Expert System for Creating Financial Reports Explained in Simple Terms

How an expert system for creating financial reports can be created, explained in simple terms understandable to both accountants and software engineers with the purpose of enabling communications to actually create such a cloud-based software application.

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"Great things are done by a series of small things brought together." Vincent Van Gogh

Executive summary:

- This document describes how a rules-based expert system which assists in the construction of a financial report would work in terms understandable to accountants and software engineers.
- Created financial reports may, or may not, be output in the XBRL technical format. Reports would just as well be published in PDF, HTML, Microsoft Word, Open Doc, Adobe InDesign, or other human readable presentation format.
- The purpose of this rules-based expert system is to use more modern approaches to creating such reports and making the process better, faster, and cheaper than current approaches to creating financial reports which are basically outdated.
- As such, this application contemplates a paradigm shift; a new modern approach to financial reporting not an incremental innovation of the current approach.

As explained in the book *The Great Upheaval*¹, the world is in the midst of a "great upheaval" where the world is transitioning from an analog, industrial economy to a digital, knowledge economy. To understand the notion of a rules-based expert system effectively the reader must understand that an analog, industrial economy works differently than a digital, knowledge economy.

What makes "digital, knowledge economy" work in the context required by financial reporting has been explained by me in other documents such as *Computational Professional Services*², *Essence of Accounting*³, *Financial Report Knowledge Graphs*⁴, and the *Seattle Method*⁵. That "digital" accounting, reporting, auditing, and analysis can work has been proven and I will not repeat that proof here.

I have the tendency to create over documented explanations in order to help the reader have access to all the information that I have access to in order to follow the logic of my explanations and reach their own conclusions. In this document I will try and keep explanations as terse and easy to read as possible, linking to additional explanations where a reader can go for details if they desire to do so.

The objective of this paper is to provide as non-technical as possible explanation of the essence of what a rules-based expert system does for those creating such financial reports. This will be explained in terms that an accountant can understand, in terms that a software engineer can understand, and such that accountants and software engineers working together to create such an application can communicate effectively.

This document articulates one way of creating an expert system for constructing financial reports. There are other approaches.

Vision for Expert System for Creating Financial Reports

I am more convinced than ever that some sort of graph database is the way to go to store information for a report within some sort of database. I now understand the rigidity of a relational database, the increased flexibility of a graph database, the power of a graph database

¹ Author Levine and Scott J. van Pelt, *The Great Upheaval*, <u>https://www.amazon.com/Great-Upheaval-Educations-Present-Uncertain/dp/1421442574</u>

² Charles Hoffman, CPA, *Computational Professional Services*, <u>http://xbrlsite.azurewebsites.net/2020/library/ComputationalProfessionalServices.pdf</u>

³ Charles Hoffman, CPA, *Essence of Accounting*,

http://xbrlsite.azurewebsites.net/2020/Library/EssenceOfAccounting.pdf ⁴ Charles Hoffman, CPA, *Financial Report Knowledge Graphs*,

http://xbrlsite.azurewebsites.net/2021/Library/FinancialReportKnowledgeGraphs.pdf

⁵ Charles Hoffman, CPA, *Seattle Method*, <u>http://xbrlsite.com/seattlemethod/SeattleMethod.pdf</u>

to represent relations, and the power of a graph database to express a logical schema, and the ease with which a logic/rules/knowledge/insights engine can "interact" with that graph. You do need some sort of logic engine to process the logic; which TerminusDB has (DATALOG). Other graph databases do NOT have that sort of engine.

PROLOG and RDF+OWL+SHACL (the Semantic Web Stack) can likewise do just as good a job as a graph database and they have logic engines and/or semantic reasoners to interact with the graph. You COULD do this same thing with a relational database, but you would have to build many things that you get for free with a graph database and some sort of logic/rules/reasoning/knowledge/insights engine to interact with that knowledge graph.

But I am wondering if creating your OWN logic engine (which Pesseract did) is a better way to go or if it would be reinventing a wheel that already exists. Building some sort of logic processor is a non-trivial task. But doing so could have advantages because you could specifically TUNE the logic engine to be exactly what you need it to do.

An observation with respect to what Auditchain did with Pacioli is that Pacioli is a batch oriented processor currently. What you need is a more "dynamic" processor, more like a video game during the report creation process. Allowing users to do the wrong things, then discovering them at the END of the process, and then letting the user then FIX the issue is not the way to go.

The knowledge graph includes all the core pieces (logical statements) of a report (terms, associations, structures, rules, facts). In addition to this, additional pieces (logical statements) are added such as the model structure rules, the reporting checklist, the disclosure mechanics, the type-subtype (wider-narrower or general-special) associations, the fundamental accounting concept relations, disclosures, topics, templates, exemplars. All of these pieces (logical statements) provide metadata that can be leveraged to enable a logic/rules/reasoning/knowledge/insights engine to assist the human user of the software application. Add to that a state machine that provides additional information and you have a massive amount of useful information that can be used to drive recommender systems, project management systems, construction systems, and other such ways the software can augment the business user's skills.

This document assists in the process of creating a blueprint to make such a rules-based expert system to be created.

Components of a Knowledge Based System

I have provided versions of a graphic which you see the most current version below for several years which summarizes the "Components of a Knowledge Based System" which is as some people call it "a good ole fashioned rules-based expert system".

That graphic is the basis for Pesseract⁶ which is a working proof of concept which a software engineer and I created to figure out how to construct an expert system for creating financial reports. Fundamentally, that graphic shows all the pieces you need to create such an expert system. Pesseract has within it what is essentially a special purpose problem solving logic engine.



Business Professional User Interface

The business professional user interface are the components that are exposed to the business professional using the system. Business professionals need transparency as to the terms, associations, structures, rules, facts, line of reasoning, problem solving logic, problem solving method, and the plausibility of all conclusions reached by the system. The business professional user interface will very likely be a cloud-based interface.

The following is one of a number of screen shots⁷ of the working proof of concept software application Pesseract which provides an example of a user interface with which a business professional would interact:

⁶ Pesseract, <u>http://pesseract.azurewebsites.net/</u>

⁷ Additional Pesseract User Interface Screenshots, <u>https://photos.app.goo.gl/cWeZYaMBEbmSSm7v8</u>

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	essage ust Console				

A financial report is a knowledge graph⁸. The user interface is non-technical requiring only business and accounting knowledge to effectively understand the software application and how to use it. The interface is a specialized logical interface that leverages the *Logical Theory Describing Financial Report⁹*. Because the interface is specialized for one specific area of knowledge instead of a general technical interface that can be used for any area of knowledge, it can be easy to use.

Justification and Explanation Mechanism

The justification and explanation mechanisms of the software application explains and justifies and provides transparency into how conclusions have been reached by the software application and communicates this information to the software user. The rules used, facts used, line of reasoning, and origin of all facts are knowable to the business user of the software. There is transparency into all conclusions that are reached by the software application. Nothing is a black box.

Below you see the fundamental accounting concept relations continuity cross check verification checks provided by XBRL Cloud's Evidence Package¹⁰ which is a review tool that can be used to verify XBRL-based financial reports:

http://xbrlsite.azurewebsites.net/2021/Library/FinancialReportKnowledgeGraphs.pdf

⁸ Financial Report Knowledge Graphs,

⁹ Logical Theory Describing Financial Report,

http://xbrlsite.com/seattlemethod/LogicalTheoryDescribingFinancialReport Terse.pdf

¹⁰ XBRL Cloud Evidence Package, <u>http://xbrlsite.azurewebsites.net/2017/Prototypes/Microsoft2017/evidence-package/USFACRenderingSummary.html</u>

		Period [Axis]
		2017-06-30
		Fact
Balance Sheet [Line Items]	Value	Origin
Assets [Roll Up]		
Current Assets	159,851,000,000	fac:CurrentAssets[us-gaap:AssetsCurrent[159,851,000,000]]
Noncurrent Assets		fac:NoncurrentAssets[81,235,000,000] = fac:Assets[us- gaap:Assets[241,086,000,000]] - fac:CurrentAssets[us- gaap:AssetsCurrent[159,851,000,000]] □
		Fact determination of fac:NoncurrentAssets
		1 us-gaap:AssetsNoncurrent -
	81,235,000,000	fac:Assets[us-gaap:Assets[241,086,000,000]] - fac:CurrentAssets[us- 2 gaap:AssetsCurrent[159,851,000,000]] 81,235,000,000
Assets	241,086,000,000	fac:Assets[us-gaap:Assets[241,086,000,000]]
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If you look at the fundamental accounting concept relations continuity cross check verification results you see that the business user can trace each fact two it's origin, understand all rules used by the software to reach conclusions, etc.

Pesseract provides similar functionality:

Components (10)				द	Rendering	Model Structure	Fact Table		Business Rules Structur	e Business Rules Validation R	les
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Network View	Component Vier	v O Bloc	k View		Network	101 - Unknown - Bal	ance Sheet, Cla	ssified			5
Filter Type	iter Level	- Filter	Status	_	Table	Balance Sheet, Class	ified [Table]				ذ
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Enter text to filter			▼ Clear							Period [Axis] 👻	e c
⊕ 001-General Information ●	General Inform	ation [Table]			Balance Sheet [Line Iter	ms]		Unit [Axi	s] 🔻	2017-06-30	Þ
	ied 🔶 Balance S	heet, Classified	[Table]		Assets [Roll Up]						3
201.7-Income Statement, I	Multi Step, With	Operating Incor	me, Special 6	•	Current Assets			USD		159,851,000,000	1(
Income Statement, Single S	Step [lable]	0			Noncurrent Assets			USD		81,235,000,000	1
211-Net Income (Loss) Bre	211-Net Income (Loss) Breakdown Net Income (Loss) Breakdown Assets USD										- {
Available to Common Breal	Fact Character	stics and Prope	rties			23					- <
301-Statement of Comprel Income (Loss) [Table]	Properties	operties Occurrences Provenance To Do									
311-Comprehensive Incom	fac:Noncurre	ntAssets[81,23	35,000,000]:=	= fac:As	sets[us-gaap:Assets[241,	086,000,000]] 🔺		USD		64,527,000,000	1
(Loss) Breakdown [Table]	- fac:Current	Assets[us-gaap	:AssetsCurren	t[159,8	51,000,000]]			USD		104,165,000,000	2
# 401-Cash Flow Statement							Liabilities	USD		168,692,000,000	
# 411.1-Net Cash Flow Bread								USD		xsi:nil	13
H 20.1-Continuing and Disc Statement [Table]	Fact origin:							USD		0	Ì
	1 u	s-gaap:AssetsN	loncurrent			-					7
	f	ac:NoncurrentA	ssets[81,235,	,000,000	0]:=			USD		72,394,000,000	Ś
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XBRL Cloud's Disclosure Mechanics and Reporting Checklist¹¹ provides the rules used, line of reasoning used, and conclusions reached for determining if a disclosure is structured consistent with its expected specification:

Disclosure mechanics rules:

¹¹ XBRL Cloud Disclosure Mechanics and Reporting Checklist,

http://xbrlsite.azurewebsites.net/2017/Prototypes/Microsoft2017/Disclosure%20Mechanics%20and%20Reporting %20Checklist.html



#### Line of reasoning:



#### Conclusion reached:

#	Disclosure	Category	Level	Pattern	Applicable	Found	Disclosure Consistent	Representation Concept [TEXT BLOCK]	Representation Concept [DETAIL]	Checklist Category	Reason
1	Document Information [Hierarchy]	DOCUMENT	Level4Detail	HIERARCHY	True	True	CONSISTENT	NOT-EXPECTED	Document Fiscal Period Focus	Required disclosure	Disclosure always required
2	Document and Entity Information [Hierarchy]	DOCUMENT	Level4Detail	HIERARCHY	False	True	CONSISTENT	NOT-EXPECTED	Entity Registrant Name	Alternative representation	Not necessary, satisfied by Document Information [Hierarchy] disclosure
3	Entity Information_by Legal Entity (Hierarchy)	DOCUMENT	Level4Detail	HIERARCHY	True	True	CONSISTENT	NOT-EXPECTED	Entity Registrant Name	Required disclosure	Disclosure always required
4	Document and Entity Information [Hierarchy]	DOCUMENT	Level4Detail	HIERARCHY	False	True	CONSISTENT	NOT-EXPECTED	Entity Registrant Name	Alternative representation	Not necessary, satisfied by Entity Information, by Legal Entity [Hierarchy] disclosure
5	Balance Sheet	STATEMENT	Level4Detail	COMPONENT	True	True	CONSISTENT	NOT-EXPECTED	NOT-EXPECTED	Required disclosure	Disclosure always required, satisfied by Assets [Roll Up] and Liabilities and Equity [Roll Up]
6	Assets [Roll Up]	STATEMENT	Level4Detail	ROLL UP	True	True	CONSISTENT	NOT-EXPECTED	Assets	Part of disclosure	Disclosure always required
7	Liabilities and Equity [Roll Up]	STATEMENT	Level4Detail	ROLL UP	True	True	CONSISTENT	NOT-EXPECTED	Liabilities and Equity	Part of disclosure	Disclosure always required
8	Income Statement, by Legal Entity (Roll Up)	STATEMENT	Level4Detail	ROLL UP	True	True	CONSISTENT	NOT-EXPECTED	Net Income (Loss) Attributable to Parent	Required disclosure	Disclosure always required
9	Statement of Income and Comprehensive Income [Roll Up]	DISCLOSURE	Level4Detail	ROLL UP	False	True	CONSISTENT	NOT-EXPECTED	Net Income (Loss) Attributable to Parent	Alternative representation	Not necessary, satisfied by Income Statement, by Legal Entity [Roll Up] disclosure
10	Statement of Comprehensive Income (Roll Up)	STATEMENT	Level4Detail	ROLL UP	True	True	CONSISTENT	NOT-EXPECTED	Comprehensive Income (Loss), Net of Tax, Attributable to Parent	Required disclosure	Disclosure always required
have -	Strevent of Income and	-DISCLOPHEE-	weidelein	ROLLIA	Falsen	Tue	CONSISTENT	NOLEXPECTER	manym		Watarrazzan, zztist W-Pytemryl pl Growenbersive to ra 1801

Similar functionality is offered by Pesseract:

Disclosure mechanics rules:

Ξ		38	Inventory, Net (Current) [Roll Up]	Disclosure	Level3TextBlock/Level4Detail							
	Rules	Line o	of Reasoning		~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~							
	This disc	losure:	disclosures:InventoryNetRollUp									
	- MUST Ł	pe repre	esented by a network with the SEC Category: cm:	DisclosureType	}							
	- MUST b	be repre	esented as a Level 4 Disclosure Detail with the	e concept arrangeme	ent pattern: cm:RollUp							
	- cm:F	lollUp R	REQUIRES total: us-gaap:InventoryNet									
	- 0	r by the	e allowed alternative concept: us-gaap:Inventory	NetOfAllowancesCus	stomerAdvancesAndProgressBillings							
	- 0	r by the	e allowed alternative concept: us-gaap:PublicUtiliti	esInventory	5							
	- 0	- Or by the allowed alternative concept: us-gaap:AirlineRelatedInventory										
	- 0	r by the	e allowed alternative concept: us-gaap:RetailRela	tedInventory	لم ا							
	- 0	r by the	e allowed alternative concept: us-gaap:EnergyRel	atedInventory	\$							
	- 0	r by the	e allowed alternative concept: us-gaap:Agricultura	RelatedInventory								
	- MUST Ł	be repre	esented as using the Level 3 Disclosure Text I	Block: us-gaap:Sche	eduleOfInventoryCurrentTableTextBlock							
	- Or b	y the a	llowed alternative concept: us-gaap:ScheduleOfU	tilityInventoryTextB	lock Ş							
	- Require	es the p	policy to be reported using the Level 2 Policy Te	ext Block: us-gaap:	InventoryPolicyTextBlock							
	- Or b	y the a	llowed alternative concept: us-gaap:InventoryMa	jorClassesPolicy	فمر							
	- Or b	y the a	llowed alternative concept: us-gaap:InventorySu	ppliesPolicy	2							
	- Or by the allowed alternative concept: us-gaap:InventoryWorkInProcessPolicy											
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Line of reasoning:

Ξ	38 Inventory,	Net (Current) [Roll Up]	Disclosure	Level3TextBlock/Level4Detail	>
	Rules Line of Reasoning				Ĩ
	#### Disclosure mechanics	validation explanation for disclosure: d	disclosures:Inventory	NetRollUp ####	5
	Level 4 Disclosure Detai	il			ς
	Looking in networks with	SEC Category: Disclosure			ļ
	Looking for blocks with co	ncept arrangement pattern: RollUp			۲ ۲
	Looking for Concept: us-g	jaap:InventoryNet			ſ
	*FOUND Concept: us-gaa	ap:InventoryNet in network:			(
	Concept located in netwo	rk: 100710 - Disclosure - Components o	of Inventories (Detail)		5
	Level 3 Disclosure Text	Block			ξ
	Looking in networks with	SEC Category: Disclosure			5
	Looking for Level 3 Disclos	sure Text Block: us-gaap:ScheduleOfIn	ventoryCurrentTable	TextBlock	>
	*FOUND Level 3 Disclosur	e Text Block: us-gaap:ScheduleOfInve	ntoryCurrentTableTex	ktBlock in network:	
$\sim$	Text block located	www. 100370 - Disclosure - INVENTORIE	ES (Tables)	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	$\sim\sim\sim\sim$

#### Conclusion reached¹²:

- 0046557	DAL.	* End	Cear						
Primary Enforme	ion .								
	Discours	Category	(end	Pattern	Disclosure Found	Decisione Consistent	Applicable	Representation Concept (TCHT 0LOCK)	Representation Concept DETA3
x	4 Accurate to Other Comprehensive Showing Soc.	Declasera	und Technol, Lovel Octal	RollHorward	Trus	CONSISTENT	Truc	Schedulo Of Accamulated Othor Camprolensive Income Issa Table [Text Black]	Studdeddo's Bgats
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2	30 Future Minimum Payments, Present Value of Ne	Declawro	Cend ShortBody, Level (Detail	Rallap	True	CONSISTENT	line:	Schedule Of Follow Memory Lease Reymonts For Capital Leases Table (Hent Book)	Capital Loades Folds of Minimum Reymonia Doc
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	34 Income Statement, by Legal 6-May (NoT Up)	Statement	Level Data	Raflay	True	CONSISTENT	Inv	NOT EXPECTED	Net Income Low
	28 Decome Tax Reported (Renafic), Connect and Dec.	Declawro	Conditional food, Revel Kitelal	2000	Texes	CONSISTENT	Brus .	Schedule Of Componentia Of Income Tax Biopenes Renefit Table (Text Block)	Shares Tan Brownie Burefit

Similar mechanisms exist for all other categories of rules verified using the method that has been created which leverages OMG's Standard Business Report Model (SBRM)¹³. The following interface provides a summary of verification results:



### Reasoning, Inference, Knowledge, Insights, Rules Engine

The reasoning, inference, rules, knowledge, and insights engine (not exactly sure what to call it) use the machine-based rules, a line of reasoning for solving problems using some problem solving logic and problem solving method (i.e. forward chaining, backward chaining) to reach conclusions about facts and all other statements made within the logical system. This includes capabilities to logically derive or infer new facts or other information based on existing facts and rules. It also includes the capability to determine consistency of facts with the systems knowledge base of rules.

 ¹² Pesseract disclosure mechanics verification of 94.8% of all 124 disclosures verified, <u>http://xbrlsite.azurewebsites.net/2020/Prototype/Microsoft/Microsoft2017_Discovery.jpg</u>
 13 SPDM Progress Property http://ubrl.acure.ego.gom/iourge//2020/1/20/akms_progress.pdf

¹³ SBRM Progress Report, <u>http://xbrl.squarespace.com/journal/2020/1/30/sbrm-progress-report.html</u>

As pointed out by the RuleML industry consortium¹⁴, there are three primary problem solving logic paradigms¹⁵: Semantic Web approach, Graph Database approach, and Logic Programming approach. There is an intersection between these three paradigms represented by PSOA RuleML¹⁶ where one paradigm can be translated logically to each of the other paradigms.



DATALOG¹⁷ is the "sweet spot" in terms of balancing processing power, processing safety to avoid logical paradoxes which cause systems to completely fail, and transportability between different technical syntax alternatives. For example, pyDatalog¹⁸. This video, *Datalog in Practice*¹⁹, helps you understand Datalog.

