Accounting Process Automation XBRL Application Profile

An efficient, effective, safe, and reliable approach to implementing accounting process automation leveraging the XBRL global standard technical syntax

The Accounting Process Automation XBRL Application Profile is an application profile of XBRL which is 100% compliant with the XBRL 2.1, XBRL Dimensions 1.0, XBRL Formula 1.0, and Generic Linkbase 1.0 specifications. The profile follows the spirit of the XBRL Abstract Model 2.0 Public Working Draft. The profile leverages the best ideas of XBRL architectures used for financial reporting. This profile can be used within an organization to implement accounting process automation. This application profile anticipates the use of XBRL's extensibility features. This document provides non-normative explanation and a formal specification for normative guidance.

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Introduction

In the article, *Surety Data Standards: Is Manual Data Entry Dead?*[2], the National Association of Surety Bond Producers (NASBP) says "The gruesome (and grueling) days of painful re-keying of data may be coming to an end. Could data standards be the magic bullet?" The article goes on:

> "In 2017, The Hartford successfully brought standardized WIP reports into their internal financial management system, **reducing WIP report processing from 20 minutes to 3 seconds**."

How was the process improvement, reducing a task from 20 minutes to 3 seconds, achieved? The answer is standards.

Commercial software is becoming available to enable accounting process automation. One example of commercially available software is Blackline which offers accounting process automation[3], continuous accounting[4], smart close[5], and finance controls and automation[6].

While accounting process automation is really in its infancy; the automation of accounting, reporting, auditing, and analysis tasks will likely grow significantly in the coming years.

If one looks into implementing accounting process automation one soon realizes that you have to use some technical syntax in that implementation.

Leveraging the global standard XBRL technical syntax for such implementation makes a lot of sense. XBRL is a database (XBRL instance). XBRL is a declarative approach to representing business logic and rules (XBRL taxonomy schema, XBRL linkbases, and XBRL formula). XBRL has a run-time system (XBRL processor, XBRL Formula processor).

This application profile endeavors to specify an XBRL application profile which will allow those wishing to effectively implement accounting process automation to leverage the features and functionality of the global standard XBRL. This application profile anticipates the use of XBRL's extensibility features.

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2 NASBP, *Surety Data Standards: Is Manual Data Entry Dead?*, https://www.nasbp.org/pipeline/morearticles/manual-entry-end

3 Blackline, Accounting Process Automation, https://www.blackline.com/accounting-process-automation

4 Blackline, Continuous Accounting, https://www.blackline.com/continuous-accounting

5 Blackline, Smart Close, https://www.blackline.com/smart-close

6 Blackline, Finance Controls and Automation, https://www.blackline.com/finance-controls-and-automation

This document is a normative explanation of the Accounting Process Automation XBRL Application Profile. The profile is compliant with the XBRL 2.1[7], XBRL Dimensions 1.0[8], XBRL Formula 1.0[9], and Generic Links 1.0[10] specifications. The profile follows the spirit of the XBRL Abstract Model 2.0[11] public working draft and the Open Information Model 1.0[12] candidate recommendation.

The profile takes the best ideas from financial reporting taxonomy architectures[13] and combines those ideas to create a safe, reliable, robust, thoroughly tested, implementation of an XBRL-based business report. This profile uses a well understood multidimensional model. This profile is intended to enable the generation of ledgers, journals, and reports that are readable by both human-based processes and machine-based processes.

This profile anticipates the need for high quality machine-readable reports that can be proven to be complete, correct, consistent, accurate, internal integrity, and otherwise structurally, mechanically, mathematically, and logically sound. The feature of non-repudiation is many times required. Immutability of reports is often required. Proving that reports comply with statutory and regulatory reporting requirements is often a feature.

The profile makes further restrictions upon the syntax and semantics of the XBRL technical specifications, basically eliminating certain specific aspects of XBRL from being used and more rigorously defines business logic (semantics) a business report.

The objective of this profile is to provide a safe, reliable, predictable, robust, consistent, rigorously tested, and easy to use approach to making use of XBRL to enable automation of accounting, reporting, auditing, and analysis tasks. The way this objective is achieved is to eliminate unsafe or unnecessary parts of the XBRL technical syntax and to clearly, unambiguously, and rigidly define business report semantics.

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7 XBRL International, *Extensible Business Reporting Language (XBRL)*, http://www.xbrl.org/Specification/XBRL-2.1/REC-2003-12-31/XBRL-2.1-REC-2003-12-31+corrected-errata-2013-02-20.html

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

9 XBRL International, *XBRL Formula 1.0*, https://specifications.xbrl.org/work-product-index-formula-formula-1.0.html

10 XBRL International, *Generic Links*, https://specifications.xbrl.org/spec-group-index-generic-links.html

11 XBRL International, *XBRL Abstract Model 2.0*, Public Working Draft 06 June 2012, http://www.xbrl.org/specification/abstractmodel-primary/pwd-2012-06-06/abstractmodel-primary-pwd-2012-06-06.html

12 XBRL International, *Open Information Model 1.0*, Candidate Recommendation 02 May 2017, http://www.xbrl.org/Specification/oim/CR-2017-05-02/oim-CR-2017-05-02.html

13 Charles Hoffman, CPA, *XBRL-based Digital Financial Reporting Profiles and General Business Reporting Profile*, http://xbrlsite.azurewebsites.net/2018/Library/Profiles-2018-10-22.pdf

1.1. Intended audience of this document

The intended audience of this document is business professionals and software developers implementing software intended to be used by business professionals.

