Understanding Model-driven Standards-based Semantic-oriented AI-powered Financial Reporting

A new modern approach to financial reporting using software that actually understands the financial report that the software is working with

by

Charles Hoffman, CPA

A resource for professional accountants who want to understand the fundamentals of model-driven standards-based semantic-oriented artificial intelligence powered financial report creation, a cornerstone of modern accountancy, which is enabled by the Seattle Method[1], OMG's Standard Business Report Model (SBRM)[2], and/or XBRL International's Open Information Model (OIM)[3].

2025-03-25 (draft)

https://digitalfinancialreporting.blogspot.com/2024/12/master-class-in-representing-financial.html

[1] Charles Hoffman, CPA, Seattle Method, http://xbrlsite.com/seattlemethod/SeattleMethod.pdf

[2] Object Management Group (OMG), *Standard Business Report Model (SBRM)*, https://www.omg.org/spec/SBRM/

[3] XBRL International, *Open Information Model (OIM)*, https://specifications.xbrl.org/spec-group-index-open-information-model.html

About the author:

Charles Hoffman, CPA, is credited as being the *Father of XBRL*. He started his public accounting career as an auditor with the international firm then called Price Waterhouse, served various roles in industry and public accounting for over 25 years, and has worked with XBRL since its introduction by the AICPA in 1998. In 2006, he received the AICPA Special Recognition Award for his pioneering role in developing XBRL. He has authored numerous publications including *XBRL for Dummies*, a number of *Journal of Accountancy* articles, writes a blog relating to XBRL, and contributed to a number of XBRL related technical specification and best practices documents. Currently, Charlie works as a consultant to CPAs and software vendors who want to better understand the subtle details of this new digital medium.

Charlie was co-editor of the first ever US GAAP XBRL taxonomy, contributor to the *XBRL 2.1 Specification* and the *XBRL Dimensions* specification, editor of the *Financial Reporting Taxonomy Architecture* and *Financial Reporting Instance Standards*, co-author of the *US GAAP Taxonomy Architecture*, part of the project team which created the *US GAAP Taxonomy*, and a major contributor to the IFRS XBRL taxonomy for a five-year period, and consultant to numerous other XBRL taxonomy projects.

Acknowledgements:

While I did physically create the information in this resource, I could have not done so without the gracious help of a number of people, directly and indirectly, over the years. I see myself as merely a custodian of this important information, nurturing it along for the benefit of all, condensing countless discussions into something hopefully useful for the common good.

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There are others which I probably left off and for this I apologize. I acknowledge and appreciate the thinking others contributed to this endeavor.

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"I skate to where the puck is going to be, not where it has been." Wayne Gretzky, legendary Canadian hockey star

* * *

In his paper, *Computational Law: The Cop in the Backseat*[4], Michael Genesereth uses Intuit's TurboTax as an example of computational law. Computational Law is that branch of legal informatics concerned with the automation of legal analysis. The goal of work in the field is the development of computer systems capable of doing legal calculations of various sorts, such as compliance checking, legal planning, and regulatory analysis. Genesereth describes Turbotax thus:

> "Intuit's TurboTax is a simple example of a rudimentary Computational Law system. Millions use it each year to prepare their tax forms. Based on values supplied by its user, it automatically computes the user's tax obligations and fills in the appropriate tax forms. If asked, it can supply explanations for its results in the form of references to the relevant portions of the tax code."

Informatics of Accountancy[5] is concerned with the automation of accounting, reporting, auditing, and analysis.

A model-driven standards-based semantic-oriented AI-powered approach to financial reporting is a paradigm shift. Today, most external financial reports such as those reports created by public companies which are submitted to the U.S. Securities and Exchange Commission (SEC) or listed companies which are submitted to the European Single Market Authority (ESMA) are created using sets of electronic documents and electronic spreadsheets that are cobbled together in some sort of process which results in that external financial report being output. Then, XBRL is generated for submission to the regulators that require that format by "bolting on" additional work to that existing process.

How much does the software used to process those electronic documents and electronic spreadsheets actually understand the financial reports those tools are constructing and the financial information contained in those reports? Zero.

The processes used today are not model-driven, not standards-based, not semantic-oriented, and nor is that process powered by AI in any way.

What if software used to create those reports did understand the financial reports that were being created and the financial information that was contained in the reports? What if that software could assist accountants creating those reports, somewhat similar to how a calculator helps an accountant do math? What if humans and artificial intelligence could work together as a team to perform the task of creating a financial report?

This document helps accountants, auditors, and analysts understand standards-based model-based semantic oriented financial reports and why they will be the next step in the evolution of accountancy; usuring in a new era of modern accountancy. This document will contribute to making you a model-based financial report master craftsman.

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[4] Stanford University, Michael Genesereth, *Computational Law: The Cop in the Backseat*, https://law.stanford.edu/2016/01/13/michael-genesereths-computational-law-the-cop-in-the-backseat/

[5] Charles Hoffman, CPA, *Informatics of Accountancy*, https://twinfox.io/xbrl/2024/library/InformaticsForAccountancy.pdf

1. Introduction

Intuit's TurboTax is model-driven. The idea of model-based reporting is not new. For example, the Quantrix Modeler[6] has been around for quite some time. The whitepaper, *Whitepaper: Quantrix and Excel: 3 Key Differences*[7], explains key conceptual and practical differences between Quantrix and Microsoft Excel.

A forth coming book, *Real-time Financial Accounting the Data Centric Way*, also mentions model driven financial reporting.

While Quantrix can be considered a "model-based" approach to financial modeling, there is a difference between what Quantrix offers and what I mean by standards-based model-based semantics-oriented intelligent agent powered financial reporting. The key differences can be summarized as follows:

- Model-driven
- Global standards-based
- Semantic-oriented
- Intelligent software agent powered
- Customizable

The rest of this introduction will explain those important differences and help accountants, auditors, and analysts understand precisely what I mean and empower them to understand what impact model-based reporting will have on the future of accountancy.

1.1. Model-driven

Quantrix is a model-driven tool. Microsoft Word and Excel are document-based tools. Technically, a more accurate description is that Word and Excel are model-driven tools; but the model they use are how things are put into a document or onto a spreadsheet, not a financial report.

For example, when working with Word; pieces of a report go into a paragraph, a list, a table and then there is some sort of sequencing of those document-based artifacts into what looks like a report that was typed on a piece of paper. Excel is similar, but the artifacts involved are workbooks, worksheets, rows, columns, and cells.

A model-based report constructs disclosures, organizes those disclosures into some sort of flow, the disclosures have financial report line items and facts in them. The actual model will be explained in a forthcoming section.

Another thing about the Quantrix model is that the model is limited to OLAP (Online Analytical Processing)[8]. By contrast, the model-driven approach that a financial report

[6] Quantrix, Quantrix Platform, https://discovery.quantrix.com/financial-modeling-software/
[7] Quantrix, *Whitepaper: Quantrix and Excel: 3 Key Differences*, https://quantrix.com/quantrix-whitepapers/quantrix-and-excel/
[8] Wikipedia, *Online Analytical Processing*, https://en.wikipedia.org/wiki/Online_analytical_processing

model uses is based on the multidimensional model provided by XBRL Dimensions[9]. Both the Seattle Method and XBRL International Open Information Model (OIM) leverage that global standard technical specification of a multidimensional model. At this point it is unclear what physical implementation of a multidimensional model the OMG Standard Business Report Model (SBRM) will leverage. Logically, the Seattle Method, OIM, and SBRM obviously are equivalent. The logic of a financial report does not change by simply changing the technical format of the financial report.

1.2. Global standards-based

Quantrix is not standards-based, that tool uses a proprietary oriented technical format. The form of model-driven financial reporting that I am describing leverages a global standard-based technical format for getting information into and out of software. Because of the global standard-based technical format, software vendors cannot lock you into their specific software.

To understand the traction that the global standard XBRL is getting, have a look at what the Financial Accounting Standards Board (FASB) has published (is publishing) on their website using that global standard XBRL technical format:

- US GAAP Reporting Taxonomy[10], machine-readable information related to US GAAP financial reporting provided using the global standard XBRL
- SEC Reporting Taxonomy[11], used by public companies who are required to report to the U.S. Securities and Exchange Commission (SEC) using the XBRL format
- GAAP Employee Benefit Plans Taxonomy[12], machine-readable information related to financial reporting by retirement plans and welfare plans which leverages the XBRL technical format
- GAAP Meta Model Relationships Taxonomy[13], explains fundamental relationship between financial reporting concepts in machine readable terms using XBRL
- DQC Rules Taxonomy[14], Data Quality Committee rules published in machine-readable form

[9] XBRL International, *XBRL Dimensions*, https://specifications.xbrl.org/work-product-index-group-dimensions-dimensions.html
[10] FASB, *2025 GAAP Reporting Taxonomy*, https://www.fasb.org/page/detail?pageId=/projects/FASB-Taxonomies/2025-gaap-financial-reporting-taxonomy.html
[11] FASB, *2025 SEC Reporting Taxonomy*, https://www.fasb.org/page/detail?pageId=/projects/FASB-Taxonomies/2025-sec-reporting-taxonomy.html
[12] FASB, *GAAP Employee Benefit Plan Taxonomy Website Terms and Conditions*, https://fasb.org/page/detail?pageId=/projects/FASB-Taxonomies/2025-disclaimer-gaap-employee-benefit-plan-taxonomy.html
[13] FASB, *GAAP Meta Model Relationships Taxonomy*, https://www.fasb.org/page/detail?pageId=/projects/FASB-Taxonomies/gaap-meta-model-relationships-taxonomy.html
[14] FASB, *DQC Rules Taxonomy*, https://www.fasb.org/projects/fasb-taxonomies/dqc-rules-taxonomy

Effectively, financial reporting is being digitized. And the machine readable technical format of choice tends to be the global standard XBRL technical format. In addition to this machine readable information; infrastructure for creating more XBRL-based machine readable information has been created. XBRL International published, *Accounting Semantics Arcroles 1.0*[15], which are part of the building blocks that are used to represent financial report information using the XBRL global standard technical format.

Two key things to take away from this section. First, "digital" works differently than representing things in a physical format such as paper. While accounting, reporting, auditing, and analysis has been performed via paper or electronic versions of paper or "e-paper" like word processing documents and presentation oriented electronic spreadsheets in the past; this is undergoing a very significant change as you can see by what the FASB is doing. Second, if you don't understand "digital"; you really might want to up your digital proficiency[16] to better understand what is going on. The change is a big one.

1.3. Semantic-oriented

Quantrix provides the ability to create a model-driven report using semantics, basically meaning and logic, that the user of Quantrix specifies. It is unclear whether such models can be shared between financial reports, but the models are OLAP models and they are not global standards-based semantic-oriented models. In this regard Quantrix is again proprietary.

The model of a financial report is semantic, that meaning and logic is sharable across report models, and the financial report model is based on the logical model of the global standard XBRL. The Seattle Method, OIM, and SBRM further enhance that logical model of a financial report enabling additional capabilities.

