Understanding Global Open Industry Standards Based Model-driven Semantic-oriented Artificial Intelligence Powered Accounting and Audit Working Papers

A new modern approach to accounting and audit working papers

by

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A resource for professional accountants who want to understand the fundamentals of global open industry standards-based, model-driven, semantic-oriented, artificial intelligence powered accounting and audit working papers and schedules which are enabled by XBRL International's Open Information Model (OIM)[1], OMG's Standard Business Report Model (SBRM)[2], and the Seattle Method[3].

2025-11-07 (draft)

https://digitalfinancialreporting.blogspot.com/

https://seattlemethod.blogspot.com/

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

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

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

About the authors:

Charles Hoffman, CPA[4], 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.

Acknowledgements:

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[4] LinkedIn, Charles Hoffman, https://www.linkedin.com/in/charleshoffmancpa/

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In this document, several accountants contemplate the real opportunity to create a new approach to representing accounting and audit working papers and schedules that will, we believe, better serve the needs of all accountants.

The information in this document is based on 25+ years of work related to experimenting with XBRL-based digital financial reports.

The authors observe that the notion of the "Semantic Web"[5], labeled property graphs (LPGs) and graph databases, logic programming, artificial intelligence, and other such technologies are maturing and offer real opportunities within accountancy.

By "accountancy" we mean accounting, reporting, auditing (internal and third party), and analysis; external compliance reporting, internal management and cost reporting, external tax reporting, and other comprehensive basis of reporting.

There is a tremendous amount of hype today surrounding artificial intelligence. There is a lot of confusion related to what is referred to as the Semantic Web Stack[6], whether labeled property graphs are better than RDF and the rest of the Semantic Web Stack or maybe not[7], the role of the *Extensible Business Reporting Language* (XBRL)[8], good old fashioned artificial intelligence (GOFAI)[9] which was developed in the 1960s and 1970s and its role in the future, and of course LLMs and transformers and all the other forms of machine learning[10] and everything that promises.

Yet, the tool of choice is till overwhelmingly Excel and relational databases. In 1966, Abraham Maslow wrote "It is tempting, if the only tool you have is a hammer, to treat everything as if it were a nail."

The purpose of this paper is to assist the authors of this paper to sort through all the current rhetoric to find technologies that will actually provide value within accountancy. We decided to write this paper in order to force us to better communicate our thinking and to provide this information to other accountants who might be interested in this same information.

We believe that there is something here within this technology, buried within the hype which must be sorted through. Our observations are grounded in trying to make XBRL-based digital financial reporting work effectively. We believe, because the evidence from experimentation and testing shows, that these new technologies can be synthesized together in order to create accounting and audit working papers in a completely new manner.

We believe that we see that the foundations in all this "digital" stuff will be something like RDF Star and machine interpretable metadata created by subject matter experts (SMEs) such as professional accountants and that all other technologies will be "reconciled" to RDF Star or supplement RDF Star[11].

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[5] Seattle Method, *Semantic Web and AI: Can we finally realize the original vision?*, https://seattlemethod.blogspot.com/2025/04/semantic-web-and-ai-can-we-finally.html

[6] Wikipedia, *Semantic Web Stack*, https://en.wikipedia.org/wiki/Semantic_Web_Stack

[7] Mannheim University, *Labeled Property Graphs*, https://www.uni-mannheim.de/media/Einrichtungen/dws/Files_Teaching/Knowledge_Graphs/HWS2024/IE650_KG_07_Labeled-Property-Graphs.pdf

[8] XBRL International, *What is XBRL?*, https://www.xbrl.org/the-standard/what/what-is-xbrl/

[9] Wikipedia, *GOFAI*, https://en.wikipedia.org/wiki/GOFAI

[10] Wikipedia, *Machine Learning*, https://en.wikipedia.org/wiki/Machine_learning

[11] Onotext, *RDF-Star: Metadata Complexity Simplified*, https://www.ontotext.com/blog/rdf-star-metadata-complexity-simplified/

1. Introduction

If you distill a computer down to its essence, it is easier to understand what a computer can and cannot do and the obstacles that get in the way of a computer to perform work.

in his paper, *Ontology for the Twenty First Century: An Introduction with Recommendations[12]*, Andrew D. Spear outlined the fundamental strengths of computers and the obstacles that get in the way of harnessing that power:

Fundamental strengths/capabilities of computers:

- **store** information reliably and efficiently (tremendous amounts)
- **retrieve** information reliably and efficiently
- **process** stored information reliably and efficiently, mechanically repeating the same process over and over
- **access** information instantly, made available to individuals and more importantly other machine-based processes anytime and anywhere on the planet in real time

Major obstacles to harnessing the power of computers:

- **business professional idiosyncrasies**; different business professionals use different terminologies to refer to exactly the same thing
- **information technology idiosyncrasies**; information technology professionals use different technology options, techniques, and formats to encode and store, retrieve, and process exactly the same information
- **inconsistent domain understanding** of and **technology's limitations in expressing** interconnections within an area of knowledge
- **computers are dumb beasts**; computers don't understand themselves, the programs they run, or the information that they store, retrieve, process, or provide access to

And so, to get the fundamental capabilities effectively (store, retrieve, process, access); one must (a) agree on terminology by create a shared conceptualization[13], (b) represent[14] that shared conceptualization completely[15] and precisely per agreement with some professional community[16], (c) sort through what is computable and what is not computable[17] and separating the work[18] to be performed by humans

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[12] Andrew D. Spear, *Ontology for the Twenty First Century: An Introduction with Recommendations*, https://mba.eci.ufmg.br/downloads/pos/OntologyCenturyPART-Spear.pdf

[13] Seattle Method, *Conceptualization*, https://seattlemethod.blogspot.com/2025/09/conceptualization.html

[14] Seattle Method, *Knowledge Representation Approach*, https://seattlemethod.blogspot.com/2025/01/knowledge-representation-approach.html

[15] Seattle Method, *Completely*, https://seattlemethod.blogspot.com/2025/07/complete.html

[16] Seattle Method, *Area of Knowledge*, https://seattlemethod.blogspot.com/2025/01/area-of-knowledge.html

[17] Seattle Method, *Complexity*, https://seattlemethod.blogspot.com/2025/01/complexity.html

[18] Seattle Method, *Work*, https://seattlemethod.blogspot.com/2025/01/work-tasks.html

and work to be performed by the machine, (d) achieve a shared understanding[19], and finally (e) construct a knowledge based system[20] that pulls all the pieces of the puzzle together.

You can avoid all that effort, "a" through "e", by just using Excel. How does Excel solve the problem? Well, the computer will not do much; you just continue with the current human bucket brigade of "copy-paste" and "rekeying" to overcome the fact that a computer is a dumb beast that literally needs to be held by the hand like a small child to get it to do anything useful.

But what if you could get accountants to agree enough on terminology like "Assets", "Liabilities", and "Equity"? What if you could agree on one global open industry standard approach to representing that knowledge in machine readable form? What if a professional community could create a conceptualization that was complete enough and precise enough to actually be able to output high quality work products? What if humans and computers could effectively team up and work together, like an accountant using a calculator but a thousand times more powerful? What if you could get software engineers and informatics professionals, and industrial engineers to work together to create a "mindful machine" that actually understood accountancy?

