Global Standards-based Semantic Audit Working Papers

When I started at Price Waterhouse as an auditor in 1982, accounting and audit working papers and schedules were created on physical paper[1]. Every page.

Today's accounting and audit working papers and schedules are electronic proxies for paper documents such as HTML, PDF, Word, Excel, and other such document formats that are presentation oriented and not understandable by machines.

Tomorrow's modern accounting and audit working papers and schedules will be electronic proxies for databases, will be based on global standards such as XBRL, machine understandable, and will be queryable so that they can be interrogated using machine-based processes.

Audit working paper systems will evolve, perhaps, from being:

1. 100% paper-based systems like when I started auditing with Price Waterhouse in 1982.
2. Partially paper-based and partially electronic-based sets of working papers.
3. 100% electronic-based sets of audit working papers all of which are presentation oriented such as Excel spreadsheets, Word documents, PDFs, HTML documents, and such.
4. Partially presentation oriented electronic audit working papers as in #3 and some XBRL-based machine readable logic representation using global standard audit working papers.
5. Perhaps 80% presentation oriented electronic working papers and 20% logic representation oriented machine readable based on global standards such as XBRL.
6. Perhaps 20% presentation oriented electronic working papers and 80% logic representation oriented machine readable based on global standards such as XBRL and RDF.
7. Perhaps 5% presentation oriented and 95% logic oriented.

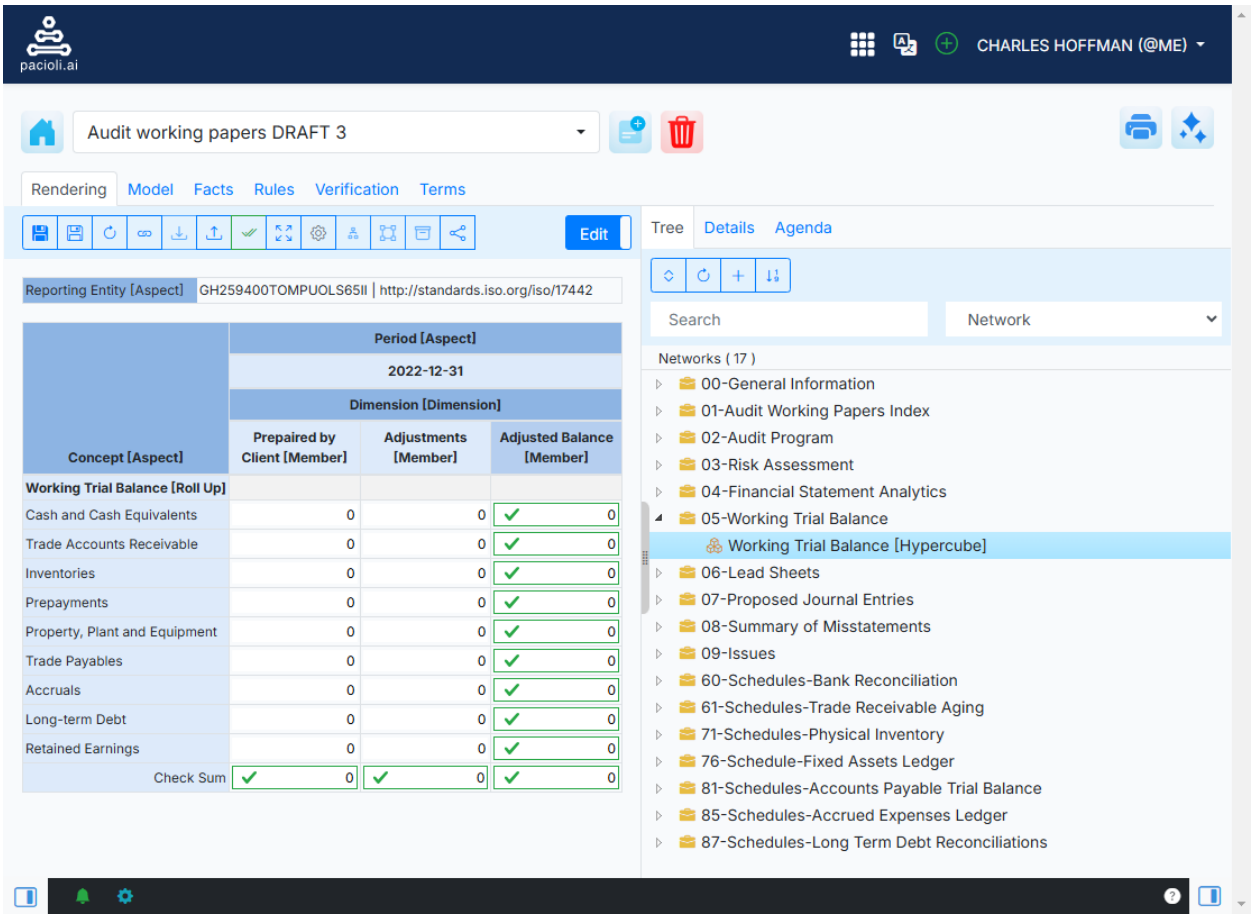
The first target for logical representation of audit working papers is everything that flows through the general journal to the general ledger to a trial balance and then onto the primary financial statements and detailed disclosures of the financial account information, effectively disaggregation of information from the primary financial statements.