There are multiple levels of the semantic model of a financial report, the meaning and logic which can then be interpreted by software applications. A report itself has a logical model. What goes into that logical report model is separate and therefore different reporting schemes still share the same report model logic.

All of these semantics can be represented in machine readable form and exchanged between different software implementations using the global standards based physical format used to represent the standard semantics published by, say, the FASB as pointed out above, or by the IFRS Foundation for International Financial Reporting Standards or EFRAG for sustainability reporting, ESG, CSRD, or whatever you might call it.

To the extent that this machine-readable and therefore machine-interpretable semantics is made available to software applications, software can supercharge the skills of skilled and experienced accountants working with those financial reports.

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[15] XBRL International, Accounting semantics arcroles 1.0, https://www.xbrl.org/REQ/accounting-semantics-req/REQ-2023-01-04/accounting-semantics-req-2023-01-04.html

[16] Charles Hoffman, *Digital Proficiency*, https://digitalfinancialreporting.blogspot.com/2024/05/digital-proficiency.html

1.4. Intelligent software agent powered

Quantrix does have some intelligence, but it does not provide a complete first order logic rules engine. Model-driven financial reporting does provide a powerful yet safe implementation of first order logic using DATALOG[17] which is a safe subset of declarative logic programming language PROLOG[18]. Those rule and rule-based logic can be supplemented by probability-based logic and large language models (LLMs) for even more information processing capabilities.

To understand the type of intelligence a software agent would have, look at the logic implemented for the Seattle Method related to financial reporting:

- Theory of Mathematical Integrity
- Theory of Model Structure
- Theory of Information Blocks
- Theory of Fundamental Accounting Concepts and Reporting Styles
- Theory of Types and Parts
- Theory of Disclosures and Disclosure Mechanics
- Theory of Reportability

Other intelligence can be added, for example something like Theory of Normalization which would convert as reported financial report information into a normalization model.

While TurboTax is a true model-driven software application and while TurboTax can be considered semantic-oriented; there is a big difference between the intelligence of TurboTax and model-driven financial reports. TurboTax is basically a standard form based intelligent software agent, whereas model-driven intelligence enables those creating financial reports to customize their report model because, unlike tax forms, financial statements are not forms.

Further, because customizations of financial reports must be keep within permitted boundaries or customizations of the report model logic as well as financial reporting scheme logic; model-driven intelligent software also provides "guardrails" to control the wild behaviour of accounts creating model-driven reports; keeping them within those permitted boundaries.

1.5. Customizable

A financial statement is not standardized form. While the model of a financial report is fixed; what a reporting economic entity puts into that model is specific to that reporting economic entity, but it does follow logical patterns. As such, creators of model-driven financial reports need to be able to work within that fixed report model and be able to configure their custom report model within the boundaries of what is permitted. Customizations are controlled and kept within permitted boundaries.

TurboTax is a form editor. Intuit has to create each of the forms generated by TurboTax. Users of TurboTax cannot change forms.

[17] Wikipedia, *Datalog*, https://en.wikipedia.org/wiki/Datalog
[18] Wikipedia, Prolog, https://en.wikipedia.org/wiki/Prolog

2. Craft of Creating Financial Statements

Financial statements tell a story. It is a milestone in an accountant's career when the accountant can weave together a logical, cogent, true and fair narrative from information provided and tell a story about an economic entity in the form of a financial statement and comply with the rules of the financial reporting scheme being used.

With the ability to perform that task, an accountant has achieved accounting literacy.

That is precisely what an accountant creating a financial statement must do, whether that report is document-based or model-driven.

But instead of doing this with Microsoft Word, Excel and typing a bunch of stuff into applications that don't understand accounting; with a model-driven report, accountants need to construct a report model, then report information to tell the story they want to tell about an economic entity. They need to represent that report in terms that both humans and machines, such as software applications, must be able to understand.

Authors Dean Allemang and James Hendler say it well in their book *Semantic Web for the Working Ontologist*[19]:

> "In the hands of someone with no knowledge, they can produce clumsy, ugly, barely functional output; but in the hands of a skilled craftsmen, they can produce works of utility, beauty, and durability."

A brick wall is made of exactly two things: bricks, mortar. But a brick wall created by a master craftsman, or mason, and a brick wall created by a "weekend warrior" with no knowledge of masonry will be very different.

Master craftsmen are created and that process takes time and effort. Skills and experience that turn you into a master craftsman need to be accumulated and added to your base of understanding. Accumulating these skills and experience takes time, effort, and a great deal of practice.

When using a model-based semantic-oriented approach and intelligent software agents are leveraged and global standards based financial report knowledge is provided which drives a software application, an expert system really; the accountant creating that report can be as skilled as the accountant that represented that knowledge in machine readable form.

The technology behind something like a global standards-based model-driven semantic-oriented intelligent software agent powered expert systems software application can be extremely complex. And complexity[20] cannot simply be ignored in order to make creating such software easier. The notion of irreducible complexity (a.k.a. essential complexity) helps one understand that all the individual components of a system[21] need to be there for the system to operate effectively.

While irreducible complexity helps you understand that complexity cannot be removed; the *Law of Conservation of Complexity* points out that complexity can be moved.

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[19] Dean Allemang and James Hendler, *Semantic Web for the Working Ontologist*, page 1, https://www.amazon.com/Semantic-Web-Working-Ontologist-Effective/dp/0123859654
[20] Complexity, https://seattlemethod.blogspot.com/2025/01/complexity.html
[21] System, https://seattlemethod.blogspot.com/2025/01/system.html

There are many other important considerations[22] when trying to figure out how to construct something like an expert systems software application that can deliver an effective model-driven semantic-oriented approach assisted by intelligent software agents; but while complicated, such software can, and in fact has, been created. This usher in a new era of human and machine teaming to perform work[23].

Humans and machines teaming up to perform work, each bringing what they do best to the table, making processes better, faster, and cheaper is what this is all about. The threat of inaccuracies is reduced; quality goes up. The drudgery of accounting, reporting, auditing, and analysis is reduced.

Automation can streamline many of the mundane tasks performed by accountants, auditors, and analysts. Artificial intelligence will amplify, augment, and empower; even supercharge; these financial professionals rather than replace them. That drudgery and the toil involved with accounting, reporting, auditing, and analysis will be performed by the machine partner that is good at performing mundane repetitive tasks which are involved with these processes.

A paradigm shift is occurring. The territory is changing. A new mental map is necessary. Trying to use your old mental map to understand the new territory will be unsatisfying. While it may seem nuts to believe there is a better way to do financial reporting, even insane; that is exactly what I am saying. Accountants looking back twenty five or fifty years from now will see the current practices are barbaric.

This shift is caused by the difference between how "realspace" (the real world, analog) and "cyberspace" (the internet, digital) operate. While many things will stay the same; it is also the case that entirely new business models and products are possible. Model-driven semantic-oriented intelligent agent powered financial reporting leveraging global standards is one of those possibilities.

But how do you make this model-driven approach actually work?

3. Essence of a Financial Statement

A financial statement is not just one big thing. A financial statement is, rather, a collection of many smaller pieces that work together. This becomes clear when you look at a financial statement as a model of the report and the information that is being reported using that model.

3.1. Knowledge Graph

The term knowledge graph has been gaining a lot of attention over the past several years. A financial report is a knowledge graph[24].

Knowledge is the understanding or interpretation of information. Knowledge relates to terms, structures, associations, rules, facts, and skills acquired by a person through experience or education that relates to the theoretical or practical understanding of something.

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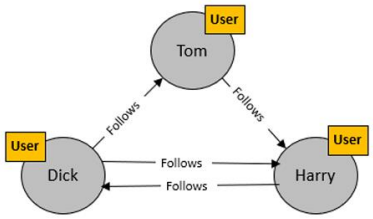
[22] Seattle Method Overview, https://seattlemethod.blogspot.com/2025/01/overview.html
[23] Work, https://digitalfinancialreporting.blogspot.com/2025/01/work.html
[24] Charles Hoffman, CPA, *Financial Report Knowledge Graphs*, http://xbrlsite.azurewebsites.net/2021/Library/FinancialReportKnowledgeGraphs.pdf

A graph, in formal terms, is a set of vertices and edges. In less intimidating language, a graph is a set of nodes and the relationships that connect the nodes together. Graphs represent things as nodes and the ways in which those things relate to one another and rest of the world as associations between those things.

A graph is a general-purpose communications tool that allows us to model all sorts of scenarios in terms that are innately understandable to humans. One thing that can be represented in the form of a graph is knowledge.

This is a simple graph of knowledge, or a knowledge graph:



Similarly, the "things" which make up a financial report and the "associations between things" can be represented within a machine-readable knowledge graph such as the global standard XBRL. XBRL is actually an extra fancy professional grade global standard knowledge graph[25].

Using clever and creative techniques, the fact that a financial report is a knowledge graph can be leveraged to your advantage.

3.2. Atomic Design Methodology

To provide the required flexibility technical people need to build model-driven reporting effectively; but also to provide the necessary ease of use to business professionals to allow them to succeed, the *Atomic Design Methodology*[26] was leveraged.

The notion of atoms, molecules, organisms, and species[27] are used. Elegance, grace, and beauty are achieved by good design principles and practices.

A kludge is an engineering/computer science term that defines what is best described as a workaround or quick-and-dirty solution that is typically clumsy, inelegant, inefficient, difficult to extend and hard to maintain; but it gets the job done. The nautical term for a kludge is jury rig. By contrast, elegance is beauty that shows unusual effectiveness, grace, and simplicity.

3.3. Objects Used to Construct Report

A system is a set of interrelated and interdependent elements (a.k.a. parts, things), groups (a.k.a. types, categories, sets) into which the elements fall, and interaction

[25] *XBRL is an Extra Fancy Knowledge Graph*, https://digitalfinancialreporting.blogspot.com/2024/05/xbrl-is-extra-fancy-knowledge-graph.html
[26] Atomic Design Methodology, https://digitalfinancialreporting.blogspot.com/2023/12/atomic-design-methodology.html
[27] Atoms, Molecules, Organisms, and Designing Systems, https://digitalfinancialreporting.blogspot.com/2025/01/atoms-molecules-organisms-and-designing.html

patterns that describe the interactions between the different types of elements within a system. A system has a nature and structures.

A logical system is a set of logical statements about the things that make up a system such as a financial report. Here is a description of the objects used to construct the logical system we refer to as a financial statement:

- Terms
- Structure (a.k.a. Assembly)
- Rules
- Disclosures
- Facts
- Information

There are plenty of places to get more information about these objects that are used to work with a financial report[28]. I am providing only a brief summary of these objects to make several points.

First, those terms are rather easy for a business professional which tends to have a liberal arts degree (as contrast to technical training like a computer person) to understand. Second, believe it or not but you learned the fundamentals of how the semantic web works in fifth grade English class[29]. Finally, don't try to understand the underlying technologies at work, all you need to understand is the rules of logic; think philosophy not computer science.