What if the means to create such a mindful machine that could literally read and interpret accounting and audit working papers. How useful would that be?

Well, the fact-of-the-matter is that creating such a machine is not only possible, such a machine actually exists within several working proof of concepts. Sure, the machine is somewhat rudimentary, more like a Wright Flyer[21] as opposed to an SR-71 Blackbird for the time being. But things will evolve.

The mindful machine plus the machine interpretable accounting and audit working papers provide an ecosystem for professional accountants to perform work.

Let us explain the corner stones or keystones of the new type of tool, a professional tool for accountants; let us explain what we mean by:

- Global open industry standards-based
- Model-driven
- Semantic-oriented
- Artificial intelligence powered
- Customizable

1.1. Global Open Industry Standards-based

Today, performing accounting, reporting, auditing, and analysis work is like, as we pointed out before, is a bucket brigade of humans moving information around. A lot of what a professional accountant does can be considered what amounts to "janitorial

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work". Accountants are "data janitors". Fixing mistakes. Tracking and tracing down problems[22]. When things get bad, accountants resort to "the plug"[23].

Lots of things worked this way, no standards. For example, before the ISO standard shipping container[24] existed, pretty much all cargo was loaded by hand. But today, because if the intermodal shipping container[25]; transportation of cargo is vastly more efficient not just on ships, but moving cargo from a ship to a train; a train to a truck; or a truck back to a train or ship.

What if something similar could be achieved for the universal technology of accountability[26]? Well, it not only can; it has. Accounting is the language of business[27]. Double entry bookkeeping is a global standard. It is just that accounting systems don't really coordinate their implementations.
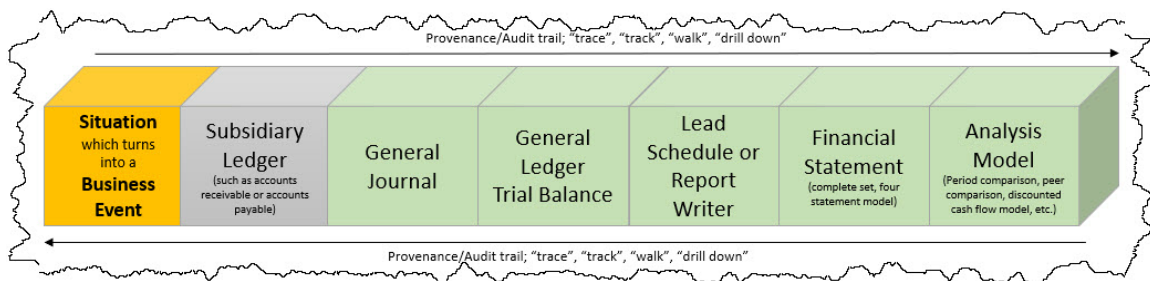
To understand the traction that the global open standard XBRL is getting, have a look at what the Financial Accounting Standards Board (FASB) has published (is publishing) on their website using that global standard XBRL technical format:

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[22] Digital Financial Reporting, *Transaction Chasing*, https://digitalfinancialreporting.blogspot.com/2025/09/transaction-chasing.html

[23] Digital Financial Reporting, *Problem with the Plug*, https://digitalfinancialreporting.blogspot.com/2025/03/problem-with-plug.html

[24] Wikipedia, *ISO 866*, https://en.wikipedia.org/wiki/ISO_668

[25] Wikipedia, *Intermodal Shipping Container*, https://en.wikipedia.org/wiki/Intermodal_container

[26] Digital Financial Reporting, *Universal Technology of Accountability*, https://digitalfinancialreporting.blogspot.com/2023/02/universal-technology-for-accountability.html

[27] Digital Financial Reporting, *Accounting, the Language of Business*, https://digitalfinancialreporting.blogspot.com/2025/09/accounting-language-of-business.html

- US GAAP Reporting Taxonomy[28], machine-readable information related to US GAAP financial reporting provided using the global standard XBRL

- SEC Reporting Taxonomy[29], 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[30], machine-readable information related to financial reporting by retirement plans and welfare plans which leverages the XBRL technical format

- GAAP Meta Model Relationships Taxonomy[31], explains fundamental relationship between financial reporting concepts in machine readable terms using XBRL

- DQC Rules Taxonomy[32], Data Quality Committee rules published in machine-readable form

- XBRL Global Ledger[33] is a global standard for transactional reporting

The IFRS Foundation has not yet progressed as much as the FASB, but they have published IFRS XBRL Taxonomies for financial reporting and they do mention digital financial reporting[34].

Effectively, financial reporting is being digitized. And the machine readable technical format of choice tends to be the global open industry 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*[35], which are part of the building blocks that are used to represent financial report information using the XBRL global open industry standard technical format.

In addition, a new version of the XBRL Open Information Model is being created and *XBRL Rules and Query Language 3.0*[36] is being created.

Finally, laws have been passed like the *Financial Data Transparency Act of 2022* (FDTA)[37]. People talk about "algorithmic regulation".

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[28] FASB, *2025 GAAP Reporting Taxonomy*, https://www.fasb.org/page/detail?pageId=/projects/FASB-Taxonomies/2025-gaap-financial-reporting-taxonomy.html

[29] FASB, *2025 SEC Reporting Taxonomy*, https://www.fasb.org/page/detail?pageId=/projects/FASB-Taxonomies/2025-sec-reporting-taxonomy.html

[30] 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

[31] FASB, *GAAP Meta Model Relationships Taxonomy*, https://www.fasb.org/page/detail?pageId=/projects/FASB-Taxonomies/gaap-meta-model-relationships-taxonomy.html

[32] FASB, *DQC Rules Taxonomy*, https://www.fasb.org/projects/fasb-taxonomies/dqc-rules-taxonomy

[33] XBRL International, XBRL *Global Ledger 2015*, https://specifications.xbrl.org/work-product-index-xbrl-gl-xbrl-gl-2015.html

[34] IFRS Foundation, Digital Financial Reporting, https://www.ifrs.org/digital-financial-reporting/

[35] 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

[36] XBRL International, *XBRL Rules and Query Language 3.0,* https://specifications.xbrl.org/work-product-index-formula-rules-and-query.html

[37] Digital Financial Reporting, *Financial Data Transparency Act of 2022*, https://digitalfinancialreporting.blogspot.com/2022/12/financial-data-transparency-act-of-2022.html

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[38] to better understand what is going on. The change is a big one. A paradigm shift is occurring and old mental maps will not be helpful in understanding the new paradigm. Many global open industry standards are already in place and battle hardened. Others are surely to come.

1.2. Model-driven

What exactly does Microsoft Excel or Microsoft Word understand about financial statements? Literally nothing.

But what if a software application could understand financial statements? By "understand" I mean the software has the capability to interpret such reports.

Machines and humans interact with information in different ways. Being able to distinguish between the two effectively will help you understand artificial intelligence capabilities more precisely.

