Demonstration: IPSAS Core Prototype (International Public Sector Accounting Standards)

May 1, 2019

The IPSAS Core prototype is an XBRL-based profile that was created to comprehensively test XBRL-based financial reports. The objective was to induce the maximum complexity into the smallest working financial report in order to exercise the XBRL-based taxonomy that underlies the report and what it takes to make sure that the actual XBRL-based financial reports works as expected and can be verified to be correct.
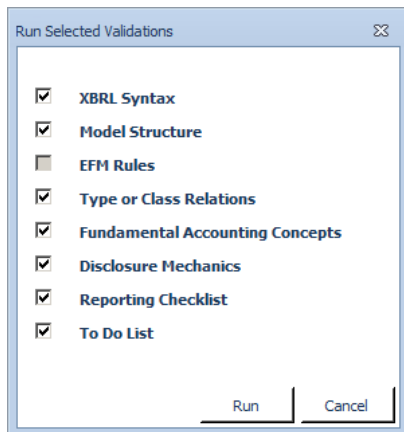
Initial view

This is the initial view when the IPSAS core prototype is loaded into Pesseract, a software application for creating XBRL-based financial reports. Pesseract is an expert system that is driven by the underlying IPSAS XBRL Taxonomy.

Validate report

To validate the report against the XBRL-based taxonomy, a single button is pressed.

Note that EFM Rules relate to XBRL-based reports that are submitted to the SEC and are not applicable to IPSAS reports.

Report validation status

After the "Run" button is pressed, a few minutes pass and the following results are shown and several new documents are opened in the software application:
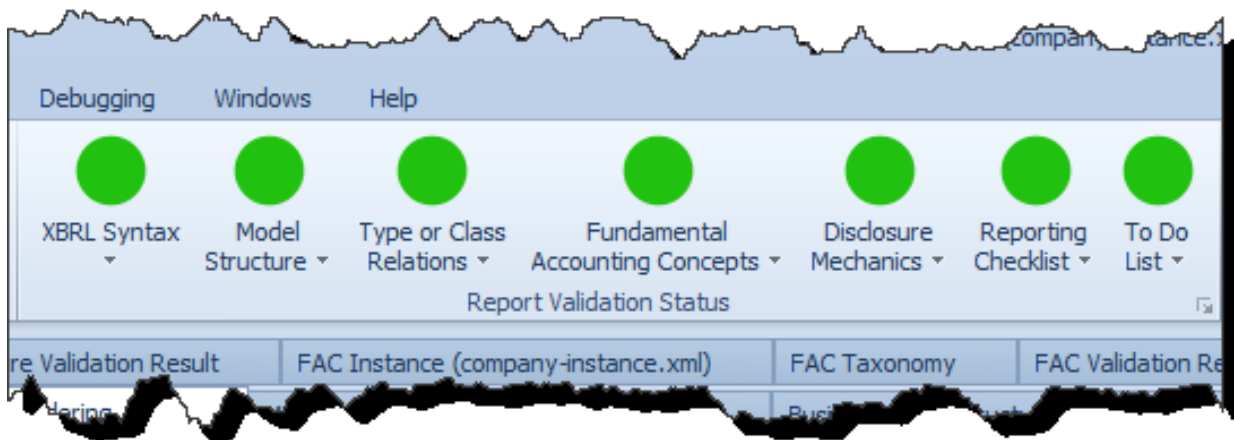
What happened? When the report was loaded into the software application, along with the report the XBRL-based "taxonomy" which underlies the report and is really an ontology is also loaded into the software application. The taxonomy provides machine-readable information that both describes the XBRL-based report and can be used to verify that the XBRL-based report is created correctly. To the extent that these rules exist; it is to that extent that automated validation processes can be leveraged to make sure that the report has been constructed correctly and is without logical error, mathematical error, consistency error, mechanical error, etc. Any detail of the report that cannot be checked using such automated processes must be checked using human-based processes. Please note the ontology

spectrum diagram below which helps one understand all that must be verified to make sure the report is correctly created in every detail[1]:
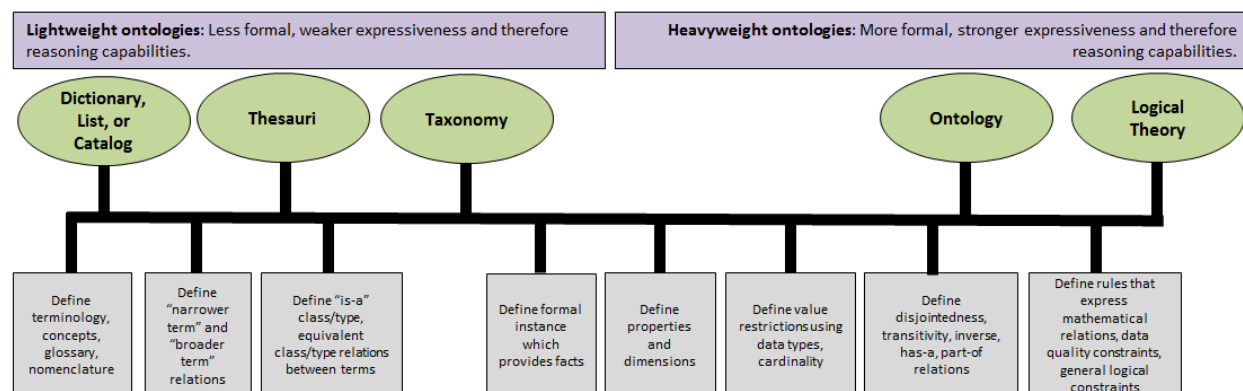
Agenda

If the agenda tab is pressed (on the right) the agenda form is opened. The agenda is completely empty. Why? The reason the agenda is empty is because all the agenda items that would be listed that must be competed have been completed and so the agenda is empty and therefore the report is deemed complete.

The agenda will make more sense if we delete a couple of parts of the report and then observe what happens within the agenda.

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[1] Ontology Spectrum, http://xbrl.squarespace.com/journal/2019/4/27/ontology-spectrum.html

Delete three fragments

Go to the bottom of the list of fragments of the report (left side of the screen) and delete these three networks: (select a component which will turn green; then right click and select "Delete" from the menu provided)
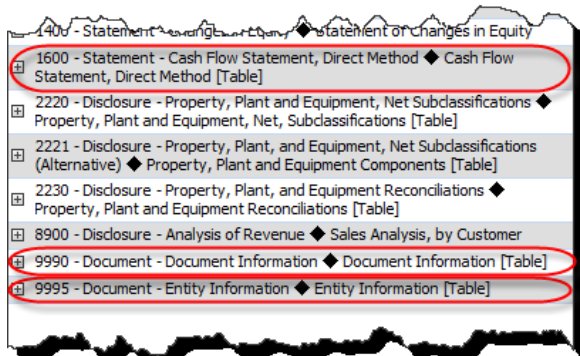
Select and delete a component:
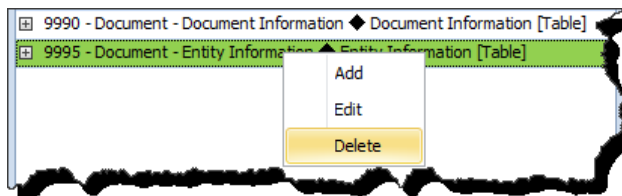
Notice that after you have deleted the three components we specified that those three components now are shown in the agenda which indicates that those three pieces still need to be added to the report:

What is going on?