The average business professional should not need to read or understand this document. Software vendors should embed the information specified within this document within software applications such that the average business professional may only comply with these rules.

1.2. Organization of this document

This document is organized to be read linearly, start to finish.

1.3. Terminology

Throughout this document, several words are used to signify the requirements of this specification. These words are capitalized when they should be interpreted as having a strict meaning. The following definitions are taken from RFC2119[14] and modified so that they are more appropriately worded for use within this standard.

Term	Meaning
MUST	This word means that the definition is an absolute requirement of this specification.
MUST NOT	This phrase, or the phrase "MUST NEVER," means that the definition is an absolute prohibition of this specification.
SHOULD	This word means that valid reasons may exist in particular circumstances to ignore a particular item, but the full implications must be understood and be carefully considered before choosing a different course.
SHOULD NOT	This phrase means that valid reasons may exist in particular circumstances when the particular behavior is acceptable or even useful, but the full implications should be understood and the case carefully considered before implementing any behavior described with this phrase.

[14] IETF, *Key words for use in RFCs to Indicate Requirement Levels*, https://www.ietf.org/rfc/rfc2119.txt

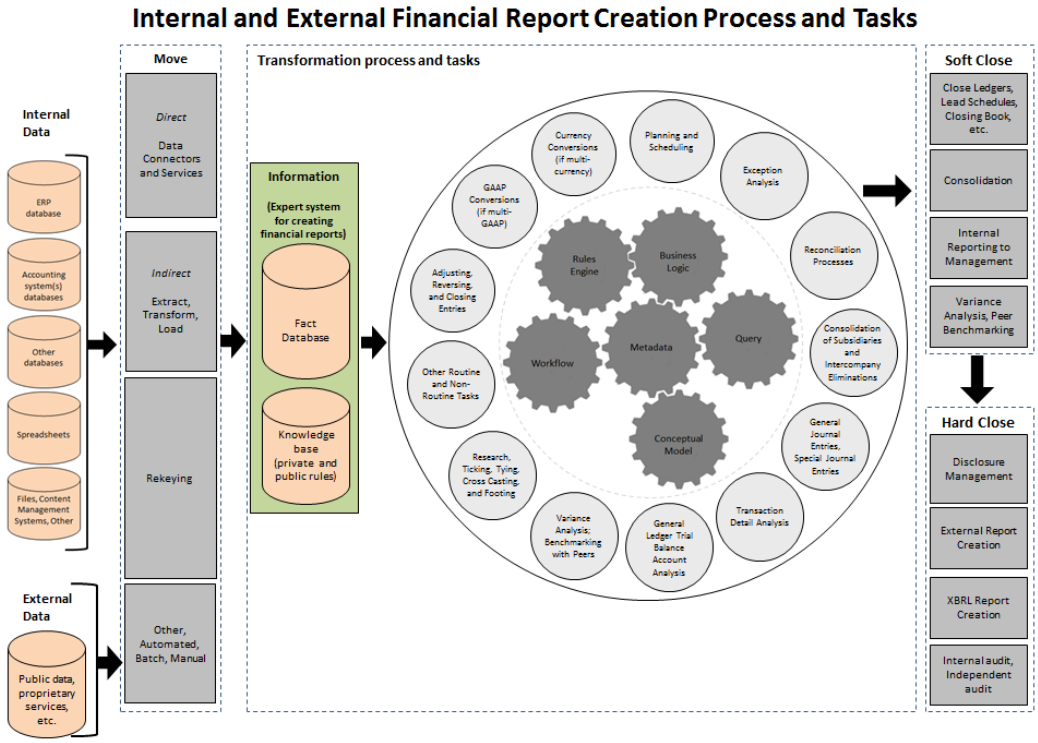
Term	Meaning
MAY	This word means that an item is truly optional. One business unit may choose to include the item because a particular marketplace requires it or because the business unit feels that it enhances the product while another business may omit the same item. An implementation which does not include a particular option MUST be prepared to interoperate with another implementation which does include the option, though perhaps with reduced functionality. Conversely, an implementation which does include a particular option MUST be prepared to interoperate with another implementation which does not include the option (except, of course, for the feature the option provides).

Again, keep in mind that the primary purpose of this document is to create reliable, safe, predictable, interoperable, high-quality, high-function software applications in support of the automation of accounting, reporting, auditing, and analysis workflows and tasks.

1.4. System narrative

The systems in which this application profile will most likely be used are accounting information systems[15]. This system includes accounting, reporting, auditing (internal and external), and analysis.

[15] Wikipedia, *Accounting Information System*, https://en.wikipedia.org/wiki/Accounting_information_system



Information is stored within many different types of databases, spreadsheets, content information systems which record the transactions, events, circumstances, and other phenomenon which comprise the information that might end up within an internal or external financial report.

Information can be put into two broad groups: information which flows through a double-entry accounting system and all other information.