Machines interpret information according to predefined rules. Those rules are defined by things like schemas, ontologies, theories, and other conditions, restrictions, or constraints that have been represented in some sort of machine-readable form. Machines interpret, they don't actually understand what they are doing.

Humans understand information based on context, skills, experience, research, observation, and reasoning. Humans actually know the meaning of something. Humans may even comprehend something which is to understand something completely. Humans bring meaning to their ability to understand beyond information that is actually provided in the form of intuition and common knowledge that machines simply don't have. Humans can understand implications, "deeper meaning" from context, experience, skills, and knowledge that goes beyond the actual information itself.

Machines just interpret. And so, what exactly is a machine interpreting?

In Microsoft Excel, there is a model. But that model is based on workbooks, spreadsheets, columns, rows, and cells. Artifacts of a document. Microsoft Word understands things like paragraphs, lists, tables (rows, columns, cells), pages, sections, and other such publishing related artifacts.

A model-driven report constructs disclosures, organizes those disclosures into some sort of flow, the disclosures have financial report line items and facts in them. The model of the report is based on the meaning conveyed by the report, not structures used to organize information in the form of a spreadsheet or document so a human can then read the spreadsheet/document.

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

The *Logical Theory Describing Financial Report (Terse)*[39] describes that model in terms of logical patterns that exist in a financial report. Those logical patterns for a theory which describes the logic of a financial report.

The model of a report is based on XBRL International's *Open Information Model* (OIM) and OMG's *Standard Business Report Model* (SBRM). OIM is the basis for the *Seattle Method* and SBRM is effectively based on the *Seattle Method* model of a business report. So, OIM, SBRM, and the *Seattle Method* are pretty well aligned.

That OIM, SBRM, and Seattle Method model of a financial report model uses the multidimensional model provided by XBRL Dimensions[40]. 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) does or will leverage.

To wrap this up for now, know that a meaning based model of a financial report enable a software application to effectively interpret the artifacts that make up the structure of that financial report.

1.3. *Semantic-oriented*

The model of a financial report is semantic (i.e. things[41], not strings), that meaning and logic is sharable across report models, and the financial report model is based on the logical model of the global open industry standard XBRL. The Seattle Method, OIM, and SBRM further enhance that logical model of a financial report enabling additional capabilities.

For example, nowhere in XBRL is there a notion of a "disclosure". The Seattle Method and SBRM explicitly define the notion of a disclosure.

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 open industry 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. All these semantics, think rules and specifications, are provided declaratively rather than being buried within software code.

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

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[39] Seattle Method, *Logical Theory Describing Financial Report (Terse)*, http://xbrlsite.com/seattlemethod/LogicalTheoryDescribingFinancialReport_Terse.pdf

[40] XBRL International, *XBRL Dimensions*, https://specifications.xbrl.org/work-product-index-group-dimensions-dimensions.html

[41] Digital Financial Reporting, Things, https://digitalfinancialreporting.blogspot.com/2024/11/things.html

A financial report is a knowledge graph. To understand this better, we suggest diving into *Financial Report Knowledge Graphs*[42].

1.4. Artificial Intelligence Powered (empowering)

Model-driven financial reporting provides a powerful yet safe implementation of first order logic using DATALOG[43] which is a safe subset of declarative logic programming language PROLOG[44]. Those rule and rule-based logic can be supplemented by probability-based logic and large language models (LLMs) for even more information processing capabilities.

The graphic below is inspired by a similar graphic created by DARPA and provided in this video, *A DARPA Perspective on Artificial Intelligence*[45], show the impact of a hybrid approach to artificial and human/machine teaming. #1 shows all work being performed by humans. #2 shows the capabilities of rules-based artificial intelligence and handcrafted knowledge. #3 shows the capabilities of probability based artificial intelligence based on statistical learning. #4 shows what can be achieved using a hybrid approach which combines #1, #2, and #3 and used a contextualized, model-driven approach. (GREEN is work performed by a human and BLUE is work performed by a machine)
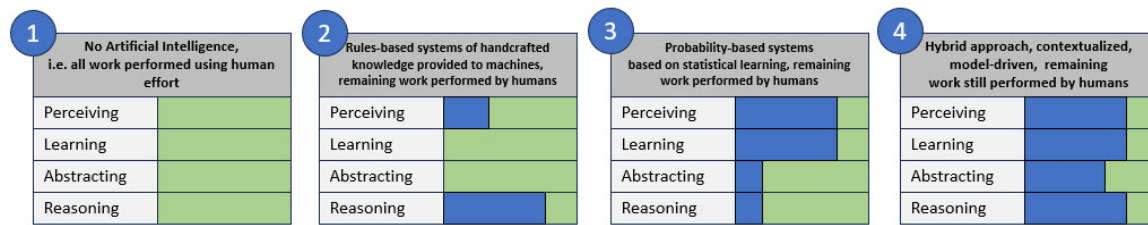
A model-driven report is effectively a knowledge graph. That knowledge graph can be the basis for a knowledge based system[46] (a.k.a. mindful machine, deductive apparatus, expert system).

To understand the type of intelligence a software agent[47] would have, look at the logic implemented for the Seattle Method in the form of a set of micro-theories 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

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[42] Charles Hoffman, CPA, *Financial Report Knowledge Graphs*, http://xbrlsite.azurewebsites.net/2021/Library/FinancialReportKnowledgeGraphs.pdf

[43] Wikipedia, *Datalog*, https://en.wikipedia.org/wiki/Datalog

[44] Wikipedia, Prolog, https://en.wikipedia.org/wiki/Prolog

[45] YouTube, *A DARPA Perspective on Artificial Intelligence*, https://youtu.be/-O01G3tSYpU

[46] Seattle Method, *Knowledge Based System*, https://seattlemethod.blogspot.com/2025/09/knowledge-based-systems.html

[47] Seattle Method, *Agent*, https://seattlemethod.blogspot.com/2025/01/agent.html

- Theory of Reportability

Rules empower artificial intelligence. Completeness in not produced by reasoning however; completeness needs to be declared and/or governed[48]. Epistemic risk is the chance of being wrong and that risk must be managed.

Other intelligence can be added, for example something like *Theory of Normalization* which would convert as reported financial report information into a normalization model or the *Theory of Business Events* which understand business events[49].

Obviously, I would need to create something like the *Theory of Accounting and Audit Working Papers and Schedules*.

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 something like 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 kept 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 accountants creating model-driven reports; keeping them within those permitted boundaries.

We will look at customization next.

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 financial report model is specific to that reporting economic entity, but it does follow logical patterns of the financial report model. And every financial report model follows the logic of a business report model because a financial report is a specialization of the more general business report.

As such, creators of model-driven financial reports need to be able to work within that fixed business 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.

There are a number of layers which should not be confused. A complete discussion of this is beyond the scope of this document. To better understand this, please refer to the *Theory of Fundamental Accounting Concepts and Reporting Styles*[50].