# Knowledge Graph

Information that the rules/logic/reasoning/knowledge/insights engine interacts with is stored in a machine-readable knowledge graph. Some people are of the opinion that the "facts" (fact database) are separate from the knowledge graph. In that case, then consider this the "Knowledge Graph" plus the

¹⁴ RuleML.org, *Graph-Relational Data, Ontologies, and Rules*, <u>http://wiki.ruleml.org/index.php/Graph-Relational Data, Ontologies, and Rules</u>

¹⁵ Implementing Knowledge Graphs, <u>http://xbrl.squarespace.com/journal/2021/9/20/implementing-knowledge-graphs.html</u>

¹⁶ RuleML.org, PSOA RuleML, <u>http://wiki.ruleml.org/index.php/PSOA_RuleML</u>

¹⁷ Wikipedia, *Datalog*, <u>https://en.wikipedia.org/wiki/Datalog</u>

¹⁸ pypi.org, pyDatalog, <u>https://pypi.org/project/pyDatalog/</u>

¹⁹ YouTube, Datalog in Practice, <u>https://youtu.be/RQVZ0tBj2F4</u>

"Fact Database". Combining or separating those two pieces is an implementation detail which really does not matter; effectively a machine can interact with all of the information that it needs to interact with. The knowledge graph is constrained using a physical schema²⁰ which constrains the technical syntax schemas for the physical syntax used and logical schemas²¹ to constrain the logic that is stored withing that physical schema. The Seattle Method²² outlines the financial report levels²³ that specifies the necessary logic which must be constrained to keep the system quality high.

# **Burying Complexity**

A *kluge* is a term from the engineering and computer science world that refers to something that is convoluted and messy but gets the job done. Elegance is the quality of being pleasingly ingenious, simple, neat. Elegance is about beating down complexity.

Complexity can never be removed from a system, but complexity can be moved. The *Law of Conservation of Complexity* states: "Every application has an inherent amount of irreducible complexity. The question is who will have to deal with that complexity: the application user, the application developer, or the platform developer that the application runs on?"

*Irreducible complexity* is explained as follows: A single system which is composed of several interacting parts that contribute to the basic function and where the removal of any one of the parts causes the system to effectively cease functioning.

For example, consider a simple mechanism such as a mousetrap. That mousetrap is composed of several different parts each of which is essential to the proper functioning of the mousetrap: a flat wooden base, a spring, a horizontal bar, a catch bar, the catch, and staples that hold the parts to the wooden base.

If you have all the parts and the parts are assembled together properly, the mousetrap works as it was designed to work.

But if you remove one of the parts of the mousetrap then the mousetrap will no longer function as it was designed; it will simply not work. That is irreducible complexity: the complexity of the design requires that it can't be reduced any farther without losing functionality.

Simplistic and simple are not the same thing.

*Simplistic* is 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. Simplistic is over-simplifying. Simplistic means that you have a naïve understanding of the area of knowledge, you don't understand the complexities of the area of knowledge. Removing or forgetting complicated things does not allow for the creation of a real-world solution that will actually work for an area of knowledge.

*Simple* is something that is not complicated, that is easy to understand or do. Simple means without complications. An explanation of something can be consistent with the area of knowledge in the real world, consider all important subtleties and nuances, and still be simple, straight forward, and therefore easy to understand and use.

²⁰ Wikipedia, *Physical Schema*, <u>https://en.wikipedia.org/wiki/Physical_schema</u>

²¹ Wikipedia, Logical Schema, https://en.wikipedia.org/wiki/Logical_schema

²² Charles Hoffman, CPA, Seattle Method, <u>http://xbrlsite.com/seattlemethod/SeattleMethod.pdf</u>

²³ Auditchain, *Financial Report Levels*, <u>http://accounting.auditchain.finance/library/FinancialReportLevels.pdf</u>

Hard problems call for great efforts. Great effort was undertaken to bury complexity, achieve elegance, such that the millions of professional accountants that will use this system will benefit from that effort.

# **Exchange of Complex Information**

A key to employing "digital" in accounting, reporting, auditing, and analysis in the enterprise is that information exchange needs to work effectively, predictably, reliably, safely, and correctly. XBRL is the global standard for the exchange of business information. The *Seattle Method* leverages and enhances that global standard.

The *Seattle Method* has worked to create a proven, good practices, standards-based pragmatic approach to creating provably high quality XBRL-based general purpose financial reports where report creators are permitted to modify the report model.

Auditchain²⁴ enhances the XBRL standard by adding the features of trust, provenance, coordination, and an economy.

The objective is seen not as some regulatory mandate but rather an opportunity to understand and leverage the power of digital. When complex information, like financial information, can be effectively exchanged then opportunities open up that make seemingly magical things possible. (But don't tell anyone that it really is not magic, it was really just rolling up our sleeves and doing the hard work to make this actually work.)

# Area of Knowledge

An area of knowledge is a highly organized socially constructed aggregation of shared knowledge for a distinct subject matter. An area of knowledge has a specialized insider vocabulary, jargon, underlying assumptions (axioms, theorems, constraints), and persistent open questions that have not necessarily been resolved (i.e. flexibility is necessary).

Accounting is an area of knowledge. You can explain aspects of the accounting area of knowledge, such as the nature of a financial report, using a logical theory which explains a logical model. A logical theory can be tested and proven by providing a proof.

Knowledge can be represented in human-readable form, in machine-readable form, or in a machine-readable form that can be effectively converted into human-readable form. Other terms for area of knowledge are a knowledge domain or simply domain or universe of discourse.

# **Information Supply Chain**

Accounting, reporting, auditing, and analysis can be thought of as a supply chain; an information supply chain. Jane Gleeson-White titled Chapter 1 of her book *Double Entry: How the Merchants of Venice* 

²⁴ Auditchain Explained in Simple Terms, <u>http://xbrlsite.azurewebsites.net/2022/library/AuditchainExplained.pdf</u>

*Created Modern Finance*²⁵, Accounting: Our First Communications Technology. Double entry bookkeeping is a mathematical model²⁶ created over 800 years ago but perfectly suited for the information age.

The members of this information supply chain can interact more effectively and efficiently using high quality curated machine-readable metadata represented in a global standard technical format.



XBRL based global standard information, high-quality curated knowledge, and a logic/reasoning/rules/ knowledge/insights engine with proper process control can significantly reduce system friction.

²⁵ Jane Gleeson-White, *Double Entry: How the Merchants of Venice Created Modern Finance*, <u>https://www.amazon.com/gp/product/B007Q6XKA8/</u>

²⁶ The Mathematics of Double Entry Bookkeeping, <u>http://xbrl.squarespace.com/journal/2019/11/4/the-mathematics-of-double-entry-bookkeeping.html</u>



The process of creating financial reports, auditing those reports, and analyzing report information can be completely rethought.



Such a system removes the repetitive, mechanical, mundane, even gruesome and grueling tasks and processes from the responsibility of humans freeing up accountants, auditors, and analysts to do what they do best: judgement, analysis, creativity, non-routine tasks, unstructured tasks, politics, compassion, innovation, improvising.

# Lean Six Sigma

Processes and tasks are controlled and quality is kept very high by using Lean Six Sigma principles, philosophies, and techniques. Lean Six Sigma²⁷ is a discipline that combines the problem-solving methodologies and quality enhancement techniques of Six Sigma²⁸ with the process improvement tools and efficiency concepts of Lean Manufacturing²⁹. Born in the manufacturing sector, Lean Six Sigma works to produce products and services in a way that meets consumer demand without creating wasted time, money and resources.

Specifically, Lean³⁰ is 'the purposeful elimination of wasteful activities.' It focuses on making process throughout your company faster, which effects production over a period of time. Six Sigma³¹ works to develop a measurable process that is nearly flawless in terms of defects, while improving quality and removing as much variation as possible from the system. For additional details, please refer to Lean Six Sigma³².

# PROOF

To demonstrate how to create an expert system for creating financial reports in this document I will primarily be using the PROOF³³ example of an XBRL-based financial report. Occasionally I might use other examples when they provide significantly enhanced information, but for continuity I will try to stick to the PROOF example as much as I can.

# Pacioli Verification of Proof

The following is the verification script that will run the complete verification set provided by the *Seattle Method* against the PROOF report using the Pacioli Power User Tool:

https://pacioli.auditchain.finance/tools/PowerUserTool.swinb

Verification Script to Run: (paste this into the tool)

²⁷ Wikipedia, Lean Six Sigma, <u>https://en.wikipedia.org/wiki/Lean Six Sigma</u>

²⁸ Wikipedia, Six Sigma, <u>https://en.wikipedia.org/wiki/Six_Sigma</u>

²⁹ Wikipedia, Lean Manufacturing, <u>https://en.wikipedia.org/wiki/Lean_manufacturing</u>

³⁰ YouTube.com, *Lean Six Sigma in 8 Minutes*, <u>https://youtu.be/s2HCrhNVfak</u>

³¹ YouTube.com, Six Sigma in 9 Minutes, <u>https://youtu.be/4EDYfSI-fmc</u>

³² Charles Hoffman, CPA, *Lean Six Sigma*,

http://www.xbrlsite.com/mastering/Part01_Chapter02.K_LeanSixSigma.pdf

³³ PROOF, <u>http://www.xbrlsite.com/seattlemethod/proof/documentation/index.html</u>

% Proof, all Verification, OK % checkReport3("http://www.xbrlsite.com/seattlemethod/proof/referenceimplementation/instance.xml", ['http://www.xbrlsite.com/seattlemethod/proof/fac/ReportingStyles/PROOF-BSC-IS01-CF1_schema.xsd', 'http://www.xbrlsite.com/seattlemethod/proof/type-subtype/type-subtype2.xsd', 'http://www.xbrlsite.com/seattlemethod/proof/type-subtype/type-subtype2.xsd', 'http://www.xbrlsite.com/seattlemethod/proof/disclosure-mechanics/disclosure-mechanics.xsd', 'http://www.xbrlsite.com/seattlemethod/proof/disclosure-mechanics/disclosure-mechanics.xsd', 'http://www.xbrlsite.com/seattlemethod/proof/reporting-checklist/reporting-checklist-rules-def.xml', 'http://www.xbrlsite.com/seattlemethod/proof/model-structure/ModelStructure-rules-strict-def.xml'], [newRulesFormat, saveToIPFS, extendedJSON, cacheValidity(3600)], Result, IPFSlink).

#### Result:

#### https://ipfs.infura.io/ipfs/QmThRvsiKiBMME3X9ECZcJWFDdZVDR3NptBsJvF4JQ9Uqm

As can be seen, the report is verified to be 100% valid per the set of rules that have been provided to the Pacioli logic/rules/reasoning/knowledge/insights engine.

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2	02-Net Assets	Structures	Facts	Pivots		
3	03-Income Statement	Structures	Facts	Pivots		
4	04-Income Statement (Alternative)	Structures	Facts	Pivots		
5	05-Comprehensive Income	Structures	Facts	Pivots		
6	06-Cash Flow	Structures	Facts	Pivots		
7	07-Prior Period Errors	Structures	Facts	Pivots		
8	08-Prior Period Errors (Alternative)	Structures	Facts	Pivots		
9	09-Changes in Equity	Structures	Facts	Pivots		
10	10-Policies	Structures	Facts	Pivots		
11	11-Variance Analysis	Structures	Facts	Pivots		
12	12-Segment Revenues	Structures	Facts	Pivots		
13	13-Stock Plan Activity	Structures	Facts	Pivots		
14	14-Financial Highlights	Structures	Facts	Pivots		
15	FAC-001-General Information	Structures	Facts	Pivots		
16	FAC-101-Balance Sheet, Classified	Structures	Facts	Pivots		
17	FAC-201-Income Statement 1	Structures	Facts	Pivots		
18	FAC-301-Comprehensive Income	Structures	Facts	Pivots		
19	FAC-401-Cash Flow Statement	Structures	Facts	Pivots		
20	FAC-701-Validation Results	Structures	Facts	Pivots		
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While the organization of the information per the Pacioli verification report are not necessarily optimal, the information is very useful in understanding how to construct an expert system for creating financial

reports. The full set of rules used to drive the report specification and creation can be obtained from the links above and reading other links referenced by those initial links.

# XBRL Cloud Verification of Proof

The following is a product offered by XBRL Cloud which is used to verify XBRL-based reports which they refer to as the Evidence Package³⁴:

Component Perspective Over	view Pe	erspective					
<ul> <li>All Components (14)</li> </ul>	*	Rendering					
01-Balance Sheet   Balance Sheet [Hypercube]	☑	Component: (Ne Network	etwork and Table) 01-Balance Sheet (http://www.xbrlsite.com/seattlemeth	od/report/role/Ba	alanceSheet)		
Rendering   Model Structure   Fact Table Business Rules   Combined		Table	Balance Sheet [Hypercube]				
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04-Income Statement (Alternative)   Comprehensive Income Statement		Noncurrent Assec	15	Assets	3,500 ¹	0 1	
Rendering   Model Structure   Fact Table Business Rules   Combined		Liabilities and E	Equity [Roll Up]				
		Liabilities [Roll	Up]				
05-Comprehensive Income   Comprehensive Income Statement		Current Liabilities	5		0	0	
[Hypercube]		Noncurrent Liabil	lities	and dates	0	0	
Rendering   Model Structure   Fact Table Business Rules   Combined				Liabilities	0	0	
06-Cash Flow   Cash Flow [Hypercube]		Equity [Roll Up	]				
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Business Rules   Combined		Equity Attributab	ie to Noncontrolling Interests	Equity	500	0	
07 Prior Pariod Errors   Prior Pariod				Equity	3,300	0	
Errors [Hypercube]			Liab	lities and Equity	3,500	0	
Rendering   Model Structure   Fact Table Business Rules   Combined		1: This is a test pa	arenthetical explanation.				
08-Prior Period Errors (Alternative)   Prior Period Errors [Hypercube]							
Rendering   Model Structure   Fact Table Business Rules   Combined							
09-Changes in Equity   Changes in Equity [Hypercube]							
Rendering   Model Structure   Fact Table Business Rules   Combined							
10-Policies   Policies [Hypercube]							
<u>Business Rules</u>   <u>Combined</u>							
11-Variance Analysis   Variance Analysis [Hypercube]	₹.		Copyright (c), 2012 - 20	21, XBRL Cloud,	Inc. All Rights Res	erved. <u>Terms of Use</u>	2

³⁴ XBRL Cloud Evidence Package for PROOF, <u>http://www.xbrlsite.com/site1/seattlemethod/proof/reference-implementation/evidence-package/</u>

### **Pesseract Verification of Proof**

Pesseract³⁵ is a working proof of concept that can be used to view and verify XBRL-based financial reports. Pesseract is an application that must be downloaded and installed (i.e. it is not a cloud based software application). If you need a license, please contact me and I will send you one.

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	11-Variance Analysis + Variance Ana	alvsis [Hypercube]	Noncorrent class	littes	Linkittine	U	0		FFM Rules	0
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			Equity Attributa	ble to Noncontrolling Inte	erests	500	0		Reporting Checklist	0
	Component Properties	^			Equity	3,500	0		To Do List	0
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# Luca Verification of Proof

Luca³⁶ is a cloud-based application for creating XBRL-based financial reports.

Luca Dashboard About	Financial Reporting Sc	hemes		🐹 0xaae	a1469155929FB360	1976e7715cD42dca0FF6e9	් Logout
Select report: PROOF Seattle Method	Toggle Filter						
+ Create new report	+ Add						
Enter report information		k ≑ StandardLabel	ReportElementName	Datatype	BalanceType	CalendarPeriodType	Actions
Base information	Hypercube proof	Balance Sheet [Hypercube]	BalanceSheetHypercube				
Terma	LineItems proof	Balance Sheet [Line Items]	BalanceSheetLineItems				
Terms	Abstract proof	Balance Sheet [Arithmetic]	BalanceSheetSet				
Labels	Concept proof	Assets	Assets	Monetary	Debit	Instant	
References	Concept proof	Liabilities	Liabilities	Monetary	Credit	Instant	
Structures	Concept proof	Equity	Equity	Monetary	Credit	Instant	
Associations	Hypercube proof	Comprehensive Income Statement [Hypercube]	ComprehensiveIncomeStatementHypercube				
Rules	LineItems proof	Comprehensive Income Statement [Line Items]	ComprehensiveIncomeStatementLineItems				
Facts	Abstract proof	Comprehensive Income [Roll Up]	ComprehensiveIncomeRollUp				
Generate report	Concept proof	Revenues	Revenues	Monetary	Credit	Duration	
	Per page 10 +		« ( <b>1</b> 2 3 4		where we	~~~~~^	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~

³⁵ Pesseract, <u>http://pesseract.azurewebsites.net/</u>

³⁶ Luca, <u>http://luca.yaxbrl.com/</u>

Luca does not yet have 100% support for the Seattle Method, but it is very close and helpful in understanding XBRL-based Financial Reports³⁷.

# **Expert System for Creating Financial Reports**

In this section I will explain each piece of the expert system for creating financial reports, the metadata that drives the expert system, the interaction of the pieces of the report, and other such information. I will try to stick to the interfaces of Pesseract³⁸ as much as possible but will add additional information to help explain the systems functionality.

The expert system is a combination of recommender systems³⁹, wizards, metadata, models, and other such software components. For additional information, please see to prior documents that I had previously created to explain these ideas: *Putting the Expertise into an XBRL-based Knowledge Based System for Creating Financial Reports*⁴⁰ (2017) which explains Pesseract and *Guide to Building an Expert System for Creating Financial Reports*⁴¹ (2018) which further builds on that first document.

In this document I will try and incorporate all relevant information from the prior two documents.

For the most comprehensive understanding of expert systems, I would strongly recommend that you read Frank Puppe's book *Systematic Introduction to Expert Systems*⁴². In particular, Part 1 the Introduction is extremely helpful.

Finally, special mention of CLIPS⁴³ is worth making. CLIPS was originally created by NASA but was then placed into the open source community. CLIPS has a lot of excellent ideas, in particular the notion of an agenda. It is worth reading through the CLIPS User Manual.

I will try and organize the examples in the most logical order that I can so that readers can understand how the application actually works. This will be way easier to explain when I can show you a real working version of this expert system for creating financial reports. That first version will likely be copied. Further creators will very likely improve upon the initial version over time.

 ⁴⁰ Putting the Expertise into an XBRL-based Knowledge Based System for Creating Financial Reports, <u>http://pesseract.azurewebsites.net/PuttingTheExpertiseIntoKnowledgeBasedSystem.pdf</u>
 ⁴¹ Building an Expert System for Creating Financial Reports,

³⁷ Cloud-based Luca, <u>http://xbrl.squarespace.com/journal/2021/8/31/cloud-based-luca.html</u>

³⁸ Pesseract, <u>http://pesseract.azurewebsites.net/</u>

³⁹ Recommender Systems, <u>http://xbrl.squarespace.com/journal/2021/9/19/recommender-systems.html</u>

http://xbrlsite.azurewebsites.net/2018/Library/GuideToBuildingAnExpertSystemForCreatingFinancialReports.pdf ⁴² Frank Puppe, *Systematic Introduction to Expert Systems*, <u>https://www.amazon.com/Systematic-Introduction-Expert-Systems-Representations/dp/3642779735</u>

⁴³ Using CLIPS to Understand Expert Systems and Logic Programming, <u>http://xbrl.squarespace.com/journal/2016/9/15/using-clips-to-understand-expert-systems-and-logic-programmi.html</u>

### Agenda

Similar to how CLIPS works, the expert system for creating financial reports is driven by an agenda. The agenda is driven by the reporting checklist rules (disclosure rules)⁴⁴. Viewing the reporting checklist rules in Pesseract you can see what information is included in the reporting checklist:

-	Arcrole	Order
V D Definition View		
🗸 🔷 Reporting Checklist		
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🗸 🕞 [FinancialReport]	http://www.xbrlsite.com/seattlemethod/conceptual-model/arcrole/class-equivalentClass	1
🕞 Balance Sheet	http://www.xbrlsite.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles	2
🕞 Assets Roll Up	http://www.xbrlsite.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles	3
🕞 Liabilities and Equity Roll Up	http://www.xbrlsite.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles	4
🕞 Assets Roll Forward	http://www.xbrlsite.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles	5
🕞 Basis of Reporting	http://www.xbrlsite.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles	6
🕞 Cash Flow Statement	http://www.xbrlsite.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/ar	7
Changes in Equity	http://www.xbrlsite.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/ar	8
🕞 Comprehensive Income	http://www.xbrlsite.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles	9
🕞 Financial Highlights	http://www.xbrlsite.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles	10
🕞 Income Statement Alternative	http://www.xbrlsite.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/ar	11
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🕞 Net Assets Roll Up	http://www.xbrlsite.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/ar	13
🕞 Net Cash Flow Roll Up	http://www.xbrlsite.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles	14
🕞 Prior Period Error	http://www.xbrlsite.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles	15
Prior Period Error Alternative	http://www.xbrlsite.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles	16
🕞 Revenue Recognition Policy	http://www.xbrlsite.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcro	17
🕞 Segment Revenues	http://www.xbrlsite.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectrum.com/seattlemethod/conceptual-model/drules-arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles	18
🚯 Stock Plan Activity	http://www.xbrlsite.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectives/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcr	19
Variance Analysis	http://www.xbrlsite.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosurespectives/arcroles/arcroles/arcrole/financialReport-requiresDisclosurespectives/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcrol	20
💽 Income Statement	http://www.xbrlsite.com/seattlemethod/conceptual-model/drules-arcroles/arcrole/financialReport-requiresDisclosure arcroles/arcroles/arcroles/arcrole/financialReport-requiresDisclosure arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcroles/arcrol	21

The reporting checklist is simply an XBRL definition linkbase that uses special arcroles to specify information about what is required to be provided within a financial report.