3.4. Information Logic Patterns

The logic of the information represented within a block of information has patterns. Some of those patterns are:

- Set
- Roll Up
- Roll Forward
- Arithmetic
- Adjustment (a.k.a. Restatement)
- Variance (a.k.a. Difference)

Again, the point is that accountants tend to understand the terms that you see above that describe the logic of how a system works.

[28] *Throwing Something Against the Wall to See if it Sticks*, https://digitalfinancialreporting.blogspot.com/2024/11/throwing-something-at-wall-to-see-if-it.html

[29] *You Learned About the Semantic Web Fundamentals in Fifth Grade*, https://digitalfinancialreporting.blogspot.com/2025/03/you-learned-about-semantic-web.html

3.5. Best Practices

An area of knowledge is a highly organized socially constructed aggregation of shared knowledge (a.k.a. corpus) for a distinct subject matter. Subject matter experts (SMEs) create, use, and maintain an area of knowledge.

An area of knowledge has a specialized insider vocabulary, underlying assumptions (axioms, theorems, constraints, assertions, restrictions), and persistent open questions that have not necessarily been resolved (i.e. flexibility is necessary). You can think about an area of knowledge as being characterized in a spectrum with two extremes:

- **Kind area of knowledge**: clear rules, lots of patterns, lots of rules, repetitive patterns, and unchanging tasks.
- **Wicked area of knowledge**: obscure data, few or no rules, constant change, and abstract ideas.

Stakeholders of a system need to be in agreement as to an undisputed core knowledge of an area of knowledge. Sensemaking is the process of determining the knowledge, or deeper meaning or significance or essence, of the collective experience for those within an area of knowledge.

The *Cynefin Framework*[30] provides a tool for understanding and categorizing knowledge and rules within a corpus. Per the Cynefin Framework, knowledge can be categorized as being:

- **Best practice** (obvious)
- **Good practice** (only obvious if you have the right skills and experience like subject matter experts)
- **Emergent practice** (tend to have to have more skills and experience, then can use principles to group alternatives into sets of good practices)
- **Novel practice** (tends to be unique, but describable, only the "best of the best" work at this level within an area of knowledge)

The point here is that confusing the moving parts of the puzzle causes confusion in understanding how model-driven financial reporting will actually work or whether it can even work.

Rather, if you really want to understand model-driven standards-based semantic-oriented AI-powered financial reporting and you are willing to make the investment (this is the investment[31]); then it is understandable rather than being mysterious. It is only a mystery if you don't understand how it actually works.

[30] Wikipedia, *Cynefin Framework*, https://en.wikipedia.org/wiki/Cynefin_framework
[31] *Seattle Method Overview*, https://seattlemethod.blogspot.com/2025/01/overview.html

4. Very Basic Example of Global Standard Model-driven Standards-based Semantic-oriented AI-powered Financial Reporting

In this section I will provide a very basic example of model-driven global standards-based semantic-oriented AI-powered financial reporting.

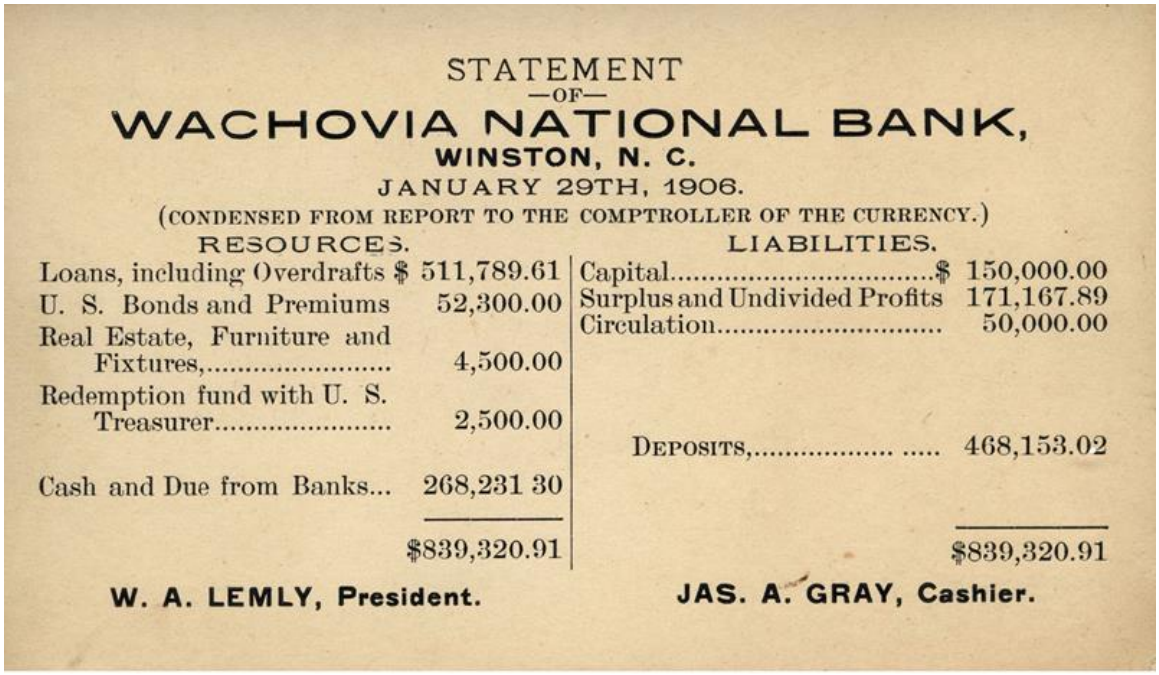
Fundamentally, to use a model-driven standards-based semantic-oriented AI-powered approach to financial reporting and you want that system to actually work, you need to:

1. **Describe/explain/specify** a financial reporting scheme using a machine-understandable[32] global standard technical syntax such as XBRL.
2. **Construct/create** the financial report using specially designed software that is built specifically for that purpose of using the above description/specification to construct a report model and the report.
3. **Verification/validation** of what you constructed in terms of a report model and report does, in fact, follow that description/specification of the financial reporting scheme.
4. **Extract/interpret/analyze** information from the report either manually or with the assistance of a computer based process.

I want to keep this very basic example, well, very basic and cover the key aspects of global standards-based model-driven semantic-oriented artificial intelligence powered financial reporting.

Wikipedia, in the article on financial statements, provides the following financial report[33], which I will use as this very basic example:

[32] *Understandability*, https://digitalfinancialreporting.blogspot.com/2024/04/understandability.html
[33] Wikipedia, *Financial Statement*, https://en.wikipedia.org/wiki/Financial_statement



STATEMENT
—OF—
WACHOVIA NATIONAL BANK,
WINSTON, N. C.
JANUARY 29TH, 1906.
(CONDENSED FROM REPORT TO THE COMPTROLLER OF THE CURRENCY.)

RESOURCES.		LIABILITIES.	
Loans, including Overdrafts	$ 511,789.61	Capital	$ 150,000.00
U. S. Bonds and Premiums	52,300.00	Surplus and Undivided Profits	171,167.89
Real Estate, Furniture and Fixtures	4,500.00	Circulation	50,000.00
Redemption fund with U. S. Treasurer	2,500.00		
		DEPOSITS	468,153.02
Cash and Due from Banks	268,231 30		
	$839,320.91		$839,320.91

W. A. LEMLY, President. JAS. A. GRAY, Cashier.

In the final section of this document I will provide additional examples which you can use to grasp the true capabilities of global standards-based model-driven semantic-oriented artificial intelligence powered financial reporting and other uses of this approach for accounting working papers, audit working papers and schedules, and financial analysis models.

4.1. Describe/Explain/Specify

The first step in model-driven reporting is to describe, explain, and otherwise specify that financial reporting scheme using is to construct the base financial reporting scheme using some global standard technical format such as XBRL or some other technical format specified by SBRM.

In my very basic example, I am pretending that the Office of the Comptroller of the Currency is specifying such a base financial reporting scheme. The report called for seems to be called the *Report to the Comptroller of the Currency* per that financial report example provided by Wikipedia.

Looking at this reporting scheme, that scheme seems to have one information structure or assembly called the "Report to the Comptroller". That structure/assembly seems to be made up of two separate blocks of information:

1. Resources
2. Liabilities

Resources are made up of six line items:

- Loans, including Overdrafts
- U.S. Bonds and Premiums
- Real Estate, Furniture and Fixtures
- Redemption fund with U.S. Treasurer

- Cash and Due from Banks
- Total Resources

Liabilities are made up of five line items:

- Capital
- Surplus and Undivided Profits
- Circulation
- Deposits
- Total Liabilities

There appears to be three mathematical rules that describe the relationship between the high level concepts that make up those structures/assemblies:

- Roll up of the individual line item subcomponents of total resources
- Roll up of the individual line item subcomponents of total Liabilities
- Resources = Liabilities

Normally, each of those terms would be documented in some sort of rules or regulations that mandate the report and describe the details related to each of the terms that are used to report the required line items. I will add dummy documentation and references to simulate pointing to authoritative literature that backs up the machine-readable representation of the reporting scheme.

There are two high level fundamental accounting concepts, "Resources" and "Liabilities". The relationship between those two high level concepts is "Resources = Liabilities". There is only one reporting style.

There are two "types" or categories of things, "resources" and "liabilities" and those two different types have the following categories of subtypes:

- Resources
    - Loans, including Overdrafts
    - U.S. Bonds and Premiums
    - Real Estate, Furniture and Fixtures
    - Redemption fund with U.S. Treasurer
    - Cash and Due from Banks
- Liabilities
    - Capital
    - Surplus and Undivided Profits
    - Circulation
    - Deposits

There is one disclosure, "Report of the Comptroler of the Currency". That disclosure is comprised of two information blocks: Resources and Liabilities.

- The disclosure "Resources"
    - Is a roll up.

- Total of the roll up is "Resources"
- The disclosure "Liabilities"
  - Is a roll up
  - Total of the roll up is "Liabilities"

There is only one reportability rule: The one disclosure, Report of the Comptroller of the Currency, MUST always be provided. That disclosure has two subparts, subcomponents of resources and subcomponents of liabilities that are required to be provided per that disclosure.