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[48] Digital Financial Reporting, *Completeness is not produced by reasoning – it must be declared or governed*, https://digitalfinancialreporting.blogspot.com/2025/11/completeness-is-not-produced-by.html

[49] Digital Financial Reporting, *Events*, https://digitalfinancialreporting.blogspot.com/2025/09/events.html

[50] Digital Financial Reporting, *Theory of Fundamental Accounting Concepts and Reporting Styles*, https://digitalfinancialreporting.blogspot.com/2024/12/theory-of-fundamental-accounting.html

Like financial reports, accounting and audit working papers and schedules are not forms. They are customizable, and can be customized, using the same ideas applied to financial statements. Further, best practices can be canonized in the form of accounting and audit working paper and schedule templates as contrast to every accounting schedule and audit working paper be a unique work of art which is what tends to occur today. It is hard to leverage individually created works of art; it is easier to leverage standard, but customizable, best practices based tools.

2. Craft of Creating Accounting and Audit Working Papers

Charlie began his career in accounting in 1982 as an auditor with Price Waterhouse when accounting and audit working papers and schedules were 100% paper. But within three months, he was creating many of those same working papers and schedules first in VisiCalc and then Lotus 1-2-3. He would create those schedules and working papers electronically, then print them out, and tape them into the bundle of paper working papers and schedules that supported his audits. The Compaq luggable computer was invented a few years later and electronic spreadsheets became even more compelling.

Today, accounting and audit working papers tend to be 100% electronic proxies for those paper documents now created in Excel or some other traditional electronic spreadsheet, Word or some other word processing document, PDF generated from some word processing document, and maybe HTML.

All of these are presentation oriented proxies for documents and none of them is truly interpretable by a computer based process.

But what if these accounting and audit artifacts where more like databases instead of documents. Think logic oriented spreadsheets[51]. Actually, they would be more like

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[51] Digital Financial Reporting, *Universal Global Standard Logical Spreadsheet (Professional Spreadsheet)*, https://digitalfinancialreporting.blogspot.com/2023/05/universal-global-standard-logical.html

dynamic pivot tables. These professional tools would be built specifically for the needs of professional accountants and auditors.

Key to all this is the core pattern[52] which drives all of this, the information block or simply the block[53].
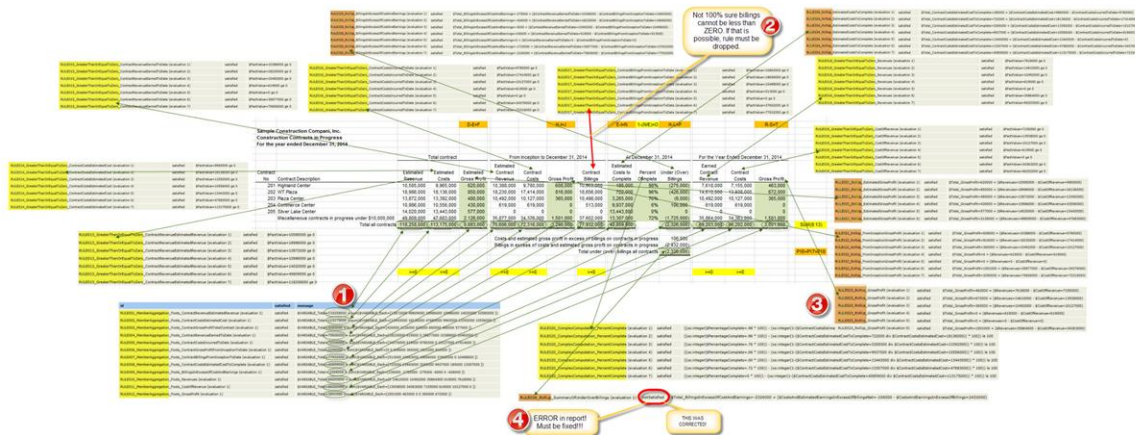
Excel has it's place and will likely never go away. But Excel and other traditional spreadsheets don't scale very well. Other alternatives are necessary.

We don't want to dive into the details of information blocks here. If you want to understand them now, we would recommend starting with the *Showcase of Capabilities*[54].

2.1. Master Craftsperson

Authors Dean Allemang and James Hendler say it well in their book *Semantic Web for the Working Ontologist*[55]:

> "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 real experience with masonry will be very different.

2.2. Becoming a Master Craftsperson

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

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[52] Seattle Method, *Core Pattern*, https://seattlemethod.blogspot.com/2025/11/core-pattern.html

[53] WIP Table, https://www.xbrlsite.com/2016/Prototype/WIP1/WIP_Table_DataToRulesMap.jpg

[54] Seattle Method, *Showcase of Capabilities*, https://seattlemethod.blogspot.com/p/showcase-of-capabilities.html

[55] Dean Allemang and James Hendler*, Semantic Web for the Working Ontologist*, page 1, https://www.amazon.com/Semantic-Web-Working-Ontologist-Effective/dp/0123859654

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[56] 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[57] 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.

There are many other important considerations[58] 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 ushers in a new era of human and machine teaming to perform work[59].

2.3. Human/Machine Teaming

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[60] 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.

2.4. Paradigm Shift

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 as 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.

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[56] Complexity, https://seattlemethod.blogspot.com/2025/01/complexity.html

[57] System, https://seattlemethod.blogspot.com/2025/01/system.html

[58] Seattle Method Overview, https://seattlemethod.blogspot.com/2025/01/overview.html

[59] Work, https://digitalfinancialreporting.blogspot.com/2025/01/work.html

[60] Digital Financial Reporting, *The Threat of Inaccuracy,*
https://digitalfinancialreporting.blogspot.com/2024/08/the-threat-of-inaccuracy.html

2.5. Digital First

What is happening is not about bolting on more work onto existing processes which are fundamentally flawed. Financial reporting errors and audit failures are higher than they should be[61]. Accountants, auditors, and analysts are being stressed by the increasing volume of information, the increasing complexity of information, and the increasing pace of information flow.

Sarbanes Oxley addresses the symptoms the "hairball" that seems to have become normalized[62]. It is not normal. Sarbanes Oxley addresses the symptoms. But model-driven reporting addresses the conditions which are causing the hairball.

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

3. Essence Accounting and Audit Working Papers and Schedules

Just as financial statements are knowledge graphs; so too are accounting and audit working papers and schedules.

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[63]. Likewise, accounting and audit working papers are knowledge graphs. And if they are thought of and treated like knowledge graphs entirely new possibilities open up.

Knowledge[64] 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.