The terms reporting checklist and disclosure rules are used interchangeably.

While the PROOF reporting checklist is not that exciting because it only uses one arcrole which states that every mentioned disclosure is required, the US GAAP reporting checklist⁴⁵ uses the full spectrum of options that could exist within the reporting checklist:

- report-requiresDisclosure
- report-reportsConcept
- reportingLineItem-requiresDisclosure
- disclosure-allowedAlternativeDisclosure
- concept-allowedAlternativeConcept
- report-possibleDisclosure

⁴⁴ Reporting Checklist Rules, <u>http://www.xbrlsite.com/seattlemethod/proof/reporting-checklist/reporting-checklist-rules-def.xml</u>

⁴⁵ US GAAP Reporting Checklist (Prototype), <u>http://xbrlsite.azurewebsites.net/2020/reporting-scheme/us-gaap/reporting-checklist/reporting-checklist-rules-def.xml</u>

Note that reporting checklist rules are further explained in *Disclosure Rules (a.k.a. Reporting Checklist)*⁴⁶, please see that resource for further details.

The reporting checklist rules specify what is required to be reported within a financial report for a specific financial reporting scheme, for a specific reporting style, for a specific industry within a financial reporting scheme, etc. Individual organizations could have policies for what is disclosed which can be recorded using this machine readable checklist. Combinations of reporting checklists can be used, leveraging XBRL's extensibility capabilities.

And so this is what the agenda would look like for the PROOF report before any information has been entered into the report⁴⁷:

Disclosure	Explanation	Add		
Balance Sheet	Disclosure always required	1		
Assets Roll Up	Disclosure always required	1	100	
⊥iabilities and Equity     Roll Up	Disclosure always required	1	12	
Assets Roll Forward	Disclosure always required	1	1	
Basis of Reporting	Disclosure always required	7		
	t Disclosure always required	1	R	
Changes in Equity	Disclosure always required	7		
	Disclosure always required	7	R	
⊕ Financial Highlights	Disclosure always required	7		
Income Statement Alternative	Disclosure always required	7		
	s Disclosure always required	7	18	
	Disclosure always required	1	10	
Net Cash Flow Roll L	Jp Disclosure always required	1	6	
Prior Period Error     Erro	Disclosure always required	1	R	
■ Prior Period Error Alternative	Disclosure always required	7	1	
∃ Revenue Recognitio Policy	n Disclosure always required	1		
<u>∃</u> Segment Revenues	Disclosure always required	7		
	Disclosure always required	1	10	
Variance Analysis	Disclosure always required	1	12	
∃ Income Statement	Disclosure always required	1	10	

⁴⁶ Disclosure Rules (a.k.a. Reporting Checklist),

http://www.xbrlsite.com/mastering/Part02_Chapter05.N_DisclosureRules.pdf

⁴⁷ Empty Report, <u>http://xbrlsite.com/seattlemethod/pictures/072-Agenda.jpg</u>

Note that there is a one-to-one correlation between the reporting checklist and the agenda. This is because the XBRL definition relations drive both the reporting checklist rules and the agenda. By way of contrast, this is what the agenda looks like after the financial report has been completed⁴⁸:



Above, the agenda is EMPTY because each required disclosure within the report which was specified within the reporting checklist has been created and exists within the report and therefore the agenda is empty.

The entire process of creating each piece of a report is shown in this report creation example⁴⁹. The graphic below⁵⁰ shows that four pieces of the report have been created (Assets [Roll Up], Liabilities and

⁴⁸ Completed Report, <u>http://xbrlsite.com/seattlemethod/pictures/090-Agenda.jpg</u>

⁴⁹ Report Creation Example, <u>http://xbrlsite.com/seattlemethod/pictures/Index.html</u>

⁵⁰ Partially completed agenda, <u>http://xbrlsite.com/seattlemethod/pictures/076-Agenda.jpg</u>

Equity [Roll Up], Net Assets [Roll Up], and Comprehensive Income [Roll Up]) and that 15 additional fragments of the report are still as of yet to be created:

🖮 🔛 🔊 🕙 = 🎂 = =	Instan	ce (instance_dr-ForChris.xml) - Pes	seract			-	۰
Home Options and Preferences Tools View Knowledge	Base Debugging Windows Help						
Tarted New Open Save	RL Syntax Disclosure Reporting To Do Mechanics - Checklist - List - Report Validation Status 17	eferenced wonomies es Application Mode					
Jactanes Asstance & Facilities and Y Transmission and David	Distance Mathematic Validation Date	h Deserves the distance		T Annoda			
Instance (instance_or-Porchins.xm)  Iaxonomy (report.xso) Uisdo	Ure Mechanics Taxonomy Disclosure Mechanics validation Resu	It Reporting Checkist Taxon	omy Reporting Checkist Validation Result	Agenda			Υ. ·
BIOCKS (4)	Component (Network and Table)	Business Rules Structure	Business Rules validation Results Elements	Enter text to filter		-	
Network View     O Component View     O Block View	Network 03 - Unknown - Income Statement						
The Two	Table Comprehensive Income Statement [Hy	percube]		Disclosure	Explanation	Adi	dd
Filter Type Filter Level Filter Status	Reporting Entity [Axis]	GH259400TOMPUOLS6511 http://	standards.iso.org/iso/17442	Assets Roll Forward	Disclosure always required	1	8
Enter tout to filter	Line [Asia]			Basis of Reporting	Disclosure always required	7	
Lander text to inter	Unit (Adds)			Cash Flow Statement	Disclosure always required	7	
Assets [Roll Up]		Period [Axis] 🛛 👻		Changes in Equity	Disclosure always required	7	-
Liabilities and Equity [Roll Up]	Comprehensive Income Statement [Line Items]	2020-01-01/2020-12-31	2019-01-01/2019-12-31	Comprehensive	Disdosure always required	7	-
Net Assets [Roll Up]	Comprehensive Income [Roll Up]			Financial Highlights	Disclosure always required	7	-
Comprehensive Income [Roll Up]	Revenues	7,000	0	Income Statement	Disclosure always required	1	100
	(Expenses)	(3,000)	0	Alternative	bibliobare anayorequired	1	
	Gains	1,000	0	Nature of Operations	Disclosure always required	1	
	(Losses)	(2,000)	0		Disclosure always required	2	10
	Net Income	3,000	0	Prior Period Error	Disclosure always required	2	1
				Prior Period Error     Alternative	Disdosure always required	7	
				Revenue Recognition Policy	Disclosure always required	7	0
				Segment Revenues	Disclosure always required	7	
				Stock Plan Activity	Disclosure always required	1	
				Variance Analysis	Disclosure always required	7	-
Block Properties A Component O3-Income Statement   Component Comprehense France Statement   Component Patts Ralup  Hender Aggregation Patte  Label  Confidence Hold   Confidence  Hold   Confidence  Hold   Catematic Statement  Catematic Statematic Statement  Catematic Statematic Statematic Statement  Catematic Statematic State							

Note that Pacioli shows an additional and useful piece of information for each completed fragment of a financial report:

$\sim$	today mun	structures	~ <b>Fâ\</b>	, wots
7	07-Prior Period Errors	Structures	Facts	Pivots
8	08-Prior Period Errors (Alternative)	Structures	Facts	Pivots
9	09-Changes in Equity	Structures	Facts	Pivots
10	10-Policies	Structures	Facts	Pivots
11	11-Variance Analysis	Structures	Facts	Pivots
12	12-Segment Revenues	Structures	Facts	Pivots
13	13-Stock Plan Activity	Structures	Facts	Pivots
47			$\bigtriangledown$	Lind

Above, in this case the GREEN bar shows that the report fragment has been completed and that the verification of the mathematical computations and all other verification tasks have been completed satisfactory. Because the "Policies" and "Stock Activity Plan" have no mathematical computations, the bars shown are BLACK. Had an error existed within a fragment of the report that had been created, a YELLOW or ORANGE or RED bar might be shown to indicate various different types of issues that might exist. This information relates to the project management features of the expert system is providing to

the creator of the financial report. An implementation of this feature in Pesseract might look something like the following:

Blocks (18)		R					
O Network View	O Component View	Block View					
Filter Type	Filter Level	▼ Filter Status ▼					
Enter text to filter   Clear							
Assets [Roll Up]							
Liabilities and Equity [Rol	Up]						
Net Assets [Roll Up]							
Comprehensive Income [	Roll Up]						
Comprehensive Income [	Roll Up]						
Comprehensive Income [	Roll Up]						
Assets Roll Forward [Roll	Up] [Roll Forward]						
Net Cash Flow [Roll Up]							
Prior Period Errors [Adjus	stment]						
Prior Period Errors [Adjus	stment] [Hierarchy]						
Changes in Equity [Roll F	orward]						
Basis of Reporting [Text	Block]						
Nature of Operations [Te	ext Block]						
Revenue Recognition Pol	icy [Text Block]						
Variance Analysis [Roll U	p]						
Segment Revenues [Set]	[Hierarchy]						
Weighted Average Grant	Date Fair Value [Roll Fo	orward Info]					
Financial Highlights [Set]	[Hierarchy]						
Block Properties		A 4					
Component	01-Balan	nce Sheet   Balance Sheet					
Abstract	Balance	Balance Sheet [Line Items]					
Concept Arrang	ement Patte RollUp						
Member Aggreg	ation Patte						
Name	proof:As	ssetsRollUp					
Label	Assets [	Roll Up]					
Confidence	disclosur	es:AssetsRollUp					
Status	HIGH						
Status	InProgre	2SS 👻					

Note that from the above information the user of the software can understand each fragment of the report, in the above each Block of information, is free from error. If, for example, the "Net Assets [Roll Up]" was showing as BLACK, that would mean that the rules for the roll up were missing from the report.

Note that Pacioli provides a Reporting Checklist report⁵¹. A problem with that report is that it is a flat list of the rules rather than a hierarchy. While the PROOF reporting checklist looks flat, generally reporting checklists are hierarchical. The US GAAP Reporting Checklist is a better representation of what a reporting checklist would tend to look like.

### **Identifying Disclosures**

Accountants understand and work with the disclosures of a report. Effectively, a financial report is a series of disclosures organized within a sequence.

When I use the term "disclosure" I am referring to the collection of disclosures represented within the notes, policies, and each of the primary financial statements. Accountants have specific terminology and differentiate between information that is "presented" in the primary financial statements and that which is "disclosed" in the notes. Further, supplemental information that is not considered part of the notes is also covered by the term "disclosure" as I am using the term. Perhaps there might be some different better term that "disclosure" such as "logical disclosure" or something, but for now I am using the term "disclosure" and this paragraph explains how that term is defined.

Another important thing to understand is that there are several different approaches that could be used to organize disclosures within an XBRL-based financial report. One organization mechanism⁵² which is many times required to be in a specific way but also can be used in arbitrary ways is the XBRL Network. Because Network use can be arbitrary, a disclosure could be contained in different networks almost arbitrarily. Another organization mechanism is the XBRL Dimensions Hypercube (a.k.a. Table). Like Networks, Hypercubes must sometimes be used in specific ways and at other times Hypercube use can be arbitrary. The final organization mechanism is what I refer to as the information block or simply Block. A Block is never arbitrary. A Block is a logical artifact that is always represented using specific physical technical syntax. A Block is simply a logical pattern that, by definition, can always be mapped to a Disclosure.

For more information on Networks and Hypercubes please see *Representing Structures*⁵³. For more information related to Blocks, please see *Structures*⁵⁴.

Finally, while it is theoretically possible to provide a one-to-one correlation between a Network and a Disclosure; this is not done in practice in the US GAAP XBRL Taxonomy, the IFRS XBRL Taxonomy, or XBRLbased financial reports. While it is theoretically possible to provide a one-to-one correlation between a Hypercube and a Disclosure; and while this can be a very practical approach; this approach is also not used by the US GAAP XBRL Taxonomy, the IFRS XBRL Taxonomy, or in SEC or ESMA financial reports. Further, both the US GAAP and IFRS XBRL Taxonomies represent disclosures using the exact same Hypercube, such as "us-gaap:StatementTable" and therefore that approach cannot be used to create such a one-to-one correlation between Hypercubes and Disclosures. Further, both the US GAAP XBRL Taxonomy and IFRS XBRL Taxonomy violate a fundamental best practice recommended by XBRL International related to

⁵¹ Pacioli Reporting Checklist report,

https://bafybeicptuxhaahe7lt6sok7ibztzdtfkrymfmfijyzurbto67dgighx5a.ipfs.infura-ipfs.io/disclosureChecks.html ⁵² See Essentials of XBRL-based Digital Financial Reporting for a thorough discussion,

http://xbrlsite.azurewebsites.net/2021/essentials/EssentialsOfXBRLBasedDigitalFinancialReporting.pdf ⁵³ Representing Structures,

http://www.xbrlsite.com/mastering/Part02_Chapter05.H_RepresentingStructuresUsingHypercubes.pdf

⁵⁴ Structures, <u>http://www.xbrlsite.com/mastering/Part02</u> Chapter05.E Structures.pdf

mixing dimensional models⁵⁵. As such, there are disclosures contained in both the US GAAP and IFRS XBRL Taxonomies that are not associational with any Hypercube.

And so this begs the question, "If you cannot identify Disclosures using Networks or Hypercubes; then how exactly do you (a) uniquely identify disclosures and (b) provide a one-to-one correlation between that object and the disclosure.

The answer to this question is to use Blocks and Prototype Theory.

#### **Prototype Theory**

Prototype theory is described in detail within Structures section 3.1056. In summary, there are two approaches to identify something. The first approach is to use a unique identifier that is guaranteed to be unique to some set of objects. This approach works great if the objects you are working with provide unique identifiers. What do you do if you don't have unique identifiers within the set of objects you are working with? The second approach to identifying something is prototype theory. According to prototype theory, objects can be defined by their resemblance to a unique prototype that is a best or most typical example of the essence of the object, sharing the maximum number of features or traits with that prototype. A prototype consists of characteristic features.

#### **Disclosure Mechanics Rules**

Disclosure mechanics⁵⁷ rules provide the necessary information that allows software to (a) describe the essence of a specific disclosure basically providing a logical schema for a disclosure in machine readable form, (b) use that machine readable essence, ala prototype theory, to discover the information Block that is used to represent that Disclosure and, (c) verify that the representation of that Disclosure is consistent with the logical schema.

The Disclosures for the PROOF⁵⁸ can help you understand how all this works. First, Disclosures are defined in the form of the elements within an XBRL taxonomy schema⁵⁹. Then, disclosure mechanics rules are created for each disclosure using XBRL definition relations and a specific set of arcroles that represent logical characteristics that make up the essence of each Disclosure and the XBRL definition relations are hooked together within an XBRL taxonomy schema⁶⁰.

The PROOF disclosure mechanics rules are pretty small, easy to understand, and don't really represent what the disclosure rules can do. A better example to explain these disclosure mechanics rules is the US

http://xbrl.squarespace.com/journal/2015/3/31/xbrl-international-guidance-clarifies-xbrl-dimensions-semant.html ⁵⁶ Structures, Section 3.10, *Prototype Theory*,

topics/disclosures.xsd

⁵⁵ XBRL International Guidance Clarifies XBRL Dimensions Semantics,

http://www.xbrlsite.com/mastering/Part02_Chapter05.E_Structures.pdf

⁵⁷ Disclosure Mechanics, <u>http://www.xbrlsite.com/mastering/Part02_Chapter05.M_DisclosureMechnics.pdf</u>

 ⁵⁸ PROOF, Disclosures, <u>http://www.xbrlsite.com/seattlemethod/proof/documentation/Disclosures.html</u>
 ⁵⁹ Disclosures, XBRL Taxonomy Schema, <u>http://www.xbrlsite.com/seattlemethod/proof/disclosures-</u>

⁶⁰ Disclosure Mechanics Rules, XBRL Taxonomy Schema, <u>http://www.xbrlsite.com/seattlemethod/proof/disclosure-mechanics/disclosure-mechanics.xsd</u>

GAAP XBRL Taxonomy disclosure rules. Here is an example for the Disclosure "Inventory, Net (Current) [Roll Up]"⁶¹:

Natural language:

Rules for disclosure: disclosures:InventoryNetRollUp
Inis disclosure:
- MUST be represented as the Concept Arrangement Pattern: cm:RollUp
- cm:RollUp REQUIRES total concept: us-gaap:InventoryNet
- OR alternative total concept: us-gaap:InventoryNetOfAllowancesCustomerAdvancesAndProgressBillings
- OR alternative total concept: us-gaap:PublicUtilitiesInventory
<ul> <li>OR alternative total concept: us-gaap:AirlineRelatedInventory</li> </ul>
<ul> <li>OR alternative total concept: us-gaap:RetailRelatedInventory</li> </ul>
<ul> <li>OR alternative total concept: us-gaap:EnergyRelatedInventory</li> </ul>
<ul> <li>OR alternative total concept: us-gaap:AgriculturalRelatedInventory</li> </ul>
- MUST be represented as using the Level 3 Disclosure [Text Block]: us-gaap:ScheduleOfInventoryCurrentTableTextBlock
<ul> <li>OR alternative Level 3 Disclosure [Text Block]: us-gaap:ScheduleOfUtilityInventoryTextBlock</li> </ul>
- REQUIRES the policy to be reported using the Level 2 Policy Text Block concept: us-gaap:InventoryPolicyTextBlock
- OR alternative Level 2 Policy Text Block concept: us-gaap:InventoryMajorClassesPolicy
<ul> <li>OR alternative Level 2 Policy Text Block concept: us-gaap:InventorySuppliesPolicy</li> </ul>
- OR alternative Level 2 Policy Text Block concept: us-gaap:InventoryWorkInProcessPolicy
- OR alternative Level 2 Policy Text Block concept: us-gaap:InventoryFinishedGoodsPolicy
- REQUIRES the note to be reported using the Level 1 Note Text Block concept: us-gaap:InventoryDisclosureTextBlock

Here are the 20 Disclosures that are represented in the PROOF example:

Prim	Primary Information									
#		Disclosure	Category	Level	Pattern	Disclosure	Disclosure	Applicable	Representation Concept [TEXT BLOCK]	Representation Concept DETAIL
±	1	Assets Roll Forward	Unknown	Level4Detail	RollForward	True	CONSISTENT	True	NOT-EXPECTED	Assets
	2	Assets Roll Up	Unknown	Level4Detail	RollUp	True	CONSISTENT	True	NOT-EXPECTED	Assets
	Rule	es Line of Reasoning								
	This o	disclosure: disclosures:AssetsRollUp								
	- MUS	ST be represented using the Hyperc	ube/[Table] nam	ed: proof:BalanceShe	eetHypercube					
	- MUS	ST be represented as a Level 4 Dis	sclosure Detai	with the concept arr	angement patter	n: cm:RollUp				
	- C	m:RollUp REQUIRES total: proof:As	sets							
±	3	Balance Sheet	Unknown	UNKNOWN	Component	True	CONSISTENT	True	-	-
±	4	Basis of Reporting	Unknown	Level 1TextBlock	TextBlock	True	CONSISTENT	True	Basis of Reporting [Text Block]	NOT-EXPECTED
±	5	Cash Flow Statement	Unknown	UNKNOWN	Component	True	CONSISTENT	True	-	-
±	6	Changes in Equity	Unknown	Level4Detail	RollForward	True	CONSISTENT	True	NOT-EXPECTED	Equity
±	7	Comprehensive Income	Unknown	Level4Detail	RollUp	True	CONSISTENT	True	NOT-EXPECTED	Comprehensive Income
±	8	Financial Highlights	Unknown	Level4Detail	Hierarchy	True	CONSISTENT	True	NOT-EXPECTED	Revenues
±	9	Income Statement	Unknown	Level4Detail	RollUp	True	CONSISTENT	True	NOT-EXPECTED	Net Income
±	10	Income Statement Alternative	Unknown	Level4Detail	RollUp	True	CONSISTENT	True	NOT-EXPECTED	Net Income
±	11	Liabilities and Equity Roll Up	Unknown	Level4Detail	RollUp	True	CONSISTENT	True	NOT-EXPECTED	Liabilities and Equity
±	12	Nature of Operations	Unknown	Level 1TextBlock	TextBlock	True	CONSISTENT	True	Nature of Operations [Text Block]	NOT-EXPECTED
±	13	Net Assets Roll Up	Unknown	Level4Detail	RollUp	True	CONSISTENT	True	NOT-EXPECTED	Net Assets
±	14	Net Cash Flow Roll Up	Unknown	Level4Detail	RollUp	True	CONSISTENT	True	NOT-EXPECTED	Net Cash Flow
÷	15	Prior Period Error	Unknown	Level4Detail	Adjustment	True	CONSISTENT	True	NOT-EXPECTED	Equity
±	16	Prior Period Error Alternative	Unknown	Level4Detail	Hierarchy	True	CONSISTENT	True	NOT-EXPECTED	Equity
÷	17	Revenue Recognition Policy	Unknown	Level 1TextBlock	TextBlock	True	CONSISTENT	True	Revenue Recognition Policy [Text Block]	NOT-EXPECTED
±	18	Segment Revenues	Unknown	Level4Detail	Hierarchy	True	CONSISTENT	True	NOT-EXPECTED	Revenues
±	19	Stock Plan Activity	Unknown	Level4Detail	RollForwar	True	CONSISTENT	True	NOT-EXPECTED	Nonvested Fair Value
Ŧ	20	Variance Analysis	Unknown	Level4Detail	RollUp	True	CONSISTENT	True	NOT-EXPECTED	Net Income

Notice the "Rule" and the "Line of Reasoning" for the Assets Roll Up Disclosure. That same information exists for each Disclosure. You cannot see the Line of Reasoning above, so we show that below:

⁶¹ US GAAP, Inventory, Net (Current) [Roll Up], <u>http://xbrlsite.azurewebsites.net/2020/reporting-scheme/us-gaap/disclosures-topics/disclosures-detail/Disclosure-517.html</u>

Rules	Line of Reasoning	
####D	sclosure mechanics validation explanation for disclosure: disclosures:AssetsRollUp####	-
Level 4	Disclosure Detail	
Looki	g for blocks with concept arrangement pattern: RollUp	
Looki	g for Hypercube/[Table]: proof:BalanceSheetHypercube	
*FOU	ND Hypercube/[Table]: proof:BalanceSheetHypercube in network:	
Looki	g for Concept: proof:Assets	
*FOU	ND Concept: proof:Assets in network:	
Conc	pt located in network: 01-Balance Sheet	
CONCL	ISION	
Disclo	sure found in report: True	
Disclo	sure mechanics are CONSISTENT because the Level 4 Disclosure Detail concept was FOUND.	
####	ND of disclosure mechanics validation explanation for this disclosure ####	

The Line of Reasoning is provided by the logic/rules/reasoning/knowledge/insights engine and can help the application user understand why a Disclosure was discovered or why it was not discovered. This is useful for debugging disclosure mechanics rules as they are being created and debugging reports to make them properly functioning financial reports.