Imagine being able to query/interrogate a set of accounting and audit working papers using logic[2] with the assistance of a machine. Bye-bye grunt work.

[1] *Semantic Accounting and Auditing Working Papers*, https://digitalfinancialreporting.blogspot.com/2023/05/semantic-accounting-and-auditing.html

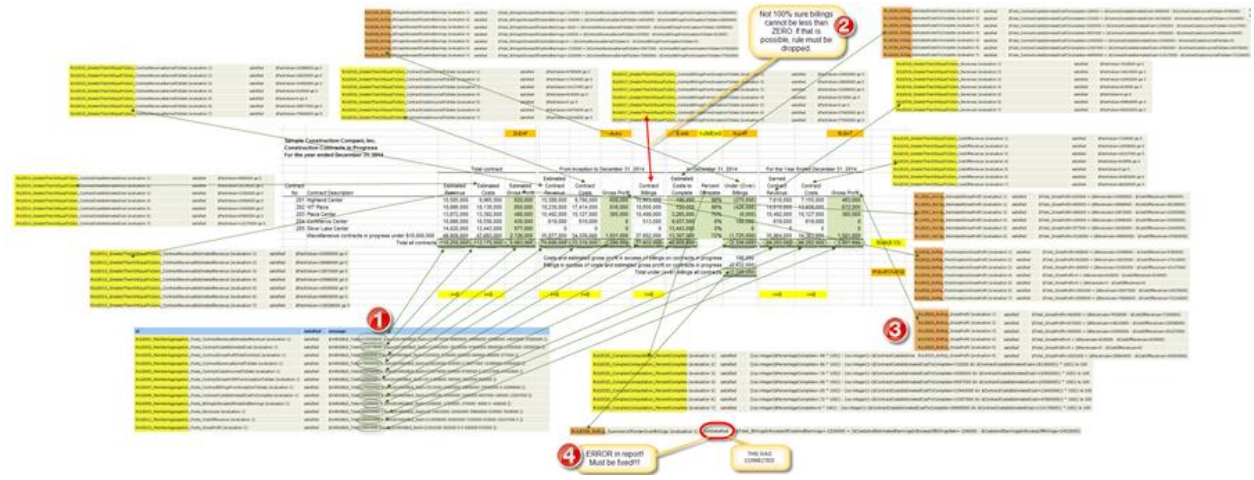
[2] *Using logic programming for theory representation and scientific inference,* https://www.sciencedirect.com/science/article/pii/S0732118X20302130

Here is what a set of audit working papers might look like within a software application designed to interact with those audit working papers: (shows a prototype working trial balance)



Note that all information is tied together with logic.

http://www.xbrlsite.com/2016/Prototype/WIP1/WIP_Table_DataToRulesMap.jpg



Here you see a set of lead schedules which reconciles the chart of accounts balances to the line item in the financial report into which a chart of accounts amounts aggregates into:

Concept [Aspect]	Period [Aspect]		
	2022-12-31		
	Status [Dimension]		
	Prepared by Client [Member]	Adjustments [Member]	Adjusted [Member]
Cash and Cash Equivalents [Roll Up]			
000-1100-00 - BofA Checking	40000	0	✓ 40000
000-1105-00 - Payroll imprest account - B of A	15000	0	✓ 15000
000-1107-00 - Petty cash on hand	5000	0	✓ 5000
Cash and Cash Equivalents	✓ 60000	✓ 0	✓ 60000
Trade Accounts Receivable [Roll Up]			
000-1200-00 - AR	180000	50000	✓ 230000
Trade Accounts Receivable	✓ 180000	✓ 50000	✓ 230000
Inventories [Roll Up]			
000-1300-00 - Inventory on hand	300000	0	✓ 300000
Inventories	✓ 300000	✓ 0	✓ 300000
Property, Plant and Equipment [Roll Up]			
000-1500-00 - Furniture and fixtures	210000	0	✓ 210000
Property, Plant and Equipment	✓ 210000	✓ 0	✓ 210000
Trade Accounts Payable [Roll Up]			
000-2150-00 - AP	90000	0	✓ 90000
Trade Payables	✓ 90000	✓ 0	✓ 90000
Long-term Debt [Roll Up]			
000-2300-00 - Note payable Bank of America	50000	25000	✓ 75000
Long-term Debt	✓ 50000	✓ 25000	✓ 75000
Retained Earnings [Roll Up]			
000-3200-00 - RE	350000	0	✓ 350000
Retained Earnings	✓ 350000	✓ 0	✓ 350000

Individual working papers and schedules can be represented in XBRL using the same sort of mechanisms used to create financial reports. Here is the type of schedule which can be represented: (this is an accounts receivable aging by customer, the total would tie to the lead schedule)

Customer Number	Customer Name	Total	Current	Portion 61 to 90	Portion 91 to 120	Portion 120 Plus
MANCHEST0001	Manchester Suites	**$500.00**	$250.00	$250.00	$0.00	$0.00
COMPUTER0001	Computerized Phone Systems	**$1,000.00**	$1,000.00	$0.00	$0.00	$0.00
ATMORERE0001	Atmore Retirement Center	**$250.00**	$250.00	$0.00	$0.00	$0.00
VISTATRA0001	Vista Travel	**$250.00**	$0.00	$0.00	$0.00	$250.00
		$2,000.00	$1,500.00	$250.00	$0.00	$250.00