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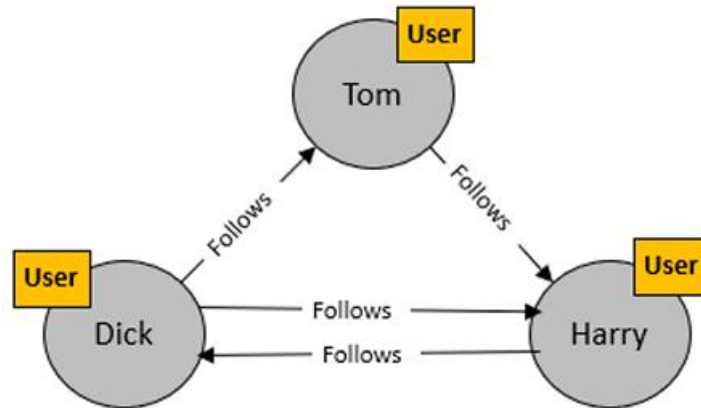
A graph is a general-purpose communications tool that allows us to model all sorts of scenarios in terms that are innately understandable to humans. One thing that can be represented in the form of a graph is knowledge. This is a simple graph of knowledge, or a knowledge graph:

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[61] Digital Financial Reporting, *Financial Statement and Audit Quality*, https://digitalfinancialreporting.blogspot.com/2025/10/financial-statement-and-audit-quality.html

[62] Digital Financial Reporting, *Creeping Normality, Integration Hairball, and Why Most Organizations are Not Ready for AI*, https://digitalfinancialreporting.blogspot.com/2024/03/creeping-normality-integration-hairball.html

[63] Charles Hoffman, CPA, *Financial Report Knowledge Graphs*, http://xbrlsite.azurewebsites.net/2021/Library/FinancialReportKnowledgeGraphs.pdf

[64] Seattle Method, *Knowledge*, https://seattlemethod.blogspot.com/2025/01/knowledge.html

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[65]. And XBRL can also be used to represent accounting and audit working papers to turn them into knowledge graphs.

Using clever and creative techniques, the fact that an accounting or audit working paper or schedule is a knowledge graph can be leveraged to your advantage.

3.2. Traditional Electronic Spreadsheets are Not Knowledge Graphs

Excel and other traditional electronic spreadsheets are not knowledge graphs[66]. They are document models and they are not semantic oriented. Excel is too flexible to be able to control effectively and linking Excel spreadsheets into a process is brittle because the linking mechanism is a position in a spreadsheet which does not scale.

Further, all knowledge graphs are not the same.

3.3. 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*[67] was leveraged by the Seattle Method.

The notion of atoms, molecules, organisms, and species[68] are used. Elegance, grace, and beauty are achieved by good design principles and practices. But also scalability, ease of maintenance, and consistency are achievable.

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[65] *XBRL is an Extra Fancy Knowledge Graph*, https://digitalfinancialreporting.blogspot.com/2024/05/xbrl-is-extra-fancy-knowledge-graph.html

[66] Digital Financial Reporting, *Excel is Not a Knowledge Graph; Not all Knowledge Graphs are the Same*, https://digitalfinancialreporting.blogspot.com/2024/12/excel-is-not-knowledge-graph-not-all.html

[67] Atomic Design Methodology, https://digitalfinancialreporting.blogspot.com/2023/12/atomic-design-methodology.html

[68] Atoms, Molecules, Organisms, and Designing Systems, https://digitalfinancialreporting.blogspot.com/2025/01/atoms-molecules-organisms-and-designing.html

A kludge[69] 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.

Species Level: Domain agnostic, complete, collaborative, tamper-resistant, information oriented, specialized, clear, reliable, high-quality, powerful

Organism Level: Manageable, customizable, easy to use, templatized, global orientation, trustworthy, transparent, provenance, explainable, effective exchange

Molecular Level: dimensional fact model, logic-based, model driven, artificial intelligence powered, semantic/meaning oriented

Atomic Level: IRI-based triple store database, immutable, DATALOG reasoning engine, schema-full, safe, robust, flexible, generalized, data oriented

Standards Level: Globally unique content identifiers (IRI), Unicode encodings, XML Schema data types, RDF, First-order (Horn) logic, cryptography, blockchain

3.4. Objects Used to Construct Accounting and Audit Working Papers

A system[70] 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 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 an accounting or audit working paper or schedule. Here is a description of the objects used to construct the logical system we refer to as an accounting or audit working paper or schedule:

- Terms
- Structure (a.k.a. Assembly)
- Associations (a.k.a. Relations)
- Rules (a.k.a. Conditions, Assertions, Constraints, Restrictions)
- Facts

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[71]. Finally, don't try to understand the

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[69] Digital Financial Reporting, No Kludge, https://digitalfinancialreporting.blogspot.com/2025/10/no-kludge.html

[70] Seattle Method, *System*, https://seattlemethod.blogspot.com/2025/01/system.html

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

underlying technologies at work, all you need to understand is the rules of logic; think philosophy not computer science.

3.5. 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, Correction of an Error)
- Variance (a.k.a. Difference)
- Text Block (a.k.a. Prose)
- Member Aggregation

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

3.6. Best Practices

An area of knowledge[72] 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*[73] 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)

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[72] Seattle Method, *Area of Knowledge*, https://seattlemethod.blogspot.com/2025/01/area-of-knowledge.html

[73] Wikipedia, *Cynefin Framework*, https://en.wikipedia.org/wiki/Cynefin_framework

- **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 accounting and audit working papers and schedules will actually work or whether it can even work.

Rather, if you really want to understand model-driven standards-based semantic-oriented AI-powered accounting and audit working papers and schedules and you are willing to make the investment (this is the investment[74]); then it is understandable rather than being mysterious. It is only a mystery if you don't understand how it actually works.

3.7. *Canonical Standard Templates*

Imagine having a global open industry standard canonical best practices example or archetype of every accounting and audit working paper. But you are also free to modify any of the canonical best practices examples, they really are only templates. An archetype is like a template or an exemplar.

Canonical templates can be created using a global open industry standard format and can be shared between software applications:

- Chart of accounts

- Business events

- Journal entries

- Ledger trial balance

- Adjusted ledger trial balance

- Detailed ledger trial balances (a.k.a. supporting schedules like accounts receivable, inventories, accounts payable, etc.)

- Lead schedules

- Reconciliation

- Variance analysis

- Movement analysis

- Comparisons

- Tax schedules

- Supporting schedules

- Planning schedules

- Consolidation

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[74] *Seattle Method Overview*, https://seattlemethod.blogspot.com/2025/01/overview.html

These canonical standard templates would be specific for external compliance reporting, internal management and cost accounting, external tax reporting, and other specific reporting use cases. But all these working papers and schedules have patterns which can be leveraged effectively.

3.8. Mindful Machine for Accountancy

A mindful machine for accountancy[75] is a knowledge based system[76] that is specific to accountancy. It has a global standard query syntax that is specific to the things within accountancy. This mindful machine for accountancy enables effective teaming of humans and machines. It leverages both rules-based symbolic artificial intelligence, probability-based machine learning, as well as model-driven approaches and contextualization.

This mindful machine interacts with the accounting and audit working paper(s) and schedule(s) knowledge graph which is easy to interpret.

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[75] Digital Financial Reporting, *Build a Mindful Machine for Accountancy*, https://digitalfinancialreporting.blogspot.com/2025/10/building-mindful-machine-for-accountancy.html

[76] Seattle Method, *Knowledge Based System,* https://seattlemethod.blogspot.com/2025/09/knowledge-based-systems.html

4. Basic Example of Global Open Industry Standards-based Model-driven Semantic-oriented AI-powered Accounting Working Paper

In this section we will provide a very basic example of a global open industry standards-based model-driven semantic oriented artificial intelligence powered accounting working paper.

Fundamentally, to use a global open industry standards-based model-driven semantic oriented artificial intelligence powered approach to creating an accounting or audit working paper or schedule and you want that system to actually work, you need to:

1. **Describe/explain/specify** a working paper or schedule using a machine-understandable[77] global standard technical syntax such as XBRL.

