwards.

Not requiring public companies to articulate these roll forward relations has the consequence of allowing mathematical error in the XBRL-based digital financial reports of public companies.

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[25] See the three summaries of error provide in my blog post *Understanding Logical, Mechanical, and Mathematical Accounting Relations in XBRL-based Digital Financial Reports*, http://xbrl.squarespace.com/journal/2016/12/15/understanding-logical-mechanical-and-mathematical-accounting.html

[26] Basically an XBRL definition linkbase relation is created between the extension concept and the existing US GAAP XBRL Taxonomy concept using the "essence-alias" (http://www.xbrl.org/2003/arcrole/essence-alias) relation or a "general-special" relation (http://www.xbrl.org/2003/arcrole/general-special)

Another common mathematical relation, commonly referred to as a member aggregation, is likewise not provided for in XBRL-based financial filings of public companies. An example of a member aggregation is a breakdown of revenues by business segment or a breakdown of long-lived assets by geographic area. A member aggregation is very similar to a roll up but it aggregates values across some set of [Member]s of an [Axis].

Neither a roll forward nor a member aggregation relationship can be represented using XBRL calculation relations. However, both of these types of mathematical relations can be represented using XBRL Formula.

1.12.4. Consequences of concept duplication or not having a clear distinction between a concept and a preferred label for a concept

While the US GAAP XBRL Taxonomy is in pretty good shape when it comes to issues related to concept duplication, there is still a fairly significant issue and the ramifications of the issue has profound impact on making use of information reported in XBRL-based financial reports.

To understand this issue, one must understand and properly differentiate between the following three things:

- **Notion, idea, phenomenon**: something that exists in reality that needs to be represented
- **Name**: helps computers identify some notion/idea/phenomenon that is a representation of reality within some machine-readable conceptual model
- **Preferred label**: alternative ways used to refer to name

For example, the FASB defines the notion of "Equity" in the US GAAP conceptual framework. The FASB defines "Equity". The US GAAP XBRL Taxonomy does not define the concept "equity". The US GAAP XBRL Taxonomy defines the concept "us-gaap:StockholdersEquity". The FASB states specifically that "Net assets" is another preferred label for describing the notion of "Equity" in the conceptual framework. "Stockholders' equity", "Partner capital", and "Proprietors' equity" are all preferred labels for the notion of "Equity".

Today, when querying a financial report for "Equity", either of the following US GAAP XBRL Taxonomy concepts could be representing the notion of "Equity" within an XBRL-based digital financial report:

Fundamental Concept Name	US GAAP XBRL Taxonomy Concept Name
fac:Equity	us-gaap:StockholdersEquityIncludingPortionAttributableToNoncontrollingInterest
fac:Equity	us-gaap:StockholdersEquity
fac:Equity	us-gaap:PartnersCapitalIncludingPortionAttributableToNoncontrollingInterest
fac:Equity	us-gaap:PartnersCapital
fac:Equity	us-gaap:CommonStockholdersEquity
fac:Equity	us-gaap:MembersEquity

A consequence of this is that querying XBRL-digital financial reports is more complicated for analysts and investors who desire to make use of information provided by such reports.

1. Each software vendors providing software to query financial reports must create a correct mapping of concepts and if the mappings of each software

vendors is different, then results returned by each software application would/could be different.

2. Software vendors would need to collaborate with each other to create mappings to be sure software returns consistent and correct query results.

This issue is particularly profound when trying to return the proper values for the three concepts "Net income (loss) attributable to parent", "Net income (loss) attributable to noncontrolling interest" and "Net income (loss)" (parent + noncontrolling interest).

Another way to state this is that extracting information from an XBRL-based public company financial report is not as safe, reliable, and predictable as it could be or ought to be.

1.12.5. Consequences of not requiring important totals and subtotals to be reported

Current reporting practices and US GAAP allow for flexibility when reporting information because they do not dis-allow certain approaches to reporting information. This flexibility is not a problem for humans who can easily derive the meaning of information being conveyed. However, this same flexibility has extremely negative and expensive consequences when a machine attempts to read the same information when reported in the form of an XBRL-based digital financial report. An example will help make this point. Consider the following fragment of a balance sheet.

	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	$ 142,500	$ 117,500

This reporting entity reports one line item "Cash". A human understands that "Current assets" is the same value as "Cash" and that "Assets" is likewise the same value as "Current assets" and "Cash". Having a machine figure this out is not impossible, and in fact is not really particularly challenging for one single line item such as "Assets". However, when you consider that there are many, many line items that could likewise have this similar issue and that the possible permutations and combinations are almost endless one begins to realize that taking the route of allowing infinite flexibility will create an extremely brittle and unreliable system.

This is even more of an issue because it is always less than 10% and generally less than 2% of all public companies that cause most of these sorts of issues.

Alternatively, if a handful of specific totals were required to be reported which, based on common practice, tend to already be reported, the system could be very reliable. So, in the case above while it might be a bit redundant, a total for "Current assets" and "Assets" would be provided with the same values for "Cash" as shown. There are only a handful of totals that tend to cause issues including: Assets, Equity, Revenues, Cost of revenues, Operating income (loss), Nonoperating income (expenses), Net cash flow from investing activities, Net cash flow from financing activities.