So, what is going on? How does the software application know that those three pieces now need to be added to the report? Is it simply because if you delete an item to software adds the item to the agenda? Of course simply deleting components and then adding the to the agenda is not what is going on, that would not be useful.

Try deleting the "Analysis of Revenue" component. Notice that nothing happens in the Agenda. This is because the software application understands that the Analysis of Revenue is not a required disclosure.
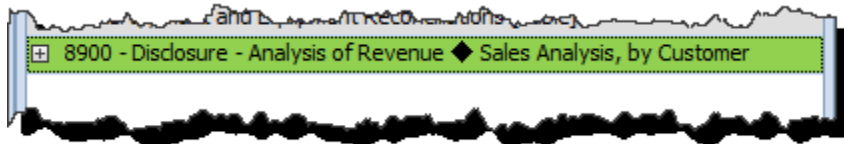
Automated reporting checklist

As was said, the Pesseract software application is an expert system for creating financial reports. The software understands financial reports. How, you ask? In many ways. First, let's look at the machine-readable reporting checklist.

Many accountants creating a financial report and most auditors use what is called a "disclosure checklist" to review a report to make sure the report is created correctly. This disclosure checklist is a human readable "memory jogger" that assists in the process of making sure a report is created correctly and nothing was left out. What if you could convey information from that human-readable memory jogger in a machine-readable form and let the software application help you make sure the report is created correctly per statutory and regulator reporting rules? Well, that is exactly what we have done with Pesseract.

Of course, it is impossible for a computer application to tell you if everything is 100% correct; but the software can certainly help the accountant creating a financial report. Here is how it works.

First, the statutory and regulatory rules are represented in machine-readable form using the XBRL technical syntax[2]. For these specific rules, XBRL definition relations are used to represent the information in machine readable form.

Don't worry, you will never need to work with this information at the level we are going to show you here; but we wanted to get into the details so that those who are curious can understand how all this functionality actually works.

Basically, the notion of a "FinancialReport" is created and the notion of the "DocumentInformation" (one of the disclosures you deleted) is created and finally the notion that "financialReport-

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[2] Reporting checklist rules for IPSAS in machine readable XBRL, http://xbrlsite.azurewebsites.net/2016/conceptual-model/reporting-scheme/ipsas/disclosure-mechanics/ReportingChecklist-ipsas-rules-def.xml

requiresDisclsoure" is created. Without getting into all the details, here is that information represented in an XBRL definition linkbase:

```
- <link:definitionLink xlink:title="A financial report REQUIRE ~document information."
    xlink:role="http://www.xbrlsite.com/2019/Prototype/elr/role/ReportingChecklist"
    xlink:type="extended">
        <link:loc xlink:type="locator"
            xlink:href="http://xbrlsite.azurewebsites.net/2016/conceptual-
            model/cm.xsd#cm_FinancialReport" xlink:label="cm_FinancialReport"/>
        <link:loc xlink:type="locator"
            xlink:href="http://xbrlsite.azurewebsites.net/2016/conceptual-model/reporting-
            scheme/ipsas/disclosures-
            topics/disclosures.xsd#disclosures_DocumentInformation"
            xlink:label="disclosures_DocumentInformation"/>
        <link:definitionArc xlink:type="arc" use="optional" order="2"
            xlink:from="cm_FinancialReport" xlink:to="disclosures_DocumentInformation"
            xlink:arcrole="http://xbrlsite.azurewebsites.net/2016/conceptual-model/drules-
            arcroles/arcrole/financialReport-requiresDisclosure"/>
</link:definitionLink>
```

Again, don't worry; you never need to work at the level of the XBRL technical syntax. Here is that same information one level higher; an XBRL taxonomy tool reads the XBRL file and provides the information to the user of the application

This is the level that a professional accountant would work with all this machine-readable information. The machine readable information is also readable by humans. Software converts the machine-readable information into human-readable form.

The following two screen shots show what the reporting checklist looks like for the IPSAS core prototype. A typical reporting checklist would be much, much longer. But what we did is created an abridged reporting checklist in order to make it easier for the user to get the full picture.

Reporting checklist before the three disclosures were deleted:

#	Disclosure	Checklist Category	Reason Disclosure Must Exist	Discovered	Expectation Met	Link to Disclosure Mechanics
0	Reporting Checklist					
1	Document Information	Required disclosure	Disclosure always required	True	CONSISTENT	Document Information
2	Entity Information	Required disclosure	Disclosure always required	True	CONSISTENT	Entity Information
3	Statement of Financial Position, Classified	Required disclosure	Disclosure always required, satisfied by Assets Roll Up and Liabilities and Net A…	True	CONSISTENT	Statement of Financial Position, Classified
4	Assets Roll Up	Part of disclosure	Satisfies Statement of Financial Position, Classified disclosure	True	N/A	Assets Roll Up
5	Liabilities and Net Assets/Equity Roll Up	Part of disclosure	Satisfies Statement of Financial Position, Classified disclosure	True	N/A	Liabilities and Net Assets/Equity Roll Up
6	Statement of Financial Performance, by Function	Required disclosure	Disclosure always required	True	CONSISTENT	Statement of Financial Performance, by Function
7	Cash Flow Statement, Direct Method	Required disclosure	Disclosure always required	True	CONSISTENT	Cash Flow Statement, Direct Method
8	Statement of Changes in Net Assets/Equity	Required disclosure	Disclosure always required	True	CONSISTENT	Statement of Changes in Net Assets/Equity
9	Surplus (Deficit) Breakdown	Line item exists, then disclosure requi…	Required because line item ipsas:SurplusDeficitAttributableToNoncontrollingInt…	True	CONSISTENT	Surplus (Deficit) Breakdown
10	Share Capital by Class	Line item exists, then disclosure requi…	Required because line item ipsas:ShareCapital was reported	True	CONSISTENT	Share Capital by Class
11	Property, Plant, and Equipment, Net Subclassifications	Line item exists, then disclosure requi…	Disclosure is required, satisfied by Property, Plant, and Equipment, Net Subdas…	True	N/A	Property, Plant, and Equipment, Net Subclassifications
12	Property, Plant, and Equipment, Net Subclassifications (Al…	Alternative representation	Alternative to required disclosure Property, Plant, and Equipment, Net Subclassi…	True	CONSISTENT	Property, Plant, and Equipment, Net Subclassifications (Al…
13	Property, Plant, and Equipment, Net Reconciliations	Line item exists, then disclosure requi…	Required because line item ipsas:PropertyPlantAndEquipmentNet was reported	True	CONSISTENT	Property, Plant, and Equipment, Net Reconciliations
14	Prior Period Adjustment	Possible disclosure	Disclosure is present	True	CONSISTENT	Prior Period Adjustment
15	Revenue Detail by Customer	Possible disclosure	Disclosure is present	True	CONSISTENT	Revenue Detail by Customer
16	Statement of Financial Performance, Comparison of Budge…	Possible disclosure	Disclosure is present	True	CONSISTENT	Statement of Financial Performance, Comparison of Budge…

Because the three disclosures existed, the validation process found the disclosures and reported that the three disclosures and all the other information described by the machine-readable rules where consistent with the rules expectation. This information is reported in this easy to read automated reporting checklist above.