2. **Construct/create** the working paper or schedule using specially designed software that is built specifically for that purpose of using the above description/specification to construct a model and the information that fits into that model.

3. **Verification/validation** of what you constructed in terms of a model and report does, in fact, follow that description/specification of the working paper or schedule model.

4. **Extract/interpret/analyze** information from the working paper of set of such working papers either manually or with the assistance of a computer based process.

Again, we want to keep this very basic example, well, very basic and but cover the key aspects of global open industry standards-based model-driven semantic-oriented artificial intelligence powered approach.

What we will create as or very basic example is a trial balance. There are many different formats that might be used to present a trial balance of ledger account balances.

But we are not going to focus on any specific presentation of the trial balance; rather we are going to focus on the logic of the things represented which tend to be the same for every trial balance.

We know that a trial balance has accounts and because we are creating a general ledger trial balance it will be the accounts from the chart of accounts. We know that for each account there will be an amount. That amount will be either a debit amount or a credit amount. We also know that the sum of the debit amounts will always be the same as the sum of the credit amounts.

Because we will be using the global open industry standard XBRL to represent the logic of the information contained in the trial balances and we must follow that standard; we also realize that we have to be explicit and also state the economic entity providing the information in that trial balance, the currency of the amount represented, the number of decimal places that we are providing for the amount, and finally that the

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[77] *Understandability*, https://digitalfinancialreporting.blogspot.com/2024/04/understandability.html

amounts are at a specific point in time for the real (a.k.a. permanent) accounts and is the sum of all financial transactions for a period of time for nominal (a.k.a. temporary) accounts. Effectively, we are following the fundamental mathematical and logical rules of double entry bookkeeping. And so logically, the trial balance of general ledger accounts would look something like the following:

Paul's Guitar Shop, Inc. Unadjusted Trial Balance December 31, 2015		
Account	**Debit**	**Credit**
Cash	$ 32,800	
Accounts Receivable	300	
Inventory	39,800	
Leasehold Improvements	100,000	
Accounts Payable		$ 49,000
Long-term Liabilities		99,500
Common Stock		10,000
Dividends	1,000	
Revenues		27,800
Cost of Goods Sold	10,200	
Rent Expense	500	
Supplies Expense	500	
Utilities Expense	200	
Wages Expense	500	
Interest Expense	500	
Totals	**$ 186,300**	**$ (186,300)**

Remember that we said that "computers are dumb beasts". So, there are a few other things that we have to deal with to be able to exchange this information with someone else. Things like the data type of the amount, how will the amounts that are debits be represented as contrast to how the amounts that are credits be represented. How exactly are you going to identify the economic entity? By name or tax id or stock market ticker symbol or some other identifier? What format will you use for the date? Those are some of the examples of things that are addressed by the global open industry standard XBRL which will be the technical format that will carry the logic; things that an accountant really does not care about but, as you know from trying to share an Excel spreadsheet with someone else; things that matter in the real world.

And so that will give you a basic idea of what it means to represent information in the manner we are suggesting.

In the final section of this document, we will provide additional examples which you can use to grasp the true capabilities of global open industry standards-based model-driven semantic-oriented artificial intelligence powered accounting and audit working papers provided by 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 the accounting working paper model or schema that will be used to create the

accounting working paper using some global open industry standard technical format such as XBRL or some other technical format specified by SBRM or OIM. We are going to use a methodology created by Charlie he refers to as the Seattle Method which is based on best practices gleaned from 15 years of reports being provided to the Securities and Exchange Commission (SEC); effectively reverse engineering the XBRL-based financial reports to understand how exactly they work and how to get XBRL to do exactly what we want.

For this very basic example, we just grabbed some traditionally created trial balance from the internet because we had to put some real numbers into the trial balance and we did not want to spend the time to make up numbers.

Looking at this specific working paper and considering the best practices proposed by the Seattle Method; the optimal way to approach this is to create three structures and link them together. Those structures separate the real accounts, nominal accounts, and something to hook those two together which is the income summary:

1. Real accounts
2. Temporary accounts
3. Reconciliation

Real accounts are:

- Cash
- Accounts Receivable
- Inventory
- Lease improvements
- Accounts Payable
- Long-term Liabilities
- Common Stock

Nominal or temporary accounts are:

- Revenues
- Cost of Goods Sold
- Rent Expense
- Supplies Expense
- Utilities Expense
- Wages Expense
- Interest Expense

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 real accounts
- Roll up of the individual line item subcomponents nominal accounts
- Roll forward of retained earnings

For the benefit of the non-accountants reading this documentation we want to say one additional thing to help them understand the difference between an open trial balance and a closed trial balance. Plus, there is one more piece of information that we need to have which is the opening balances of the real accounts.

Real or permanent accounts (i.e. the stuff that goes on the balance sheet) reflect the ongoing financial position of a reporting economic entity and those accounts accumulate over time and are never reset at the end of a fiscal period.

Nominal or temporary accounts (i.e. the stuff that flows through the income statement) captures performance of the reporting economic entity over a specific period of time. These nominal accounts are always reset to zero to begin with zero account balances for tracking in the next fiscal cycle.

Effectively what happens is that the nominal accounts of the income statement, using one common technique, flow through what is often referred to as the income summary and is then transferred to the real accounts by posting the income summary (i.e. net income or loss) to the opening balance of retained earnings.

All this logic and technique is part of the global open industry standard referred to as double entry bookkeeping which is a mathematical model[78]. Saying this another way; the mathematical model of double entry bookkeeping is basically a specification.

4.2. Construct/Create

This is the representation which is organized a little differently than the screen shot of the original trial balance, this is what I came up with:

(IMPORTANT NOTE: the rendering currently has a bug which is not entering commas in the numbers and is not lining them up correctly, this is an issue with specific software, not a limitation of XBRL)

Concept [Aspect]	Period [Aspect]	
	2015-12-31	2014-12-31
Trial Balance [Roll Up]		
Cash	$ 32800	$ 0
Accounts Receivable	300	0
Inventory	39800	0
Leasehold Improvements	100000	0
Accounts Payable	(49000)	0
Long-term Liabilities	(99500)	0
Common Stock	(10000)	0
Retained Earnings	(14400)	0
Check Sum	$ 0	$ 0

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[78] David Ellerman, *The Mathematics of Double Entry Bookkeeping*, https://www.ellerman.org/wp-content/uploads/2012/12/DEB-Math-Mag.CV_.pdf

Concept [Aspect]	Period [Aspect]
	2015-01-01 | 2015-12-31
Net Income (Loss) [Roll Up]	
Revenues	$ 27800
Cost of Goods Sold	(10200)
Rent Expense	(500)
Supplies Expense	(500)
Utilities Expense	(200)
Wages Expense	(500)
Interest Expense	(500)
Net Income (Loss)	$ 15400

Concept [Aspect]	Period [Aspect]
	2015-01-01 | 2015-12-31
Retained Earnings [Roll Forward]	
Retained Earnings, Beginning Balance	$ 0
Net Income (Loss)	15400
Dividends	(1000)
Retained Earnings, Ending Balance	$ 14400