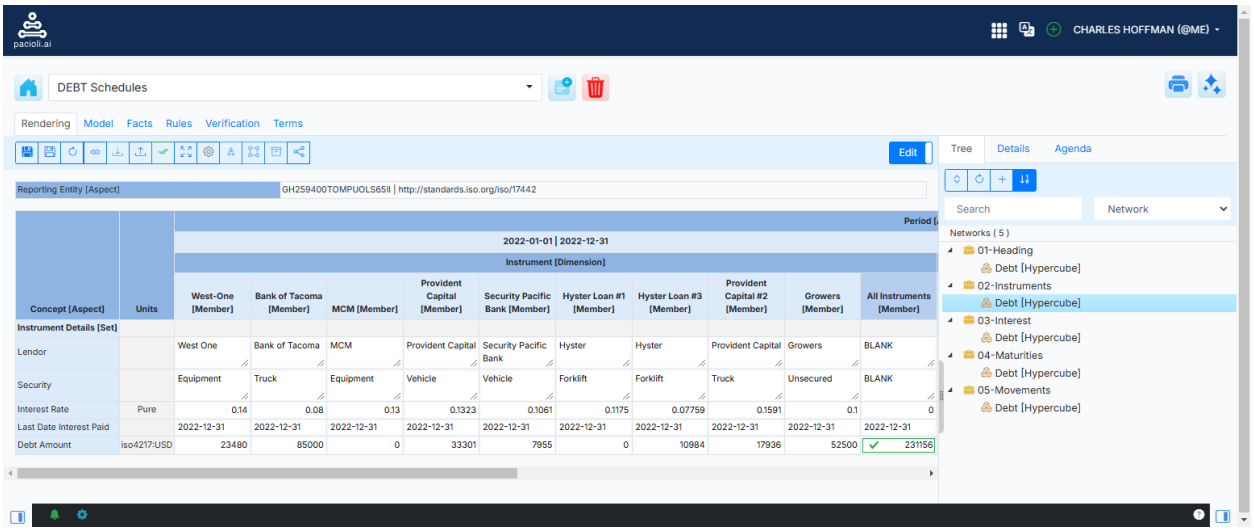
The following is an example of a significantly more complex looking schedule of information related to long-term debt that is actually multiple individual schedules that have been combined into one big schedule:

Long Term Debt
Audit Schedule
2018

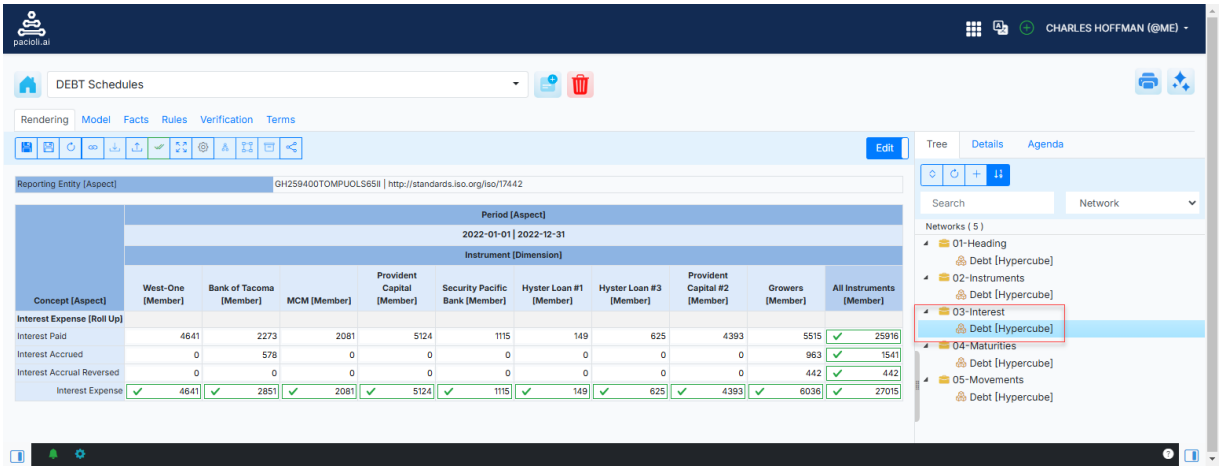
								Maturities							Date Last				
Lendor	Origional Loan Amount	Security	Interest Rate	12/31/2017 Balance	Repaid Debt	Additional Borrowed	12/31/2018 Balance	(Current) 2019	Year 2 2020	Year 3 2021	Year 4 2022	Year 5 2023	There After	Total	Interest Paid	Interest Paid	Interest Accrual	Reverse Prior Year	Interest Expense	Narrative for disclosures
Lendor number 1	1,000	Equipment	14%	1,000	(1,000)	1,000	1,000	500	100	100	100	100	100	1,000	2018-12-31	140	0	0	140	Note payable to a bank, principal payments of $11,300 due September 15 and October 15, 2004, 2005, and 2006 with an additional principal payment of $880 paid when the note is due on October 15, 2006, interest at prime plus 2% is payable monthly, secured b
Lendor number 2	1,000	Truck	8%	0	0	1,000	1,000	100	250	250	250	100	50	1,000	2018-12-31	80	0	0	80	Note payable to a bank, principal payments of $3,400 due monthly from August through January, interest at prime plus 2% payable monthly, due October 5, 2009, secured by a vehicle
Lendor number 3	1,000	Equipment	13%	0	0	1,000	1,000	100	250	250	250	150	0	1,000	2018-12-31	130	0	0	130	Note payable to a related party, payable in semi-annual principal installments of $10,000 plus interest at 10%, unsecured
Lendor number 4	1,000	Vehicle	10.61%	0	0	1,000	1,000	100	250	250	250	150	0	1,000	2018-12-31	106	0	0	106	Capital lease payable in monthly installments of $425 including interest at 10.6%, due May 2005, secured by a vehicle
Lendor number 5	1,000	Forklift	11.75%	0	0	1,000	1,000	100	250	250	250	150	0	1,000	2018-12-31	118	0	0	118	Capital leases payable in monthly installments totaling $851 including interest at 11.75%, due July 2004, secured by equipment
Lender number 6	1,000	Unsecured	10%	0	0	1,000	1,000	100	250	250	250	150	0	1,000	2018-12-31	100	0	0	100	Notes payable to various parties under marketing agreements outlined in Note 1, interest is payable semi-annually at 10%, principal is payable on demand one year after termination of the marketing agreement, unsecured
				1,000	(1,000)	6,000	6,000	1,000	1,350	1,350	1,350	800	150	6,000		674	0	0	674	