Reporting checklist after the three disclosures where deleted:

#	Disclosure	Checklist Category	Reason Disclosure Must Exist	Discovered	Expectation Met	Link to Disclosure Mechanics
0	Reporting Checklist					
1	Document Information	Required disclosure	Disclosure always required	False	INCONSISTENT	Document Information
2	Entity Information	Required disclosure	Disclosure always required	False	INCONSISTENT	Entity Information
3	Statement of Financial Position, Classified	Required disclosure	Disclosure always required, satisfied by Assets Roll Up and Liabilities and Net A…	True	CONSISTENT	Statement of Financial Position, Classified
4	Assets Roll Up	Part of disclosure	Satisfies Statement of Financial Position, Classified disclosure	True	N/A	Assets Roll Up
5	Liabilities and Net Assets/Equity Roll Up	Part of disclosure	Satisfies Statement of Financial Position, Classified disclosure	True	N/A	Liabilities and Net Assets/Equity Roll Up
6	Statement of Financial Performance, by Function	Required disclosure	Disclosure always required	True	CONSISTENT	Statement of Financial Performance, by Function
7	Cash Flow Statement, Direct Method	Required disclosure	Disclosure always required	False	INCONSISTENT	Cash Flow Statement, Direct Method
8	Statement of Changes in Net Assets/Equity	Required disclosure	Disclosure always required	True	CONSISTENT	Statement of Changes in Net Assets/Equity
9	Surplus (Deficit) Breakdown	Line item exists, then disclosure requi…	Required because line item ipsas:SurplusDeficitAttributableToNoncontrollingInt…	True	CONSISTENT	Surplus (Deficit) Breakdown
10	Share Capital by Class	Line item exists, then disclosure requi…	Required because line item ipsas:ShareCapital was reported	True	CONSISTENT	Share Capital by Class
11	Property, Plant, and Equipment, Net Subclassifications	Line item exists, then disclosure requi…	Disclosure is required, satisfied by Property, Plant, and Equipment, Net Subclas…	False	N/A	Property, Plant, and Equipment, Net Subclassifications
12	Property, Plant, and Equipment, Net Subclassifications (Al…	Alternative representation	Alternative to required disclosure Property, Plant, and Equipment, Net Subclassi…	True	CONSISTENT	Property, Plant, and Equipment, Net Subclassifications (Al…
13	Property, Plant, and Equipment, Net Reconciliations	Line item exists, then disclosure requi…	Required because line item ipsas:PropertyPlantAndEquipmentNet was reported	True	CONSISTENT	Property, Plant, and Equipment, Net Reconciliations
14	Prior Period Adjustment	Possible disclosure	Disclosure is present	True	CONSISTENT	Prior Period Adjustment
15	Revenue Detail by Customer	Possible disclosure	Disclosure is NOT present	False	N/A	Revenue Detail by Customer
16	Statement of Financial Performance, Comparison of Budge…	Possible disclosure	Disclosure is present	True	CONSISTENT	Statement of Financial Performance, Comparison of Budge…

If the validation were run after the three disclosures were deleted; clearly the three disclosures would not be discovered, and therefore they report is inconsistent with the expectation provided by the machine-readable rules and this inconsistency is reported in the reporting checklist.

So, how do you make the reporting checklist rules and the report consistent? You simply add those three disclosures and once again the rules that describe your expectation and the actual results from checking that expectation in the report are consistent.

Fragments

A report is not one big thing; a report is made up of report fragments or fragments. A fragment with which those working with XBRL reports are familiar with is the Network. This is a list of networks in the IPSAS Core prototype:

⊞ 1110 - Statement - Statement of Financial Position, Classified
⊞ 1160 - Statement - Classes of Share Capital (Parenthetical)
⊞ 1211 - Statement - Statement of Financial Performance, by Function
⊞ 1240 - Statement - Surplus (Deficit) Breakdown by Controlling and Noncontrolling Interest (Parenthetical)
⊞ 1290 - Statement - Statement of Financial Performance, Comparison of Budgeted and Actual Amounts
⊞ 1300 - Statement - Changes in Equity, Prior Period Adjustments
⊞ 1400 - Statement - Changes in Equity
⊞ 1600 - Statement - Cash Flow Statement, Direct Method
⊞ 2220 - Disclosure - Property, Plant and Equipment, Net Subclassifications
⊞ 2221 - Disclosure - Property, Plant, and Equipment, Net Subclassifications (Alternative)
⊞ 2230 - Disclosure - Property, Plant, and Equipment Reconciliations
⊞ 8900 - Disclosure - Analysis of Revenue
⊞ 9990 - Document - Document Information
⊞ 9995 - Document - Entity Information

But how fragments can be represented is somewhat arbitrary and therefore inconsistent. Someone creating a report could put, for example, two [Table]s in one Network. So, because of the possibility of inconsistency you cannot really use Networks effectively.

Most, but not all, put only one [Table] per network. We have done the same thing in the IPSAS Core prototype, there is one explicit [Table] per network. We call this network+[Table] combination a Component.

⊞ 1110 - Statement - Statement of Financial Position, Classified ◆ Statement of Financial Position, Classified [Table]
⊞ 1160 - Statement - Classes of Share Capital (Parenthetical) ◆ Share Capital, by Class [Table]
⊞ 1211 - Statement - Statement of Financial Performance, by Function ◆ Statement of Financial Performance, by Function [Table]
⊞ 1240 - Statement - Surplus (Deficit) Breakdown by Controlling and Noncontrolling Interest (Parenthetical) ◆ Surplus (Deficit) Breakdown [Table]
⊞ 1290 - Statement - Statement of Financial Performance, Comparison of Budgeted and Actual Amounts ◆ Statement of Financial Performance, Comparison of Bugeted and Actual Amounts [Table]
⊞ 1300 - Statement - Changes in Equity, Prior Period Adjustments ◆ Statement of Changes in Equity, Prior Period Adjustments [Table]
⊞ 1400 - Statement - Changes in Equity ◆ Statement of Changes in Equity [Table]
⊞ 1600 - Statement - Cash Flow Statement, Direct Method ◆ Cash Flow Statement, Direct Method [Table]
⊞ 2220 - Disclosure - Property, Plant and Equipment, Net Subclassifications ◆ Property, Plant and Equipment, Net, Subclassifications [Table]
⊞ 2221 - Disclosure - Property, Plant, and Equipment, Net Subclassifications (Alternative) ◆ Property, Plant and Equipment Components [Table]
⊞ 2230 - Disclosure - Property, Plant, and Equipment Reconciliations ◆ Property, Plant and Equipment Reconciliations [Table]
⊞ 8900 - Disclosure - Analysis of Revenue ◆ Sales Analysis, by Customer [Table]
⊞ 9990 - Document - Document Information ◆ Document Information [Table]
⊞ 9995 - Document - Entity Information ◆ Entity Information [Table]

But, because what you can put into a [Table] is still arbitrary and subject to personal preference, working with report information at the level of these arbitrary [Table]s is also not effective.