When structuring the report model templates, the following modeling rules must be followed per the best practices based approach that I am following. The table below shows the default modeling rules and the rules are strictly enforced:

		Parent						
		Network	Hypercube	Dimension	Member	LineItems	Abstract	Concept
Child	Network	Illegal XBRL	Illegal XBRL	Illegal XBRL	Illegal XBRL	Illegal XBRL	Illegal XBRL	Illegal XBRL
	Hypercube	Permitted	Disallowed	Disallowed	Disallowed	Disallowed	Permitted	Disallowed
	Dimension	Disallowed	Permitted	Disallowed	Disallowed	Disallowed	Disallowed	Disallowed
	Member	Disallowed	Disallowed	Permitted	Permitted	Disallowed	Disallowed	Disallowed
	LineItems	Disallowed	Permitted	Disallowed	Disallowed	Disallowed	Disallowed	Disallowed
	Abstract	Permitted	Disallowed	Disallowed	Disallowed	Permitted	Permitted	Disallowed
	Concept	Disallowed	Disallowed	Disallowed	Disallowed	Permitted	Permitted	Disallowed

Considering all the information summarized in this section, I put all the pieces together, represent the information using the XBRL technical format and I come up with the following base financial reporting scheme representation for this financial reporting scheme[34]: (note that this is a very minimal, rudimentary view which serves to provide a prototype of information about a financial reporting scheme)

Office of the Comptroller of the Currency 1906 (occ)

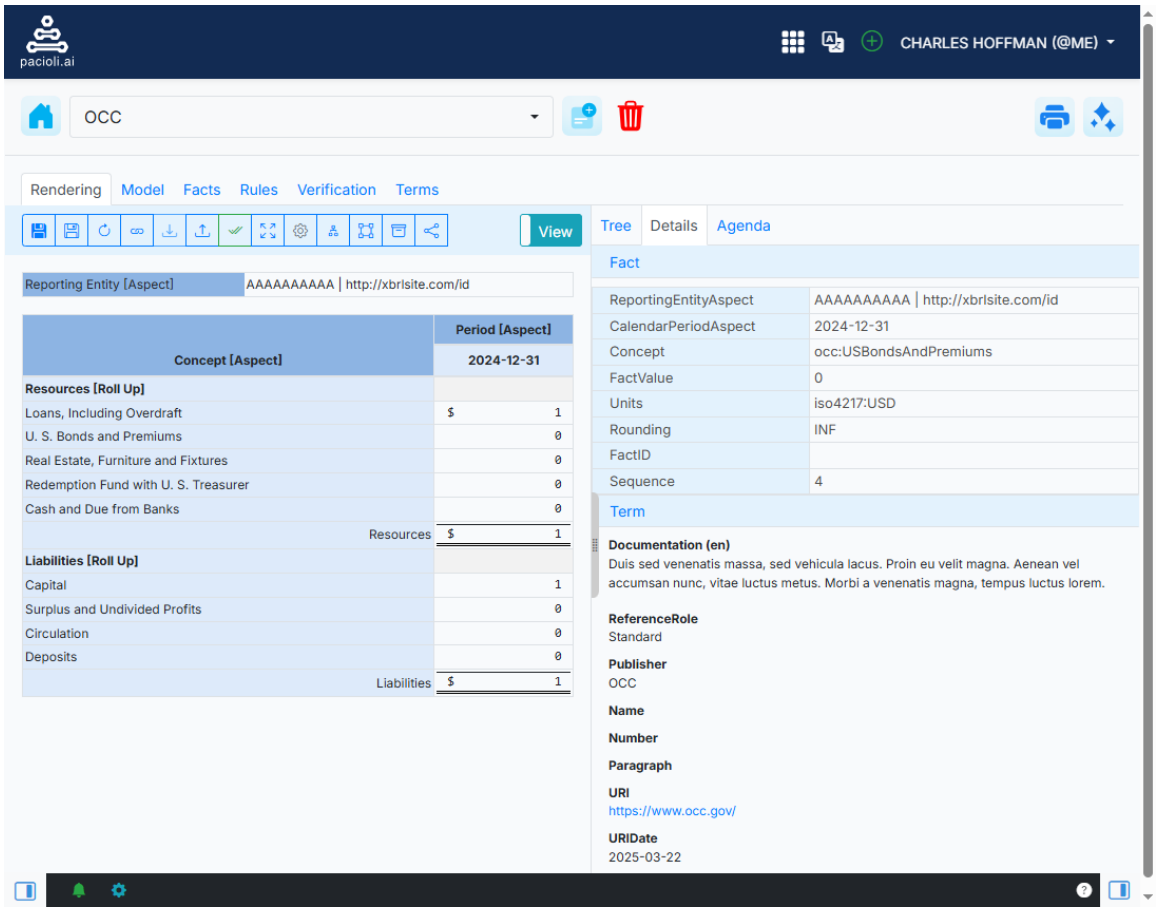
Terms | Entry Point | Structures | Disclosure Mechanics | Reporting Styles | Model Structure Rules | Website

Line		Object Class	Period Type	Balance	Report Element Name
1	**Report to Comptroller**	Network			http://xbrlsite.com/seattlemethod/occ/role/ReportToComptroller
2	**Report to Comptroller [Hypercube]**	Table			occ:ReportToComptrollerHypercube
3	Hypercube [Line Items]	LineItems			occ:HypercubeLineItems
4	Resources [Roll Up]	Abstract			occ:ResourcesRollUp
5	Loans, Including Overdraft	Concept (Monetary)	As Of	Debit	occ:LoansIncludingOverdraft
6	U. S. Bonds and Premiums	Concept (Monetary)	As Of	Debit	occ:USBondsAndPremiums
7	Real Estate, Furniture and Fixtures	Concept (Monetary)	As Of	Debit	occ:RealEstateFurnitureAndFixtures
8	Redemption Fund with U. S. Treasurer	Concept (Monetary)	As Of	Debit	occ:RedemptionFundWithUSTreasurer
9	Cash and Due from Banks	Concept (Monetary)	As Of	Debit	occ:CashAndDueFromBanks
10	Resources	Concept (Monetary)	As Of	Debit	occ:Resources
11	Liabilities [Roll Up]	Abstract			occ:LiabilitiesRollUp
12	Capital	Concept (Monetary)	As Of	Credit	occ:Capital
13	Surplus and Undivided Profits	Concept (Monetary)	As Of	Credit	occ:SurplusAndUndividedProfits
14	Circulation	Concept (Monetary)	As Of	Credit	occ:Circulation
15	Deposits	Concept (Monetary)	As Of	Credit	occ:Deposits
16	Liabilities	Concept (Monetary)	As Of	Credit	occ:Liabilities

3/23/2025 6:44:07 AM

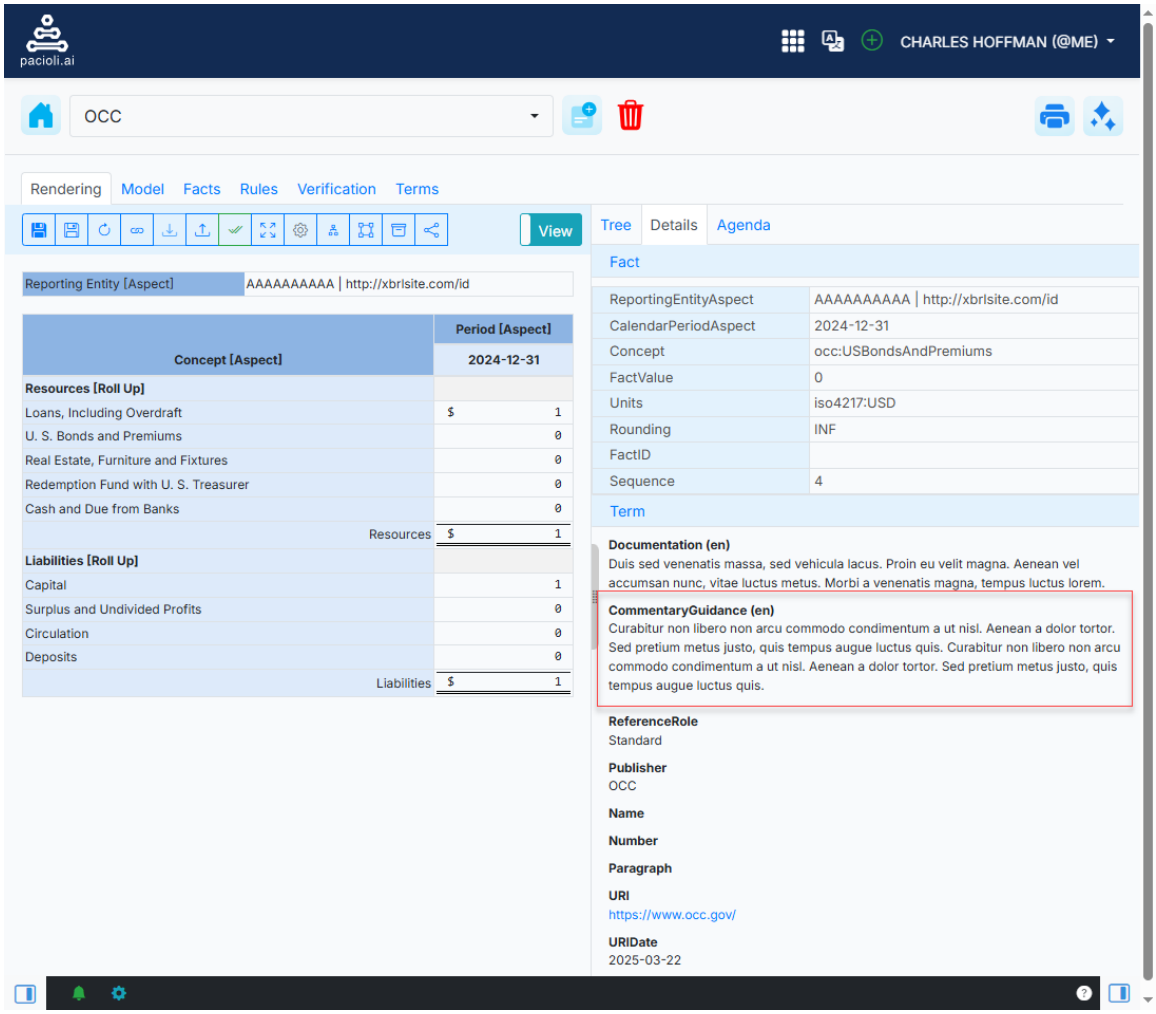
This is another view of the base financial reporting scheme from the perspective of what you can think of as a report testing the operation of the reporting scheme. This view shows the important documentation that explains each reporting scheme term and links to reference material for each term:

[34] Financial Reporting Scheme, Office of the Comptroller of the Currency, http://www.xbrlsite.com/seattlemethod/platinum/occ/base/occ_ModelStructure.html



Understand that if others create additional interpretations of this reporting scheme or commentary; those interpretations and commentary, if provided using the global standard XBRL technical format, can be shown with the documentation and references shown by the publishers of the base reporting scheme.

For example, here is a screen show of the same application as above with commentary added to the published base financial reporting scheme independent of the publisher of the base financial reporting scheme. This demonstrates the flexibility and extensibility of XBRL based financial reporting schemes.



In order to test the functioning of the base financial reporting scheme which was tested, a prototype financial report can be created and verified using the published financial reporting scheme.