Information is stored in general and special ledgers. Transactions are posted to ledgers via journals. Information is stored in spreadsheets.

A **report** is simply some set of information. A report could be a ledger, the entries within a journal, the contents of a spreadsheet, the results of a query from a database, etc. What all these reports have in common is the notion that some set of facts is grouped together usually for some specific reason. Another term for this is the notion of a fact ledger[16]. Reports are readable by machines but the information in a report can also be readable to humans.

A **report fragment** is a set of facts which go together (tend to be cohesive and share a certain common nature) for some specific purpose within a business report. For example, a "balance sheet" is

16 Charles Hoffman, CPA and Andrew Noble, *Introducing the Fact Ledger*, http://xbrlsite.azurewebsites.net/2018/Library/IntroductionToTheFactLedger.pdf

a component of a financial business report. "Maturities of long-term debt" is a component of a financial business report.

A **fact** describes a single, observable, piece of information contained within a report which is contextualized for unambiguous interpretation or analysis by distinguishing characteristics of the fact. Every fact has exactly one value. Every fact must have one characteristic but may have many characteristics.

A **characteristic or aspect** provides information necessary to describe a fact or unambiguously distinguish one fact from another fact. A fact has a set of one or many characteristics or aspects, the set being a property of the fact, which describes the fact.

A **document** is an organized set of report fragments. Report fragments are sequenced or organized in an appropriate flow. A report can be sensibly and logically represented as an electronic document (such as a Word or PDF document), a web document (such as an HTML file or Wiki page), an OLAP-type cube, a multidimensional hypercube, a spreadsheet, or any other visual form including something provided by a dynamic viewing application (such as a pivot table, or drill-down information viewer).

The presentation or view of a report within a document is created by one or more digital report viewing tools (commonly known as rendering engines), which are specifically capable of reading the structured digital format (in this case XBRL technical syntax) and then creating a structured presentation. It is important to know that different rendering engines may present the same digital business report in different ways. This does not mean that the underlying representation or meaning being conveyed is different, only that the translation of the semantic representation to a visual presentation is different.

Rendering engines are expected to understand the semantics of a business report which will help them in creating understandable human readable renderings. Alternatively, pixel-perfect renderings can be created manually using Inline XBRL.

1.5. Methodology

The methodology which will be used to create and maintain this specification and related artifacts is the build, test, deploy, and maintain methodology[17]. Quality matters and testing and proof of concepts contribute to achieving the high quality that is necessary.

[17] EDM Council, *FIBO™ Build, Test, Deploy and Maintain Methodology*, https://spec.edmcouncil.org/fibo/doc/20170930_FIBO_BTDM.pdf

1.6. General high-level requirements

The following is a summary of general high-level requirements of this specification:

- **Straightforwardly usable over the Internet**: The business reports are intended to be used over the Internet.
- **Shall support a wide variety of common business use cases**: A wide variety of business use cases should be handled, considering the 80/20 rule is appropriate. It is not a requirement to meet all business use cases.
- **Minimal options**: The number of optional features is to be kept to the absolute minimum, ideally zero.
- **Formal and concise**: The design shall be formal and concise.
- **Readable by both humans and machines**: A report should be readable by both humans and machines. Information provide within a report should be more a representation of information than presentation oriented.
- **Global standard format with high level of semantics:** The format of the report should be a global standard which can provide a high level of semantic clarity.
- **The "model" and the "view" should not be intermingled**: The information and the model should be separate.
- **Business rules separate**: Business rules should be separated from the information. Business rules which are external to the report should be allowed for.
- **Managed global standard**: The report should ultimately be a global standard under the control of someone like OMG, XBRL International, ISO, Apache OpenOffice, or some other such organization.
- **Provide technical syntax, structural interoperability, but be domain neutral**: The XBRL technical syntax will be used to represent a report and the metadata/rules of the report providing a formal "shape" of a report. But the semantics of the information within a report is determined by the creators of the report. Business domain user information would always fit into the required report "shape". Reports are expected to interoperate semantically with other semantic standards such as FIBO[18] and proprietary approaches to

[18] EDMcouncil, *FIBO*, https://spec.edmcouncil.org/fibo/

representing semantics such as SSIM[19] created by software vendors.

- **Format should allow for versioning, collaboration, etc.**: The syntax format should allow for ease of versioning, constructing systems which are collaborative in nature (multi-user).

1.7. System high-level requirements

The following is a summary of the high-level system requirements for reports:

- Minimize the probability of ambiguity between what a reporting entity may say and what a user of the report may interpret.
- Maximize safe reuse of information contained within a report.
- Minimize the possibility of errors within the report.
- Maximize the probability of detecting errors using automated processes assisted by software applications.
- Maximize the probability that any software which supports XBRL will be able to make use of a report with no need for adjusting the software.

1.8. Principles

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

A first step of arriving at harmony is outlining the interests, perceptions, positions, and risks of each constituency/stakeholder group.

A "stakeholder" is anyone that has a vested interest. Another term for stakeholder is "constituent". A "constituent" is a component part of something.