So, what we did is go one level deeper into a report to what we call the "Block" or what the Logical Theory that Describes a Business Report[3] calls a "Fact Set". A "fact set" or "block", again they are synonyms for the same idea, are consistent across reports. Yes, you have to factor in variability in what

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[3] Charles Hoffman and Rene van Egmond, *Logical Theory Describing a Business Report*, http://xbrlsite.azurewebsites.net/2019/Library/LogicalTheoryDescribingBusinessReport.pdf

might be reported because of allowed alternatives; but when you work at the fact set level and you factor in all allowed alternatives, report information is consistent.

This is the set of 24 fact sets that make up the XBRL-based IPSAS Core prototype financial report:

Assets [Roll Up]
Liabilities and Net Assets/Equity [Roll Up]
Share Capital, by Class [Set] [Hierarchy]
Surplus (Deficit) [Roll Up]
Surplus (Deficit) Breakdown [Roll Up]
Surplus (Deficit) from Continuing Operations [Roll Up]
Accumulated Surpluses (Deficits), Prior Period Adjustments [Adjustment]
Share Capital Reconciliation [Roll Forward]
Reserves Reconciliation [Roll Forward]
Accumulated Surpluses (Deficits) Reconciliation [Roll Forward]
Noncontrolling Interest Reconciliation [Roll Forward]
Net Assets/Equity Reconciliation [Roll Forward]
Net Cash Flow [Roll Up]
Cash and Cash Equivalents Reconciliation [Roll Forward]
Property, Plant and Equipment, Net [Roll Up]
Property, Plant, and Equipment, Net, Components [Roll Up]
Land [Reconciliation] [Roll Forward]
Buildings, Net [Reconciliation] [Roll Forward]
Machinery, Net [Reconciliation] [Roll Forward]
Furniture and Fixtures, Net [Reconciliation] [Roll Forward]
Property, Plant and Equipment, Net [Reconciliation] [Roll Forward]
Sales Analysis, by Customer [Set] [Hierarchy]
Document Information [Set] [Hierarchy]
Entity Information [Set] [Hierarchy]

And so, the "fact set" or "block" is the level that you can work with consistently. Yes, you do have to adjust for allowed variability, but that is trivial, you just create different rules for each allowed alternative.

Once you are working at the fact set or block level, you start to see leveragable patterns.

Disclosure mechanics

Each block (or fact set, I am going to consistently use block for the rest of this document as that is what is used in the application) has patterns. Those patterns can be distilled down into machine-readable rules that I call disclosure mechanics rules.

All the disclosure mechanics rules are organized into an XBRL taxonomy scheme that holds all rules[4]. The taxonomy schema points to individual rules[5]. We will not show you the XBRL definition relation that are used to represent the rules. This human-redable information was created from those XBRL-based definition relations:

Rules	Line of Reasoning
This disclosure: disclosures:PropertyPlantAndEquipmentNetReconciliations	
- MUST be represented using the Hypercube/[Table] named: ipsas:PropertyPlantAndEquipmentReconciliationsTable	
- MUST be represented as a **Level 4 Disclosure Detail** with the concept arrangement pattern: cm:RollForward	
- cm:RollForward REQUIRES beginning/ending balance: ipsas:PropertyPlantAndEquipmentNet	

These rules are pretty basic and you can see that the actual disclosure follows the rules above that describe the mechanics of the property, plant, and equipment reconciliation or roll forward:

Component: (Network and Table)		
Network	2230 - Disclosure -**Property, Plant, and Equipment Reconciliations**	
Table	Property, Plant and Equipment Reconciliations [Table]	

Reporting Entity [Axis]	1234567890 http://regulator.gov/id	
Reporting Scenario [Axis]	Actual [Member]	
Report Date [Axis]	Reported as of March 18, 2020 [Member]	
Legal Entity [Axis]	Consolidated Entity [Member]	
Unit [Axis]	USD	

	Period [Axis] ▼	
Property, Plant and Equipment, Net [Reconciliation]	2020-01-01/2020-12-31	2019-01-01/2019-12-31
Property, Plant and Equipment, Net [Reconciliation]		
Property, Plant and Equipment, Net, Opening Balance	4,000	4,000
Property, Plant and Equipment, Net, Additions	4,000	4,000
Property, Plant and Equipment, Net, Disposals	(4,000)	(4,000)
Property, Plant and Equipment, Net, Revaluations	0	0
Property, Plant and Equipment, Net, Other Increase (Decrease)	0	0
Property, Plant and Equipment, Net, Closing Balance	4,000	4,000

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[4] XBRL taxonomy schema for IPSAS disclosure mechanics rules, http://xbrlsite.azurewebsites.net/2016/conceptual-model/reporting-scheme/ipsas/disclosure-mechanics/disclosure-mechanics-ipsas.xsd
[5] Individual rule for the PPE reconciliation, http://xbrlsite.azurewebsites.net/2016/conceptual-model/reporting-scheme/ipsas/disclosure-mechanics/1369-rules-def.xml

First the disclosure is represented by the [Table] named
"ipsas:PropertyPlantAndEquipmentReconciliationsTable". It is a roll forward which is another term used
to describe "reconciliation". And, the instant concept "ipsas:PropertyPlantAndEquipmentNet" is the
expected beginning/ending balance concept expected by the rule.

There are exactly three rules and only those three rules are sufficient to describe the property, plant,
and equipment enough to be able to identify the disclosure and verify that the disclosure has been
structured correctly.

If you contrast that to, say, a US GAAP XBRL Taxonomy rule for representing a disclosure there is a lot of
information which can be learned. So, how are you supposed to create an "Inventory Roll Pp" per the
US GAAP XBRL Taxonomy?

1. Inventory roll up is, in fact, always a ROLL UP.
2. A ROLL UP has a TOTAL. That TOTAL is REQUIRED.
3. The **concept** used to represent total inventory is "**us-gaap:InventoryNet**".
4. Alternatively, you could use other concepts.
5. Per SEC rules, if you provide a Level 4 Detailed Disclosure; you MUST also provide a Level 3
   Disclosure Text Block.
6. If you report inventory, you MUST provide an inventory POLICY.
7. There are alternative ways you might represent the INVENTORY POLICY.