If you go back to the financial report in Pesseract you can see that every information Block has been identified as being a specific Disclosure. This is how the Agenda works. The reporting checklist specifies what disclosures need to exist in the report and the disclosure mechanics rules is used to find the actual disclosure in the report.

Blocks (18)	Rendering	Model Structure	Fact Table	Business Rules Structure	Business Rules Validation Results
	Component: (Netwo	rk and Table)	- Chard		
	Table	Balance Sheet [Hypercu	hel		
Filter Type 🔹 Filter Level 🔹 Filter Status 🔹	Таріс	bulance oncer [riyperca	bej		
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Enter text to filter   Clear	Unit [Axis]		(	USD	Ŷ
Assets [Roll Up]			P	Period [Axis] 🛛 🗸	
Liabilities and Equity [Roll Up]	Balance Sheet [Line It	tems]		2020-12-31	2019-12-31
Net Assets [Roll Up]	Assets [Roll Up]				
Comprehensive Income [Roll Up]	Current Assets			500	0
Comprehensive Income [Roll Up]	Noncurrent Assets			3 000	0
Comprehensive Income [Roll Up]			Assets	3,000	0
Assets Roll Forward [Roll Up] [Roll Forward]				3,500	U
Net Cash Flow [Roll Up]					
Prior Period Errors [Adjustment]					
Prior Period Errors [Adjustment] [Hierarchy]					
Changes in Equity [Roll Forward]					
Basis of Reporting [Text Block]					
Nature of Operations [Text Block]					
Revenue Recognition Policy [Text Block]					
Variance Analysis [Roll Up]					
Segment Revenues [Set] [Hierarchy]					
Weighted Average Grant Date Fair Value [Roll Forward Info]					
Financial Highlights [Set] [Hierarchy]					
Block Properties					
Component 01-Balance Sheet   Balance Sheet					
Abstract Balance Sheet [] ine Items]					
Concept Arrangement Patt Rollup					
Member Aggregation Patte					
Name proof:AssetsRollUp					
Label Assets [Roll Up]					
Disclosure disclosures:AssetsRollUp					
Contidence HIGH					
Status InProgress -					

Pacioli provides another approach to viewing this information⁶²:

#	Network	Hypercube	Block	Disclosures
1	01-Balance Sheet	Balance Sheet [Hypercube]	Assets [RollUp]	disclosures:AssetsRollUp, disclosures:BalanceSheet
2	01-Balance Sheet	Balance Sheet [Hypercube]	Liabilities and Equity [RollUp]	disclosures:BalanceSheet, disclosures:LiabilitiesAndEquityRollUp
3	02-Net Assets	Net Assets [Hypercube]	Net Assets [RollUp]	disclosures:NetAssetsRollUp
4	03-Income Statement	Comprehensive Income Statement [Hypercube]	Net Income [RollUp]	disclosures:IncomeStatement
5	04-Income Statement (Alternative)	Comprehensive Income Statement [Hypercube]	Net Income [RollUp]	disclosures:IncomeStatement, disclosures:IncomeStatementAlternative
6	05-Comprehensive Income	Comprehensive Income Statement [Hypercube]	Comprehensive Income [RollUp]	disclosures:ComprehensiveIncome
7	06-Cash Flow	Cash Flow [Hypercube]	Net Cash Flow [RollUp]	disclosures:CashFlowStatement, disclosures:NetCashFlowRollUp
8	06-Cash Flow	Cash Flow [Hypercube]	Assets, Beginning Balance [RollForward]	disclosures:AssetsRollForward, disclosures:CashFlowStatement
9	07-Prior Period Errors	Prior Period Errors [Hypercube]	Equity, Origionally Stated [Adjustment]	disclosures:PriorPeriodError
10	08-Prior Period Errors (Alternative)	Prior Period Errors [Hypercube]	Prior Period Errors [Adjustment] [Hierarchy]	disclosures: PriorPeriodErrorAlternative
11	09-Changes in Equity	Changes in Equity [Hypercube]	Equity, Beginning Balance [RollForward]	disclosures:ChangesInEquity
12	10-Policies	Policies [Hypercube]	Basis of Reporting [Text Block] [Level1TextBlock]	disclosures:BasisOfReporting
13	10-Policies	Policies [Hypercube]	Nature of Operations [Text Block] [Level1TextBlock]	disclosures:NatureOfOperations
14	10-Policies	Policies [Hypercube]	Revenue Recognition Policy [Text Block] [Level1TextBlock]	disclosures:RevenueRecognitionPolicy
15	11-Variance Analysis	Variance Analysis [Hypercube]	Net Income [RollUp]	disclosures:VarianceAnalysis
16	12-Segment Revenues	Segment Revenues [Hypercube]	Segment Revenues [Set] [Hierarchy]	disclosures:SegmentRevenues
17	13-Stock Plan Activity	Weighted Average Grant Date Fair Value [Hypercube]	Nonvested Fair Value, Beginning Balance [RollForwardInfo]	disclosures:StockPlanActivity
18	14-Financial Highlights	Financial Highlights [Hypercube]	Financial Highlights [Set] [Hierarchy]	disclosures:FinancialHighlights

Pacioli's organization is not optimal because it combines some Disclosures together in the same cell. What would be better is a completely new report that provides a list of actual Disclosures rather than grouping the Disclosures as they are shown above. The Disclosures Mechanics list⁶³ provides that information, but no way to navigate to the actual Disclosure. But Pacioli also provides an interesting Blocks Graph view which shows the logical relationships between the information Blocks⁶⁴:



⁶² Pacioli Blocks report, <u>https://bafybeicptuxhaahe7lt6sok7ibztzdtfkrymfmfijyzurbto67dgighx5a.ipfs.infura-ipfs.io/blocks.html</u>

⁶³ Pacioli Disclosure Mechanics list,

https://bafybeicptuxhaahe7lt6sok7ibztzdtfkrymfmfijyzurbto67dgighx5a.ipfs.infura-ipfs.io/disclosures.html ⁶⁴ Pacioli Blocks Graph report, <u>https://bafybeicptuxhaahe7lt6sok7ibztzdtfkrymfmfijyzurbto67dgighx5a.ipfs.infura-ipfs.io/blocksGraph.html</u>

This graph view could very likely be better organized to help understand the report information, navigate to the different Blocks that make up a financial report, and other such things.

The Pacioli view of the Blocks helps you see an improvement that could be made to the Pesseract software application. See the screen shot of the user interface used to review the report fragments of the financial statement. Imagine the addition of another radio button at the top of the form that would provide the "Disclosure View" of the report:

Blocks (18)	Rendering	Model Structure	Fact Table	Business Rules Structure	Business Rules Validation Results
	Component: (Netwo	rk and Table)	-		
O Network view O Component view O Block view	Network	01 - Unknown - Balance	Sheet		
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Assets [Roll Up]			Pe	riod [Axis] 🛛 🔻	
Liabilities and Equity [Roll Up]	Balance Sheet [Line It	tems]		2020-12-31	2019-12-31
Net Assets [Roll Up]	Assets [Roll Up]				
Comprehensive Income [Roll Up]	Current Assets			500	0
Comprehensive Income [Roll Up]	Noncurrent Assets			3 000	0
Comprehensive Income [Roll Up]			Assets	5,000	0
Assets Roll Forward [Roll Up] [Roll Forward]				3,500 -	U -
Net Cash Flow [Roll Up]					
Prior Period Errors [Adjustment]					
Prior Period Errors [Adjustment] [Hierarchy]					
Changes in Equity [Roll Forward]					
Basis of Reporting [Text Block]					
Nature of Operations [Text Block]					
Revenue Recognition Policy [Text Block]					
Variance Analysis [Roll Up]					
Segment Revenues [Set] [Hierarchy]					
Weighted Average Grant Date Fair Value [Roll Forward Info]					
Financial Highlights [Set] [Hierarchy]					
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Label Assets [Roll Up]					
Disclosure disclosures:AssetsRollUp					
Contidence HIGH					
Status InProgress -					

Adding that Disclosure view would provide a complete set of views of a financial report: by Network, by Network + Hypercube (called Component), by Block, and now by Disclosure.

NOTE: Notice that there are 18 information Blocks and 20 Disclosures. That is because there are two disclosures, the "Balance Sheet" and the "Cash Flow Statement" that are Disclosures that have no Blocks of their own, rather they are made up of other Blocks. The Balance Sheet is made up of the two Blocks, Assets [Roll Up] and Liabilities and Equity [Roll Up]. The Cash Flow Statement is made up of the "Net Cash Flow [Roll Up] and the Assets [Roll Forward].

The following is a summary of the disclosures within the Microsoft 10-K for 2017⁶⁵ that were identified and verified using US GAAP disclosure mechanics rules:

⁶⁵ Disclosure Mechanics Verification Results, <u>http://xbrlsite.azurewebsites.net/2022/Library/DisclosureMechanics_Microsoft.jpg</u>

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	<ul> <li>Bernsteinsteinsteinsteinsteinsteinsteinstei</li></ul>							seen.chiefail and for a service of the formation of the service and for a service of the formation of the service and formation of the service of the service of the service and formation of the service of the service of the service and formation of the service of the service of the service and formation of the service of the service and formation of the service of the service and formation of the service and forma	
	<ul> <li>Bernschlichster Mith</li> <li>Bernschlichster Mith</li></ul>								
	<ul> <li>Bernschland (Park)</li> <li>Bernschland (Park</li></ul>							seven control of contr	
	<ul> <li>Bernstein Schlerich</li> <li>Bernstein Schlerich&lt;</li></ul>							see.es.es.es.es.es.es.es.es.es.es.es.es.	
	<ul> <li>Bernsteinsteinsteinsteinsteinsteinsteinstei</li></ul>							series of a second seco	

#### US GAAP related Disclosure Rule:

_	
	Rules Line of Reasoning
ſ	This disclosure: disclosures:InventoryNetRollUp
I	- MUST be represented by a network with the SEC Category: cm:DisclosureType
ľ	- MUST be represented as a Level 4 Disclosure Detail with the concept arrangement pattern: cm:RollUp
	- cm:RollUp REQUIRES total: us-gaap:InventoryNet
ſ	- Or by the allowed alternative concept: us-gaap:InventoryNetOfAllowancesCustomerAdvancesAndProgressBillings
	- Or by the allowed alternative concept: us-gaap:PublicUtilitiesInventory
ľ	- 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
ľ	- Or by the allowed alternative concept: us-gaap:ScheduleOfUtilityInventoryTextBlock
ſ	- 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
ſ	- Requires the note to be reported using the Level 1 Note Text Block: us-gaap:InventoryDisclosureTextBlock

#### US GAAP related Line of Reasoning:

Rules Line of Reasoning	
#### Disclosure mechanics validation explanation for disclosure: disclosures:InventoryNetRollUp ####	
Level 4 Disclosure Detail	
Looking in networks with SEC Category: Disdosure	
Looking for blocks with concept arrangement pattern: RollUp	
Looking for Concept: us-gaap:InventoryNet	
*FOUND Concept: us-gaap:InventoryNet in network:	
Concept located in network: 100710 - Disclosure - Components of Inventories (Detail)	
Level 3 Disclosure Text Block	
Looking in networks with SEC Category: Disclosure	
Looking for Level 3 Disclosure Text Block: us-gaap:ScheduleOfInventoryCurrentTableTextBlock	
*FOUND Level 3 Disclosure Text Block: us-gaap:ScheduleOfInventoryCurrentTableTextBlock in network:	
Text block located in network: 100370 - Disclosure - INVENTORIES (Tables)	
Level 2 Policy Text Block	
Looking in networks with SEC Category: Disdosure	
Looking for Level 2 policy text block: us-gaap:InventoryPolicyTextBlock	
*FOUND Level 2 policy text block: us-gaap:InventoryPolicyTextBlock in network:	
Text block located in network: 100300 - Disclosure - ACCOUNTING POLICIES (Policies)	
Level 1 Note Text Block	
Looking in networks with SEC Category: Disclosure	
Looking for Level 1 note text block: us-gaap:InventoryDisclosureTextBlock	
*FOUND Level 1 note text block: us-gaap:InventoryDisclosureTextBlock in network:	
Text block located in network: 100140 - Disclosure - INVENTORIES	
CONCLUSION	
Disclosure found in report: True	
Disclosure mechanics are CONSISTENT because both the Level 3 Disclosure Text Block and Level 4 Disclosure Detail concepts were h	FOUND.
#### END of disclosure mechanics validation explanation for this disclosure ####	

### Viewing Disclosures (Report Fragments)

The graphic below shows the Components view of the report fragments (remembering that a Component is a Network PLUS a Hypercube). Note that if the Component is expanded you see the Blocks that make up the Component. Below you see that the "Balance Sheet <> Balance Sheet [Hypercube]" is made up of two information Blocks, "Assets [Roll Up]" and "Liabilities and Equity [Roll Up]". If you were to click on either of the Blocks the view in the right pane would be changed to show only that Block in the rendering view⁶⁶.

Components (14)		4	Rendering	Model Structure	Fact Table		Business Rules Structure	Business Rules Validation Results	Elements
			Component: (Netwo	rk and Table)	-				
INEtwork view     Compone	Block view		Network	01 - Unknown -Balar	ice Sheet				
Filter Type 🔻 Filter Level	▼ Filter Status	-	Table	Balance Sheet [Hyper	cubej				
			Reporting Entity [Axis]			GH2594	100TOMPUOLS65II http://s	tandards.iso.org/iso/17442	٢
Enter text to filter	▼ Clear		Unit [Axis]			USD			Ŷ
01-Balance Sheet      Balance Sheet	[Hypercube]					Period [	Axis] 👻		
Assets [Roll Up]			Balance Sheet [Line It	ems]			2020-12-31	2019-12-31	
Liabilities and Equity [Roll Up]			Assets [Roll Up]						
1 02-Net Assets   Net Assets [Hyper]	cube]		Current Assets				500	0	
⊕ 03-Income Statement ◆ Comprehen	nsive Income Statement [Hypercube]		Noncurrent Assets				2 000	0	
04-Income Statement (Alternative)	Comprehensive Income Statement				Assets		2 500 1	0 1	
[Typercube]     [Typercube]     [Typercube]     [Typercube]     [Typercube]	rehensive Income Statement (Hypercu	pel	Liabilities and Equit	v [Roll Lip]			3,500	0	
06-Cash Flow      Cash Flow [Hyperg	ubel		Liabilities [Roll Un]	, [ron ob]					
07-Prior Period Errors      Prior Period	Errors [Hypercube]		Current Liabilities					0	
08-Prior Period Errors (Alternative)	<ul> <li>Prior Period Errors [Hypercube]</li> </ul>		Noncurrent Liabilities				0	0	
99-Changes in Equity ◆ Changes in	Equity [Hypercube]				Liabilities		0	0	
10-Policies   Policies [Hypercube]			Fauity [Poll Up]		Labinates		U	U	
🖽 11-Variance Analysis 🔶 Variance An	alysis [Hypercube]		Equity [Koil Op]	Controlling Interacts					
12-Segment Revenues    Segment R	Revenues [Hypercube]		Equity Attributable to	Controlling Interests			3,000	0	
⊞ 13-Stock Plan Activity ◆ Weighted A	Average Grant Date Fair Value		Equity Attributable to I	voncontrolling Interests	Equity		500	0	
	ighlights [Hypercube]				Equity		3,500	0	
				Liabi	ities and Equity		3,500	0	
		=1							
Component Properties		^							
> Network	01-Balance Sheet	_							
Disclosure	Balance Sheet [Hypercube]	_							
Confidence	disclosures:BalanceSneet	-1							
Status	InProgress								
Collections	11110grCSS	~							
Advanced		~							

For example, we click on the "Assets [Roll Up]" information Block:

Components (14)	Rendering	Model Structure	Fact Table	Business Rules Structur	e Business Rules Validation Res	ults Elements
a	Component: (Netwo	ork and Table)				
Network View     O Component View     O Block View	Network	01 - Unknown - Balan	ce Sheet			
Filter Tune	Table	Balance Sheet [Hyper	cube]			
The type of the tevel of the status	Reporting Entity [Axis	5]		GH259400TOMPUOLS65II http:	//standards.iso.org/iso/17442	Ŷ
Enter text to filter	Unit [Avie]					Ŷ
	onic [road]			1 000		
01-Balance Sheet  Balance Sheet [Hypercube]				Period [Axis] 🛛 🔫		
Assets [Roll Up]	Balance Sheet [Line I	tems]		2020-12-31	2019-12-31	
Liabilities and Equity [Roll Up]	Assets [Roll Up]					
① 02-Net Assets ◆ Net Assets [Hypercube]	Current Assets			500	0	
03-Income Statement  Comprehensive Income Statement [Hypercube]	Noncurrent Accete			500	0	
- 04-Income Statement (Alternative)  Comprehensive Income Statement	Noncurrent Assets			3,000	0	
Hypercube]			Assets	3,500 1	0 1	
B 05-Comprehensive Income ◆ Comprehensive Income Statement [Hypercube]     Comprehensive Income ◆ Comprehensive Income Statement [Hypercube]     S = 05-Comprehensive Income ◆ Comprehensive Income Statement [Hypercube]     S = 05-Comprehensive Income ◆ Comprehensive Income Statement [Hypercube]     S = 05-Comprehensive Income ◆ Comprehensive Income Statement [Hypercube]     S = 05-Comprehensive Income ◆ Comprehensive Income Statement [Hypercube]     S = 05-Comprehensive Income ◆ Comprehensive Income Statement [Hypercube]     S = 05-Comprehensive Income ◆ Comprehensive Income Statement [Hypercube]     S = 05-Comprehensive Income ◆ Comprehensive Income Statement [Hypercube]     S = 05-Comprehensive Income ◆ Comprehensive Income Statement [Hypercube]						
O6-Cash Flow ◆ Cash Flow [Hypercube]						
07-Prior Period Errors  Prior Period Errors [Hypercube]						
08-Prior Period Errors (Alternative)      Prior Period Errors [Hypercube]	:					
09-Changes in Equity   Changes in Equity [Hypercube]						
Frid-Policies + Policies Hugeraubel	mm	man.	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	- mon	m_mm

For each Disclosure, Information Block, Component or Network you can get six different views:

⁶⁶ Report Fragment Views, <u>http://xbrlsite.com/seattlemethod/pictures2/Index.html</u>

#### Rendering View:

Pendering	Model Structure	Eact Table		Rusiness Rules Structure	Rusiness Rules Validation Res	ulta Elementa
Concerning	moder Structure	l'act table		Dusiness Rules Structure	Business Rules validation Res	urts Liements
Component: (Netw	ork and Table)	and Charat				
Network	UI - Unknown - Bala	nce Sneet				
Table	Balance Sheet [Hype	rcubej				
Reporting Entity [A	ds]		GH259	400TOMPUOLS65II http://	/standards.iso.org/iso/17442	
Unit [Axis]			USD			
			Period	[Axis] 👻		
Balance Sheet [Line	Items]			2020-12-31	2019-12-31	
Assets [Roll Up]						
Current Assets				500	0	
Noncurrent Assets				3,000	0	
		Assets		3,500 1	0 1	

The rendering is dynamically created from information contained in each of the other views of the report. Further, the rendering is a pivot table that the user can reconfigure.