Foundational to arriving at harmony is having a common conceptual framework including a set of consistent principles or assumptions or world view for thinking about the system. For example, accounting and financial reporting have such a conceptual framework including

[19] Pacio, *Standardised Semantic Information Model (SSIM)*, https://www.pacio.io/wp-content/uploads/2018/08/stack-grid.pdf

principles/assumptions such as "materiality" and "going concern" and "conservatism".

This "framework for agreeing" helps the communications process which increases harmony and decreases dissonance. This is about bringing the system into balance, consciously creating the appropriate equilibrium/balance.

The following is a set of principles which those creating this specification agree to use to understand their perceptions, positions, and risks when it comes to creating this specification.

1. Prudence dictates that using information from an XBRL-based report should not be a guessing game.
2. A near zero defect report is useful, a defective financial report is not useful.
3. Rules prevent anarchy.
4. The only way to achieve a meaningful exchange of information without disputes is with the prior existence of and agreement as to a standard set of technical syntax rules, business logic rules, and workflow rules.
5. Explicitly stated information or reliably derived information is preferable to implicit information. Derived and implied are not the same things.
6. Reports can be guaranteed to be defect free using automated processes to the extent that machine-readable rules exist.
7. When possible to effectively create, machine-based automated processes tend to be more desirable than human-based manual processes because machine processes are more reliable and cost less.
8. Computers have limited reasoning capacity.
9. Business logic rules should be created by knowledgeable business professionals, not information technology professionals.
10. The stronger the problem solving logic, the more a machine can achieve.
11. Catastrophic logical failures are to be avoided at all cost; they cause systems to completely fail.
12. Complexity cannot be removed from a system, but complexity can be moved.
13. Simplicity and simplistic are not the same thing. Simplistic entails dumbing down a problem in order to make the problem easier to solve. Simplistic ignores complexity in

order to solve a problem which can get you into trouble. Simple is something that is not complicated, that is easy to understand or do. Simple means "without complications".

14. Double-entry accounting procedures, processes, and techniques to report creation where possible. Double-entry accounting helps detect fraud and helps distinguish an unintended error from fraud.

2. Restrictions on XBRL Technical Syntax

The following section summarizes parts which exist within the XBRL 2.1 Specification, XBRL Dimensions 1.0 specification, and XBRL Formula 1.0 specification which MUST NOT exist within XBRL taxonomy schemas, XBRL linkbases, and XBRL instances which comply with this application profile.

All other aspects of XBRL 2.1, XBRL Dimensions 1.0, XBRL Formula 1.0, and Generic Linkbase 1.0 are allowed other than those items specifically prohibited within this section.

2.1. Tuples MUST NOT exist.

Tuples can always be detected because elements which define tuples have a substitutionGroup attribute value of “xbrli:tuple”. No such elements are allowed under this profile.

Reasoning: Tuples are not allowed by the US GAAP Taxonomy Architecture or the IFRS XBRL Taxonomy architecture and are therefore not allowed within SEC XBRL financial filings. Tuples and XBRL Dimensions tend to provide the same functionality so both are not necessary. XBRL Dimensions provides better functionality than tuples.

2.2. Complex typed members MUST NOT exist.

Typed members can always be detected as they contain the xbrldt:typedDomainRef attribute which defines the typed member. No such attribute should ever be detected within a discoverable taxonomy set (DTS) which makes use of this profile.

Reasoning: Typed members are not allowed by the US GAAP XBRL Taxonomy or IFRS XBRL Taxonomy Architecture and are therefore not allowed within SEC XBRL financial filings. Explicit members can be created which serve the same general purpose as typed members.

[CSH: The US GAAP XBRL Taxonomy Architecture used to disallow all typed members; but now the FASB is using simple typed members. The ESEF disallows all typed members. We could allow simple typed members only and only disallow complex typed

members as it is complex typed members which cause problems. It may be a good idea because while it is true that explicit members can always be used to articulate what can be articulated using typed members, typed members do has a bit more flexibility which can be useful.]

2.3. Context scenario elements MUST NOT exist.

Context elements which contain a <scenario> element can always be detected. No such element should ever be detected within a discoverable taxonomy set (DTS) which makes use of this profile.

Reasoning: Scenario elements within contexts are not allowed by the US GAAP Taxonomy Architecture and are therefore not allowed within SEC XBRL financial filings. XBRL makes no distinction between dimensions and members which are contained within a <scenario> element and those contained within a element. Therefore, use of both elements is unnecessary.

[CSH: ESMA allows <scenario>; therefore this should be changed to allow EITHER or <scenario> but not both in the same document.]

2.4. Precision attributes MUST NOT be provided on any fact within an XBRL instance.

Precision attributes can always be detected on facts. No such attribute should ever be detected within an XBRL instance which makes use of this profile.

Reasoning: Precision attributes are not allowed by the US GAAP Taxonomy Architecture and are therefore not allowed within SEC XBRL financial filings. The decimals attribute, which is allowed, serves exactly the same purpose as the precision attribute. If both attributes are allowed then it make it necessary to convert from decimals to precision and precision to decimals which could cause interoperability issues.

2.5. Prohibition of relations MUST NOT be used.

XBRL's prohibition of relations features MUST NOT be used.

Reasoning: Prohibition features are unsafe.