So, these are the US GAAP XBRL Taxonomy rules for representing a real-life disclosure:

Each of the 24 blocks in the IPSAS Core prototype work in exactly this same way. In fact, each of the 192 blocks that are used to represent disclosures of Microsoft in their 2017 10-K also work in exactly this same way.

Fundamental accounting concept relations:

Each different entity that reports using the IPSAS using some reporting style. Those reporting styles fall into identifiable patterns. For example, some entity report a "classified balance sheet" but others report using an "unclassified" or "order of liquidity balance sheet".

In the IPSAS Core prototype, seven reporting styles were defined[6]. The specific reporting style used in the IPSAS Core example provides 11 consistency checks to make sure reported facts are consistent with and do not contradict other reported facts. They serve as consistency cross checks.

To compare this to XBRL-based reports used by the US GAAP XBRL Taxonomy, it has about 100 different reporting styles with an average of about 23 consistency rule per reporting style. Users work with the rules in this form:

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[6] IPSAS reporting styles, http://xbrlsite.azurewebsites.net/2016/conceptual-model/reporting-scheme/ipsas/fac/Documentation/rss.xml

Model structure rules

Model structure rules or rules that are related to physically representing the information model definition are represented by rules[7]. The rules communicate the allowed and disallowed relations between a parent report element category and a child report element category and can be shown graphically as such:

| Child	Parent						
	Network	Table	Axis	Member	LineItems	Abstract	Concept
[Network]	0	0	0	0	0	0	0
[Table]	14	0	0	0	0	0	0
[Axis]	0	43	0	0	0	0	0
[Member]	0	0	43	12	0	0	0
[LineItems]	0	14	0	0	0	0	0
[Abstract]	0	0	0	0	24	14	0
[Concept]	0	0	0	0	0	155	0

This information model description must follow the rules described above.

Label	Report Element Class	Period	Balance	Preferred Label Role	Name
Statement of Financial Position, Classified [Table]	[Table]			Standard Label	ipsas:StatementOfFinancialPositionClassifiedTable
Legal Entity [Axis]	[Axis]			Standard Label	frm:LegalEntityAxis
Consolidated Entity [Member]	[Member]			Standard Label	frm:ConsolidatedEntityMember
Report Date [Axis]	[Axis]			Standard Label	frm:ReportDateAxis
Reported as of March 18, 2020 [Member]	[Member]			Standard Label	company:ReportedAsOfMarch182020Member
Reporting Scenario [Axis]	[Axis]			Standard Label	frm:ReportingScenarioAxis
Actual [Member]	[Member]			Standard Label	frm:ActualMember
Statement of Financial Position, Classified [Line Items]	[LineItems]			Standard Label	ipsas:StatementOfFinancialPositionClassifiedLineItems
Assets [Roll Up]	[Abstract]			Standard Label	ipsas:AssetsRollUp
Current Assets [Roll Up]	[Abstract]			Standard Label	ipsas:CurrentAssetsRollUp
Cash and Cash Equivalents	[Concept] Monetary	As Of	Debit	Standard Label	ipsas:CashAndCashEquivalents
Receivables, Net, Current	[Concept] Monetary	As Of	Debit	Standard Label	ipsas:ReceivablesNetCurrent
Inventory	[Concept] Monetary	As Of	Debit	Standard Label	ipsas:Inventory
Prepaid Expenses	[Concept] Monetary	As Of	Debit	Standard Label	ipsas:PrepaidExpenses
Investments, at Cost	[Concept] Monetary	As Of	Debit	Standard Label	ipsas:InvestmentsAtCost
Other Current Assets	[Concept] Monetary	As Of	Debit	Standard Label	ipsas:OtherCurrentAssets
Current Assets, Total	[Concept] Monetary	As Of	Debit	Total Label	ipsas:CurrentAssets
Noncurrent Assets [Roll Up]	[Abstract]			Standard Label	ipsas:NoncurrentAssetsRollUp
Property, Plant, and Equipment, Net, Total	[Concept] Monetary	As Of	Debit	Total Label	ipsas:PropertyPlantAndEquipmentNet
Investment in Affiliates	[Concept] Monetary	As Of	Debit	Standard Label	ipsas:InvestmentInAffiliates
Receivables, Net, Noncurrent	[Concept] Monetary	As Of	Debit	Standard Label	ipsas:ReceivablesNetNoncurrent
Other Noncurrent Assets	[Concept] Monetary	As Of	Debit	Standard Label	ipsas:OtherNoncurrentAssets
Noncurrent Assets, Total	[Concept] Monetary	As Of	Debit	Total Label	ipsas:NoncurrentAssets
Assets, Total	[Concept] Monetary	As Of	Debit	Total Label	ipsas:Assets
Liabilities and Net Assets/Equity [Roll Up]	[Abstract]			Standard Label	ipsas:LiabilitiesAndNetAssetsEquityRollUp
Liabilities [Roll Up]	[Abstract]			Standard Label	ipsas:LiabilitiesRollUp
Current Liabilities [Roll Up]	[Abstract]			Standard Label	ipsas:CurrentLiabilitiesRollUp
Payables from Exchange Transactions	[Concept] Monetary	As Of	Credit	Standard Label	ipsas:PayablesFromExchangeTransactions
Long-Term Debt, Current	[Concept] Monetary	As Of	Credit	Standard Label	ipsas:LongTermDebtCurrent
Other Current Liabilities	[Concept] Monetary	As Of	Credit	Standard Label	ipsas:OtherCurrentLiabilities
Current Liabilities, Total	[Concept] Monetary	As Of	Credit	Total Label	ipsas:CurrentLiabilities
Noncurrent Liabilities [Roll Up]	[Abstract]			Standard Label	ipsas:NoncurrentLiabilitiesRollUp
Long-Term Debt, Noncurrent	[Concept] Monetary	As Of	Credit	Standard Label	ipsas:LongTermDebtNoncurrent
Other Noncurrent Liabilities	[Concept] Monetary	As Of	Credit	Standard Label	ipsas:OtherNoncurrentLiabilities
Noncurrent Liabilities, Total	[Concept] Monetary	As Of	Credit	Total Label	ipsas:NoncurrentLiabilities
Liabilities, Total	[Concept] Monetary	As Of	Credit	Total Label	ipsas:Liabilities
Net Assets/Equity [Roll Up]	[Abstract]			Standard Label	ipsas:NetAssetsEquityRollUp
Controlling Interest [Roll Up]	[Abstract]			Standard Label	ipsas:ControllingInterestRollUp
Share Capital	[Concept] Monetary	As Of	Credit	Standard Label	ipsas:ShareCapital
Reserves	[Concept] Monetary	As Of	Credit	Standard Label	ipsas:Reserves
Accumulated Surpluses (Deficits)	[Concept] Monetary	As Of	Credit	Standard Label	ipsas:AccumulatedSurplusesDeficits
Controlling Interest	[Concept] Monetary	As Of	Credit	Standard Label	ipsas:ControllingInterest
Noncontrolling Interest	[Concept] Monetary	As Of	Credit	Standard Label	ipsas:NoncontrollingInterest
Net Assets	[Concept] Monetary	As Of	Credit	Terse Label	ipsas:Equity
Liabilities and Net Assets/Equity, Total	[Concept] Monetary	As Of	Credit	Total Label	ipsas:LiabilitiesAndNetAssetsEquity