The one complex schedule can be broken down into several simpler schedules that convey the same information:

Debt instruments:

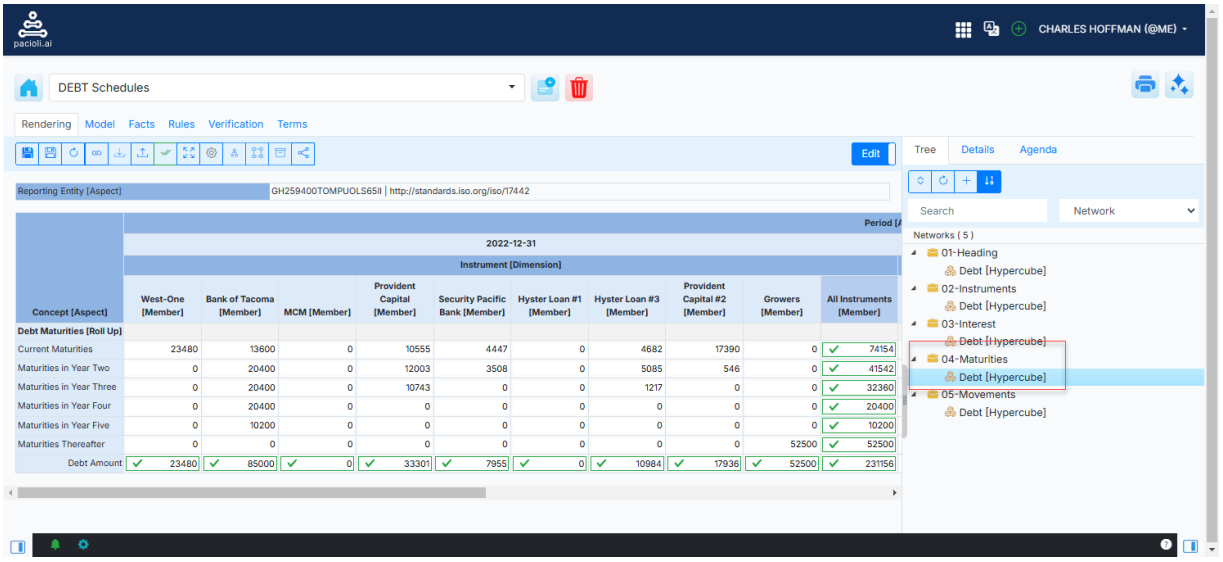


Interest paid per instrument:



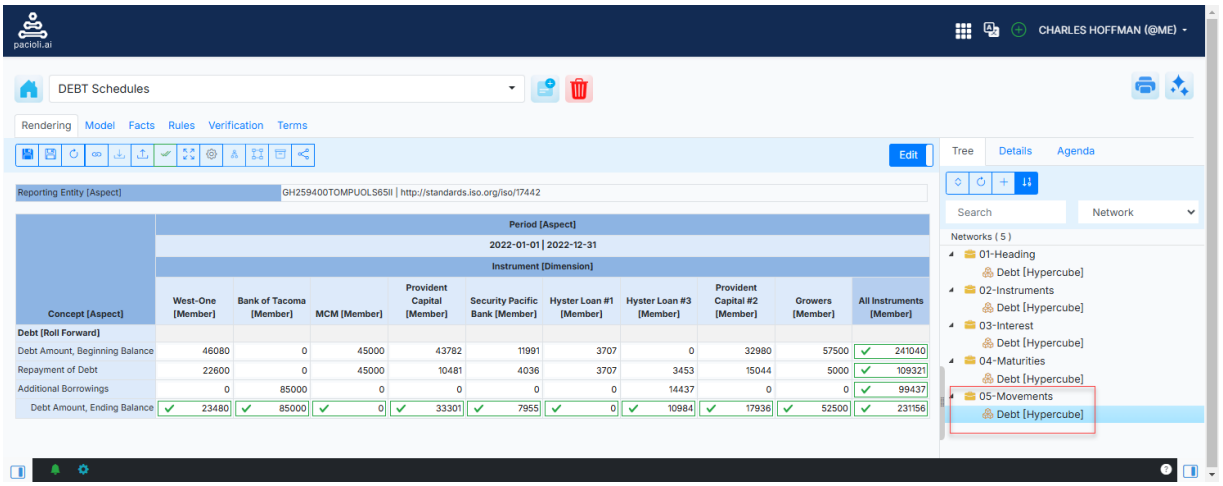
Concept [Aspect]	West-One [Member]	Bank of Tacoma [Member]	MCM [Member]	Provident Capital [Member]	Security Pacific Bank [Member]	Hyster Loan #1 [Member]	Hyster Loan #3 [Member]	Provident Capital #2 [Member]	Growers [Member]	All Instruments [Member]
Period [Aspect]	2022-01-01 | 2022-12-31									
Instrument [Dimension]										
Interest Expense (Roll Up)										
Interest Paid	4641	2273	2081	5124	1115	149	625	4393	5515	25916
Interest Accrued	0	578	0	0	0	0	0	0	963	1541
Interest Accrual Reversed	0	0	0	0	0	0	0	0	442	442
Interest Expense	4641	2851	2081	5124	1115	149	625	4393	6036	27015