[CSH: This items should be considered, they are from Roland]

THESE ARE FROM A DOCUMENT ROLAND CREATED:

Proposed architectural guidelines

A reporter who wants to create a custom extension MUST obey the following guidelines:

1. A maximum of one schema and/or one linkbase can be created;
2. All concepts created MUST be XBRL valid;
3. ~~All concepts created MUST have a standard label in the preferred language of the report;~~ (already have)
4. All concepts created MUST occur in the instance and in a relationship specifying the place in the presentation (either through a presentation or table relationship);
5. All concepts created MUST have a definition of their meaning. Plain text is to be provided through the definitionLabel role, references to a definition document (PDF etc.) through a standard reference link;
6. No addition of custom XML schema attributes or elements is allowed, only elements in the listed substitutionGroups;
7. No addition of ELR's, only extension of existing ELR's is allowed;
8. No addition of root parents inside existing ELR's is allowed;
9. Numeric custom items MUST be placed in a definitional relationship to existing numeric items:
    a. Custom item is a summation of existing items: custom item is the parent in a D-relationship with the existing items as the children and an arcrole of 'total-breakdown'.
    b. Custom item is a detailing of an existing item: custom item is the parent in a D-relationship with the existing item as its child and an arcrole of 'general-special'.
    c. Custom item is both a summation of existing items but also detailing other existing items: custom item is the parent in a D-relationship with the existing items as the children in the arcroles as stipulated above.

3. Restrictions on Semantics

The following is a summary of additional restrictions explicitly placed on the semantics of reports articulated using the XBRL technical syntax which adhere to this application profile. This section basically makes things which are legal in XBRL illegal. The reason for imposing these restrictions is they cause irrational, illogical or nonsensical representations when expressed in XBRL.

3.1. Report elements contained within or defined by an XBRL taxonomy MUST clearly be defined such that they can be categorized into one of the following groups of report elements:

- **Hypercube** – a hypercube can always be detected by the value of the substitutionGroup attribute value of xbrldt:hypercube. Other common terms used for hypercube include Table, Cube, Matrix, Array.
- **Dimension** – a dimension can always be detected by the value of the substitutionGroup attribute value of xbrldt:dimension. Other terms used for dimension include Axis or Aspect.
- **Member** – a member can always be detected by the value of the dataType attribute value of nonnum:domainItemType from the namespace identifier http://www.xbrl.org/dtr/type/non-numeric.
- **Primary Items** – a primary items report element can always be detected by the fact that it is the last child of a hypercube within the presentation relations and that it has an abstract attribute value of "true". Other terms used for Primary Items includes Line Items.
- **Abstract** – an abstract can always be detected by the fact that it is not identifiable as a hypercube, dimension, or member and that does have an abstract attribute with the value of "true".
- **Concept** – a concept can always be detected by the fact that it is not a hypercube, dimension, member, primary item, or abstract.

This rule implies that every XML Schema element defined in an XBRL taxonomy schema can be categorized into one of these groups and that the term "report element", or "XML Schema element" or "element" or "XBRL element" should never be used. Rather, the terms above should be used to refer to report elements.

3.2. Report element categories MUST be related in specific ways.

One report element category can only be related to another report element category in very specific ways when represented in XBRL presentation relations. Note that XBRL definition relations are more restrictive than XBRL presentation relations. The same is true with XBRL calculation relations. The intent of this rule is to minimize ambiguity and maximize consistency with XBRL definition relations, particularly XBRL Dimensions relations expressed using XBRL definition relations.

This is a more restrictive relations model, this model is encouraged.

		Restrictive model (Meets EFM filing rules, but less ambigous)						
		Parent						
		Network	Table	Axis	Member	LineItems	Abstract	Concept
Child	Network	Illegal XBRL	Illegal XBRL	Illegal XBRL	Illegal XBRL	Illegal XBRL	Illegal XBRL	Illegal XBRL
	Table	OK	Disallowed	Disallowed	Disallowed	Disallowed	OK	Disallowed
	Axis	Disallowed	OK	Disallowed	Disallowed	Disallowed	Disallowed	Disallowed
	Member	Disallowed	Disallowed	OK	OK	Disallowed	Disallowed	Disallowed
	LineItems	Disallowed	OK	Disallowed	Disallowed	Disallowed	Disallowed	Disallowed
	Abstract	OK	Disallowed	Disallowed	Disallowed	OK	Disallowed	Disallowed
	Concept	Disallowed	Disallowed	Disallowed	Disallowed	OK	OK	Disallowed

This is a more relaxed model. Nonsensical relations are disallowed because the relations introduce ambiguity. Other less ambiguous relations are not advised.

		LAX Model, SEC filers supported						
		Parent						
		Network	Table	Axis	Member	LineItems	Abstract	Concept
Child	Network	Illegal XBRL	Illegal XBRL	Illegal XBRL	Illegal XBRL	Illegal XBRL	Illegal XBRL	Illegal XBRL
	Table	OK	Disallowed	Disallowed	Disallowed	Disallowed	OK	Disallowed
	Axis	Disallowed	OK	Disallowed	Disallowed	Disallowed	Disallowed	Disallowed
	Member	Disallowed	Disallowed	OK	OK	Disallowed	Disallowed	Disallowed
	LineItems	Disallowed	OK	Disallowed	Disallowed	Disallowed	Disallowed	Disallowed
	Abstract	OK	Disallowed	Disallowed	Disallowed	OK	Not advised	Not advised
	Concept	Not advised	Disallowed	Disallowed	Disallowed	OK	OK	Not advised

3.3. Hypercubes, dimensions, members, primary items, and abstracts MUST have a periodType attribute value of XBRL equal to "duration".