#### Model Structure View:

Rend	ering	Model Struct	ure	Fact Table		Busin	iess Rules St	tructure	Business Rule	s Validation Results	Elements
Label			R	eport Element Class	Per	riod	Balance	Preferred	l Label Role	Name	
✓ Ba	lance Sł	neet [Hypercube]	ר]	[able]				Standard	Label	proof:BalanceSheet	Hypercube
~	Balanc	e Sheet [Line Items]	լլ	ineItems]				Standard	Label	proof:BalanceSheet	LineItems
	✓ As	sets [Roll Up]	[4	Abstract]				Standard	Label	proof:AssetsRollUp	
		Current Assets	[0	Concept] Monetary	As	Of	Debit	Standard	Label	proof:CurrentAssets	5
	Balance Sheet [Line Items]     Assets [Roll Up]     Current Assets     Noncurrent Assets     Assets		[0	[Concept] Monetary		Of	Debit	Standard	Label	proof:NoncurrentAs	sets
	alance Sheet [HyperCube]  Balance Sheet [Line Items]  Assets [Roll Up]  Current Assets  Noncurrent Assets  Assets		[0	Concept] Monetary	As	Of	Debit	Standard	Label	proof:Assets	
4											

#### Fact Table View:

Rer	ndering	Model Structure	Fact Table	Business Ru	les Structure	Busine	ss Rules Vali	dation R	esults Ele	ements
Drag	) a column header h	ere to group by that col	umn							
#	Reporting Entity			Period	Concept		Fact Value	Unit	Rounding	Parenthetical Ex
1	GH259400TOMPU	OLS65II http://standard	s.iso.org/iso/17442	2020-12-31	Current Asset	s	500	USD	0	
2	GH259400TOMPU	OLS65II http://standard	s.iso.org/iso/17442	2019-12-31	Current Asset	s	0	USD	0	
3	GH259400TOMPU	OLS65II http://standard	s.iso.org/iso/17442	2020-12-31	Noncurrent As	ssets	3000	USD	0	
4	GH259400TOMPU	OLS65II http://standard	s.iso.org/iso/17442	2019-12-31	Noncurrent As	ssets	0	USD	0	
5	GH259400TOMPU	OLS65II http://standard	s.iso.org/iso/17442	2020-12-31	Assets		3500	USD	0	1
6	GH259400TOMPU	OLS65II http://standard	s.iso.org/iso/17442	2019-12-31	Assets		0	USD	0	1
4										

#### Rules View: (Mathematical rules)

Rei	nderin	g	Model St	ructure	2	Fact Table		Busir	ness Rules Struc	ture	Business Rules Validation Results	Elements
Ro	l UPs											
Labe	1				Report	t Element Class	Balar	nce	Weight	Name		
~	Balano	ce Sheet [Hyp	ercube]		[Table]	]			0	proof	BalanceSheetHypercube	
	As	sets			[Conce	ept] Monetary	Debit	t	0	proof	Assets	
		Current Ass	ets		[Conce	ept] Monetary	Debit	t	1	proof	CurrentAssets	
		Noncurrent	Assets		[Conce	ept] Monetary	Debit	t	1	proof	NoncurrentAssets	
								1111				P

#### Validation Results View:

Rendering		Model Struc	ture .	Fact Tab	le	Busines	s Rules Structure	Business	Rules Validation	n Results	Elements
Roll UPs											
						*					
Entity: GH	259400TOM	PUOLS65II									~
Period: 20	20-12-31										
Repo	rting Entity	,				GH259400TOMPL	JOLS65II http://sta	ndards.iso	.org/iso/17442		
Perio	d					2020-12-31					
Unit						USD					
Label			Render	ed Value	. •	Reported Value	Calculated Value	Balance	Result	Name	
v Bala	nce Sheet [	Line Items	]							proof:Bala	anceSheetLineItems
~ A	ssets [Roll	Up]								proof:Ass	etsRollUp
	Current As	sets		500	+	500		Debit		proof:Cur	rentAssets
	Noncurren	t Assets		3,000	+	3,000		Debit		proof:Nor	ncurrentAssets
	Assets			3,500		3,500	3,500	Debit	Verified	proof:Ass	ets
						Ψ					

#### Report Elements View:

Rendering	Model Structure	Fact Table	Busine	ss Rules Str	ucture	Business Rules Validation Results	Elements
Filter Class	-						
Label		Report Element Class	Period	Balance	Name		
Balance Sheet [Hyperc	ube]	[Table]			proof:	BalanceSheetHypercube	
Balance Sheet [Line Ite	ems]	[LineItems]			proof:E	BalanceSheetLineItems	
Assets [Roll Up]		[Abstract]			proof:/	AssetsRollUp	
Current Assets		[Concept] Monetary	As Of	Debit	proof:(	CurrentAssets	
Noncurrent Assets		[Concept] Monetary	As Of	Debit	proof:	NoncurrentAssets	
Assets		[Concept] Monetary	As Of	Debit	proof:/	Assets	

Information is entered into the report by (a) importing the information into the report or (b) manually entering information into the report.

Each view can be edited. Facts can be added to the Fact Table View. Associations can be added to the Model Structure View. Rules can be added to the Rules view. You don't ever edit the Verification Results View, but as more information is entered, that view gets updated. Report elements can be added to the Report Element View which then become available in the Model Structure View and Fact Table View.

#### Slots

Information Blocks have "slots". A Slot is simply a place in an information Block where it makes logical sense for new objects to be added to the Block. Different types of Blocks, different concept arrangement patterns⁶⁷ and member arrangement patterns⁶⁸, have different slots.

Below you can see one Block, showing two Slots for that block. One Slot is that a new Line Item can be added within the roll up total. Or, a second Slot is that a new period can be added to the Block.

New period

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

This is not a comprehensive discussion of Blocks and Slots, it only provides the general ideas of what a Block is, what a Slot is, and that a financial report can be broken down into a set of Blocks each of which has specific Slots where information can be added.

#### Poka-yoke: Mistake proofing software

Poka-yoke⁶⁹ is a Lean Six Sigma technique used to prevent mistakes through smarter design. Poka-yoke is a Japanese term that means "mistake-proofing". A poka-yoke is any mechanism consciously added to a process that helps an equipment operator avoid mistakes. Its purpose is to eliminate defects by preventing, correcting, or drawing attention to human errors as the errors occur.

⁶⁷ Concept Arrangement Patterns,

http://www.xbrlsite.com/mastering/Part02_Chapter05.I_ConceptArrangementPatterns.pdf 68 Member Arrangement Patterns,

http://www.xbrlsite.com/mastering/Part02_Chapter05.J_MemberArrangementPatterns.pdf

⁶⁹ Wikipedia, Poka-yoke, <u>https://en.wikipedia.org/wiki/Poka-yoke</u>

For example, consider the graphic⁷⁰ below. You want someone to plug the plug into the receptacle such that positive and negative match up; inadvertently reversing this would have catastrophic consequences. In the top graphic notice that it is possible to make a mistake but in the bottom a mistake would be impossible because of the size differences in the positive and negative receptacle and plug.



Smart design means less user errors. Poka-yoke techniques can be used to create software that is easier to use, can eliminate certain types of user mistakes, and can help guide users to put the Lego pieces together to get what they want.

#### **Logical Glue**

Each of the view are "glued together" logically. Business report model information is hard coded into the software application. The things that can go into the business report, the stuff that is provided within the report model (i.e. XBRL taxonomy, XBRL Formulas), must fit into that hard coded business report model. Each report model MUST be consistent with the report meta-model that is prescribed by the financial reporting scheme.

In our example we are using the PROOF financial reporting scheme meta-model⁷¹. Each financial reporting scheme⁷² meta-model fits into the same business report model.

### **Templates**

Templates are complete prototypes that are valid for a Disclosure. Templates can be imported. On the Agenda, you see a button for each Disclosure that is supposed to be in a report but does not yet exist:

⁷⁰ Process Exam, Six Sigma Tools - Poka Yoke, <u>http://www.processexam.com/six-sigma-tools-poka-yoke</u>

⁷¹ PROOF Financial Reporting Scheme, <u>http://www.xbrlsite.com/seattlemethod/proof/documentation/Index.html</u>

⁷² Financial Reporting Scheme Meta-Models, <u>http://accounting.auditchain.finance/reporting-scheme/index.html</u>

Agenda			<del>Р</del>	×
Enter text to filter	•			
Disdosure	Explanation	Ad	d	٦
Balance Sheet	Disclosure always required	7		1
Assets Roll Up	Disclosure always required	7		1
Liabilities and Equity Roll Up	Disclosure always required	7		1
have proved a product of the state	$\sim\sim\sim\sim\sim\sim\sim\sim\sim\sim\sim\sim\sim\sim\sim\sim\sim\sim\sim\sim\sim\sim\sim\sim\sim\sim\sim\sim\sim\sim\sim\sim\sim\sim\sim\sim$	$\sim$	-	

When you press that button, a set of templates appears and the templates for the disclosure that you are working with is selected and each template is shown. Below you see a prototype set of templates for US GAAP Disclosures⁷³:



When you click on a template to select it for import, the template, which is represented in global standard XBRL, is imported, the expert system application makes any necessary adjustments to the template to make sure namespaces and prefixes match, and then the user can edit the template as the deem appropriate.

⁷³ Template selector, <u>https://photos.google.com/share/AF1QipOfV4MNsTK3tekplcb6HraFJ9WLIJH-</u> <u>UzyQp_CwlVQVt-45mHyhSpgNRCI7QOhoUw/photo/AF1QipOFYn1d9aqoSGBUWEYNo5OzoaTvhph604xzp-</u> <u>OB?key=aTZTUWQ1VDdVaVNldHotbkdoRGxNQVlQWkoxdHNn</u>

### Exemplars

The entire SEC EDGAR system is a repository of disclosure exemplars (a.k.a. examples). From a financial reporting logic perspective, the exemplars are generally excellent. From an XBRL point of view probably 80% are very good to excellent and 20% should be ignored. The quality of the exemplars will improve over time.

This is similarly true for the ESMA system; that too is a repository of disclosure exemplars that will improve over time.

Those reports will be sliced and diced by industry, by entity type, and by other useful classifications so that you don't need to sift through thousands of reports, a recommender system will help you find and get the example you are looking for.

Similar to templates, exemplars will be imported directly into your report where it can be modified to meet your specific needs. Think "copy and paste" on steroids.

The metadata that will help you find the exemplar that you might be looking for will be created by accountants that contribute to the system which the expert system uses to drive its functionality.

### State Machine

The expert system for creating financial reports acts more like a dynamic video game than a batch process. The expert system watches over what the user(s) are doing within the system and has access to information about the "state" of the application, a state machine⁷⁴.

State Properties		Ф	>
Properties			^
Report profile	XBRLBasedGeneralBusinessReports		
Fact count	63		
Network count	14		
<ul> <li>Block count</li> </ul>	18		
Level 1 Note Text Blocks	0		
Level 2 Policy Text Blocks	0		
Level 3 Disclosure Text Block	0		
<ul> <li>Level 4 Disclosure Details</li> </ul>	0		
Roll Ups	0		
Roll Forwards	0		
Hierarchy	0		
Roll Forward Info	0		
Adjustments	0		
Variances	0		
Unknown	0		
Unknown	18		
<ul> <li>Validation inconsistencies</li> </ul>	0		
XBRL Syntax	0		
Model Structure	0		
EFM Rules	0		
Type or Class Relations	0		
Fundamental Accounting Con	0		
Disclosure Mechanics	0		
Reporting Checklist	0		
To Do List	0		
Selected disclosure	disclosures:BalanceSheet		

⁷⁴ Wikipedia, *Finite State Machine*, <u>https://en.wikipedia.org/wiki/Finite-state_machine</u>

A good way to understand why a state machine is useful is by watching the video, State Machine Basics⁷⁵, that I put up on YouTube.com.

The state machine information is available to recommender systems, project management information, workflow management, and so forth.

### **Project Management Information**

The construction of a financial report is a project. If you have a team of people working on that report it becomes more complicated to manage that project. Project management is built into the expert system for creating financial reports. This includes "to do" lists that are manually maintained by the financial report creation team.

The project management information rolls up to a dashboard where the team working on the project can get a view of the big picture, for example this verification summary dashboard:



Cleverly designed interfaces⁷⁶ will help manage the big picture, the details, and every step in between:



⁷⁵ State Machine Basics, <u>https://youtu.be/NuFGJHJ3jOM</u>

⁷⁶ Example interface, <u>http://xbrlsite.azurewebsites.net/2021/prototypes/verification/VerificationResult.html</u>

### Model Structure

A report model consists of the following categories of report elements per the Logical Theory Describing Financial Report: Networks, Hypercubes, Dimensions, Members, LineItems, Abstracts, and Concepts.

These report element categories have permitted and unpermitted associations with other categories of report elements. These permitted and unpermitted associations are defined in XBRL definition relations⁷⁷. That information is presented in human readable form as follows:

			Parent									
		Network	Table	Axis	Member	Line Items	Abstract	Concept				
	Network	Illegal XBRL										
	Table	OK	Disallowed	Disallowed	Disallowed	Disallowed	OK	Disallowed				
B	Axis	Disallowed	ОК	Disallowed	Disallowed	Disallowed	Disallowed	Disallowed				
Child	Member	Disallowed	Disallowed	OK	OK	Disallowed	Disallowed	Disallowed				
0	Line Items	Disallowed	ОК	Disallowed	Disallowed	Disallowed	Disallowed	Disallowed				
	Abstract	Abstract OK		Disallowed	Disallowed	OK	OK	Disallowed				
	Concept	Disallowed	Disallowed	Disallowed	Disallowed	OK	OK	Disallowed				

An XBRL-based financial report can be valuated to be consistent or inconsistent with these model structure rules. Here is that evaluation for the PROOF report model structure as performed by Pesseract:

Child		Parent											
	Network	Table	Axis	Member	LineItems	Abstract	Concept						
[Network]	0	0	0	0	0	0	0						
[Table]	14	0	0	0	0	0	0						
[Axis]	0	4	0	0	0	0	0						
[Member]	0	0	4	9	0	0	0						
[LineItems]	0	14	0	0	0	0	0						
[Abstract]	0	0	0	0	15	2	0						
[Concept]	0	0	0	0	3	55	0						

When you click on any value you see the associations per the report model structure for that report:

R	Report Elements								23
	Filter Class	•							
ſ	Label	Re	eport Element Class	Period	Balance	Name			
	Report Date [Axis]	[A	xis]			proof:ReportDateAxis			
	Restatement [Axis]	[A	xis]			proof:RestatementAxis			
	Scenario [Axis]	[A	xis]			proof:ScenarioAxis			
	Segments [Axis]	[A	xis]			proof:SegmentsAxis			

Here is the same information provided by Pacioli⁷⁸:

⁷⁸ Pacioli Model Structure Verification results,

⁷⁷ Model Structure defined as XBRL definition relations, <u>http://www.xbrlsite.com/seattlemethod/proof/model-structure/ModelStructure-rules-strict-def.xml</u>

https://bafybeidv6e3zxuizutg5y4bo5eii5fwcjkdgzm6ht2kwk7xzbsqwz2mfdy.ipfs.infura-ipfs.io/modelStructure.html

Child	Parent	nt										
	Network	Hypercube (a.k.a. Table)	Dimension (a.k.a. Axis)	Member	Line Items (a.k.a. Primary Items)	Abstract	Concept					
Network	0	0	0	0	0	0	0					
Hypercube (a.k.a. Table)	14	0	0	0	0	0	0					
Dimension (a.k.a. Axis)	0	4	0	0	0	0	0					
Member	0	0	4	9	0	0	0					
Line Items (a.k.a. Primary Items)	0	14	0	0	0	0	0					
Abstract	0	0	0	0	15	2	0					
Concept	0	0	0	0	3	55	0					

Note that the following verification script was used to generate this models structure result to make the result comparable to Pesseract. In the PROOF results with all of the validation tasks run, Pacioli considers all the associations in all the verification rules in addition to the report model structure, therefore different relationship counts result:

% Proof, only model structure verification, OK %

checkReport3("http://www.xbrlsite.com/seattlemethod/proof/reference-

implementation/instance.xml",

['http://www.xbrlsite.com/seattlemethod/proof/model-structure/ModelStructure-rules-strict-def.xml'], [saveToIPFS, extendedJSON, cacheValidity(3600)], Result, IPFSlink).

Note that the permitted and unpermitted model structure relations are configurable for an individual report, for an entire reporting scheme, or for all XBRL-based reports.

Model structure information is helpful to the expert system for creating reports, for locating XBRL taxonomy report elements, recommender systems, etc.

Note that the following table shows actual relations from the 2015 10-K financial reports of 6,000 public companies that submit their XBRL-based financial reports to the SEC. Notice the patters.

		Network	Table	Axis	Member	Lineltems	Abstract	Concept
		485,842	212,618	430,552	1,360,484	212,733	727,374	3,155,641
	Network	0	0	0	0	0	0	0
	Table	513	0	0	4	4	212,090	11
	Axis	0	430,549	0	0	0	3	0
- E	Member	0	0	503,078	857,390	3	13	0
Ŭ	Lineltems	29	212,570	0	0	30	104	0
	Abstract	483,334	18	0	2	101,932	141,774	314
	Concept	8	0	1	49	1,178,684	1,969,653	7,246

### Type-Subtype Associations

Type-subtype associations, a.k.a. "wider-narrower" or "general-special" or other types of associations help accountants using report models understand the associations between such report elements. Here is an example of the associations as represented in Pacioli⁷⁹:

⁷⁹ Pacioli Type-subtype associations,

https://bafybeicptuxhaahe7lt6sok7ibztzdtfkrymfmfijyzurbto67dgighx5a.ipfs.infura-ipfs.io/typeSubTypeGraph.html



There are other approaches to representing this information for a user. As can be seen from the example above, the representations can become quite complex. But filtering by the type of association or other such things makes this information easier for a human to understand and digest.