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[7] IPSAS Model Structure Rules, http://xbrlsite.azurewebsites.net/2016/conceptual-model/reporting-scheme/ipsas/model-structure/ModelStructure-rules-ipsas-def.xml

Turn this around: logical model of a financial report

Look at all that was discussed previously and you start to see the logical model of an XBRL-based financial report. If you describe all this in terms a computer can understand, that is how you get software that can verify the report against the rules that describe that report. This can be organized into a logical model[8] and a frame work for implementing[9] such reports in software:
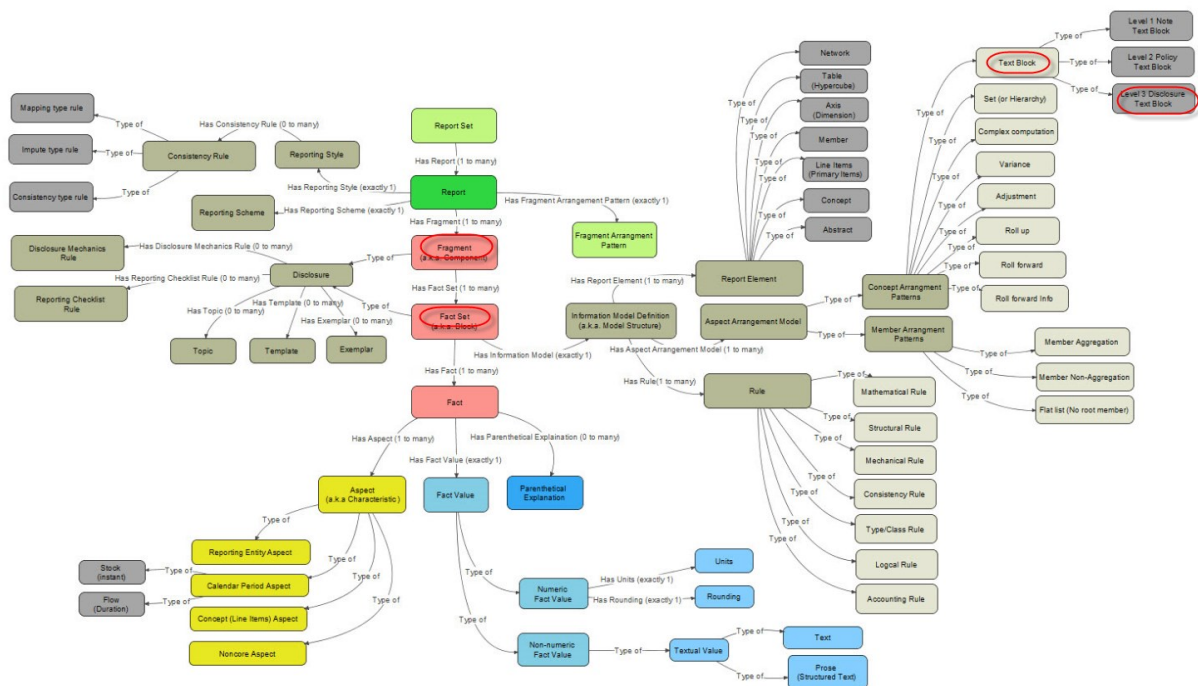
Best practices are used which provide the ability to automate the verification of the high-fidelity, high-resolution information that is provided by an XBRL-based general purpose financial report.

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[8] Logical model of a financial report, http://xbrlsite.azurewebsites.net/2016/conceptual-model/LogicalModel-2019-03-10.jpg
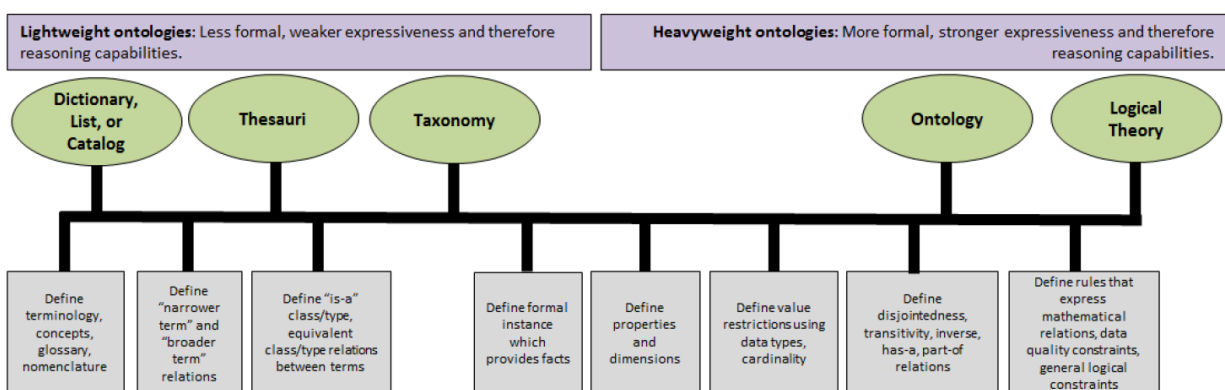
[9] Open framework for implementing XBRL-based financial reporting, http://xbrlsite.azurewebsites.net/2019/Framework/FrameworkEntitiesSummary.html