Same information in a second software application, Pesseract with is a working proof of concept: (read and validate only, cannot be used for construction)

Reporting Entity [Axis]	Example http://xbrlsite.com/id	
Unit [Axis]	USD	
	Period [Axis] ▾	
Trial Balance [Line Items]	2015-12-31	2014-12-31
Trial Balance [Roll Up]		
Cash	32,800	0
Accounts Receivable	300	0
Inventory	39,800	0
Leasehold Improvements	100,000	0
Accounts Payable	(49,000)	0
Long-term Liabilities	(99,500)	0
Common Stock	(10,000)	0
Retained Earnings	(14,400)	0
Check Sum	0	0

Reporting Entity [Axis]	Example http://xbrlsite.com/id
Unit [Axis]	USD

	Period [Axis] ▼
Income Summary [Line Items]	2015-01-01/2015-12-31
Net Income (Loss) [Roll Up]	
Revenues	27,800
Cost of Goods Sold	(10,200)
Rent Expense	(500)
Supplies Expense	(500)
Utilities Expense	(200)
Wages Expense	(500)
Interest Expense	(500)
Net Income (Loss)	15,400

Reporting Entity [Axis]	Example http://xbrlsite.com/id
Unit [Axis]	USD

	Period [Axis] ▼
Retained Earnings Roll Forward [Line Items]	2015-01-01/2015-12-31
Retained Earnings [Roll Forward]	
Retained Earnings, Beginning Balance	0
Net Income (Loss)	15,400
Dividends	(1,000)
Retained Earnings, Ending Balance	14,400

So, this explains what I created and why I created it that way. First, the original screen shot of the trial balance we are representing does not provide beginning balance information, only ending balances. Normally you would have that information. As that information was not provided, I had to make an assumption about beginning balances. I assumed that all the transactions occurred in the same fiscal year and that the beginning balances were, therefore, zero.

Second, I did not but could get the software modified to "present" the information exactly as it was presented in the DEBIT and CREDIT format with the real and nominal accounts together. However, I am separating the arbitrary presentation of the trial balance information (i.e. which is subjective and therefore of which there might be hundreds of different preferences for presentation options) with the clear representation of the LOGIC of what is going on in this accounting working paper.

To make this crystal clear; basically, we picked a "natural" or "neutral" presentation approach which makes things as clear as possible and as reusable as possible.

As such, I broke the dynamics down into three logical "modules" that precisely and clearly explains what is going on with the information being represented.

The first piece, the "Trial Balance [Roll up]" is basically the information that ends up on a balance sheet from the trial balance; the real or permanent accounts.

The second piece, the "Net Income (Loss) [Roll Up]" is the information that ends up on the income statement from the trial balance; the nominal or temporary accounts.

The third piece, the "Retained Earnings [Roll Forward]" is the information that ends up on the statement of changes in equity from the trial balance; plus, it ties together the first and second pieces mathematically. Meaning, it is impossible to change only one number in that set of schedules; you MUST change two.

Another very interesting point is that we did not have to make any modifications to any software to get a logical representation that pretty much any accountant would understand. We are using open off-the-shelf software that is being created for XBRL-based digital financial reporting to create what we are creating.

To better understand exactly how the working paper was created, let me show you the model editing view within the software application of each of the three pieces:

In the first piece above, note the connection between the actual model on the right and the view of the rendering generated by the model and the actual information that goes into the model (i.e. the numbers) on the LEFT. You get a "what you see is what you get" type of situation; you change the rendering by changing the model logic.

And so, this begs the question, "Are you telling me I don't have control over the presentation of the information." The answer is yes and no. "No" in that the representation is primarily driven by the LOGIC, not by the whims of how one person might want to represent that logic. As we said previously, we are providing one "neutral" or "natural" representation. But yes, you can change somethings by configuring that presentation color, the location of the currency indicator, the formatting of the numbers, and things like that.

Basically, you are giving up a little control of some things related to presentation in order to give you better control over other more important things; scalable accounting and audit working papers and schedules and a database that a mindful machine can effectively interact with.

Saying this another way; you can do exactly what I have done using Excel or other traditional electronic spreadsheet. In fact, this is exactly what accountants do all the

time. But with Excel, (a) every accountant does this differently, (b) none of the Excel based approaches will scale because Excel is too flexible, (c) linking things together in Excel is done using a position in a spreadsheet which is very brittle, (d) these home grown solutions may, or may not, be world class, (e) each of these approaches is effectively proprietary, and finally (f) features provide in each of these home grown approaches is different and very likely few are complete.

The global open industry standards-based model-driven semantic-oriented approach is scalable, it is rich in useful features, it is rock solid and battle tested, the fundamental design is world class (i.e. created by XBRL International, an industry consortium), and the approach is global in nature. Further, because the information is provided to a machine in a manner that is designed for machines to use, this approach will supercharge what is possible with artificial intelligence and knowledge based systems[79].

Also, realize that you can add just a little more additional work if you want and get "pixel perfect renderings" by leveraging Inline XBRL. You basically perform one additional step which is to map facts and other things to exact locations in some presentation-oriented artifact such as HTML, PDF, Adobe InDesign, Microsoft Word, Google Documents, or whatever other presentation-oriented artifact that you might have your heart set on.

But alternatively, you have a natural or neutral presentation of logic in a form that any business professional can understand and effectively work with.

So, basically you are giving up some control over presentation in order to be able to create a significantly more scalable and robust approach to creating a closing book or an audit bundle that only a few people really look and where you might even prefer a standard approach as opposed to pixel perfect works of presentation art.

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[79] Seattle Method, *Knowledge Based Systems*, https://seattlemethod.blogspot.com/2025/09/knowledge-based-systems.html

And so, you can see somewhat of the interface of the software which is pretty nice in our view. And, that GUI/UX will get better, and better, and better over the years. To better understand the dynamics of the software, you can use the actual software to understand those specific dynamics better.

4.3. Verification/Validation

The following is verification generated from a financial statement which shows you what can be verified by machine-based processes using something link a "mindful machine that understands accountancy":

#	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	✓

Note that the mindful machine that understands accountancy understands specific aspects of accountancy, not everything about accountancy. It only understands, currently, the eight or so theories that Charlie has represented for financial statements[80] and leverages via the Seattle Method.

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[80] Digital Financial Reporting, *Financial Statement Mechanics and Dynamics*, https://digitalfinancialreporting.blogspot.com/2024/12/financial-statement-mechanics-and.html

We have not yet represented the *Theory of Accounting and Audit Working Papers* in machine readable form or modified the software to process that theory. That is on our short list of things to get done.

4.4. Analyze/Extract

Additionally, we have created a few videos that explain key aspects of these new model-driven artifacts. We hope that these three very short videos will help you get your head around what is possible with model-driven accounting and audit working papers.