An alternative representation is a table⁸⁰:

#	Network	Туре	Subtype A
		<u>cm:Concept</u>	
18	Concept	cm:Concept	proof:Assets
19	Concept	cm:Concept	proof:BasisOfReportingTextBlock
20	Concept	cm:Concept	proof:ChangesInAccountingPolicy
21	Concept	cm:Concept	proof:ComprehensiveIncome
22	Concept	cm:Concept	proof:CorrectionOfAnError
23	Concept	cm:Concept	proof:CurrentAssets
24	Concept	cm:Concept	proof:CurrentLiabilities
25	Concept	cm:Concept	proof:DistributionsToOwners
26	Concept	cm:Concept	proof:Equity
27	Concept	cm:Concept	proof:EquityAttributableToControllingInterests
28	Concept	cm:Concept	proof:EquityAttributableToNoncontrollingInterests
m	garden many	and and a start a star	pp for the many many many many many many many many

Yet another view is a tree view as is shown below which comes from Pesseract:

⁸⁰ Pacioli Type-subtype associations, filterable table,

https://bafybeicptuxhaahe7lt6sok7ibztzdtfkrymfmfijyzurbto67dgighx5a.ipfs.infura-ipfs.io/typeSubTypeList.html

-		Arcrole	Order	
🗸 🔷 Things				
🗸 🕞 [Thing]			0	
<ol> <li>Assets</li> </ol>		http://www.xbrlsite.com/seattlemethod/conceptual-model/arcrole/class-subClass	1	
<ol> <li>Liabilities</li> </ol>		http://www.xbrlsite.com/seattlemethod/conceptual-model/arcrole/class-subClass	2	
<ol> <li>Liabilities and Equi</li> </ol>	ty	http://www.xbrlsite.com/seattlemethod/conceptual-model/arcrole/class-subClass	3	
🗸 🕕 Equity		http://www.xbrlsite.com/seattlemethod/conceptual-model/arcrole/class-subClass	4	
Equity Attribut	able To Controlling Interests	http://www.xbrlsite.com/seattlemethod/conceptual-model/arcrole/class-subClass	5	
<ol> <li>Equity Attribut</li> </ol>	able to Noncontrolling Interests	http://www.xbrlsite.com/seattlemethod/conceptual-model/arcrole/class-subClass	6	≣
Current Assets		http://www.xbrlsite.com/seattlemethod/conceptual-model/arcrole/class-subClass	7	
<ol> <li>Noncurrent Assets</li> </ol>	3	http://www.xbrlsite.com/seattlemethod/conceptual-model/arcrole/class-subClass	8	
Current Liabilities		http://www.xbrlsite.com/seattlemethod/conceptual-model/arcrole/class-subClass	9	
<ol> <li>Noncurrent Liabilit</li> </ol>	ies	http://www.xbrlsite.com/seattlemethod/conceptual-model/arcrole/class-subClass	10	
<ol> <li>Nonvested Fair Va</li> </ol>	lue	http://www.xbrlsite.com/seattlemethod/conceptual-model/arcrole/class-subClass	11	
Forfeited		http://www.xbrlsite.com/seattlemethod/conceptual-model/arcrole/class-subClass	12	
Granted		http://www.xbrlsite.com/seattlemethod/conceptual-model/arcrole/class-subClass	13	
Vested		http://www.xbrlsite.com/seattlemethod/conceptual-model/arcrole/class-subClass	14	
Chappes in Account	ating Policy	http://www.vbrleite.com/seattlemethod/concentual-model/arcrole/class-subClass	15	

Many other views are possible. This information and other information related to parts is useful in filtering down large XBRL taxonomies such as the US GAAP XBRL Taxonomy which has approximatley 17,000 report elements. Recommender systems that leverage the type-subtype and whole-part assocations can assist accountants using the expert system to do so effectively and effectently.

# Fundamental Accounting Concepts Continuity Cross Checks

Financial reports are not forms. Rather, creators of financial reports are permitted to organize financial report information using different subtotals, different totals, completely different concepts based on which industry they are involved with, and certain common subtotals might be omitted from their financial report for one reason or another. Additionally, because of the way XBRL taxonomies are designed different reporting entities might use different XBRL taxonomy concepts to report the exact same line item.

Because of this flexibility the fundamental accounting concepts continuity cross checks are helpful, in fact essential, to sort financial reports out and figure out if the reports have been created correctly.

Data aggregators and others attempting to use reported information can use this same information to effectively extract information from financial reports.

The PROOF report does not provide insight into the extent that fundamental accounting concepts continuity cross checks are helpful so we will use a US GAAP example to show this. Below you see a part of the fundamental accounting concepts summary provided by XBRL Cloud for Microsoft⁸¹:

⁸¹ Fundamental accounting concepts, Microsoft,

http://xbrlsite.azurewebsites.net/2017/Prototypes/Microsoft2017/evidencepackage/USFACRenderingSummary.html

	Period [Axis]						
		2017-06-30					
		Fact					
Balance Sheet [Line Items]	Value	Origin					
Assets [Roll Up]							
Current Assets	159,851,000,000	fac:CurrentAssets[us-gaap:AssetsCurrent[159,851,000,000]]	+				
Noncurrent Assets		fac:NoncurrentAssets[81,235,000,000] = fac:Assets[us- gaap:Assets[241,086,000,000]] - fac:CurrentAssets[us- gaap:AssetsCurrent[159,851,000,000]]					
		Fact determination of fac:NoncurrentAssets					
		1 us-gaap:AssetsNoncurrent	-				
	81,235,000,000	fac:Assets[us-gaap:Assets[241,086,000,000]] - fac:CurrentAssets[us- 2 gaap:AssetsCurrent[159,851,000,000]] 81,235,000,0	00				
Assets	241,086,000,000	fac:Assets[us-gaap:Assets[241,086,000,000]]	÷				
Liabilities and Equity [Roll Up]							
Liabilities [Roll Up]							
Current Liabilities	64,527,000,000	fac:CurrentLiabilities[us-gaap:LiabilitiesCurrent[64,527,000,000]]	+				
Noncurrent Liabilities	104,165,000,000	fac:NoncurrentLiabilities[104,165,000,000] = fac:Liabilities[us- gaap:Liabilities[168,692,000,000]] - fac:CurrentLiabilities[us- gaap:LiabilitiesCurrent[64,527,000,000]]	÷				
Liabilities	168,692,000,000	fac:Liabilities[us-gaap:Liabilities[168,692,000,000]]	÷				
Commitments and Contingencies	0	fac:CommitmentsAndContingencies[us- gaap:CommitmentsAndContingencies[0]]	÷				
Temporary Equity	0	fac:TemporaryEquity[0] = fac:LiabilitiesAndEquity[us- gaap:LiabilitiesAndStockholdersEquity[241,086,000,000]] - ((fac:Liabilities[us-gaap:Liabilities[168,692,000,000]] + fac:Equity[72,394,000,000]) - fac:CommitmentsAndContingencies[us- gaap:CommitmentsAndContingencies[0]])	Ŧ				
Equity [Roll Up]							
Equity Attributable to Parent	72,394,000,000	fac:EquityAttributableToParent[us-gaap:StockholdersEquity[72,394,000,000]	]] 🕀				
Equity Attributable to Noncontrolling Interest	0	fac:EquityAttributableToNoncontrollingInterest[0] = fac:Equity[72,394,000,000] - fac:EquityAttributableToParent[us- gaap:StockholdersEquity[72,394,000,000]]	÷				
Equity	72,394,000,000	fac:Equity[72,394,000,000] = fac:EquityAttributableToParent[us- gaap:StockholdersEquity[72,394,000,000]]	Ŧ				
Liabilities and Equity	241,086,000,000	fac:LiabilitiesAndEquity[us- gaap:LiabilitiesAndStockholdersEquity[241,086,000,000]]	÷				

Pacioli provides similar information⁸²:

	Period	2020 42 24	2040 42 24
Concept		2020-12-31	2019-12-51
Assets [Roll Up]			
Current Assets		500	0
Noncurrent Assets		3,000	0
Assets		3,500	0
Liabilities and Equity [Roll Up	1		
Liabilities [Roll Up]			
Current Liabilities		0	0
Noncurrent Liabilities		0	0
Liabilities		0	0
Equity [Roll Up]			
Equity Attributable to	Controlling Interests	3,000	0
Equity Attributable to	Noncontrolling Interests	500	0
Equity		3,500	0
Liabilities and Equity		3,500	0

#### Pesseract provides another alternative approach which is more summarized:

Entity	Period	ID	Test	Result	Amount Of Inconsistency	Evaluation
0000789019	2017-FY	FAC_CONSISTENCY_1	fac:Equity = ( fac:EquityAttributableToParent + fac:EquityAttributableToNoncontrollingInterest )	True	c	fac:Equity[72,394,000,000] = (fac:EquityAttributableToParent[us-gaap:StadsholdersEquity[72,394,000,000]] + fac:EquityAttributableToNoncontrollingInterest[0])
0000789019	2017-FY	FAC_CONSISTENCY_10	fac:NetCashFlowFromInvestingActivities = ( fac:NetCashFlowFromInvestingActivitiesContinuing + fac:NetCashFlowFromInvestingActivitiesDiscontinued )	True	c	faciteIcad=FlowFromInvestingLethitides[(46,781,000,000)] = ( faciteIcad=FlowFromInvestingLethiteECarenargLocspaceIteICad=ProvidedBlyLisedInInvestingActiviteSContinuingOperations[(46,781,000,000)]] + faciteIcad=FlowFromInvestingLethiteEEDecontinue([])
0000789019	2017-FY	FAC_CONSISTENCY_11	fac:NetCashFlowFromFinancingActivities = ( fac:NetCashFlowFromFinancingActivitiesContinuing + fac:NetCashFlowFromFinancingActivitiesDiscontinued )	True	c	frachterGaeFlowFromFinanchgachtites[5,498,000,000] = ( fachtetCaeFlowFromFinanchgachtitesConthurg[jus-gasphtetCaeFProvidedByUsedInFinanchgActivitesContinuingOperations[5,498,000,000]] + fachtetCaeFInorFinanchgachtitesEloxonthuse[0] )
0000789019	2017-FY	FAC_CONSISTENCY_12	fac:GrossProfit = ( fac:Revenues - fac:CostOfRevenue )	True	c	fac:GrossProfit[us-gaap:GrossProfit[ 55,689,000,000 ]] = (fac:Revenues[us-gaap:SalesRevenueNet[ 89,950,000,000 ]] - fac:CostOfRevenue[us-gaap:CostOfRevenue[ 34,261,000,000 ]] )
0000789019	2017-FY	FAC_CONSISTENCY_13	fac:OperatingIncomeLoss = ( fac:GrossProfit - fac:OperatingExpenses )	True	0	fac:OperatingIncomeLoss[us-gaap:OperatingIncomeLoss[ 22,326,000,000 ]] = (fac:GrossProfit[us-gaap:GrossProfit[ 55,689,000,000 ]] - fac:OperatingExpenses[ 33,363,000,000 ])
0000789019	2017-FY	FAC_CONSISTENCY_15	fac:incomel.ossFromContinuingOperationsBeforeTax = ( fac:OperatingIncomeEloss + fac:NonogerstrigIncomeFlusInterestAndDebtExpensePlusIncomeFromEquityMet hodinvestments)	True	c	factional cut/ProtochuturgDereintondErforTalyLargeabicromet.com/ForcEntrungDereintondErforChuturgDereintondErforChuturgDereintondErforChuturgDereintondErforChuturgDereintondErforChuturgDereintondErforChuturgDereintondErforChuturgDereintondErforChuturgDereintondErforChuturgDereintondErforChuturgDereintondErforChuturgDereintondErforChuturgDereintondErforChuturgDereintondErforChuturgDereintondErforChuturgDereintondErforChuturgDereintondErforChuturgDereintondErforChuturgDereintondErforChuturgDereintondErforChuturgDereintondErforChuturgDereintondErforChuturgDereintondErforChuturgDereintondErforChuturgDereintondErforChuturgDereintondErforChuturgDereintondErforChuturgDereintondErforChuturgDereintondErforChuturgDereintondErforChuturgDereintondErforChuturgDereintondErforChuturgDereintondErforChuturgDereintondErforChuturgDereintondErforChuturgDereintondErforChuturgDereintondErforChuturgDereintondErforChuturgDereintondErforChuturgDereintondErforChuturgDere
0000789019	2017-FY	FAC_CONSISTENCY_16	fac:IncomeLossFromContinuingOperationsAfterTax = ( fac:IncomeLossFromContinuingOperationsBeforeTax - fac:IncomeTaxExpenseBenefit)	True	c	facilitomel.oseForeContinuingOperationsAfterTar(21,204,000,000) = ( facilitomel.oseForeContinuingOperationsBeforeTar(ju:gapapi:Incomel.oseForeContinuingOperationsBeforeEncomeTaxesMinorityInteresMindincomeLoseForeEquityMethodInvestments[ 22,149,000,000]] - facilitomerEacEpteresBetrefEliguegapi:IncomeTaxEpteresBetrefEl[1,1945,000,000]])
0000789019	2017-FY	FAC_CONSISTENCY_17	fac:NetIncomeLoss = ( fac:IncomeLossFromContinuingOperationsAfterTax + fac:IncomeLossFromDiscontinuedOperationsNetOfTax + fac:ExtraordinaryItemsOfIncomeExpenseNetOfTax )	True	c	factletincomel.osg[21,204,000,000] = (factincomel.osgFromContinuingOperationsAfterTax[21,204,000,000] + factincomel.osgFromDiscontinuedOperationsRetOfTax[0] + factincomel.osgFromDiscontinuedOperationsRetOfTax[0])
0000789019	2017-FY	FAC_CONSISTENCY_18	fac:NetIncomeLoss = ( fac:NetIncomeLossAttributableToParent + fac:NetIncomeLossAttributableToNoncontrollingInterest )	True	0	fac:NetIncomeLoss[21,204,000,000] = (fac:NetIncomeLossAttributableToParent[us-gaap:NetIncomeLoss[21,204,000,000]] + fac:NetIncomeLossAttributableToNoncontrollingInterest[0])
0000789019	2017-FY	FAC_CONSISTENCY_19	fac:NetIncomeLossAvailableToCommonStockholdersBasic = ( fac:NetIncomeLossAttributableToParent - fac:PreferredStockDividend&AndOtherAdjustments )	True	c	fachletincomel.osaAvallableToCommonStodyholdersBase[21,204,000,000] = (facNetIncomeLossAttributableToParent[us-gaapsNetIncomeLoss[21,204,000,000]] - facArefereeStodDividenduAndOtherAdjustments[0])
0000789019	2017-FY	FAC_CONSISTENCY_2	fac:Assets = fac:LiabilitiesAndEquity	True	0	fac:Assets[us-gaap:Assets[241,086,000,000]] = fac:LiabilitiesAndEquity[us-gaap:LiabilitiesAndStodkholdersEquity[241,086,000,000]]
0000789019	2017-FY	FAC_CONSISTENCY_20	fac:ComprehensiveIncomeLoss = ( fac:ComprehensiveIncomeLossAttributableToParent + fac:ComprehensiveIncomeLossAttributableToNoncontrollingInterest )	True	c	fac:ComprehensiveIncomeLos[ 20,098,000,000] - (fac:ComprehensiveIncomeLosAttributableToParent[us gaap:ComprehensiveIncomeLosAttributableToParent[us gaap:ComprehensiveIncomeLosAtt
0000789019	2017-FY	FAC_CONSISTENCY_21	fac:ComprehensiveIncomeLoss = (fac:NetIncomeLoss + fac:OtherComprehensiveIncomeLoss)	True	٥	fac:ComprehensiveIncomeLoss[ 20,098,000,000 ] = ( fac:NetIncomeLoss[ 21,204,000,000 ] + fac:OtherComprehensiveIncomeLoss[ (1,106,000,000) ] )
0000789019	2017-FY	FAC_CONSISTENCY_3	fac:Assets = ( fac:CurrentAssets + fac:NoncurrentAssets )	True	c	fac:Assets[us-gaap:Assets[ 241,086,000,000 ]] = ( fac:CurrentAssets[us-gaap:AssetsCurrent[ 159,851,000,000 ]] + fac:NoncurrentAssets[ 81,235,000,000 ] )
0000789019	2017-FY	FAC_CONSISTENCY_4	fac:Liabilities = ( fac:CurrentLiabilities + fac:NoncurrentLiabilities )	True	0	fac:Labilities[us-gaap:Labilities[ 168,692,000,000 ]] = (fac:CurrentLabilities[us-gaap:LabilitiesCurrent[ 64,527,000,000 ]] + fac:NoncurrentLabilities[ 104,165,000,000 ])
0000789019	2017-FY	FAC_CONSISTENCY_5	fac:LiabilitiesAndEquity = ( fac:Liabilities + fac:CommitmentsAndContingencies + fac:TemporaryEquity + fac:Equity )	True	c	fac:LiabilitiesAndEquity[us-gaap:LiabilitiesAndStockholdersEquity[ 241,086,000,000 ]] = ( fac:Liabilities[us-gaap:Liabilities[ 168,692,000,000 ]] + fac:CommitmentsAndContingencies[us-gaap:CommitmentsAndContingencies[ ]] + fac:TemporaryEquity[ 0 ] + fac:Equity[ 72,394,000,000 ] )
0000789019	2017-FY	FAC_CONSISTENCY_50	fac:NetCashFlow = ( fac:NetCashFlowContinuing + fac:NetCashFlowDiscontinued + fac:ExchangeGainsLosses )	True	c	fac:NetCashFlow[us gaap:CashAndCashEquivalentsPeriodIncreaseDecrease[1,153,000,000]] - (fac:NetCashFlowContinuing[1,134,000,000] + fac:NetCashFlowDiscontinued[0] + fac:ExchangeGainsLosses[us-gaap:EffectOfExchangeRateOnCashAndCashEquivalents[19,000,000]])
0000789019	2017-FY	FAC_CONSISTENCY_6	fac:NetCashFlow = ( fac:NetCashFlowFromOperatingActivities + fac:NetCashFlowFromInvestingActivities + fac:NetCashFlowFromFinancingActivities + fac:ExchangeGainsLosses )	True	c	faciletica#Flow(ius-paper_CacheducAdreEquivalentSeriodIncreaseDecrease1_1133,000,000] = { faciletica#Flow(FromOperatingActivities[ 39,507,000,000 ] + faciletica#Flow(FromInvestingActivities[ 46,781,000,000 ] + faciletica#Flow(FromFinancingActivities[ 8,408,000,000 ] + faciletica#Flow(FormInvestingActivities[ 46,781,000,000 ]) + faciletica#Flow(FormFinancingActivities[ 8,408,000,000 ] + faciletica#Flow(FormInvestingActivities]
0000789019	2017-FY	FAC_CONSISTENCY_7	fac:NetCashFlowContinuing = ( fac:NetCashFlowFromOperatingActivitiesContinuing + fac:NetCashFlowFromFinancingActivitiesContinuing + fac:NetCashFlowFromFinancingActivitiesContinuing )	True	c	fschletzhifworfontung [1,13,000,000] = (fschletzhifworfonOperatingktivitesContinung) og sapottelCahiProvidedbyLedinOperatingktivitesContinungOperation[ 35,070,000,000] + ExcletzAhiFworfondunestigsktivitesContinung[og sapattelCahiProvidedbyLedinFinancingAtivitesContinungOperation[ 5,400,000,00] + facilezAhiFworfondunestigsktivitesContinung[og sapattelCahiProvidedbyLedinFinancingAtivitesContinungOperation[ 5,400,000,00] + facilezAhiFworfondunestigsktivitesContinung[og sapattelCahiProvidedbyLedinFinancingAtivitesContinungOperation[ 5,400,000,00] + facilezAhiFworfondunestigsktivitesContinung[og sapattelCahiProvidedbyLedinFinancingAtivitesContinungOperation[ 5,400,000,00] + facilezAhiFworfondunestigsktivitesContinung[og sapattelCahiProvidedbyLedinFinancingAtivitesContinungOperation[ 5,400,000,00] + facilezAhiFworfondunestigsktivitesContinungOperation[ 5,400,000,00] + facilezAhiFworfondunestigsktivitesContinungOperation[ 5,400,000,00] + facilezAhiFworfondunestigsktivitesContinungOperation[ 5,400,000,00] + facilezAhiFworfondunestigsktivitesContinungOperation[ 5,400,000,00] + facilezAhiFworfondunestigsktivitesContinungOperation[ 5,400,000,00] + facilezAhiFworfondunestigsktivitesContinungOperation[ 5,400,000,00] + facilezAhiFworfondunestigsktivitesContinungOperation[ 5,400,000,000] + facilezAhiFworfondunestigsktivesContinungOperation[ 5,400,000,000] + facilezAhiFworfondunestigsktivesContinungO
0000789019	2017-FY	FAC_CONSISTENCY_8	fac:NetCashFlowDiscontinued = ( fac:NetCashFlowFormOperatingActivitiesDiscontinued + fac:NetCashFlowFormTwestIngActivitiesDiscontinued + fac:NetCashFlowFromFinancingActivitiesDiscontinued )	True	c	$\label{eq:contract} \begin{tabular}{lllllllllllllllllllllllllllllllllll$
0000789019	2017-FY	FAC_CONSISTENCY_9	fac:NetCashFlowFromOperatingActivities = ( fac:NetCashFlowFromOperatingActivitiesContinuing + fac:NetCashFlowFromOperatingActivitiesDiscontinued )	True	c	fac:htelCadHFlowFromOperatingActivites[39,507,000,000] = ( fac:htelCadHFlowFromOperatingActivitesContinungUc-spage/HeCadHFlowidedBlyUsedInOperatingActivitesContinungOperations[39,507,000,000]] + fac:htelCadHFlowFromOperatingActivitesContinung[0]

⁸² Pacioli, Fundamental Accounting Concepts,

https://bafybeicptuxhaahe7lt6sok7ibztzdtfkrymfmfijyzurbto67dgighx5a.ipfs.infuraipfs.io/f84790a25ff59191a37a.html#38df70550bbd781f3247

Reporting Entity [Axis]	0000789019 http://www.sec.gov/CIK 🖓						
		Period [Axis] 🛛 🔻					
Balance Sheet [Line Items]	Unit [Axis] 🔹 👻	2017-06-30					
Assets [Roll Up]							
Current Assets	USD	159,851,000,000					
Noncurrent Assets	USD	81,235,000,000					
Assets	USD	241,086,000,000					
Liabilities and Equity [Roll Up]							
Liabilities [Roll Up]							
Current Liabilities	USD	64,527,000,000					
Noncurrent Liabilities	USD	104,165,000,000					
Liabilities	USD	168,692,000,000					
Commitments and Contingencies	USD	xsi:nil					
Temporary Equity	USD	0					
Equity [Roll Up]	1100						
Equity Attributable to Parent	USD	72,394,000,000					
Equity Attributable to Noncontrolling Interest	USD	0					
Liabilities and Equity	USD	/2,394,000,000					
	050	241,086,000,000					
Fact Characteristics and Properties		23					
Properties Occurrences Provenance FAC Valid	ation Result To Do						
fac:Liabilities[us-gaap:Liabilities[ 168,692,000,000 ]]							
Fact origin:							
1 us-gaap:Liabilities		168,692,000,000					

### Normalized View of Report Information

Note that the fundamental accounting concept continuity cross check information provides an approach to normalizing and comparing information reported in XBRL-based financial reports. Period comparisons (same entity, different periods) and entity comparisons (different entity, same period) are easily generated using the mappings, derivation rules, fundamental accounting concepts, and consistency rules.