Poka-yoke (mistake proof the system) and other lean six sigma techniques

Lean six sigma techniques[10] can be leveraged to control the quality of the process used to create and verify XBRL-based financial reports that have been created. Human tasks will always be necessary, but significant automation can be effectively achieved as is demonstrated by the Pesseract software application.
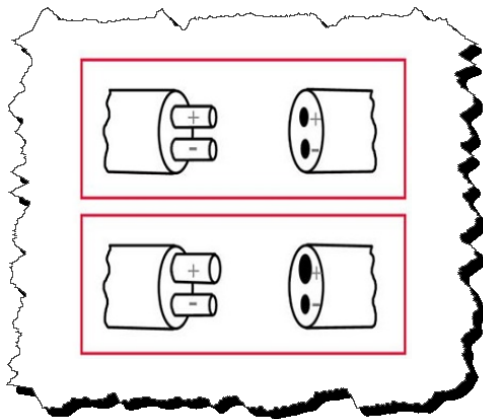
Rules are both machine-readable and human-readable: (this human readable information was generated from XBRL definition relations)
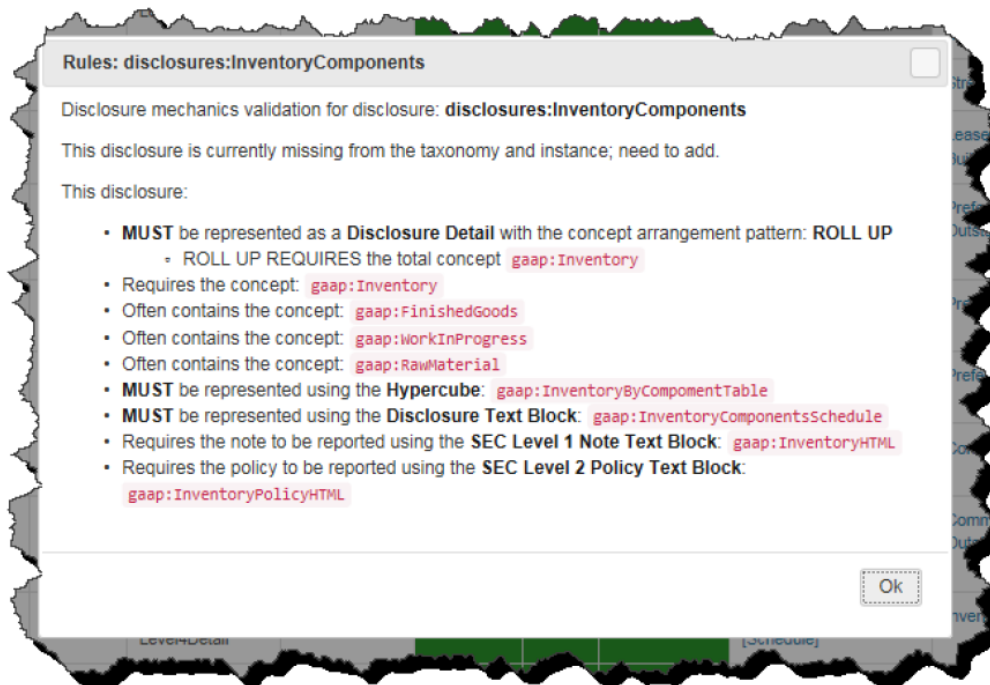
Use global standard XBRL technical syntax for 100% of the rules

The international global standard XBRL technical syntax is used to represent 100% of these machine-readable rules. This means that different software applications created by different software vendors can use the exact same rules. Here is a reporting checklist interface from two different software applcaitons:

Software application one: (XBRL Cloud)

#	Disclosure	Category	Level	Pattern	Applicable	Found	Disclosure Consistent	Representation Concept [TEXT BLOCK]	Representation Concept [DETAIL]	Checklist Category	Reason
1	Entity Information		Level4Detail	HIERARCHY	True	True	CONSISTENT	NOT-EXPECTED	Economic Entity Name	Required disclosure	Disclosure always required
2	Document Information		Level4Detail	HIERARCHY	True	True	CONSISTENT	NOT-EXPECTED	Document Title	Required disclosure	Disclosure always required
3	Financial Highlights		Level3TextBlock / Level4Detail	HIERARCHY	True	True	CONSISTENT	Financial Highlights [HTML]	Revenues, Net	Required disclosure	Disclosure always required
4	Balance Sheet		Level4Detail	COMPONENT	True	True	CONSISTENT	NOT-EXPECTED	NOT-EXPECTED	Required disclosure	Disclosure always required, satisfied by Assets [Roll Up] and Liabilities and Equity [Roll Up]
5	Assets [Roll Up]		Level4Detail	ROLL UP	True	True	CONSISTENT	NOT-EXPECTED	Assets	Part of disclosure	Disclosure always required
6	Liabilities and Equity [Roll Up]		Level4Detail	ROLL UP	True	True	CONSISTENT	NOT-EXPECTED	Liabilities and Equity	Part of disclosure	Disclosure always required
7	Income Statement		Level4Detail	ROLL UP	True	True	CONSISTENT	NOT-EXPECTED	Net Income (Loss)	Required disclosure	Disclosure always required
8	Cash Flow Statement, Direct Method		Level4Detail	ROLL UP	True	True	CONSISTENT	NOT-EXPECTED	Cash Flow, Net	Required disclosure	Disclosure always required
9	Statement of Changes in Equity		Level4Detail	ROLL FORWARD	True	True	CONSISTENT	NOT-EXPECTED	Equity	Required disclosure	Disclosure always required
10	Significant Accounting Policies		Level1TextBlock	LEVEL 1 TEXT BLOCK	True	True	CONSISTENT	Significant Accounting Policies [Note]	NOT-EXPECTED	Required disclosure	Disclosure always required
11	Basis of Reporting		Level1TextBlock	LEVEL 1 TEXT BLOCK	True	True	CONSISTENT	Overall Financial Report Presentation and Display [HTML]	NOT-EXPECTED	Required disclosure	Disclosure always required
12	Nature of Operations		Level1TextBlock	LEVEL 1 TEXT BLOCK	True	True	CONSISTENT	Nature of Business [HTML]	NOT-EXPECTED	Required disclosure	Disclosure always required
13	Cash and Cash Equivalents Components		Level3TextBlock / Level4Detail	ROLL UP	True	True	CONSISTENT	Cash and Cash Equivalents	Cash and Cash Equivalents	Line item exists, then disclosure required...	Required because line item gaap:CashAndCashEquivalents...

Software application two: (Pesseract)