PeriodType has no semantics for these types of report elements.

3.4. Hypercubes, dimensions, members, primary items, and abstracts MUST have an abstract attribute value of XBRL equal to "true".

Abstract has no semantics for these types of report elements. XBRL requires hypercubes and dimensions to be abstract. It seems

reasonable to therefore require members and primary items to likewise be abstract.

3.5. Hypercubes, dimensions, members, primary items, and abstracts MUST NOT have a balance attribute.

Balance is not an appropriate property for these report elements.

3.6. Relations expressed using XBRL definition relations related to XBRL Dimensions and relations expressed using XBRL presentation relations MUST be consistent.

This rule implies that XBRL definition relations and XBRL presentation relations must never be inconsistent and therefore ambiguous.

3.7. The extended link roles of XBRL presentation relations, XBRL calculation relations, XBRL definition relations, and XBRL formula MUST be consistent for the same report fragment.

This rule explicitly states that extended link roles identify report fragments and that the extended link role of a report fragment MUST be consistent in all linkbase structures.

3.8. Each Concept which could be used to report a Fact MUST exist within at least one Hypercube.

Facts are never "free floating" in space. As such, each Concept which might be used to define a fact MUST always exist within a Hypercube.

4. Explicit Semantics

While the previous section restricts certain specific uses of the XBRL technical format to for the purpose of minimizing the chances of ambiguity and otherwise eliminating irrational, illogical, nonsensical representations of information; this section articulates specific report logic or semantics.

4.1. Networks or hypercubes MUST articulate clear business meaning. As such all hypercubes MUST be isomorphic (carry one meaning) or no meaning at all (one standard hypercube is used and networks carry report component semantics).

[CSH: This needs work.]

4.2. Report fragments MUST be represented using the same network URI across all XBRL presentation, XBRL calculation, XBRL definition, and XBRL Formula related relation networks.

In essence this means that if a report component is expressed, then the network identifier of that report component must be the same for each set of presentation, calculation, definition, and XBRL Formula networks which express information for that report component. Any URI that is the general URI of XBRL applies to the entire document.

[CSH: This needs work.]

4.3. Report element names and IDs MUST NOT carry semantics.

The meaning of report elements is provided by the report element documentation, labels, references, relations, and business rules expressed.

4.4. The XBRL context element entity identifier and scheme MUST identify the entity issuing the report.

Use dimensions to provide any other information deemed necessary to characterize a reported fact.

4.5. The XBRL context period MUST indicate the calendar period of a reported fact.

Use dimensions to provide any other information deemed necessary to characterize an period related characteristic of a reported fact.

4.6. Members of a dimension can be arranged within one of the following member arrangement patterns:

The relations between the members of a dimension can be organized into member arrangement patterns: composition, aggregation, wholeness[20].

- **Whole-part:** [Put the whole-part stuff here]
- **Is-A:**
- **Composition:** Some single thing or finite set of things. (Infinite sets would never be reported)
- **Aggregation**: pieces of some whole and the complete list of parts of that whole. [CSH: Need to deal with subtotals or hierarchies within an aggregation. Disallow them?]

[20] Here is information related to whole-part relations; *Towards Understanding Whole-part Relations*, http://xbrl.squarespace.com/journal/2015/1/20/toward-understanding-whole-part-relations.html

[CSH: This needs work. Create the arcrole definitions.]

Basically, the arcrole "http://www.xbrl.org/2003/arcrole/parent-child" used to communicate that there is in fact some sort of relationship leaves open to interpretation exactly what that relation is and what it means. While what is expressed might be clear to those who use the "parent-child" relationship to express something; the intent tends to not come through, be misinterpreted, be inconsistent because of different people working on different areas of a taxonomy, and in general leads to confusion.

These arcroles are defined here:

http://xbrlsite.azurewebsites.net/2016/conceptual-model/cm-arcroles.xsd

4.7. Primary items MUST be arranged within one of the following concept arrangement patterns: roll up, roll forward, adjustment, variance, complex computation. All other concept arrangements of primary items will be considered a hierarchy.

The following is a summary of and further explain these concept arrangement patterns:

- **Roll up**: Fact A + Fact B + Fact C = Fact D (a total)
- **Roll forward**: Beginning balance + changes = Ending balance (this is sometimes called a "movement analysis" or BASE pattern; beginning balance + additions – subtractions = ending
- **Adjustment**: An adjustment reconciles an originally stated balance to a restated balance between two report dates; Originally stated balance + adjustments = restated balance
- **Variance**: A variance is a change across a reporting scenario. Actual amount - Budgeted amount = variance
- **Complex computation**: A complex computation is a type of concept arrangement where facts are related by some computation other than a roll up, roll forward, adjustment, or variance. For example, Net income / Weighted average shares = earnings per share. These can always be detected by the existence of XBRL Formulas.
- **Hierarchy or Set**: A hierarchy or set is a type of concept arrangement where facts are related in some way, but not mathematically.