Debt maturities for each debt instrument per category of maturity used in disclosure:



Concept [Aspect]	West-One [Member]	Bank of Tacoma [Member]	MCM [Member]	Provident Capital [Member]	Security Pacific Bank [Member]	Hyster Loan #1 [Member]	Hyster Loan #3 [Member]	Provident Capital #2 [Member]	Growers [Member]	All Instruments [Member]
Period [A										
2022-12-31										
Instrument [Dimension]										
Debt Maturities (Roll Up)										
Current Maturities	23480	13600	0	10555	4447	0	4682	17390	0	74154
Maturities in Year Two	0	20400	0	12003	3508	0	5085	546	0	41542
Maturities in Year Three	0	20400	0	10743	0	0	1217	0	0	32360
Maturities in Year Four	0	20400	0	0	0	0	0	0	0	20400
Maturities in Year Five	0	10200	0	0	0	0	0	0	0	10200
Maturities Thereafter	0	0	0	0	0	0	0	0	52500	52500
Debt Amount	23480	85000	0	33301	7955	0	10984	17936	52500	231156

Debt movements: (repayments and additional borrowings per instrument)

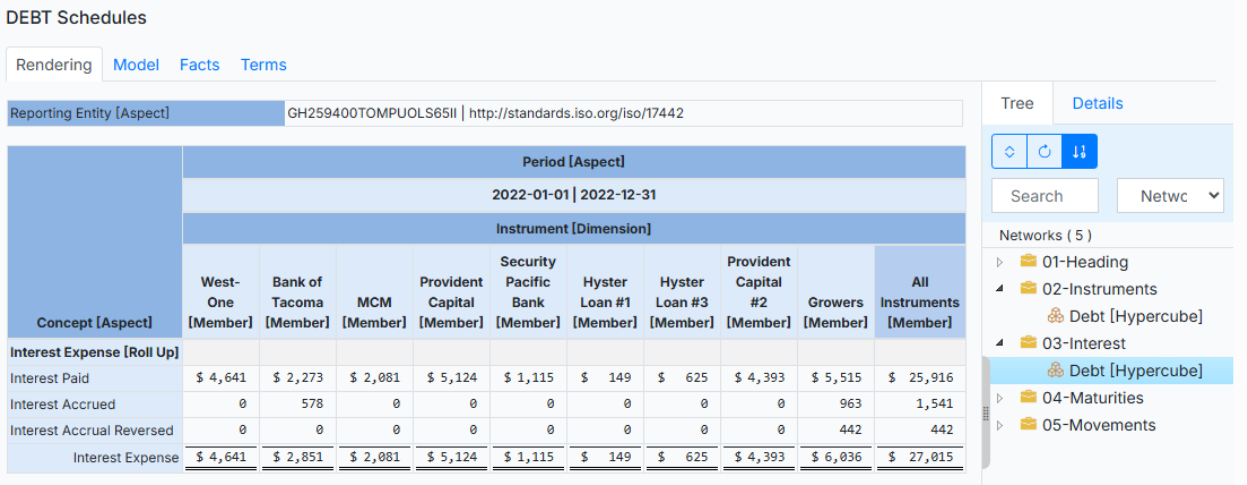


Concept [Aspect]	West-One [Member]	Bank of Tacoma [Member]	MCM [Member]	Provident Capital [Member]	Security Pacific Bank [Member]	Hyster Loan #1 [Member]	Hyster Loan #3 [Member]	Provident Capital #2 [Member]	Growers [Member]	All Instruments [Member]
Period [Aspect]	2022-01-01 | 2022-12-31									
Instrument [Dimension]										
Debt [Roll Forward]										
Debt Amount, Beginning Balance	46080	0	45000	43782	11991	3707	0	32980	57500	241040
Repayment of Debt	22600	0	45000	10481	4036	3707	3453	15044	5000	109321
Additional Borrowings	0	85000	0	0	0	0	14437	0	0	99437
Debt Amount, Ending Balance	23480	85000	0	33301	7955	0	10984	17936	52500	231156

Debt schedules viewed within three different off-the-shelf software applications that support XBRL-based information:

Auditchain Labs AG, Luca Suite:

https://luca.pacioli.ai/luca/view/0f24fd35e961e167a727b663c75a4c5ec9fb7eb86730d6292f46e6e180fc20185cb7c26b/index