This video shows a lead schedule and how you can edit that lead schedule in software which exists today: https://youtu.be/sMWhPWgeB8g

This video helps you see how mathematical computations connect different parts of a report together and deal with inconsistencies within a report: https://youtu.be/k6GfpnM40uU

This video helps you understand how you can effectively "trace" and "track" and "walk" through a set of accounting or audit working papers or schedules, and even pivot the views of the information; also note that this application is completely different that the first but the information loads just fine because the information is global open industry standard XBRL: https://youtu.be/wRrbtzP4RX4
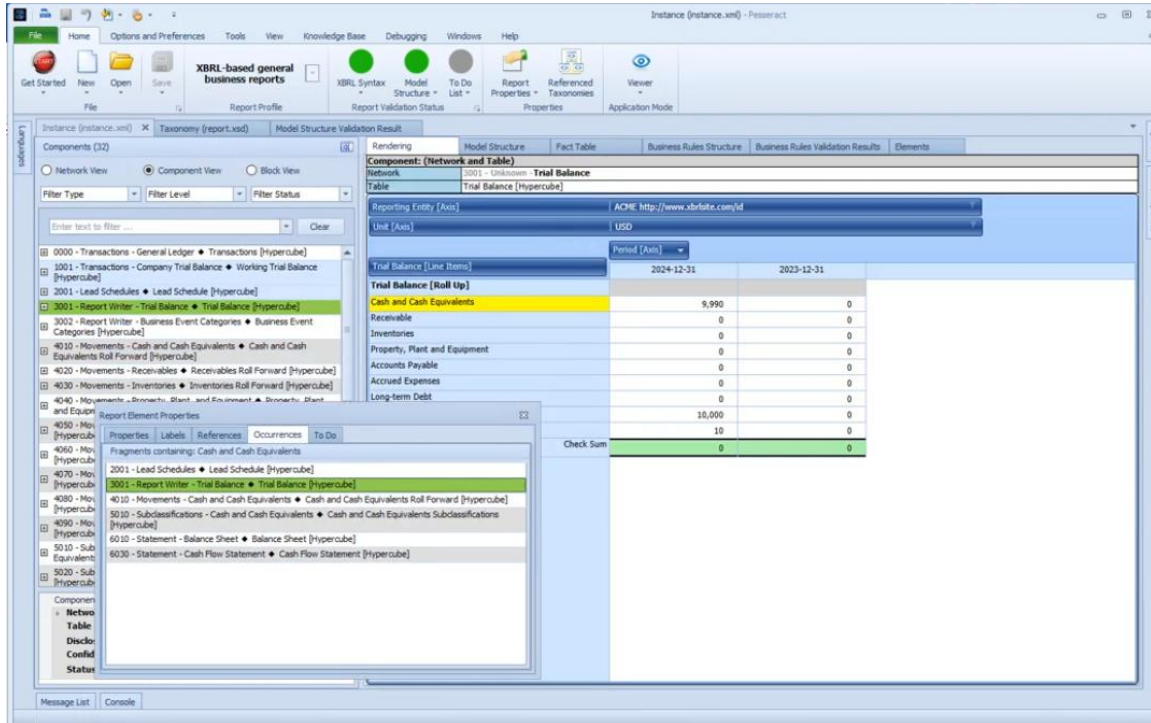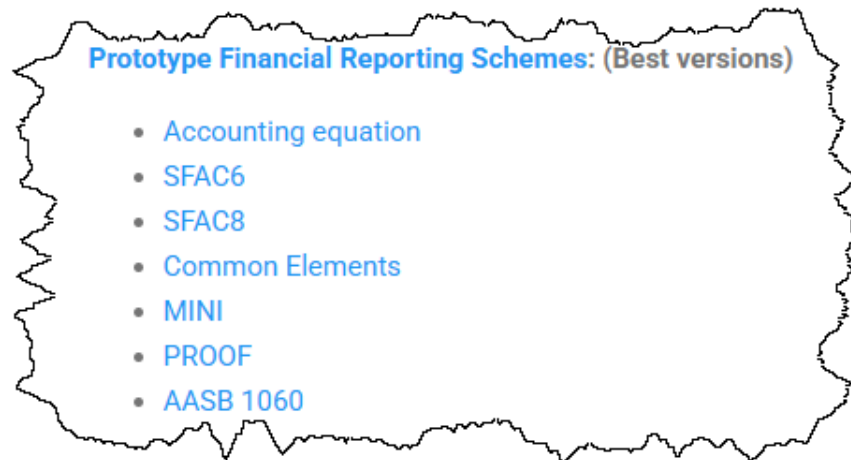
5. Capabilities of Model-driven Accounting and Audit Working Papers and Schedules

Until now, we have shown you some very basic capabilities of model-driven financial statements.

Gall's Law states that, "A complex system that works is invariably found to have evolved from a simple system that worked." Galli's Law emphasizes that effective complex systems develop from simpler, functional predecessors. The law suggests that starting with basic, operational systems and iteratively developing them is more effective than attempting to create a complex system from scratch.

Keep this thought in the back of your mind as you are provided what could be misinterpreted as being toys. They are not toys. They are deliberately and rigorously created increments, experiments, learning tools, teaching tools, and testing tools.

These working proof of concepts and examples highlight some of the additional capabilities so that the reader understands the true possibilities. Additional example financial reporting schemes are provided and can be found here[81]:

Prototype Financial Reporting Schemes: (Best versions)
- Accounting equation
- SFAC6
- SFAC8
- Common Elements
- MINI
- PROOF
- AASB 1060

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

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[81] Seattle Method, *Resources*, https://seattlemethod.blogspot.com/p/resources.html

5.2.   AASB 1060 and IFRS for SMEs

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

IFRS for SMEs is an official XBRL taxonomy published by the IFRS Foundation which has been enhanced, enriched, and augmented with additional information:

https://digitalfinancialreporting.blogspot.com/2025/05/ifrs-for-smes-xbrl-taxonomy-2024.html

5.3.   Showcase of Capabilities

The *Showcase of Capabilities*[82] is a examples and document that has many reporting use cases documented and XBRL-based reports that shows those use cases being fulfilled. There are a handful of use cases for accounting and audit working papers. You can use this information to extrapolate what might be possible.

6. Conclusion

Traditional electronic spreadsheets are not an end game; they are a stepping stone. Traditional electronic spreadsheets will always have a place in accountancy. However, an additional tool is necessary for professional accountants.

Reporting and auditing are being stressed by the increasing complexity if information, increasing volume of information, and the increasing pace of information. The same technology that is causing that stress can provide a solution.

Sarbanes Oxley addresses the symptoms of the problem that exists. It does not address the conditions which cause the problem. But global open industry standards based model-driven semantic-oriented accounting and audit working papers can address the conditions which are causing the problem.

Just as XBRL-based digital financial reporting, when used appropriately, solve many problems related to financial reporting and financial analysis; so to can XBRL-based digital accounting and audit working papers solve problems caused the use of traditional electronic spreadsheets for certain use cases.

In addition, global open industry standards based, model-driven, semantic-oriented, artificial intelligence powered accounting and audit working papers and schedules offer the possibility of bringing all sorts of new features and capabilities to accountancy; to create a coordinated and collaborative system.

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[82] Seattle Method, *Showcase of Capabilities*, https://seattlemethod.blogspot.com/p/showcase-of-capabilities.html