Each report fragment MUST be organized into identifiable and discrete concept arrangement patterns.

NOTE: As new concept arrangement patterns are identified the list of supported patterns will be expanded. If information is arranged in a manner that is not consistent with one of the supported concept arrangement patterns, then the Hierarchy pattern should be used to represent that pattern.

4.8. All computations or business rules which the creator of the report desires a user of the report to understand MUST be expressed using XBRL calculations (roll up) or XBRL Formula (all other computations).

All computations, which are part of the concept arrangement patterns, can be automatically generated by software as XBRL Formula based business rules which enforce the concept arrangement patterns. One exception to this is the complex computation pattern which could literally be any computation and therefore this is impossible to automate.

XBRL Formulas are preferred to XBRL calculations in most situations.

4.9. A Block is a report fragment which shares the same Concept Arrangement Pattern.

A Block is defined as an identifiable fragment of a report that shares the same concept arrangement pattern within a Network. For example, the following is a Block:

Inventory Disclosure [Abstract]	Period [Axis]	
	2016-03-31	2015-03-31
Inventory Disclosure [Abstract]		
Raw materials and supplies	7,993,000	7,417,000
Work-in-progress	13,147,000	6,466,000
Finished goods	5,600,000	2,891,000
Inventories	26,740,000	16,774,000

5. Expressing or Extending Domain Semantics

[CSH: This entire section needs work.]

This section provides a mechanism for controlling extensibility of a taxonomy. This section describes rules which must be followed when creating high-fidelity digital reports to effectively manage extensibility such that the creator of information and the consumer of information interpret reported information the same.

5.1. Each domain which desires to allow extensibility and to explicitly control that extensibility MUST create a set of core report elements into which each base taxonomy concept and any extension taxonomy report element MUST fit.

Extensions must extend some existing core domain concept.

For example, for the domain of financial reporting the core concepts exist: Assets, Liabilities, Equity, Revenue, Expenses, Gains, Losses, Investments by owners, Distributions to Owners, Comprehensive Income. To those core elements, the following core elements are also added: Policy, Disclosure.

A base taxonomy and any taxonomies which extend this base MUST assign a core report element to each extension concept to indicate which report element the extension report element is extending.

This is achieved by using XBRL definition links which the arcrole "class-subclass".

[CSH: This needs work.]

5.2. Each extension taxonomy MUST assign any extension report element to a core report element or a report element of the base taxonomy.

As with base taxonomies, extension taxonomies must assign each extension concept to an existing core concept.

This is achieved by using XBRL definition links which the arcrole "class-subclass".

[CSH: This needs work. This is basically the same as the idea of the ESMA "anchoring" functionality.]

5.3. Report elements MUST be grouped into one of four categories: concept required, concept optional, subclasses allowed, extension allowed.

For more information see:

http://xbrl.squarespace.com/journal/2014/9/19/phenomenon-points-to-need-for-global-standard-way-to-define.html

6. Reporting Checklist Semantics

A reporting checklist relates to the logic of when a report fragment is required to exist within a specific report.

For example, the disclosures "Nature of Operations", "Basis of Reporting" and "Significant Accounting Policies" are always required in a financial report. If the line item "Inventories" is reported, then the disclosure "Inventory Components" is required.

This information is leverageable by software applications used to construct or consume financial reports. This information is articulated as machine-readable rules as XBRL definition relations.

http://xbrlsite.azurewebsites.net/2016/conceptual-model/drules-arcroles.xsd

ArcRole
drules-arcroles:reportingLineItem-requiresDisclosure
drules-arcroles:report-possibleDisclosure
drules-arcroles:report-reportsConcept
drules-arcroles:disclosure-allowedAlternativeDisclosure
drules-arcroles:report-requiresDisclosure
drules-arcroles:concept-allowedAlternativeConcept

6.1. Reported fragments MUST be identified via the report-requiresDisclosure *arcrole.*

If a report fragment is required to be provided within a report the report-requiresDisclosure is used to identify that logic within the reporting checklist.

6.2. Concepts that, if reported, require the existence of a specific disclosure; that logic MUST be represented using the reportingLineItem-requiresDisclosure *arcrole.*

If a report provides a concept and the existence of that reported fact calls for the existence of a specific disclosure that logic MUST be expressed using the reportingLineItem-requiresDisclsoure arcrole.

6.3. Disclosures that, if reported, require the existence of an additional disclsoure; that logic MUST be represented using the reportingDisclosure-requiresDisclosure *arcrole.*

If a report provides a disclosure and the existence of that reported disclosure calls for the existence of a specific disclosure that logic MUST be expressed using the reportingDisclosure-requiresDisclsoure arcrole.

6.4. Disclosures that, if reported, could be reported using an alternative disclosure; that logic MUST be represented using the disclosure-allowsAlternativeDisclosure *arcrole.*

If a report MUST provide a disclosure and that disclosure could be provided using one or more alternative disclosures that logic MUST be expressed using the disclosure-allowsAlternativeDisclsoure arcrole.