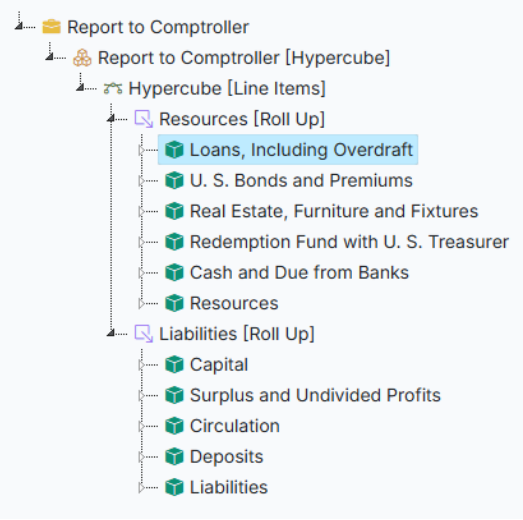
Below is a simple prototype that effectively tests the entire published financial reporting scheme. The base financial reporting scheme XBRL taxonomy information was exercised and verified using Auditchain Labs AG's Pacioli.ai and Luca Suite.

In the screen shot below you can see the prototype report created and the Pacioli Technical Analysis shows the verification results for the test report which was created[35]:

[35] Test report verification results provided by Auditchain Labs AG Pacioli.ai, https://auditchain.infura-ipfs.io/ipfs/QmVZJEYo1ME3ekqr73RwFjZTSJ7gYtdG2C6PqfZ62Uk56U/

Reporting Entity [Aspect]	AAAAAAAAAA | http://xbrlsite.com/id

Concept [Aspect]	Period [Aspect] 2024-12-31
Resources [Roll Up]	
Loans, Including Overdraft	$ 1
U. S. Bonds and Premiums	0
Real Estate, Furniture and Fixtures	0
Redemption Fund with U. S. Treasurer	0
Cash and Due from Banks	0
Resources	$ 1
Liabilities [Roll Up]	
Capital	1
Surplus and Undivided Profits	0
Circulation	0
Deposits	0
Liabilities	$ 1



Verification results summary:

#	Verification Category	Result
1	XBRL Technical Syntax Verification	
2	Report Mathematical Computations Verification (XBRL Calculations)	
3	Report Mathematical Computations Verification (XBRL Formulas)	
4	Report Model Structure Verification	
5	Fundamental Accounting Concept Consistency Crosschecks Verification	
6	Type-subtype (wider-narrower) Associations Verification	
7	Disclosure Mechanics Verification	
8	Report Disclosure Checklist Verification	
9	Other	

https://www.xbrl.org/REQ/accounting-semantics-req/REQ-2023-01-04/accounting-semantics-req-2023-01-04.html

https://specifications.xbrl.org/work-product-index-registries-lrr-2.0.html

4.2. Construct/Create

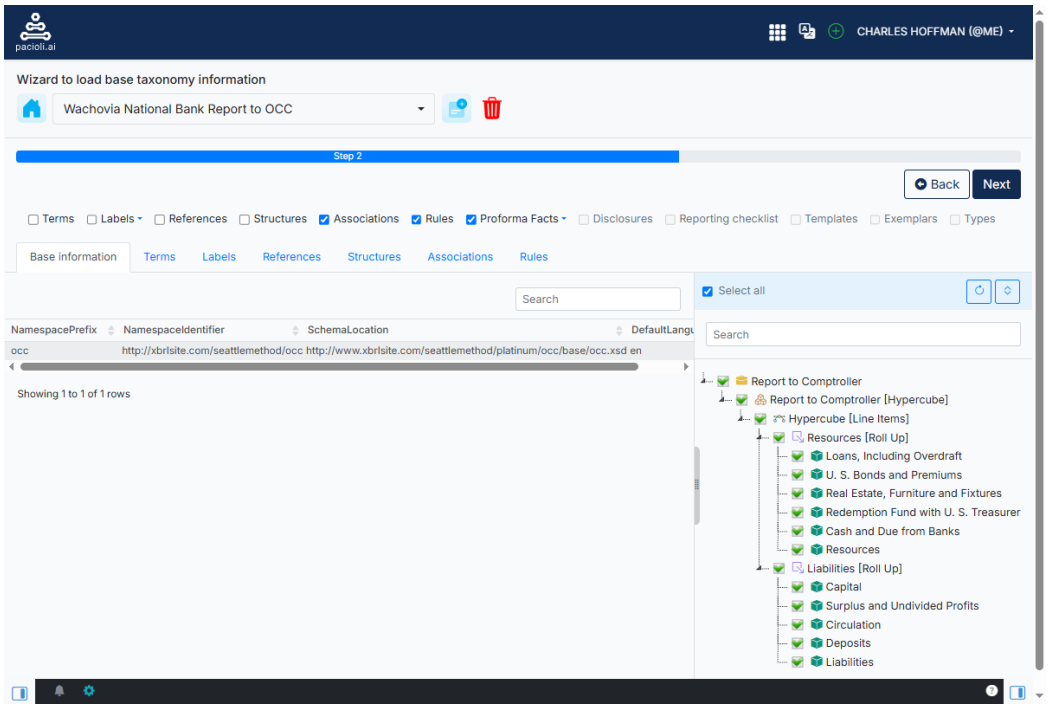
After a base financial reporting scheme is published and tested to prove that it works appropriately; that base financial reporting scheme can be used to construct or otherwise create a report. There are four ways a report can be created:

1. From templates provided by the reporting scheme.

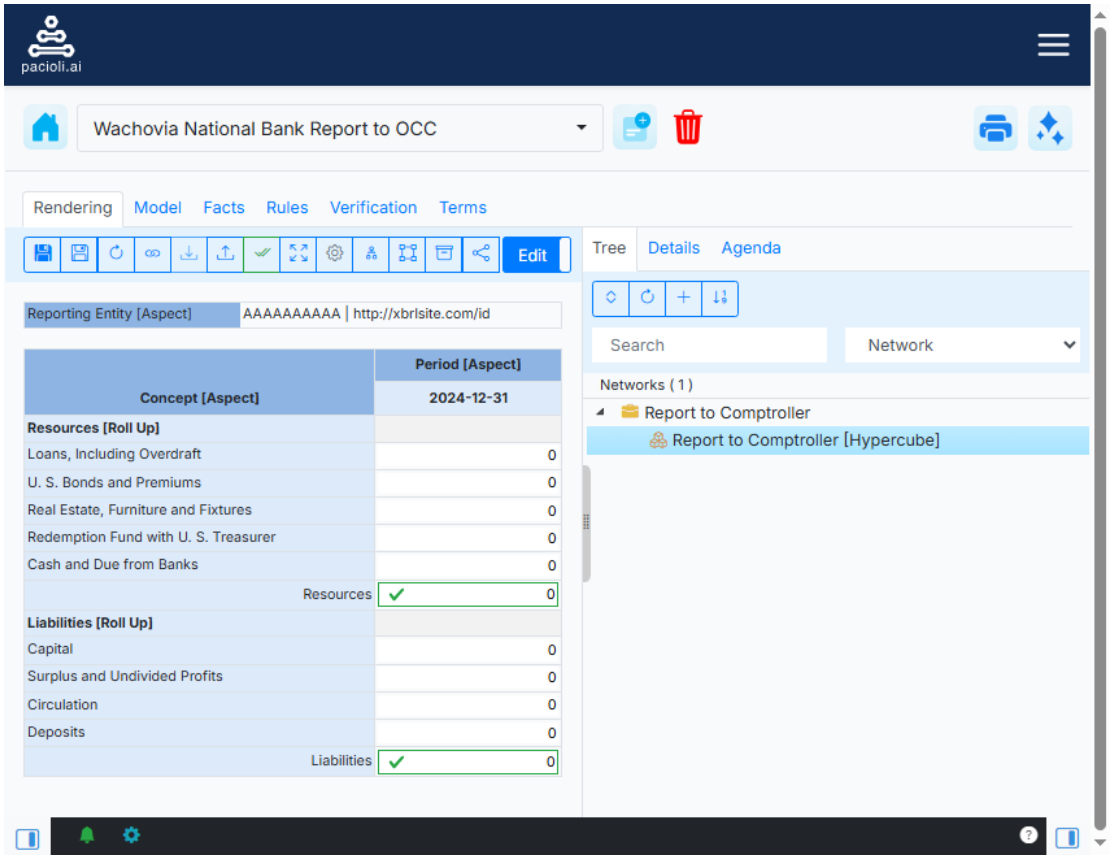
2. Manually entering information into the financial report model and report.
3. Importing information into the financial report model and report.
4. Pumping information from an application into a report creation tool using an API.

Creating a report from a template involves selecting a reporting scheme from the list of available reporting schemes, selecting the structures and line items you desire, importing information from that reporting scheme including proforma facts if you desire, and then either (a) manually entering report facts or (b) importing report facts.

Below you see a screenshot from Auditchain Labs AG's Luca Suite which provides a wizard to load a template in order to create a report:



After loading the template and the proforma facts; report information can be adjusted manually, by important facts, or by pumping facts into the report using an API which is available.



Here is what imported facts would look like. Auditchain Labs AG's Luca Suite can import information from Excel or JSON formatted report logic:

ReportingEntityAspect	CalendarPeriodAspect	ConceptAspect	FactValue	Units	Rounding	FactID	Sequence
Wachovia | http://www.comptroller.gov/token	1906-12-31	occ:LoansIncludingOverdraft	511789.61	iso4217:USD	2		1
Wachovia | http://www.comptroller.gov/token	1906-12-31	occ:USBondsAndPremiums	52300	iso4217:USD	2		2
Wachovia | http://www.comptroller.gov/token	1906-12-31	occ:RealEstateFurnitureAndFixtures	4500	iso4217:USD	2		3
Wachovia | http://www.comptroller.gov/token	1906-12-31	occ:RedemptionFundWithUSTreasurer	2500	iso4217:USD	2		4
Wachovia | http://www.comptroller.gov/token	1906-12-31	occ:CashAndDueFromBanks	268231.3	iso4217:USD	2		5
Wachovia | http://www.comptroller.gov/token	1906-12-31	occ:Resources	839320.91	iso4217:USD	2		6
Wachovia | http://www.comptroller.gov/token	1906-12-31	occ:Capital	150000	iso4217:USD	2		7
Wachovia | http://www.comptroller.gov/token	1906-12-31	occ:SurplusAndUndividedProfits	171167.89	iso4217:USD	2		8
Wachovia | http://www.comptroller.gov/token	1906-12-31	occ:Circulation	50000	iso4217:USD	2		9
Wachovia | http://www.comptroller.gov/token	1906-12-31	occ:Deposits	468153.02	iso4217:USD	2		10
Wachovia | http://www.comptroller.gov/token	1906-12-31	occ:Liabilities	839320.91	iso4217:USD	2		11

After report information is either manually entered, imported, or pushed into the software application using an API, then the report information is checked in the back ground to make sure the report is conforming to published rules of the base financial reporting scheme and the report model.