Further, if the benefits of providing these totals and the risks of not providing these totals were correctly communicated to public companies creating these XBRL-based

financial reports; a significant majority of those already not providing these totals would very likely do so voluntarily.

1.12.6. Consequences of mixing non-dimensional and dimensional representation models

Both the US GAAP XBRL Taxonomy and the SEC Edgar Filer Manual is providing improper guidance for representing classes of stock in XBRL-based financial reports. The primary negative ramification of the existing guidance is that roll ups of the balance sheet can never be created correctly if the representation approach that is currently used, provided for by the US GAAP XBRL Taxonomy, and mandated by the EFM were followed.

A specific example in a specific filing will help make this point[27].

					Period [Axis]
			2016-09-30		
			Class of Stock [Axis]		
Statement [Line Items]	Series C super dividend convertible preferred stock	Series A 12% convertible preferred stock	Series B-1 12% convertible preferred stock	Series B-2 12% convertible preferred stock	Series B-3 8% convertible preferred stock	Class of Stock [Domain]
ASSETS						
Current assets:						
Cash and cash equivalents						16,059,000
Prepaid expenses and other current assets						53,000
Total current assets						16,112,000
Intangible assets, net						3,000
Total assets						16,115,000
LIABILITIES, REDEEMABLE CONVERTIBLE PREFERRED STOCK AND STOCKHOLDERS' EQUITY						
Current liabilities:						
Accounts payable						652,000
Accrued expenses						3,435,000
Accrued dividends payable						
Total current liabilities						4,087,000
Total liabilities						4,087,000
Commitments and contingencies (Note 9)						xsi:nil
Convertible preferred stock, value	1,723,000					
Stockholders' equity:						
Undesignated stock, $0.01 par value; 20,000,000 shares authorized, 8,001,000 designated at September 30, 2016 and December 31, 2015						0
Convertible preferred stock, value		557,000	1,760,000	3,697,000	610,000	
Common stock, $0.001 par value; 50,000,000 shares authorized at September 30, 2016 and December 31, 2015, 29,396,615 and 28,825,033 issued and outstanding at September 30, 2016 and December 31, 2015, respectively						29,000
Additional paid-in capital						162,176,000
Retained deficit						(158,524,000)
Total stockholders' equity						10,305,000
Total liabilities, redeemable convertible preferred stock and stockholders' equity						16,115,000

Annotations: us-gaap:RedeemableNoncontrollingInterestEquityPreferredCarryingAmount (pointing to Convertible preferred stock, value – 1,723,000); us-gaap:PreferredStockValue (pointing to Convertible preferred stock, value row)

This is an inappropriate application of XBRL dimensions. First, the XBRL calculations for the balance sheet cannot roll up correctly using this representation approach, that is why both the "Total stockholders' equity" and "Total liabilities and equity" facts are highlighted in YELLOW because there are computation errors. It is simply impossible to ever make XBRL calculation relations work correctly given this representation approach, a clear "red flag" that something could be wrong with the approach.

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[27] GALECTIN THERAPEUTICS INC, http://www.sec.gov/Archives/edgar/data/1133416/000119312516762396/0001193125-16-762396-index.htm

Second, there is one "Class of Stock [Axis]" is being used to break down two separate line items that, as presented here, are two completely different things. Essentially, this would be like breaking out "Property, plant and equipment" and "Cash and cash equivalents" using ONE [Axis]. This is an absurd use of XBRL dimensions, inconsistent with the XBRL Dimensions technical specification.

There are two alternative approaches, both of which would work. The first approach is to simply use [Line Items], similar to every other reported fact on the balance sheet other than the two line items in question. The second approach would be to provide a total for each of the line items in question, remove the dimensions from the balance sheet all together, and to provide two parenthetical disclosures, one for each line item, which details the components of each line item within separate [Table]s. If you look at the Google filing, this is how they represent a very similar set of facts which are being disclosed.

Basically, neither alternative provides a perfect solution. The problem is, under US GAAP, economic entities tend to provide the detailed line items for something like classes of stock and not a total. The tendency today is try to make the XBRL-based digital financial report look like the paper-based report of the past. But if all the moving pieces were conscious, one might come to a different conclusion that simply following the past because that is the way things have always been before.

Finally, an [Axis] is an XBRL dimension. The XBRL Dimensions Specification defines a dimension as "Each of the different aspects by which a fact MAY be characterised."[28] It is not appropriate to characterize any of the line items for assets, liabilities, or most of the equity line items by the [Axis] or dimension "Class of Stock [Axis]". Those line items simply may not be characterized by that [Axis], they simply don't have that characteristic. Therefore, that [Axis] or dimension is not appropriate.

> HINT: To understand how to create zero defect XBRL-based financial reports, see the document *Blueprint for Creating Zero-Defect XBRL-based Digital Financial Reports[29]*.

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[28] XBRL Dimensions Specification, http://www.xbrl.org/specification/dimensions/rec-2012-01-25/dimensions-rec-2006-09-18+corrected-errata-2012-01-25-clean.html#sec-terminology

[29] *Blueprint for Creating Zero-Defect XBRL-based Digital Financial Reports*, http://xbrlsite.azurewebsites.net/2017/Library/BlueprintForZeroDefectDigitalFinancialReports.pdf