DEBT Schedules

Rendering | Model | Facts | Terms

Reporting Entity [Aspect] | GH259400TOMPUOLS65II | http://standards.iso.org/iso/17442

Concept [Aspect]	Period [Aspect] 2022-01-01 | 2022-12-31 — Instrument [Dimension]									
	West-One [Member]	Bank of Tacoma [Member]	MCM [Member]	Provident Capital [Member]	Security Pacific Bank [Member]	Hyster Loan #1 [Member]	Hyster Loan #3 [Member]	Provident Capital #2 [Member]	Growers [Member]	All Instruments [Member]
Interest Expense [Roll Up]										
Interest Paid	$ 4,641	$ 2,273	$ 2,081	$ 5,124	$ 1,115	$ 149	$ 625	$ 4,393	$ 5,515	$ 25,916
Interest Accrued	0	578	0	0	0	0	0	0	963	1,541
Interest Accrual Reversed	0	0	0	0	0	0	0	0	442	442
Interest Expense	$ 4,641	$ 2,851	$ 2,081	$ 5,124	$ 1,115	$ 149	$ 625	$ 4,393	$ 6,036	$ 27,015

Tree | Details

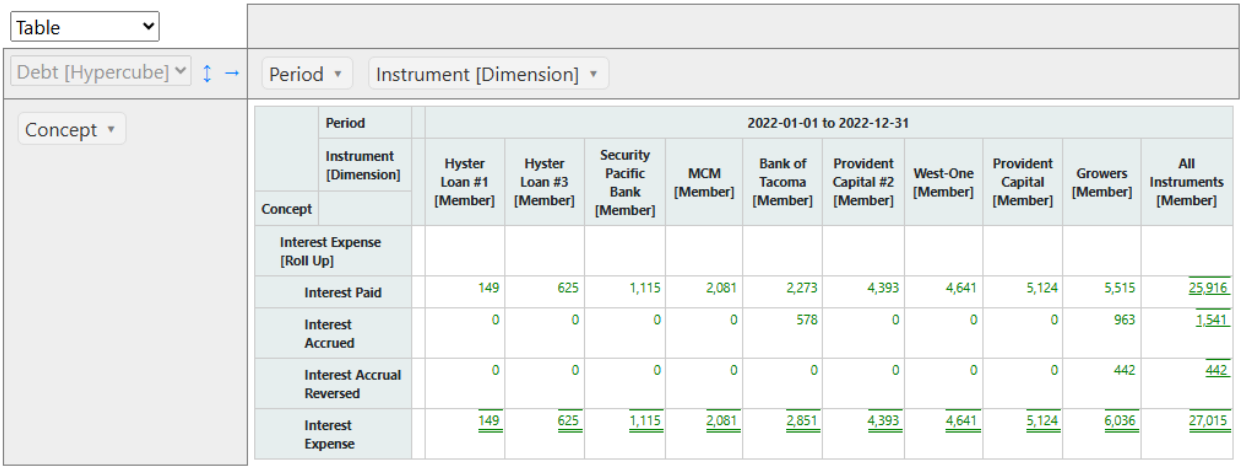
Search | Netwc

Networks (5)

- 01-Heading
- 02-Instruments
  - Debt [Hypercube]
- 03-Interest
  - Debt [Hypercube]
- 04-Maturities
- 05-Movements

Auditchain Labs AG, Pacioli.ai

https://auditchain.infura-ipfs.io/ipfs/QmVy8BnxkYYWy1ECE9Fpwa42yavqPAaKWwcVbYxgj6GvpP/



Table

Debt [Hypercube] ↕ →

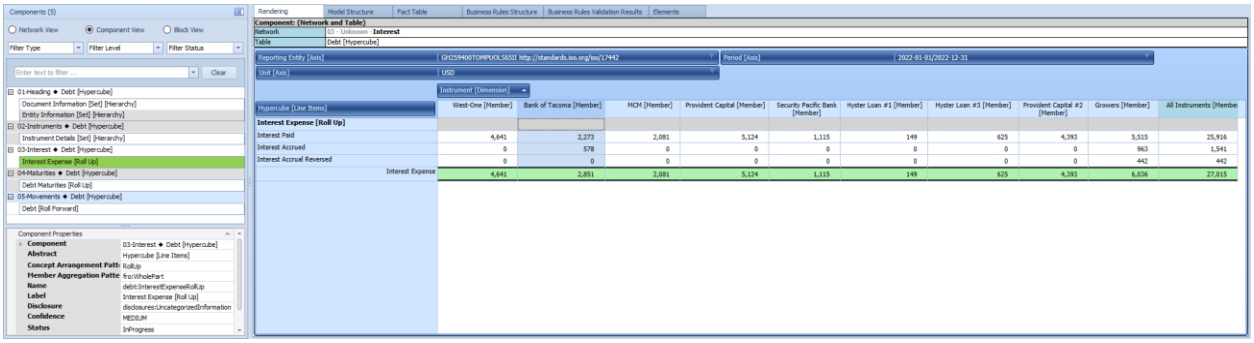
Period | Instrument [Dimension]