Here is a screen shot of the report after report facts have been imported; this is a view of the report which enable the software user to manually adjust reported information:

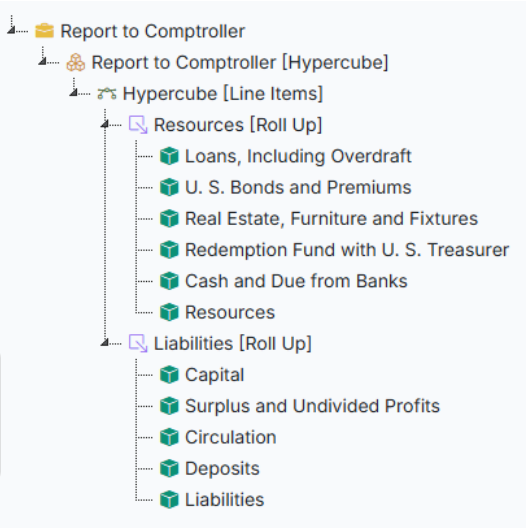
Reporting Entity [Aspect]	Wachovia | http://www.comptroller.gov/token

Concept [Aspect]	Period [Aspect]
	1906-12-31
Resources [Roll Up]	
Loans, Including Overdraft	511789.61
U. S. Bonds and Premiums	52300
Real Estate, Furniture and Fixtures	4500
Redemption Fund with U. S. Treasurer	2500
Cash and Due from Banks	268231.3
Resources	✓ 839320.91
Liabilities [Roll Up]	
Capital	150000
Surplus and Undivided Profits	171167.89
Circulation	50000
Deposits	468153.02
Liabilities	✓ 839320.91

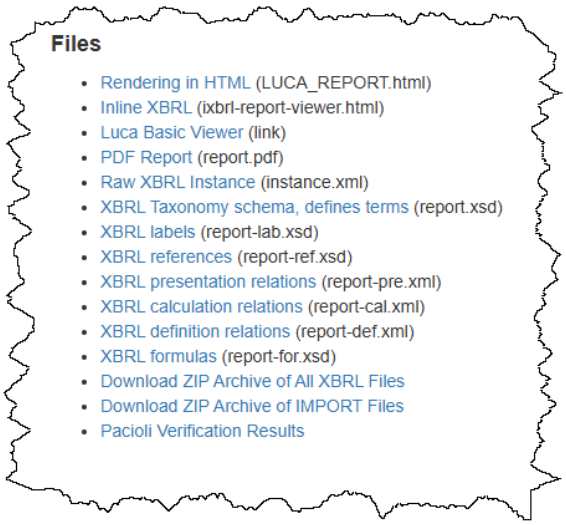
Here is another view of the report which shows a view were the report model can be adjusted; removing line items, adding line items, reconfiguring line items, etc.:

Reporting Entity [Aspect]	Wachovia | http://www.comptroller.gov/token

Concept [Aspect]	Period [Aspect]
	1906-12-31
Resources [Roll Up]	
Loans, Including Overdraft	$ 511,789.61
U. S. Bonds and Premiums	52,300.00
Real Estate, Furniture and Fixtures	4,500.00
Redemption Fund with U. S. Treasurer	2,500.00
Cash and Due from Banks	268,231.30
Resources	$ 839,320.91
Liabilities [Roll Up]	
Capital	150,000.00
Surplus and Undivided Profits	171,167.89
Circulation	50,000.00
Deposits	468,153.02
Liabilities	$ 839,320.91



Here is a published version of this very basic example model-driven financial report and all associated files[36]:



4.3. Verification/Validation

Before you publish a report after it has been constructed, it is important to perform checks to verify and otherwise validate that the report has been properly created, the information which you desire to convey is being conveyed appropriately, report information is represented using the proper information from the base reporting scheme and any modifications which have been made by the report creator to the report model of the published report.

It is impossible to automate 100% of the report verification/validation. However, software can be relied on to verify specific aspects of the reported information.

4.3.1. Theory of Physical Format

The Theory of Physical Format relates to the verification of the physical technical format or syntax of a model-driven report model and report. The format could be XBRL, but it could also be RDF, GQL, or another technical format. For this example XBRL is used. This format is verified against the XBRL conformance suite using a fully compliant XBRL processor. These are the verification results.

https://auditchain.infura-ipfs.io/ipfs/QmZoUTnduhUceTja2R75XVTxpbGaSRbcykyMJ5p9Ukf6Lq/index.html

Messages

xbrlValidation messages courtesy of Arelle (version 93b79b11de7cf66030650e9034918c1133927dce)

#	Type	Stage	Message
1	info	xbrlValidation(done)	XBRL syntax was verified

[36] Reference Implementation of Report, http://www.xbrlsite.com/seattlemethod/platinum/occ/ref/index.html

4.3.2. Theory of Mathematical Integrity

The Theory of Mathematical Integrity relates to the correct representation of mathematical information within a model-driven financial report. In XBRL there are two mechanisms for checking mathematical relations: XBRL calculations which is specific to roll up relations and XBRL Formulas which can process roll ups but also processes all other types of mathematical relations. So, this can be processed by an XBRL processor which also supports XBRL Formula.

XBRL calculations:

https://auditchain.infura-ipfs.io/ipfs/QmZoUTnduhUceTja2R75XVTxpbGaSRbcykyMJ5p9Ukf6Lq/calculations.html

Type	Defined	Bound	Derived	OK	Fail
calculation	2	2	0	2	0

Calculations

#	Type	Name	Rule Expression
1	calculation	occ:Liabilities (in ReportToComptroller) • ok:1 • failed:0	total=Capital_4+(SurplusAndUndividedProfits_3+(Circulation_2+Deposits_1)) *1 instance:* *occ:Liabilities[839,320.91] = occ:Capital[150,000.00] + occ:SurplusAndUndividedProfits[171,167.89] + occ:Circulation[50,000.00] + occ:Deposits[468,153.02]*
2	calculation	occ:Resources (in ReportToComptroller) • ok:1 • failed:0	total=LoansIncludingOverdraft_5+(USBondsAndPremiums_4+(RealEstateFurnitureAndFixtures_3+(RedemptionFundWithUSTreasurer_2+CashAndDueFromBanks_1))) *1 instance:* *occ:Resources[839,320.91] = occ:LoansIncludingOverdraft[511,789.61] + occ:USBondsAndPremiums[52,300.00] + occ:RealEstateFurnitureAndFixtures[4,500.00] + occ:RedemptionFundWithUSTreasurer[2,500.00] + occ:CashAndDueFromBanks[268,231.30]*

XBRL Formulas: (value assertions)

https://auditchain.infura-ipfs.io/ipfs/QmZoUTnduhUceTja2R75XVTxpbGaSRbcykyMJ5p9Ukf6Lq/valueAssertions.html

Type	Defined	Bound	Derived	OK	Fail
valueAssertion	2	2	0	2	0

Value Assertions

#	Type	Name	Rule Expression
1	valueAssertion	FAC_CONSISTENCY_Assets Added • ok:1 • failed:0	Assets=Liabilities *1 instance:* *fac:Assets[839,320.91] = fac:Liabilities[839,320.91]*
2	valueAssertion	RULE1 • ok:1 • failed:0	Resources=Liabilities *1 instance:* *occ:Resources[839,320.91] = occ:Liabilities[839,320.91]*

4.3.3. Theory of Model Structure

The Theory of Model Structure specifies how XBRL presentation relations are permitted to be structured. There are good practices, best practices, and practices which really should be avoided. To understand this, please see *Master Class in Representing Financial Statement Logic Using XBRL*[37]. The bottom line is that it is best to use a strict approach to representing model-driven reports to avoid unnecessary problems.

https://auditchain.infura-ipfs.io/ipfs/QmZoUTnduhUceTja2R75XVTxpbGaSRbcykyMJ5p9Ukf6Lq/modelStructure.html

Child	Parent						
	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)	2	0	0	0	0	0	0
Dimension (a.k.a. Axis)	0	0	0	0	0	0	0
Member	0	0	0	0	0	0	0
Line Items (a.k.a. Primary Items)	0	2	0	0	0	0	0
Abstract	1	0	0	0	3	3	0
Concept	0	0	0	0	0	13	0

4.3.4. Theory of Information Blocks

The Theory of Information Blocks points out that every logical block of information in a model-driven report is detectable and identifiable. This is particularly true if good practices are used to represent information blocks, but it is also true of poor practices are used. But if poor practices are used, the probability of software bugs related to representation ideocracies is higher.

https://auditchain.infura-ipfs.io/ipfs/QmZoUTnduhUceTja2R75XVTxpbGaSRbcykyMJ5p9Ukf6Lq/blocks.html

#	Network	Hypercube	Block	Pattern	Disclosures
1	FAC - 101-Balance Sheet Classified	Balance Sheet Classified [Hypercube]	Balance Sheet [Arithmetic]	Set	Uncategorized
2	Report to Comptroller	Report to Comptroller [Hypercube]	Resources	RollUp	disclosures:ReportToController, disclosures:ResourcesRollUp
3	Report to Comptroller	Report to Comptroller [Hypercube]	Liabilities	RollUp	disclosures:LiabilitiesRollUp, disclosures:ReportToController

[CSH: This is incorrect and needs to be adjusted. All the information is there, but it is not organized correctly.]

4.3.5. Theory of Fundamental Accounting Concepts and Reporting Styles

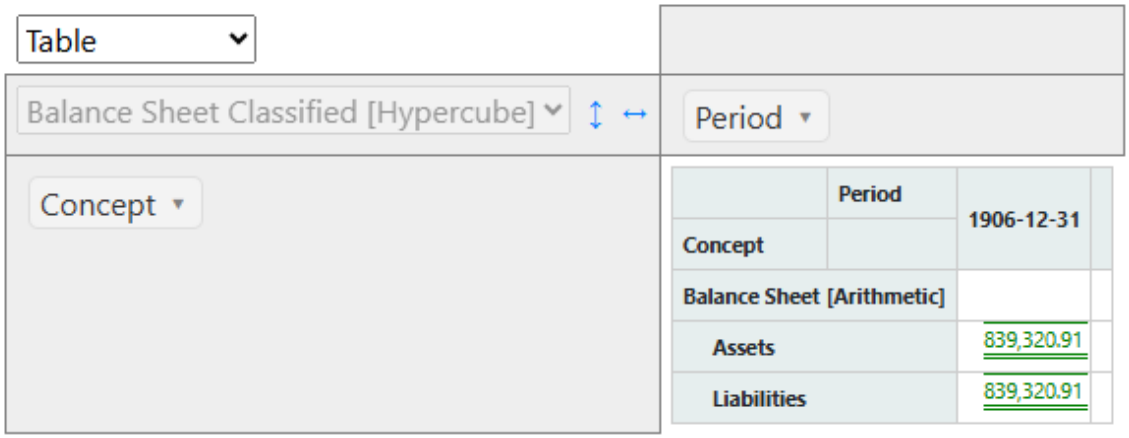
The Theory of Fundamental Accounting Concepts and Reporting Syles effectively states that each financial report is a pattern of higher-level financial concepts organized into a specific pattern of totals and subtotals. There are two big picture ideas that you need to have in mind when thinking about this which is the notion of articulation[38] and

[37] *Master Class in Representing Financial Statement Logic Using XBRL*, https://digitalfinancialreporting.blogspot.com/2024/12/master-class-in-representing-financial.html