The following are a number of examples generated using Pesseract:

#### Period comparison:

Component: (Network and Table)										
Network	001 - Unknown - General Information									
Table	General Information [Table]									
Reporting Entity [Axis]		0000789019 http://www.sec.go	v/CIK	Ŷ						
		Period [Axis] 🕆 💌								
General Information [Li	ine Items]	2016-07-01/2016-12-31	2016-07-01/2016-09-30	2015-07-01/2016-06-30	2015-07-01/2016-03-31	2015-07-01/2015-12-31				
General Information	[Hierarchy]									
Entity Registrant Name		MICROSOFT CORPORATION	MICROSOFT CORPORATION	MICROSOFT CORPORATION	MICROSOFT CORPORATION	MICROSOFT CORPORATION				
Entity Central Index Key	/	0000789019	0000789019	0000789019	0000789019	0000789019				
Entity Filer Category		Large Accelerated Filer	Large Accelerated Filer	Large Accelerated Filer	Large Accelerated Filer	Large Accelerated Filer				
Trading Symbol		MSFT	MSFT	MSFT	MSFT	MSFT				
Fiscal Year End		06-30	06-30	06-30	06-30	06-30				
Fiscal Year Focus		2017	2017	2016	2016	2016				
Fiscal Period Focus		Q2	Q1	FY	Q3	Q2				
Document Type		10-Q	10-Q	10-К	10-Q	10-Q				
Balance Sheet Date		2016-12-31	2016-09-30	2016-06-30	2016-03-31	2015-12-31				

#### Entity comparison:

Component: (Network and Table)													
Network	001 - Unknown - General Informati	11 - Unknown - General Information											
Table	General Information [Table]												
Drop Filter Fields Here													
		Period [Axis]   Reporting I	Entity [Axis]										
		2016-07-31/2017-01-28	2016-09-25/2016-12-31	2016-07-01/2016-12-31	2016-04-01/2016-12-31	2015-11-28/2016-12-02							
General Information [Li	ne Items]	0000858877 http:// www.sec.gov/CIK	0000320193 http:// www.sec.gov/CIK	0000789019 http:// www.sec.gov/CIK	0000880807 http:// www.sec.gov/CIK	0000796343 http:// www.sec.gov/CIK							
General Information	[Hierarchy]												
Entity Registrant Name		CISCO SYSTEMS, INC.	APPLE INC	MICROSOFT CORPORATION	AMERICAN SUPERCONDUC	ADOBE SYSTEMS INC							
Entity Central Index Key	/	0000858877	0000320193	0000789019	0000880807	0000796343							
Entity Filer Category		Large Accelerated Filer	Large Accelerated Filer	Large Accelerated Filer	Accelerated Filer	Large Accelerated Filer							
Trading Symbol		CSCO	AAPL	MSFT	AMSC	0							
Fiscal Year End		07-29	09-30	06-30	03-31	12-02							
Fiscal Year Focus		2017	2017	2017	2016	2016							
Fiscal Period Focus		Q2	Q1	Q2	Q3	FY							
Document Type		10-Q	10-Q	10-Q	10-Q	10-К							
Balance Sheet Date		2017-01-28	2016-12-31	2016-12-31	2016-12-31	2016-12-02							

#### Entity comparison, normalized income statement:

Component: (Netw	iomponent: (Network and Table)												
Network	201.7 - Unknown - Income Statement, Multi Step, With Operating Income, Special 6												
Table	Income Statement, Single Step [Table	e]											
Drop Filter Fields Here													
		Period [Avis] 🔹 Reporting Entity [Avis] 🔺											
		2016-07-31/2017-01-28	2016-09-25/2016-12-31	2016-07-01/2016-12-31	2016-04-01/2016-12-31	2015-11-28/2016-12-02							
Income Statement [	[Line Items]	0000858877 http:// www.sec.gov/CIK	0000320193 http:// www.sec.gov/CIK	0000789019 http:// www.sec.gov/CIK	0000880807 http:// www.sec.gov/CIK	0000796343 http:// www.sec.gov/CIK							
Net Income (Loss)	) [Roll Up]												
Income (Loss) fro	m Continuing Operations After Tax												
Income (Loss) fro	m Continuing Operations Before Tax												
Operating Income	e (Loss) [Roll Up]												
Gross Profit [Roll	Up]												
Revenues		23,932,000,000	78,351,000,000	44,543,000,000	59,000,000	5,854,430,000							
Cost of Revenue		8,772,000,000	48,175,000,000	17,745,000,000	50,992,000	819,908,000							
	Gross Profit	15,160,000,000	30,176,000,000	26,798,000,000	8,008,000	5,034,522,000							
Operating Expenses		9,390,000,000	6,817,000,000	15,396,000,000	28,562,000	3,540,920,000							
	Operating Income (Loss)	5,770,000,000	23,359,000,000	11,402,000,000	(20,554,000)	1,493,602,000							
Nonoperating Incom Plus Income (Loss) f	e (Loss) Plus Interest and Debt Expense from Equity Method Investments	146,000,000	821,000,000	286,000,000	1,142,000	(58,464,000)							
Ir	ncome (Loss) from Continuing Operations Before Tax	5,916,000,000	24,180,000,000	11,688,000,000	(19,412,000)	1,435,138,000							
Income Tax Expense	e (Benefit)	1,246,000,000	6,289,000,000	1,798,000,000	1,036,000	266,356,000							
Ir	ncome (Loss) from Continuing Operations After Tax	4,670,000,000	17,891,000,000	9,890,000,000	(20,448,000)	1,168,782,000							
Income (Loss) from	Discontinued Operations, Net of Tax	0	0	0	0	0							
Extraordinary Items	of Income (Expense), Net of Tax	0	0	0	0	0							
	Net Income (Loss)	4,670,000,000	17,891,000,000	9,890,000,000	(20,448,000)	1,168,782,000							

#### Entity comparison, normalized cash flow statement:

Component: (Net	omponent: (Network and Table)												
Network	401 - Unknown - Cash Flow Statem	ent											
Table	Cash Flow Statement [Table]	ash Flow Statement [Table]											
Drop Filter Fields H	lere												
		Period [Avis]											
		2016-07-31/2017-01-28	2016-09-25/2016-12-31	2016-07-01/2016-12-31	2016-04-01/2016-12-31	2015-11-28/2016-12-02							
Cash Flow Statem	ent [Line Items]	0000858877 http:// www.sec.gov/CIK	0000320193 http:// www.sec.gov/CIK	0000789019 http:// www.sec.gov/CIK	0000880807 http:// www.sec.gov/CIK	0000796343 http:// www.sec.gov/CIK							
Net Cash Flow [I	Roll Up]												
Net Cash Flow fr	rom Operating Activities [Roll Up]												
Net Cash Flow from	m Operating Activities, Continuing	6,502,000,000	27,056,000,000	17,842,000,000	(10,535,000)	2,199,728,000							
Net Cash Flow from Operating Activities, Discontinued		0	0	0	0	0							
Net Cash Flow from Operating Activitie		6,502,000,000	27,056,000,000	17,842,000,000	(10,535,000)	2,199,728,000							
Net Cash Flow fr	rom Investing Activities [Roll Up]												
Net Cash Flow from	m Investing Activities, Continuing	(4,978,000,000)	(19,122,000,000)	(33,221,000,000)	357,000	(960,033,000)							
Net Cash Flow from	m Investing Activities, Discontinued	0	0	0	0	0							
	Net Cash Flow from Investing Activities	(4,978,000,000)	(19,122,000,000)	(33,221,000,000)	357,000	(960,033,000)							
Net Cash Flow fr	rom Financing Activities [Roll Up]												
Net Cash Flow from	m Financing Activities, Continuing	1,743,000,000	(12,047,000,000)	17,345,000,000	(3,657,000)	(1,090,706,000)							
Net Cash Flow from	m Financing Activities, Discontinued	0	0	0	0	0							
	Net Cash Flow from Financing Activities	1,743,000,000	(12,047,000,000)	17,345,000,000	(3,657,000)	(1,090,706,000)							
Exchange Gains (L	.osses)	0	0	(8,000,000)	(432,000)	(14,234,000)							
	Net Cash Flow	3,267,000,000	(4,113,000,000)	1,958,000,000	(14,267,000)	134,755,000							

#### Entity comparison, normalized balance sheet:

Component: (Netwo	ork and Table)											
Network	101 - Unknown - Balance Sheet, Cla	ssified										
Table	Balance Sheet, Classified [Table]											
Drop Filter Fields Here	:											
		Period [Axis] 🔹 Reporting Entity [Axis] 🔺										
		2017-01-28		2016-12-31		2016-12-02						
Balance Sheet [Line I	tems]	0000858877 http:// www.sec.gov/CIK	0000320193 http:// www.sec.gov/CIK	0000789019 http:// www.sec.gov/CIK	0000880807 http:// www.sec.gov/CIK	0000796343 http:// www.sec.gov/CIK						
Assets [Roll Up]												
Current Assets		83,392,000,000	103,332,000,000	144,949,000,000	64,260,000	5,839,774,000						
Noncurrent Assets		42,856,000,000	227,809,000,000	79,661,000,000	79,661,000,000 45,981,000							
	Assets	126,248,000,000	331,141,000,000	224,610,000,000	110,241,000	12,707,114,000						
Liabilities and Equit	ty [Roll Up]											
Liabilities [Roll Up]												
Current Liabilities		22,708,000,000	84,130,000,000 70,787,000,0		70,787,000,000 38,364,000							
Noncurrent Liabilities		39,722,000,000	114,621,000,000	85,014,000,000	8,084,000	2,470,644,000						
	Liabilities	62,430,000,000	198,751,000,000	155,801,000,000	46,448,000	5,282,279,000						
Commitments and Cor	ntingencies	xsi:nil	xsi:nil	xsi:nil	xsi:nil	xsi:nil						
Temporary Equity		0	0	0	0	0						
Equity [Roll Up]												
Equity Attributable to	Parent	63,811,000,000	132,390,000,000	68,809,000,000	63,793,000	7,424,835,000						
Equity Attributable to	Noncontrolling Interest	7,000,000	0	0	0	0						
	Equity	63,818,000,000	132,390,000,000	68,809,000,000	63,793,000	7,424,835,000						
	Liabilities and Equity	126,248,000,000	331,141,000,000	224,610,000,000	110,241,000	12,707,114,000						

The examples above only scratch the surface. Using the full set of machine readable rules, the expert system can compare disclosures, compare across financial reporting schemes by creating the correct mappings, compare information and pull the accounting policies information and show that with the quantitative information, provide "drill down", links between parts of an analysis.

Here is a comparison of 23 insurance companies⁸³. This is achieved by simply providing the CIK number of the entity, the fiscal period desired, and the reporting style code. From that information, the following rendering is generated:

⁸³ Insurance company comparison,

http://www.xbrlsite.com/2016/fac/v3/Examples/IncomeStatementInsuranceBasedRevenues.jpg

Component (Network and Table)																							
National	200 3-Income Blate	mart, traurates Ba	and Revenues		and Terrary (																		
1909	(wender)	ANN CONTRACTOR CO																					
			a – a	11.11.11.11.11.11.11.11.11.11.11.11.11.							Bapar	Ting Entity (Asia)			<u>a</u> a				-11 - 12 - 12	c		z	
	AETINA INC IPAL (1122304)	APLAC INC (HIT7)	ALLEGRARY CORP DE (775NB)	AMERICAN EQUITY INVESTMENT LIFE HOXDING CO (1030628)	AMERICAN FINANCIAL GROUP INC (1942946)	AMERICAN INTERNATIONAL GROUP INC (5272)	AMERISAVE INC (SUBST2)	ALSURANT INC (1207238)	ALLURED GUARANTY LTD (1273812)	ATLANTIC AMERICAN CORP (8177)	AXA EQUITABLE LIFE INDURANCE CD (727929)	AXEE CAPITAL HOLDINGS LTD (1054874)	Alled World Assocance Collisiones AG (1953) All	Anthens, Inc. (1194208)	Argo Group International Relidings, LML (N2H174E)	BALOWN & LYONS INC (STIM)	Blue Capital Remunatore Holdings LM. (1982096)	CIGMA COMP	CINCINNATI FIRANCIAL CORP (20294)	CITIZENS INC (240H)	CNA FIRANCIAL CORP (21171)	CNO Financial Group, Inc. (1224608)	ENDURANCE SPECIALTY HOLDINGS LTD (H178758)
	Fiscal Year [Bars]	JAnia]	Finical Year (Rate)	Juneal Year	Fincal Vase	(Tintal Year	Finnal Tear	Fiscal Year	Front Year Mariel	Pincal Year	Fiscal Year (Reis)	Fincal Year [Rain]	Total Year (Anis)	Pincol Yaar Diskiel	Filed Tear	Jang .	Fiscal Year [Rave]	Piscal Year	Press Tear [Ren]	Press Veer	Discal Year	Dani	Proces Year
	2015	2011	2018	2013	2015	3015	2015	2015	2015	2015	2015	2010	2015	2010	2015	2013	2013	2015	2013	2013	2015	2013	2910
	Fiscal Particle [Particip	Press Period (Jaco)	Final Person	Finial Period	Final Paried [Arti]	Frank Partial	Filler Partiel (Auro)	Frank Partial	Frank Partial	- Frank Partial (Aut)	Finial Partiel	Finist Period [Auro]	Press Person	Freed Period	Finite Period [Retail	Frank Period JAcol	THE R	Finial Parisel	Fishe Period	Canal State	Final Parise [Bate]	Financi Personal photog	Final Period
income Nationald (Line Notes)	EV.	PC .		PF.	PV -	PT		PC -	. Pr	- PC	(- PE) - 1		- PC	. PY	- PV - 1	PY		PY .				. PY	PY
Net Income (Loss) (Not Up) Income (Loss) from Continuing Operations After Tax (Roll Up)																							
Income (Loss) from Continuing Operations Before Tax (Roll Up)																							
favoruet	80.336.500.300	20,812,000,000	4.996.475.000	1.518.837.000	6.140.000.000	\$8.327,088.300	400.3/14.000	10.325.494.000	2,257,000.000	185.217.000	8.319.002.000	4.132.304.000	1.548,400.000	73.156.503.000	1,454,800,000	240.275.300	36,100,000	37,875,000,000	6.142.000.200	238,260,500	8.101.000.000	3.811.200.208	2.047,635,200
Derafits, Crats, and Expenses	16.100.000.000	17.010.000.000	4,242,510,000	1.101.621.000	5.580 000.000	86.048.000.000	295.987.000	10.124.313.000	779.200.000	100.229.000	8.119.000.000	2.481.510.000	2,495,700,000	74,525,502,000	1.307,100.000	248.323.900	17.400.000	34.548.000.000	4.281.000.000	238.879.000	8.652.000.000	3.444.200.000	1,736,687,000
Destroy Loss: from Continuing Operations Before Tax	4,238,605,000	0 1382.000.000	D 117.348.300	0 311 314 000	0 005.000.000 e	3.261.005.000	100.007.000.0	201.101.000	1.4J1.000.000	L.706.000	1,850,000,0004	9 944,859,500 4	B #8.700,000	0 4,631,000,000	0 117,000,000 e	12.012.000 0	20,700,000	8.127.000.000	o 101,000,000	9 4.807,000 e	549,000,000	381,700,000	100,471,000
Income Tax Expense (Behefit)	1.841.002.000	1 229 000,000	196,173,000	117,404,000	165,000,000	1,004,005,000	30.505.200	56,608,500	\$75,000,000	1.300.005	186.000.000	3,028,000	5.805.000	2.071.000.005	14,305,300	10.005.000		1,250,000,000	247,000,000	872.000	75,006,500	#7,000.000	4,362,000
Insume (Lass) Hum Continuing Operations After Tan	2.594,500,000	1.538.000.000	<ul> <li>Md. 486.0001</li> </ul>	<ul> <li>2%8,830.000</li> </ul>	\$ 310.000.000	2.222.000-000	0 70.452.000 C	141,555,000	1,000,000,000	A 366.000 g	1.454.000.000	641.531.000 e	<ul> <li>B1.601.900 (</li> </ul>	0 2.680.000.000	<ul> <li>M60.200.000 €</li> </ul>	13.243.000 a	20.790.000	1077.000.000	<ul> <li>834.000.000</li> </ul>	9 -3.379.000 g	479.000.000 e	270,700,000	355.111.050
Gain (Loss) on Sale of Previously Unessel Stool by Subschary or Equity Investee, Nonoperating Income		0				0	4							1	0	0	4	1	0	0	4	4	0
Gain (Loss) on Disposition of Stock in Subsidiary or Equity Verbot Investee						4		0			. 0		. 0		4	. 0							
Posme (Loss) from Discontinued Operations, Net of Tax										1						0	4					4	8
Entraordinary Items of Income (Expense), Net of Tax.				1		4	4				. 0		- 0		. 0		4	1	0	0	. 0		
Net Income (Loss)	2,304,602,000	2 535.000.000	<ul> <li>642,168,300</li> </ul>	C 254,800.000	a 312.000.000 a	1,222,001,300	0.71481.000 0	141,308,300	1.595.000.000	4,388,000 (	1,454,000,000	540,831,500 (	0 B1 801,000 (	<ul> <li>2,560,000,000</li> </ul>	• 143.200.300 e	21,283,000	20,700,000	2,017.000.000	0 034.000.000	0 3.175.000 0	479,000.000	276,700,000	346,111,000

Additional normalized comparison examples⁸⁴.

### **Reporting Schemes**

There are many different financial reporting schemes⁸⁵. Each financial reporting scheme has a set of knowledge expressed in machine readable global standard XBRL for that specific financial reporting scheme⁸⁶. An expert system for creating financial reports would connect to that machine readable information. Pesseract, for example, points to that machine readable information:



 ⁸⁴ Additional normalized comparison examples, <u>http://www.xbrlsite.com/2016/fac/v3/Examples/Index.html</u>
 ⁸⁵ Comparison of Elements of Financial Statements,

http://xbrlsite.azurewebsites.net/2020/master/ElementsOfFinancialStatements.pdf

⁸⁶ Financial Reporting Schemes XBRL-based Knowledge Graph, <u>http://accounting.auditchain.finance/reporting-scheme/index.html</u>

### Daemons and Intelligent Software Agents

A daemon⁸⁷ is a program that continuously runs in the background and wakes up to handle periodic service requests, which might come from some other process that needs something done.

An agent is an entity capable of sensing the state of its environment and acting upon it based on a set of specified rules. An agent performs specific tasks on behalf of another. In the case of software, an agent is a software program. Intelligent software agents⁸⁸ can work behind the scenes or in the foreground to perform tasks for users of the software.



Some examples of how daemons and intelligent software agents might help accountants in the creation of XBRL-based digital financial reports includes:

- Watching over the creation of the report model structure, assuring that report element associations stay within specified permitted boundaries.
- When a user is editing model structure the software senses where the accountant is editing the report and providing a list of the report elements to the user based on the context of where the user is currently editing.
- Leveraging type-subtype association rules to help users pick the correct concept to add to a model structure and to associate concepts within permitted rules.
- Verifying in the background that the mathematics of a roll up or roll forward and other such mathematical associations "foots" and "cross casts" correctly while a report is being created.
- Watching over a report and provide information to the user of software to indicate any inconsistencies or contradictions within a report to known fundamental accounting concept associations.