Concept

Concept	Period / Instrument [Dimension]	2022-01-01 to 2022-12-31									
		Hyster Loan #1 [Member]	Hyster Loan #3 [Member]	Security Pacific Bank [Member]	MCM [Member]	Bank of Tacoma [Member]	Provident Capital #2 [Member]	West-One [Member]	Provident Capital [Member]	Growers [Member]	All Instruments [Member]
Interest Expense [Roll Up]											
Interest Paid		149	625	1,115	2,081	2,273	4,393	4,641	5,124	5,515	25,916
Interest Accrued		0	0	0	0	578	0	0	0	963	1,541
Interest Accrual Reversed		0	0	0	0	0	0	0	0	442	442
Interest Expense		149	625	1,115	2,081	2,851	4,393	4,641	5,124	6,036	27,015

(Note that the representation is pivotable like a pivot table)

Pesseract which is a working proof of concept

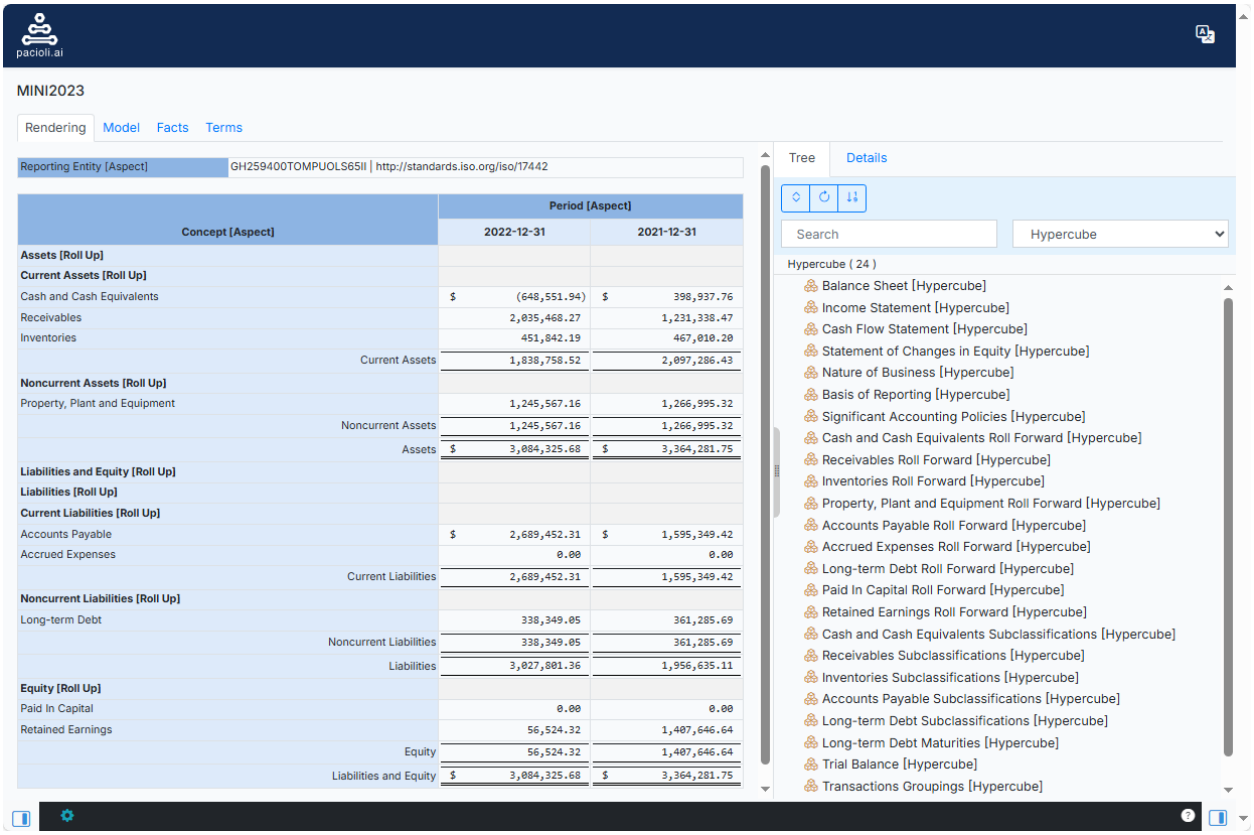


(Note that this is a desktop application)

Ultimately, accounting and auditing working papers and schedules support the information conveyed withing a financial report. Here is a working prototype of such a financial report:

Auditchain Labs AG, Luca Suite

https://luca.pacioli.ai/luca/view/0f24fd35e961e167a727b663c75a4c5ec9fb7eb86730d6292f46e6e180fc2018_iShPUXPr8RM/index



XBRL Cloud, Evidence Package:

http://xbrlsite.azurewebsites.net/2020/Prototype/iteration2/evidence-package/

Balance Sheet [Abstract]	Period [Axis]	
	2020-12-31	2019-12-31
Balance Sheet [Abstract]		
Assets [Roll Up]		
Current Assets [Roll Up]		
Cash and Cash Equivalents	(648,551.94)	398,937.76
Receivables	2,035,468.27	1,231,338.47
Inventories	451,842.19	467,010.20
Current Assets	1,838,758.52	2,097,286.43
Noncurrent Assets [Roll Up]		
Property, Plant and Equipment	1,245,567.16	1,266,995.32
Noncurrent Assets	1,245,567.16	1,266,995.32
Assets	3,084,325.68	3,364,281.75
Liabilities and Equity [Roll Up]		
Liabilities [Roll Up]		
Current Liabilities [Roll Up]		
Accounts Payable	2,689,452.31	1,595,349.42
Current Liabilities	2,689,452.31	1,595,349.42
Noncurrent Liabilities [Roll Up]		
Long-term Debt	338,349.05	361,285.69
Noncurrent Liabilities	338,349.05	361,285.69
Liabilities	3,027,801.36	1,956,635.11
Equity [Roll Up]		
Retained Earnings	56,524.32	1,407,646.64
Equity	56,524.32	1,407,646.64
Liabilities and Equity	3,084,325.68	3,364,281.75

https://auditchain.infura-ipfs.io/ipfs/Qmc8wdk2oqbhEZrVTcdC9derT6jhrACzjBRkuUrmgAkbT6/