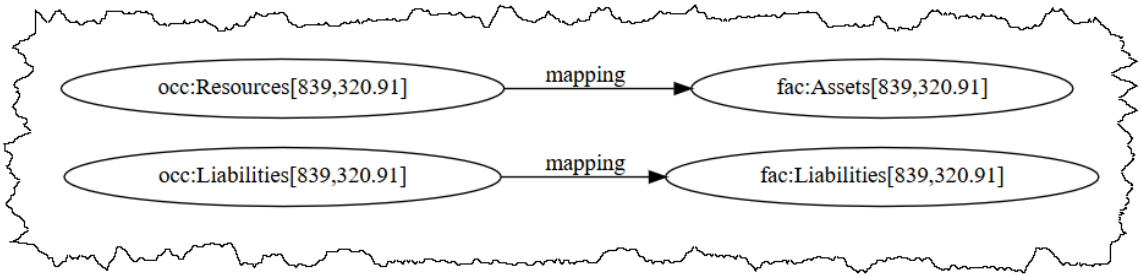
[38] *Understanding Articulation*, https://digitalfinancialreporting.blogspot.com/2023/08/understanding-articulation.html

the notion of intermediate components (a.k.a. subtotals)[39]. Effectively, financial reports are not random. Rather, there are logical patterns of how the line items of financial reports are organized and reported and these can be grouped into reporting styles of those patterns. Also, as I understand it the IASB is contemplating formally defining subtotals better.

https://auditchain.infura-ipfs.io/ipfs/QmZoUTnduhUceTja2R75XVTxpbGaSRbcykyMJ5p9Ukf6Lq/d03ff6ada6e173929dc6.html



https://auditchain.infura-ipfs.io/ipfs/QmZoUTnduhUceTja2R75XVTxpbGaSRbcykyMJ5p9Ukf6Lq/derivationsGraph.html



Note that the above mappings do not include any actual derivations of unreported line items because all line items were explicitly reported. To better understand derivations, please see these derivations related to Microsoft[40] and these derivation rules[41].

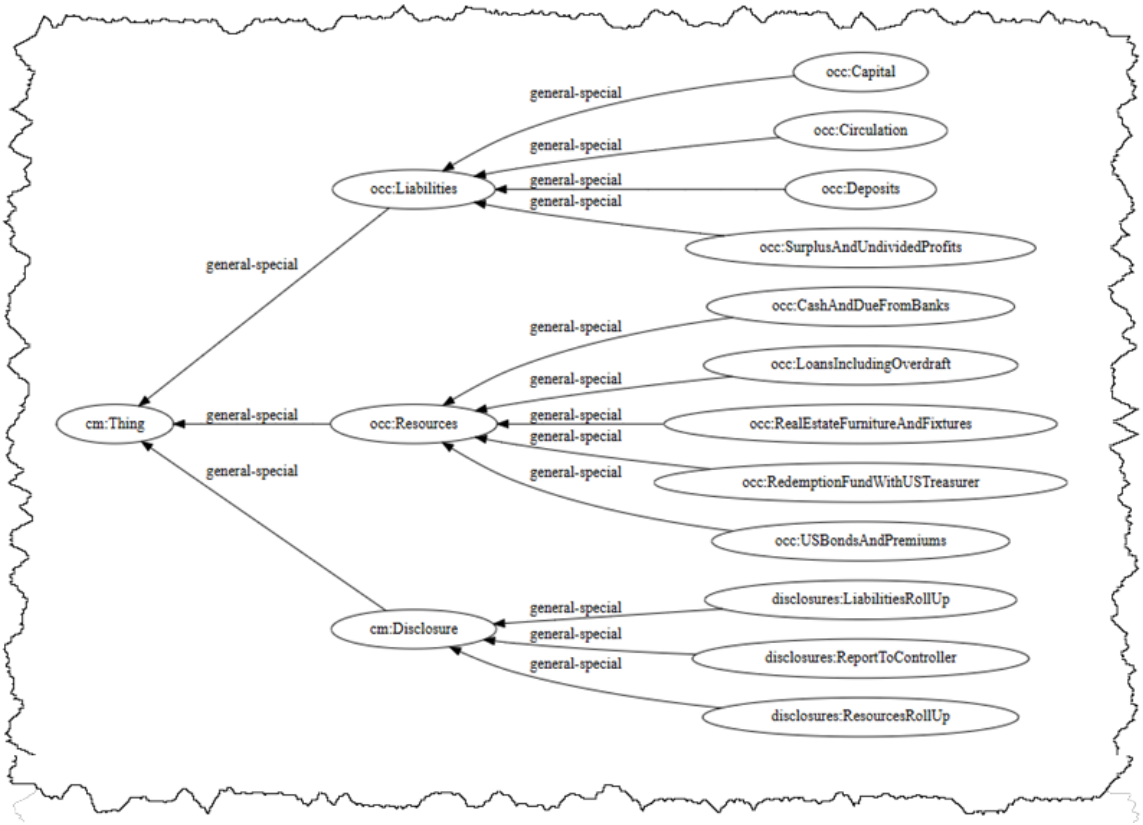
4.3.6. Theory of Types and Parts

The Theory of Types and Parts relates to what tend to be the lower-level line item relationships within a model-driven report. Effectively, every high-level line item in a

[39] Charles Hoffman, CPA, *Essence of Accounting*, page 20, https://xbrlsite.azurewebsites.net/2020/Library/EssenceOfAccounting.pdf
[40] Microsoft Derivations, https://auditchain.infura-ipfs.io/ipfs/QmRbYM5cPUCauw4Ckvbysi5ktLjS5gPyrfFov4Xv2iZRtn/derivationsGraph.html
[41] Microsoft Derivation Rules, https://auditchain.infura-ipfs.io/ipfs/QmRbYM5cPUCauw4Ckvbysi5ktLjS5gPyrfFov4Xv2iZRtn/derivations.html

model-driven financial report tends to be a category or type. Then other lower-level items are specializations of those higher level types.

https://auditchain.infura-ipfs.io/ipfs/QmZoUTnduhUceTja2R75XVTxpbGaSRbcykyMJ5p9Ukf6Lq/typeSubTypeGraph.html



4.3.7. Theory of Disclosures and Disclosure Mechanics

The Theory of Disclosures and Disclosure Mechanics relates to the idea that each information block in a report is either a disclosure or part of a disclosure. Note that statements and policies are considered disclosures per this theory. It is possible to give each disclosure a unique name, to describe the essence of the logic of a disclosure, and rules can be specified to enable the inspection and ultimate detection of each and every disclosure.

https://auditchain.infura-ipfs.io/ipfs/QmZoUTnduhUceTja2R75XVTxpbGaSRbcykyMJ5p9Ukf6Lq/disclosures.html

Type	Defined	Bound	Derived	OK	Fail
disclosure	3	3	0	3	0

Disclosure Mechanics rules

#	Type	Name	Rule Expression

1	disclosure	disclosures:LiabilitiesRollUp **Added**
		• detections:1
			Liabilities Roll Up
			• disclosures:LiabilitiesRollUp **requires:**
			  • Hypercube occ:ReportToComptrollerHypercube
			  • Concept Arrangement Pattern cm:RollUp
			  ◦ **with** occ:Liabilities
			1 instance:
			In network Report to Comptroller:
			occ:ReportToComptrollerHypercube is presented
			Detected block Liabilities [RollUp] with occ:Liabilities

2	disclosure	disclosures:ReportToController **Added**
		• detections:1
			Report to Controller
			• disclosures:ReportToController **requires:**
			  • Concept Arrangement Pattern cm:Component
			  • disclosure disclosures:ResourcesRollUp
			  • disclosure disclosures:LiabilitiesRollUp
			1 instance:
			In network Report to Comptroller:
			Report to Comptroller Report to Comptroller [Hypercube] is a component
			occ:ReportToComptrollerHypercube is presented
			Detected block Resources [RollUp] with occ:Resources
			Detected block Liabilities [RollUp] with occ:Liabilities

3	disclosure	disclosures:ResourcesRollUp **Added**
		• detections:1
			Resources Roll Up
			• disclosures:ResourcesRollUp **requires:**
			  • Hypercube occ:ReportToComptrollerHypercube
			  • Concept Arrangement Pattern cm:RollUp
			  ◦ **with** occ:Resources
			1 instance:
			In network Report to Comptroller:
			occ:ReportToComptrollerHypercube is presented
			Detected block Resources [RollUp] with occ:Resources

4.3.8. Theory of Reportability

The Theory of Reportability relates to the idea that reporting economic entities report disclosures in their financial reports accounting to logical patterns related to the compliance with the rules of a financial reporting scheme. For example, a financial reporting scheme might specify that a balance sheet, income statement, cash flow statement, and statement of changes in equity is always required; except, perhaps, in certain specific situations (i.e. a different reporting style). Or, a disclosure must be provided if a specific line item appears on a statement.

https://auditchain.infura-ipfs.io/ipfs/QmZoUTnduhUceTja2R75XVTxpbGaSRbcykyMJ5p9Ukf6Lq/disclosureChecks.html

Type	Defined	Bound	Derived	OK	Fail
disclosureCheck	3	3	0	3	0

Report Checklist Rules

#	Type	Name		Rule Expression
1	disclosureCheck	require [disclosures:LiabilitiesRollUp] Added • ok:1 • failed:0		Require disclosure: • disclosures:LiabilitiesRollUp *1 instance:* *See link above*
2	disclosureCheck	require [disclosures:ReportToController] Added • ok:1 • failed:0		Require disclosure: • disclosures:ReportToController *1 instance:* *See link above*
3	disclosureCheck	require [disclosures:ResourcesRollUp] Added • ok:1 • failed:0		Require disclosure: • disclosures:ResourcesRollUp *1 instance:* *See link above*