7. Disclosure Mechanics Semantics

A disclosure or something that is provided within a report follows certain specific structural, mechanical, mathematical, and logical rules. Disclosure mechanics semantics rules can be used to express this logic within an XBRL taxonomy.

For example, the disclosure "Inventory components" is a common financial report disclosure. That disclosure is always a roll up. That disclosure always uses the concept "us-gaap:InventoryNet" to report that roll up. That disclosure commonly includes the line items "Raw material", "Work in progress", and "Finished good". If the disclosure "Inventory components" exists; then the disclosure "Inventory Policy" is required.

This information is leverageable by software applications used to construct or consume financial reports. This information is articulated as machine-readable rules as XBRL definition relations.

Inventory Disclosure [Abstract]	Period [Axis]	
	2016-03-31	2015-03-31
Inventory Disclosure [Abstract]		
Raw materials and supplies	7,993,000	7,417,000
Work-in-progress	13,147,000	6,466,000
Finished goods	5,600,000	2,891,000
Inventories	26,740,000	16,774,000

[CSH: To do]

http://xbrlsite.azurewebsites.net/2016/conceptual-model/drules-arcroles.xsd

Disclosure mechanics:

ArcRole
drules-arcroles:disclosure-hasConceptArrangementPattern
drules-arcroles:disclosure-equivalentTextblock
drules-arcroles:disclosure-requiresConcept
drules-arcroles:concept-allowedAlternativeConcept
drules-arcroles:disclosure-oftenContainsConcept
drules-arcroles:disclosure-requiresAxis
drules-arcroles:conceptArrangementPattern-requiresConcept
drules-arcroles:disclosure-relatedLevel1NoteTextBlock
drules-arcroles:concept-allowedAlternativeConcept
drules-arcroles:disclosure-relatedPolicy
drules-arcroles:disclosure-requiresMember
drules-arcroles:reportedDisclosure-requiresDisclosure
drules-arcroles:disclosure-oftenContainsConcept
drules-arcroles:disclosure-hasMemberArrangementPattern

8. Continuity Cross-checks Semantics

It is always better to be explicit in reports. However, if it is the case that concepts could be reported using alternative concepts or that reporting certain line items are optional; then continuity cross-check semantics functionality can be used to describe this logic.

For example, the fact "Noncurrent assets" is often not reported within a financial report. If the concept "Noncurrent assets" is not explicitly reported and if the rule "Assets = Current assets + Noncurrent assets" and if the facts "Assets" and "Current assets" is reported; THEN the concept "Noncurrent assets" can be logically derived using facts which are reported and rules available such that "Noncurrent Assets = Assets – Current Assets".

Further, if a fact is reported within a report fragment and that same fact is implied to exist within another report fragment; the fact must not contradict reported or implied facts or otherwise be inconsistent with such other facts.

[CSH: To do]

9. Type or Class Relations

Concepts defined can be related to other concepts forming a "class" or "type" of concept that make up a formal set. For example, "Cash and cash equivalents" and "Receivables" and "Inventory" are all types of "Current Assets".

Types or classes of concepts defined to be used in one way may not be used in another way that is not intended by the defining taxonomy. For example, the concept "Payments to purchase property, plant, and equipment" if defined to be PART-OF "Net cash flows from investing activities" MUST NOT then be used to represent a line item of "Net cash flows from financing activities".

[CSH: To do]

10. Report Lists

When using more than one business reports, some sort of list of reports contained within a report repository is necessary. The following section specifies how to create such a report list using RSS.

[CSH: This is similar to the SEC XBRL document RSS feed. To do]

11. Units

XBRL International maintains a comprehensive global standard units registry[21]. When representing information within an XBRL-based report, when representing units, units[22] from this global standard units registry SHOULD be used where possible.

12. XBRL Formula Extension Functions

This specification defines a number of custom arcroles using the global standard XBRL approach. In order to process those custom arcroles, XBRL processors and/or XBRL Formula processors need to be extended to support this new functionality. XBRL International provides a global standard mechanism for extending XBRL Formula functionality[23].

[CSH: Need to define these extension functions. To do]

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21 XBRL International, Units Registry 1.0, https://specifications.xbrl.org/work-product-index-registries-units-registry-1.0.html

22 XBRL International, *Units*, http://www.xbrl.org/utr/utr.xml

23 XBRL International, *Functions Registry 1.0*, https://specifications.xbrl.org/work-product-index-registries-functions-registry-1.0.html

13. References

This section contains references to information that is useful for the creation of this specification. These references will not be in the final version of this specification.

Fact Ledger:

http://xbrlsite.azurewebsites.net/2018/Library/IntroductionToTheFactLedger.pdf

General Ledger Trial Balance to External Financial Report:

http://xbrlsite.azurewebsites.net/2018/RoboticFinance/TrialBalanceToReport.pdf

Leveraging the Theoretical and Mathematical Underpinnings of a Financial Report:

http://xbrlsite.azurewebsites.net/2018/Library/TheoreticalAndMathematicalUnderpinningsOfFinancialReport.pdf

Leveraging XBRL's Extensibility Effectively:

http://xbrlsite.azurewebsites.net/2018/Library/LeveragingXBRLExtensibilityEffectively.pdf