Table

Balance Sheet [Hypercube]

Period

Concept

Concept	Period	2022-12-31	2021-12-31
Assets [Roll Up]			
Current Assets [Roll Up]			
Cash and Cash Equivalents		(648,551.94)	398,937.76
Receivables		2,035,468.27	1,231,338.47
Inventories		451,842.19	467,010.20
Current Assets		1,838,758.52	2,097,286.43
Noncurrent Assets [Roll Up]			
Property, Plant and Equipment		1,245,567.16	1,266,995.32
Noncurrent Assets		1,245,567.16	1,266,995.32
Assets		3,084,325.68	3,364,281.75
Liabilities and Equity [Roll Up]			
Liabilities [Roll Up]			
Current Liabilities [Roll Up]			
Accounts Payable		2,689,452.31	1,595,349.42
Accrued Expenses		0	0
Current Liabilities		2,689,452.31	1,595,349.42
Noncurrent Liabilities [Roll Up]			
Long-term Debt		338,349.05	361,285.69
Noncurrent Liabilities		338,349.05	361,285.69
Liabilities		3,027,801.36	1,956,635.11
Equity [Roll Up]			
Paid In Capital		0	0
Retained Earnings		56,524.32	1,407,646.64
Equity		56,524.32	1,407,646.64
Liabilities and Equity		3,084,325.68	3,364,281.75

Additional Information:

Case for Semantic Oriented Accounting and Audit Working Papers:

http://xbrlsite.com/2024/Library/CaseForSemanticWorkingPapers.pdf

Special Purpose Logical Spreadsheet for Accountants:

http://www.xbrlsite.com/2023/Library/SpecialPurposeLogicalSpreadsheetsForAccountants.pdf

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

#	Feature	Excel (Traditional electronic spreadsheet)	Luca Suite Use of XBRL (Special purpose domain specific knowledge graph enabled by XBRL and SBRM)	Topbraid, Protégé, PROLOG, Other Tools (General purpose knowledge graph enabled by RDF)
1	**Orientation**	Presentation or position oriented data.	Logic and meaning oriented information for a specific area of knowledge.	Logic and meaning oriented information for any area of knowledge..
2	**Standard?**	Has become a de facto standard.	Built using existing global standard.	Built using existing global standard.
3	**Human readable**	Humans ability to interact is based on a presentation oriented model of a report using workbooks, sheets, columns, rows, cells.	Human's ability to interact is based on a fundamentally machine-readable model which is then reliabliy converted to human understandable logical model.	Human's ability to interact is based on a fundamentally machine-readable model and is general and technical oriented. Can construct easier to use interfaces for humans.
4	**Linking with other information**	Linking with other information is brittle and tends to be unreliable.	Linking with other information is fundamentally designed to be robust and safe.	Linking with other information is fundamentally designed to be robust and safe and a global standard approach.
5	**Basic functionality**	Proxy for a "document". Information extraction unreliable.	Proxy for a "database" or "knowledge graph". Information extraction reliable, but not standard.	Proxy for "database" or "knowledge graph" and has a standard query language.
6	**Global?**	Orientation is local, within one spreadsheet using identifiers and names local to the workbook.	Orientation is global, across many databases/knowledge graphs using global identifiers.	Orientation is global, across many databases/knowledge graphs using standards based global identifiers.
7	**Ease of use?**	Easy to use. You can basically do whatever you want.	Easy to use. Guardrails and bumpers help you to "stay within the boundaries". However, not appropriate for every use case.	Harder to use. Can handle pretty much any use case; but the cost of the high flexibility is that it is harder to use. But making things easy to use is possible.
8	**High level model?**	High level presentation orlented model.	High level logical domain model for a specfic area of knowledge.	No inherent high level model, but any domain model for a specific area of knowledge can be added.
9	**Dimensions?**	OLAP based dimensional model which is non standard and has some limitations.	XBRL Dimensions based dimensional model which is standard and very robust.	No dimensional model is built in, but a dimensional model can be created.
10	**Flexibility**	Infinite flexibility, possible to exchange information but brittle because it is so flexible and presentation oriented.	Adequate flexibility, easier to use and exchange information; but limited to business report model.	Maximum flexibility, but hardest to use.
11	**Standard query**	Machine readable, but not machine understandable, no query mechanism.	Machine readable, machine understandable, specialized query mechanism.	Machine readable, machine understandable, global standard general query mechanism.

Record to report:

https://xbrlsite.azurewebsites.net/2024/prototypes/lemonade-stand/RecordToReportIteration6.pdf

https://xbrlsite.azurewebsites.net/2024/prototypes/lemonade-stand/RecordToReportIteration7.pdf