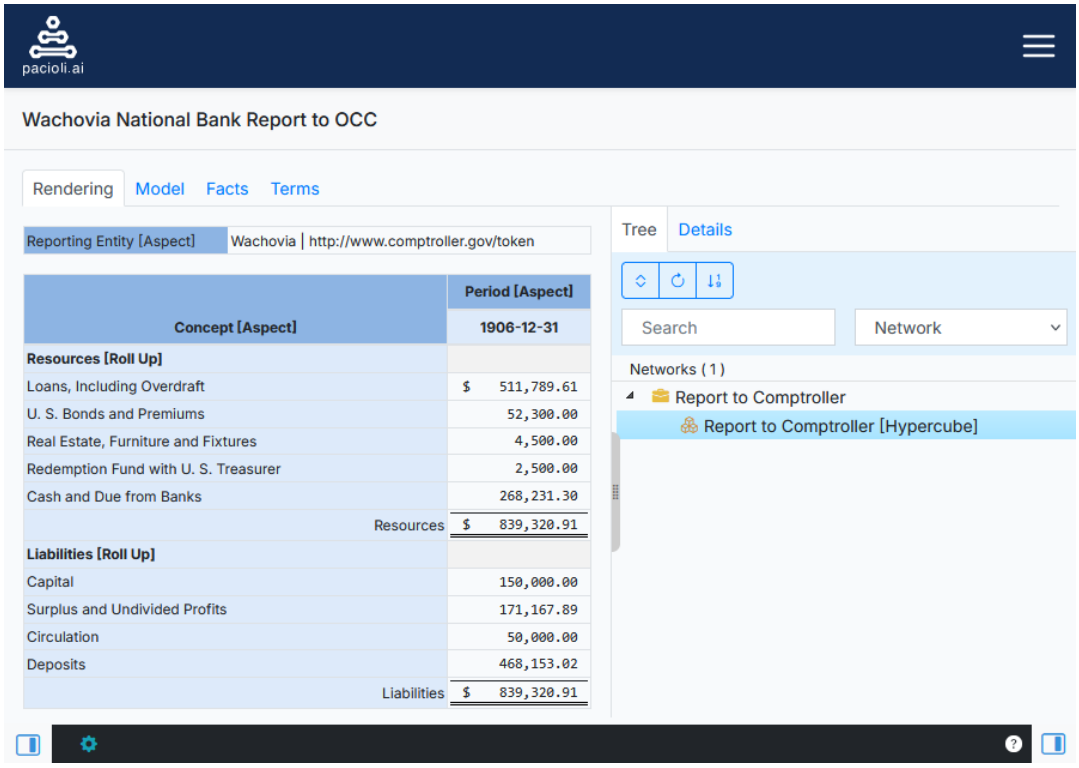
4.4. Analyze/Extract

Finally, information from the report model and report might be "extracted" via a human reading the report, extracted by analysis software to analyze an individual report, extracted by analysis software and compared to other reports published by the same reporting economic entity, or extracted and analyzed by software and compared to other reporting economic entities for benchmarking or other sort of analysis.

One benefit of a global standard report format is that different off-the-shelf software can be used to view a report (i.e. you are not limited by the means provided by the report publisher). For example, here is the very basic sample report we created as viewed within multiple different software applications:

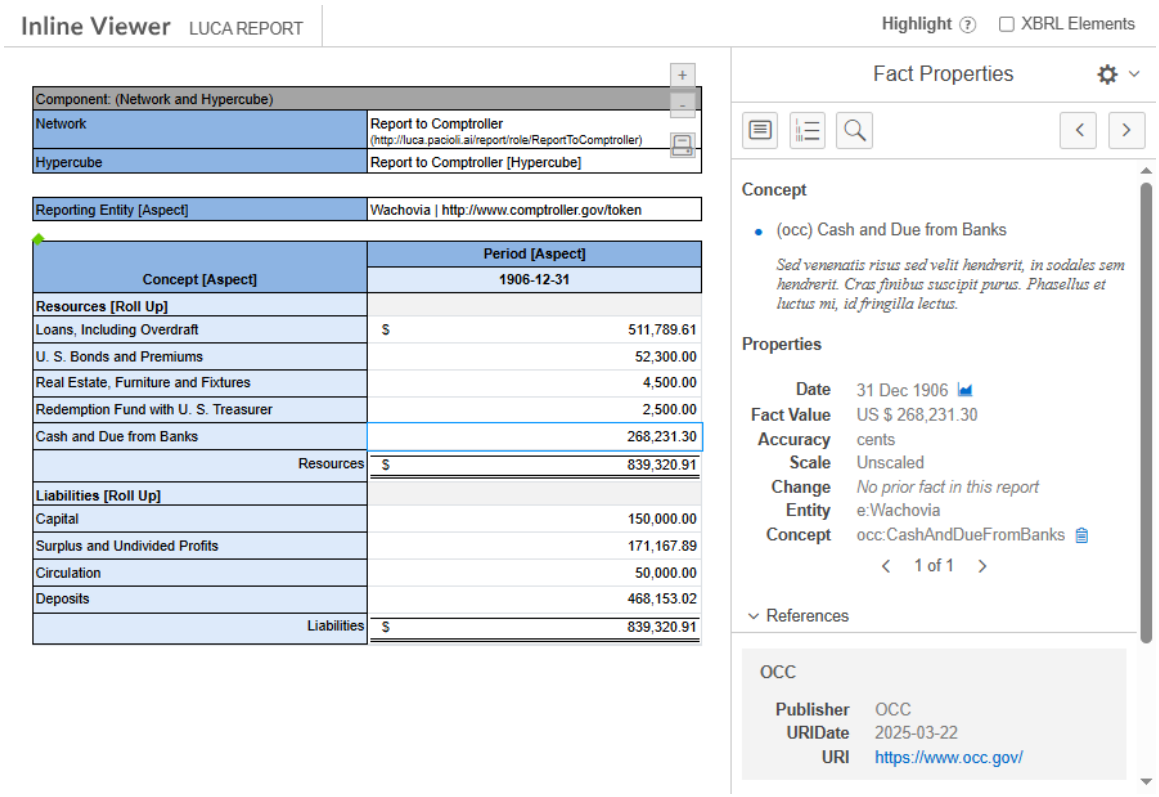
Luca Suite basic report viewer:

https://luca.pacioli.ai/luca/view/0f24fd35e961e167a727b663c75a4c5ec9fb7eb86730d6292f46e6e180fc2018f4367413/index

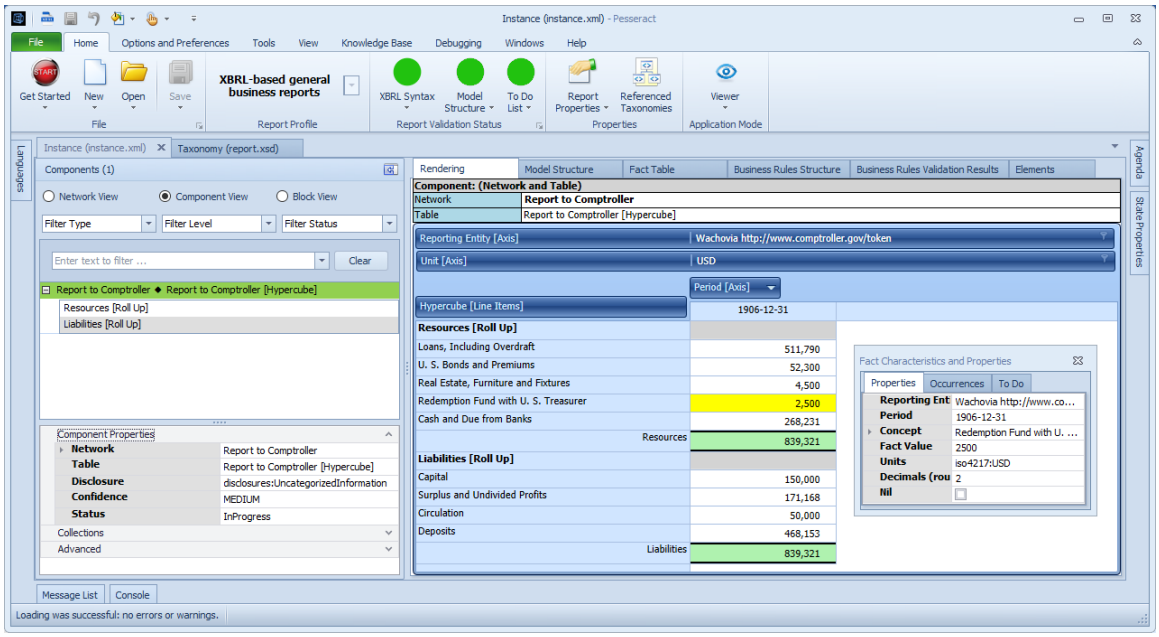


Inline XBRL viewer published by Luca Suite:

https://luca.pacioli.ai/storage/aa03cb7b-e95e-405e-b3e1-9fe4e893e5a5/0d80d425/ixbrl-report-viewer.html



Pesseract which is a working proof of concept desktop application:



Auditchain Labs AG's Pacioli.ai:

https://auditchain.infura-ipfs.io/ipfs/QmZoUTnduhUceTja2R75XVTxpbGaSRbcykyMJ5p9Ukf6Lq/

Component as one Pivot (ALL facts, but ignoring presentation hints)	
Network	**Report to Comptroller** *(http://luca.pacioli.ai/report/role/ReportToComptroller)*
Table	Report to Comptroller [Hypercube]

Entity: Wachovia (http://www.comptroller.gov/token)
Unit: iso4217:USD

Table

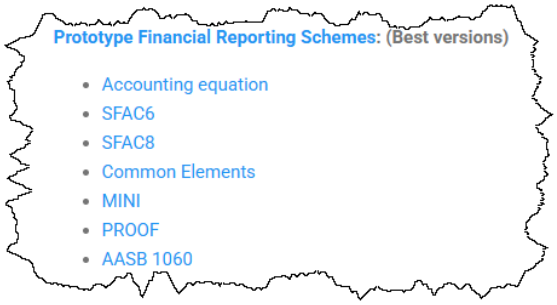
Report to Comptroller [Hypercube] ↕ ↔ Period

Concept

Concept	Period	1906-12-31
Resources [Roll Up]		
Loans, Including Overdraft		511,789.61
U. S. Bonds and Premiums		52,300
Real Estate, Furniture and Fixtures		4,500
Redemption Fund with U. S. Treasurer		2,500
Cash and Due from Banks		268,231.30
Resources		839,320.91
Liabilities [Roll Up]		
Capital		150,000
Surplus and Undivided Profits		171,167.89
Circulation		50,000
Deposits		468,153.02
Liabilities		839,320.91

5. Capabilities of Model-driven Reporting

Until now, we have shown you some very basic capabilities of model-driven financial statements. In this section we want to highlight some of the additional capabilities. Additional example financial reporting schemes are provided and can be found here[42]:



The examples start small and then grow larger and larger. There are two financial reporting schemes that might be of particular interest.

5.1. Proof

The PROOF is a testing tool which includes 100% of the capabilities of an XBRL-based model-driven report which is as condensed as possible.

https://digitalfinancialreporting.blogspot.com/2023/12/proof.html

For the best understanding of model-driven financial statements, understanding each of these examples is very helpful:

https://digitalfinancialreporting.blogspot.com/2024/12/master-class-in-representing-financial.html

5.2. AASB 1060

The AASB 1060 is a testing tool and demonstration resource which shows something which looks very much like a full financial reporting scheme, so it looks "real".

https://xbrlsite.azurewebsites.net/2021/reporting-scheme/aasb1060/base-taxonomy/aasb1060_ModelStructure2.html

Here is an example report created using that AASB 1060 financial reporting scheme:

http://xbrlsite.azurewebsites.net/2021/reporting-scheme/aasb1060/reference-implementation/index.html

5.3. Showcase of Capabilities

The *Showcase of Capabilities*[43] is a document that has many reporting use cases documented and XBRL-based reports that shows those use cases being fulfilled.

[42] Seattle Method, *Resources*, https://seattlemethod.blogspot.com/p/resources.html
[43] *Showcase of Capabilities*, http://www.xbrlsite.com/2025/library/ShowcaseOfXBRLBasedDigitalReports.pdf