 ⁸⁷ TechTarget, What is a daemon?, <u>https://www.techtarget.com/whatis/definition/daemon</u>
 ⁸⁸ Intelligent Software Agents, http://www.xbrlsite.com/mastering/Part01 Chapter02.G IntelligentSoftwareAgents.pdf

Being sure that the logical and accounting relations within a disclosure are consistent with
provided disclosure mechanics rules which specify permitted approaches to creating financial
disclosures.

### Wizards

A wizard is simply an approach to walking a user of an application through a series of steps. For example, Pesseract has a "Financial Report Creation Wizard" that walks the user through a series of steps that help them create a financial report:



A wizard is a type of recommender system. The wizard queries the user of the application for the following information:

- Which **financial reporting scheme** are they using to create the report? This will help provide the user with the correct machine readable information.
- What is the **legal form** of the reporting economic entity? This helps to application to understand what types of XBRL taxonomy concepts to use, which templates might be used, which disclosures apply, etc.
- What is the main **accounting activity** of the reporting economic entity? Again, this helps with the selection of machine readable metadata.
- What is the **industry sector** of the economic entity?

- What is the **reporting style** of the economic entity?
- Other report information.
- Other user preferences.
- Uses the collected information to suggest a list of **templates** the user can use to populate the report.

The answers to the questions are stored in the **state machine**. Then, the application uses that information to pre-filter machine readable knowledge, point the user in the right direction when performing a task, etc.

### Jigs

A jig is somewhat like a mini template. The idea of jigs in the creation of XBRL-based reports was introduced in Pesseract⁸⁹. What a jig does is it hides the technical complexity of constructing an information Block. Below you see the "jig" for the creation of a roll up. Rather than configuring the roll up; the user can simply import the jig and then modify the pieces of the jig in order to create a fragment of a financial report. A jig is simply a technique for making things easier.

Pesseract has jigs that can be used to create any information model.

Rendering	Model Structure	Fact Table		Business Rules Structure	Business Rules Validation Results	Elements	
Component: (Netwo	rk and Table)						
Network	XXXXXXX - Unknown -P	ut your netw	ork title	here			
Table	Implied [Table]						
Reporting Entity [Axis]			SAMP	nttp://www.SampleCompa	ny.com		7
Unit [Axis]			USD				۲
			Period	[Axis] 🚽			
Implied [Line Items]				2019-12-31			
Total Item [Roll Up]	l						
Item One				0			
Item Two				0			
Item Three				0			
		Total Item		0			

### **Constructing a Report**

Pulling all these pieces together to construct a report is summarized in the document *Financial Report Creation Proof*⁹⁰. Fundamentally, creating a report involves (a) creating each individual fragment of the report properly and (b) making sure there are no contradictions or inconsistencies between report fragments. An agenda helps you understand what fragments are required, which have been completed, and provide templates for each fragment to assist in the fragment creation process⁹¹. The information for each fragment can be viewed in

⁸⁹ Pesseract, *Jigs*, <u>http://xbrlsite.azurewebsites.net/2016/conceptual-model/jigs/rss.xml</u>

⁹⁰ Financial Report Creation Proof, <u>http://xbrlsite.com/2022/master-dynamic/FinancialReportCreationProof.pdf</u>

⁹¹ Report Creation, <u>http://xbrlsite.com/seattlemethod/pictures/Index.html</u>

different helpful ways⁹². Detailed lists of logical report artifacts are provided by software applications⁹³.

# Logical Data Model

Key to creating a proper, elegant expert system for creating financial reports is the logical data model that is used to store data used by the expert system, enforce a logical scheme to keep the information quality high, and flexibly query and use that information within the interfaces of the expert system.

My background is with relational databases. As such in a prototype application that I created I used a Microsoft Access Database⁹⁴ to store data. The problem with that is that enforcing the logical schema and querying information is challenging.

Another software engineer used a Microsoft SQL Server database to create Luca which is a skeleton of an expert system for creating financial reports⁹⁵. The point of Luca was to help the software engineer understand the logical data model that is necessary.

A third software engineer use a MongoDB database to create a cloud-based version of Luca which, likewise, is a skeleton of an expert system for creating financial reports⁹⁶.

This experimentation yielded a set of Excel spreadsheets that contained the logical data model that could be used to import information into Luca and cloud-based Luca. This Excel import spreadsheet set was completed when we created Pacioli. With Pacioli, you can import 100% of the PROOF into Pacioli which will then generate a complete XBRL-based financial report for the PROOF⁹⁷.

That same set of Excel files, excluding several rule formats not yet supported by the cloud-based Luca application (adjustment, variance, derivation, nonstandard), can be imported into both Pacioli and the cloud-based version of Luca. Very, very similar files can be copy and pasted into the local version of Luca and my Microsoft Access database application.

The point is that the Excel files represent the logical data model that would underly the expert system for creating financial reports.

Those Excel import files⁹⁸ are supplemented with an additional set of Excel files⁹⁹ that contain the machine readable information of the PROOF financial reporting scheme¹⁰⁰. What is the point here? The point is that if you look at the additional supplemental files information, it all fits into the same logical model as the "skeleton" logical data model that is used to import the report model and report information.

⁹⁴ Free Open Source Tool for Creating Quality XBRL-based Digital Financial Reports,

http://xbrl.squarespace.com/journal/2020/12/8/free-open-source-tool-for-creating-quality-xbrl-based-digita.html ⁹⁵ Luca, http://xbrl.squarespace.com/journal/2020/9/15/luca.html

⁹² Information Block Views, <u>http://xbrlsite.com/seattlemethod/pictures2/Index.html</u>

⁹³ Detailed Lists (Logical), <u>http://xbrlsite.com/seattlemethod/pictures3/Index.html</u>

⁹⁶ Cloud-based Luca, <u>http://xbrl.squarespace.com/journal/2021/8/31/cloud-based-luca.html</u>

⁹⁷ Pacioli Import of Proof, <u>http://xbrlsite.azurewebsites.net/2022/Library/PacioliImportOfProof.pdf</u>

⁹⁸ Excel import files, <u>http://accounting.auditchain.finance/library/proof-import-excel-2022-02-23.zip</u>

⁹⁹ Excel import files supplement, <u>http://accounting.auditchain.finance/library/proof-import-excel-2022-02-</u> 23 Supplement.zip

¹⁰⁰ Proof Financial Reporting Scheme Knowledge Graph, http://www.xbrlsite.com/seattlemethod/proof/documentation/index.html

The bottom line here is that the Luca and Pacioli import files show you the logical data model that is used to create the expert system for creating financial reports. There were a couple of short cuts that were taken related to the XBRL reference linkbase. But, that is essentially the logical data model.

But, the storage format for the data should be a graph or graph database of some sort with a logical schema enforcing the integrity of the information. While information can be effectively stored in a relational database, enforcing the logical rules is significantly more challenging when using a relational database.

To understand the logical data model of the expert system for creating financial reports it is suggested that you import the Excel¹⁰¹ files for PROOF into Luca¹⁰². Any XBRL-based report submitted to the SEC could be imported using exactly the same technique and would fit into the logical data model.

Additional work is necessary to figure out any modifications which might be necessary when the additional metadata for a financial reporting scheme¹⁰³ is added to the logical data model. While the metadata stored is likely not 100% complete, it does provide the information necessary to understand the moving parts of an expert system for creating financial reports. The PROOF tutorial for the locally installed version of Luca¹⁰⁴ is helpful in understanding the logical data model as a supplement to using cloud-based Luca tutorials¹⁰⁵ to understand the model.

The "skeleton" applications, Luca, cloud-based Luca, and my Microsoft access database, are very helpful in understanding how to start creating an expert system for creating financial reports.

# **Examples**

The following set of examples works up incrementally from a very tiny report to a complete 10-K of a public company submitted to the SEC¹⁰⁶. The examples start with the accounting equation, to SFAC 6, to Common Elements of Financial Report, to a MINI financial reporting scheme, to the PROOF we have previously mentioned, to XASB which is a prototype financial reporting scheme, to US GAAP financial reporting by Microsoft in an 10-K.

¹⁰¹ Excel files for Proof, <u>http://accounting.auditchain.finance/library/proof-import-excel-2022-02-23.zip</u>

¹⁰² Luca, <u>http://luca.yaxbrl.com/</u>

¹⁰³ Additional supplemental metadata, <u>http://accounting.auditchain.finance/library/proof-import-excel-2022-02-</u> <u>23</u> Supplement.zip

¹⁰⁴ Luca tutorials (locally installable version), <u>http://xbrl.squarespace.com/journal/2020/9/15/luca.html</u>

¹⁰⁵ Cloud-based Luca tutorials, <u>http://xbrl.squarespace.com/journal/2021/8/31/cloud-based-luca.html</u>

¹⁰⁶ Dashboard, Buildup, <u>http://xbrlsite.azurewebsites.net/2022/Prototypes/buildup/Dashboard.html</u>

#### Learning XBRL-based Reporting: Build Up (Prototype)

This is a prototype dashboard which provides a series of XBRL-based reports from very small to quite large. The purpose is to help accountants understand that reports are fragments of information blocks and what an information block is. The following is a summary of validation results for each report:

#	Entity Identifier	Economic Entity Name	View Report	Checked By	Double Check	XBRL Syntax Validation	Roll Up Computations	XBRL Formula Computations	Model Structure	FAC Consistency Crosschecks	Type/Subtype Associations	Disclosure Mechanics	Reporting Checklist	Other System Constraints
1	GH259400TOMPUOLS65II (Accounting Equation)	Accounting Equation	Info	*	*	ок	ок	ок	ок	ок	ок	ок	ок	NONE
2	GH259400TOMPUOLS65II (SFAC 6 Elements of Financial Statements)	SFAC6	Info	*	*	ок	ОК	ок	ок	ок	ок	ок	ок	NONE
3	GH259400TOMPUOLS65II (Common Elements of Financial Report)	Common Elements	Info	*	*	ок	ок	ок	ОК	ок	ок	ок	ок	NONE
4	GH259400TOMPUOLS65II (MINI Financial Reporting Scheme.)	MINI	Info	*	*	ок	ок	ок	ОК	ок	ок	ОК	ок	NONE
5	GH259400TOMPUOLS65II (PROOF of the Seattle Method.)	PROOF	Info	*	*	ок	ок	ок	ок	ок	ок	ок	ок	NONE
6	GH259400TOMPUOLS65II (XASB prototype financial reporting scheme.)	XASB	Info	*	*	ок	ок	ок	ок	ок	ок	ок	ок	NONE
7	0000789019 (Microsoft 10- K Submitted to SEC)	Microsoft 10-K	Info	2	2	ок	Inconsistent	ок	ок	ок	ок	ок	ок	NONE

# **Testing Resources**

This ZIP archive¹⁰⁷ has a plethora of examples that can be used for testing.

This XBRL-based digital financial reporting conformance suite¹⁰⁸ helps you make sure you can detect many mistakes that are made when creating XBRL-based digital financial reports.

*Learning About XBRL-based Digital Financial Reporting*¹⁰⁹ has a multitude of reports that can be used for testing.

*Mastering XBRL-based Digital Financial Reporting*¹¹⁰ is a series of examples.

My blog has a plethora¹¹¹ of documented examples that can be used for testing.

# Library of Pesseract Screen Shots, Videos, Other

The library of Pesseract screen shots help professional accountants and software engineers building an expert system for constructing financial reports to communicate and discuss details¹¹². The following video playlists help you see Pesseract in operation¹¹³. Other helpful information can be found on my blog post *Try Pesseract, Get a Glimpse of the Future of Financial Reporting*¹¹⁴.

¹⁰⁷ Pacioli Examples, <u>http://xbrlsite.azurewebsites.net/2022/Library/PacioliExamples.zip</u>

 ¹⁰⁸ XBRL-based digital financial report conformance suite, <u>http://xbrlsite.com/2020/conformance-suite/index.xml</u>
 ¹⁰⁹ Learning About XBRL-based Digital Financial Reporting,

http://xbrl.squarespace.com/journal/2022/2/9/learning-xbrl-based-digital-financial-reporting.html

¹¹⁰ Mastering XBRL-based Digital Financial Reporting, <u>http://xbrlsite.azurewebsites.net/2020/master/</u>

¹¹¹ My blog, <u>http://xbrl.squarespace.com/blog-archive/</u>

¹¹² Pesseract, Screenshots, <u>https://photos.app.goo.gl/cWeZYaMBEbmSSm7v8</u>

¹¹³ Pesseract, Video Playlists, <u>https://www.youtube.com/channel/UCRIbipm3f0DaGPuLK51rvHA/playlists</u>

¹¹⁴ Try Pesseract, Get a Glimpse of the Future of Financial Reporting,

http://xbrl.squarespace.com/journal/2020/4/3/try-pesseract-get-a-glimpse-of-the-future-of-financial-repor.html

# **Phases of Financial Report Creation Capabilities**

There are several phases of financial report creation. This section walks you through those phases.

**Phase 1**: The objective of phase 1 is to understand the logical model of a digital financial report correctly and to have basic capabilities to create reports. The application at phase 1 can be used to create reports manually by keying information into a very basic interface similar to Luca¹¹⁵, import 100% of report information using Excel import spreadsheets, and use an API to populate the software application. Once the information is in the application, XBRL is generated for the information within the application. In phase 1, information is entered directly into a form that looks very much like a database table. A high priority of this phase is getting information entry verification dialed in correctly.

StructureType	Networkldentifier	AssociationFromName	AssociationRole	AssociationToName	CalculationPolarity	PreferredLabelRole	Sequence
Presentation	BalanceSheet	proof:BalanceSheetHypercube	Parent-Child	proof:BalanceSheetLineItems			1
Presentation	BalanceSheet	proof:BalanceSheetLineItems	Parent-Child	proof:BalanceSheetSet			2
Presentation	BalanceSheet	proof:BalanceSheetSet	Parent-Child	proof:Assets			3
Presentation	BalanceSheet	proof:BalanceSheetSet	Parent-Child	proof:Liabilities			4
Presentation	BalanceSheet	proof:BalanceSheetSet	Parent-Child	proof:Equity			5
Definition	BalanceSheet	proof:BalanceSheetLineItems	RootMember-Member	proof:Assets			1
Definition	BalanceSheet	proof:BalanceSheetLineItems	Member-Member	proof:Liabilities			2
Defin/~`\n	BalanceSheet	programation and the second seco	Member-Member	proof:Equity			3
~			~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~	for the second s	han m	┶╼╌═ <b>┽</b> ╵ <u>└</u>	5

In phase 1, XBRL can be output but the application does not directly verify the XBRL output. But, the application does generate the correct XBRL output which is then verified by a separate tool that can perform all the necessary XBRL verification tasks.

**Phase 2**: The objective of phase to is to provide an improved GUI/UX for manually entering information into the report. In the prior phase for example, associations where entered into a database table as such.

In the phase 2 interfaces will be changed to be more functional, for example rather than the database table for entering information as in phase 1, in phase 2 the accusations would be entered within an interface similar to the following: (i.e. editing associations using a tree view control or such)

-	Element Type	Balance	Period	Name	Order
<ul> <li>Presentation View</li> </ul>					
🗸 🔷 01-Balance Sheet	Extended Link				
✓ 1 Balance Sheet [Hypercube]	Table	na	duration	proof:BalanceSheetHypercube	0
🗸 🕀 Balance Sheet [Line Items]	Abstract	na	duration	proof:BalanceSheetLineItems	1
🗸 💽 Assets [Roll Up]	Abstract	na	duration	proof:AssetsRollUp	2
<ol> <li>Current Assets</li> </ol>	Element	debit	instant	proof:CurrentAssets	3
Noncurrent Assets	Element	debit	instant	proof:NoncurrentAssets	4
<ol> <li>Assets</li> </ol>	Element	debit	instant	proof:Assets	5
🗸 🕀 Liabilities and Equity [Roll Up]	Abstract	na	duration	proof:LiabilitiesAndEquityRollUp	6
🗸 🚯 Liabilities [Roll Up]	Abstract	na	duration	proof:LiabilitiesRollUp	7
<ol> <li>Current Liabilities</li> </ol>	Element	credit	instant	proof:CurrentLiabilities	8
Noncurrent Liabilities	Element	credit	instant	proof:NoncurrentLiabilities	9
Liabilities	Element	credit	instant	proof:Liabilities	10
🗸 🚯 Equity [Roll Up]	Abstract	na	duration	proof:EquityRollUp	11
Equity Attributable To Controlling Interests	Element	credit	instant	proof:EquityAttributableToControllingInterests	12
Equity Attributable to Noncontrolling Interests	Element	credit	instant	proof:EquityAttributableToNoncontrollingInterests	13
Equity	Element	credit	instant	proof:Equity	14
Liabilities and Equity	Element	credit	instant	proof:LiabilitiesAndEquity	15

This type of interface is used in phase 2 because it is relatively easy to create and it is very usable. But, there is an even better way which will be created in Phase 3.

¹¹⁵ Luca which is a Phase 1 report creation tool, <u>http://luca.yaxbrl.com/</u>

**Phase 3**: In phase three when developers are familiar with the rendering, model structure, fact table, rules, verification, and report elements the real interface we want will be created. This interface for editing the report is the rendering itself:

Rendering	Model Structure	Fact Table		Business Rules Structure	Business Rules Validation Re	sults Elements				
Component: (Networ	k and Table)									
Network	01 - Unknown - Balanc	e Sheet								
Table	Balance Sheet [Hypercu	ibe]								
Reporting Entity [Axis]			GH259	GH259400TOMPUOLS65II http://standards.iso.org/iso/17442						
Unit [Axis]			USD				۲			
			Period	[Axis] 🔫						
Balance Sheet [Line It	ems]			2020-12-31	2019-12-31					
Assets [Roll Up]										
Current Assets				500	0	]				
Noncurrent Assets				3,000	0	]				
		Assets		3,500 1	0 1					
Liabilities and Equity	y [Roll Up]									
Liabilities [Roll Up]										
Current Liabilities				0	0	]				
Noncurrent Liabilities				0	0	]				
		Liabilities		0	0					
Equity [Roll Up]										
Equity Attributable To	Controlling Interests			3,000	0					
Equity Attributable to N	Ioncontrolling Interests			500	0	]				
		Equity		3,500	0					
	Liabilit	ies and Equity		3,500	0					

In phase 3, the user will be able to edit an information Block (or any report fragment preferably) from within the rendering. The rendering, which is just a table, can have rows and/or columns added or removed using the notion of slots mentioned earlier. The user can still edit the report within the fact table, model structure, elements, and so forth...but they will also be able to edit the report by directly editing the rendering.

Also, part of phase 3 is understanding and using the logical "glue" that is used to hold an information block together. As part of this phase, software engineers gain an intimate understanding of the logical model and the use of the logical model to help the business professional that uses the software. This prepares the software engineer for the next phase.

**Phase 4**: In phase 4 the focus will be on recommender systems, wizards, templates, exemplars, and other artificial intelligence related features which help the user be more efficient and effective.

# **GUI/UX**

One of the biggest challenges in creating a proper expert system for creating financial report will be to create a graphical user interface (GUI) and user experience (UX) that is (a) as close to a desktop application as possible and (b) as good as interface and as easy to use as something like Microsoft Excel. Syncfusion Software GUI/UX¹¹⁶ is an example of the bar that needs to be hit.

¹¹⁶ Syncfusion Software GUI/UX, <u>http://xbrl.squarespace.com/journal/2022/3/11/syncfusion-software-guiux.html</u>

# **F.A.I.R. Principles**

Data and metadata should follow F.A.I.R. principles¹¹⁷. These guidelines help make data and metadata (digital assets): Findability, Accessibility, Interoperability, and Reuse. The FAIR principles emphasize machine-actionability¹¹⁸ because humans increasingly rely on computational support to deal with data as a result of the increase in volume, complexity, and creation speed of data



# Conclusion

Hard problems call for great efforts. Great effort was undertaken to attempt to bury complexity, achieve elegance, such that the millions of professional accountants that will use this system will benefit from that great effort.

If an expert system for creating financial reports can be built, which I believe it can based on existing software and working proof of concepts; that software will be useful, it will be novel, and it will offer a new method for creating financial reports.

As was said at the beginning of this document:

"Great things are done by a series of small things brought together." Vincent Van Gogh

This information is made available to help accountants and software engineers get the foundations of such a system right. Software vendors should compete with each other in terms of the value add of the functionality that they provide. Fundamental functionality should simply just work.

¹¹⁷ Go-fair.org, FAIR Principles, <u>https://www.go-fair.org/fair-principles/</u>

¹¹⁸ Wikipedia, FAIR Data, <u>https://en.wikipedia.org/wiki/FAIR data</u>