#		Disclosure	Checklist Category	Reason Disclosure Must Exist	Discovered	Expectation Met	Link to Disclosure Mechanics
0		Reporting Checklist					
1		Document Information [Hierarchy]	Required disclosure	Disclosure always required	True	CONSISTENT	Document Information [Hierarchy]
	2	Document and Entity Information [Hierarchy]	Alternative representation	Not necessary, satisfied by Document Information [Hierarchy] disclosure	True	N/A	Document and Entity Information [Hierarchy]
3		Entity Information, by Legal Entity [Hierarchy]	Required disclosure	Disclosure always required	True	CONSISTENT	Entity Information, by Legal Entity [Hierarchy]
	4	Document and Entity Information [Hierarchy]	Alternative representation	Not necessary, satisfied by Entity Information, by Legal Entity [Hierarchy] discl...	True	N/A	Document and Entity Information [Hierarchy]
5		Balance Sheet	Required disclosure	Disclosure always required, satisfied by Assets [Roll Up] and Liabilities and Equi...	True	CONSISTENT	Balance Sheet
	6	Assets [Roll Up]	Part of disclosure	Satisfies Balance Sheet disclosure	True	CONSISTENT	Assets [Roll Up]
	7	Liabilities and Equity [Roll Up]	Part of disclosure	Satisfies Balance Sheet disclosure	True	CONSISTENT	Liabilities and Equity [Roll Up]
8		Income Statement, by Legal Entity [Roll Up]	Required disclosure	Disclosure always required	True	CONSISTENT	Income Statement, by Legal Entity [Roll Up]
	9	Statement of Income and Comprehensive Income [Roll Up]	Alternative representation	Not necessary, satisfied by Income Statement, by Legal Entity [Roll Up] disclos...	True	N/A	Statement of Income and Comprehensive Income [Roll Up]
10		Statement of Comprehensive Income [Roll Up]	Required disclosure	Disclosure always required	True	CONSISTENT	Statement of Comprehensive Income [Roll Up]
	11	Statement of Income and Comprehensive Income [Roll Up]	Alternative representation	Not necessary, satisfied by Statement of Comprehensive Income [Roll Up] discl...	True	N/A	Statement of Income and Comprehensive Income [Roll U...
12		Cash Flow Statement [Roll Forward]	Required disclosure	Disclosure always required	True	CONSISTENT	Cash Flow Statement [Roll Forward]
13		Statement of Changes in Equity [Roll Forward]	Required disclosure	Disclosure always required	True	CONSISTENT	Statement of Changes in Equity [Roll Forward]
15		Basis of Reporting Note [Note Level]	Required disclosure	Disclosure always required	True	CONSISTENT	Basis of Reporting Note [Note Level]
16		Significant Accounting Policies Note [Note Level]	Required disclosure	Disclosure always required	True	CONSISTENT	Significant Accounting Policies Note [Note Level]
17		Revenue Recognition Policy [Policy Text Block]	Required disclosure	Disclosure always required	True	CONSISTENT	Revenue Recognition Policy [Policy Text Block]
18		Inventory, Net (Current) [Roll Up]	Line item exists, then disclosure requi...	Required because line item us-gaap:InventoryNet was reported	True	CONSISTENT	Inventory, Net (Current} [Roll Up]
19		Property, Plant and Equipment, Net, by Type [Roll Up]	Line item exists, then disclosure requi...	Required because line item us-gaap:PropertyPlantAndEquipmentNet was repor...	True	CONSISTENT	Property, Plant and Equipment, Net, by Type [Roll Up]
	20	Property, Plant and Equipment, Net, by Type [Roll Up] (A...	Alternative representation	Not necessary, satisfied by Property, Plant and Equipment, Net, by Type [Roll ...	True	N/A	Property, Plant and Equipment, Net, by Type [Roll Up] (
21		Property, Plant and Equipment Useful Lives, by Type [Hier...	Line item exists, then disclosure requi...	Required because line item us-gaap:PropertyPlantAndEquipmentNet was repor...	True	CONSISTENT	Property, Plant and Equipment Useful Lives, by Type [

Framework for entire report

Apply these same ideas not just to the example blocks or fact sets that were shown; but rather to each and every block/fact set that makes up a report:

- Fact sets down the side in the rows.
- Rules in the columns.
- Cells are where you see inconsistencies if they existed; click on the summary number to drill down into the details.

Network	Subassembly (i.e. Block)	Model Structure Rules	Mathematical Relations Rules	Consistency Crosscheck Rules	Disclosure Mechanics Rules	Type/Class Rules	Other Constraints	Reporting Checklist Rules
1110 - Statement - Statement of Financial Position, Classified	Assets [Roll Up]	OK	OK	OK	OK	OK	OK	OK
	Liabilities and Equity [Roll Up]	OK	OK	OK	OK	OK	OK	OK
1160 - Statement - Classes of Share Capital (Parenthetical)	Share Capital, by Class [Set]	OK	OK	OK	OK	OK	OK	OK
1211 - Statement - Statement of Financial Performance, by Function	Surplus (Deficit) [Roll Up]	OK	OK	OK	OK	OK	OK	OK
1290 - Statement - Statement of Financial Performance, Comparison of Budgeted and Actual Amounts	Surplus (Deficit) from Continuing Operations [Roll Up]	OK	OK	OK	OK	OK	OK	OK
1240 - Statement - Surplus (Deficit) Breakdown by Controlling and Noncontrolling Interest (Parenthetical)	Surplus (Deficit) Breakdown [Roll Up]	OK	OK	OK	OK	OK	OK	OK
1300 - Statement - Changes in Equity, Prior Period Adjustments	Accumulated Surpluses (Deficits), Prior Period Adjustments [Adjustment]	OK	OK	OK	OK	OK	OK	OK
1400 - Statement - Changes in Equity	Share Capital Reconciliation [Roll Forward]	OK	OK	OK	OK	OK	OK	OK
	Reserves Reconciliation [Roll Forward]	OK	OK	OK	OK	OK	OK	OK
	Accumulated Surpluses (Deficits) Reconciliation [Roll Forward]	OK	OK	OK	OK	OK	OK	OK
	Noncontrolling Interest Reconciliation [Roll Forward]	OK	OK	OK	OK	OK	OK	OK
	Net Assets/Equity Reconciliation [Roll Forward]	OK	OK	OK	OK	OK	OK	OK
1600 - Statement - Cash Flow Statement, Direct Method	Net Cash Flow [Roll Up]	OK	OK	OK	OK	OK	OK	OK
	Cash and Cash Equivalents Reconciliation [Roll Forward]	OK	OK	OK	OK	OK	OK	OK
2220 - Disclosure - Property, Plant and Equipment, Net Subclassifications	Property, Plant and Equipment, Net [Roll Up]	OK	OK	OK	OK	OK	OK	OK
2221 - Disclosure - Property, Plant, and Equipment, Net Subclassifications (Alternative)	Property, Plant, and Equipment, Net, Components [Roll Up]	OK	OK	OK	OK	OK	OK	OK
2230 - Disclosure - Property, Plant, and Equipment Reconciliations	Land [Roll Forward]	OK	OK	OK	OK	OK	OK	OK
	Buildings, Net [Roll Forward]	OK	OK	OK	OK	OK	OK	OK
	Machinery, Net [Roll Forward]	OK	OK	OK	OK	OK	OK	OK
	Furniture and Fixtures, Net [Roll Forward]	OK	OK	OK	OK	OK	OK	OK
	Property, Plant and Equipment, Net [Roll Forward]	OK	OK	OK	OK	OK	OK	OK
8900 - Disclosure - Analysis of Revenue	Sales Analysis, by Customer [Set]	OK	OK	OK	OK	OK	OK	OK
9990 - Document - Document Information	Document Information [Set]	OK	OK	OK	OK	OK	OK	OK
9995 - Document - Entity Information	Entity Information [Set]	OK	OK	OK	OK	OK	OK	OK

This yields a rock-solid process for creating and evaluating each and every piece (i.e. block/fact set) of a report against very complete descriptions (rules) that a financial report must follow.

- Better
- Faster
- Cheaper

Multiple reporting schemes

While this example showed the IPSAS Core prototype in order to have a smaller set of disclosures to work with; the set of disclosures is comprehensive and exercises the most complicated aspects that you will find in any financial report from any reporting scheme including:

- US GAAP
- IFRS
- IPASA
- CAFR (GASB)
- Private companies
- ERISA
- Federal Grant Single Audit
- Not for Profit
- General business report (SBRM)

Different reporting schemes are managed using different application profiles that are used to adjust to different implementation details that are used for different financial reporting schemes. This is all managed by software applications. The software either can detect the profile you are working with automatically, or you can override the software and set to whichever profile you decide.
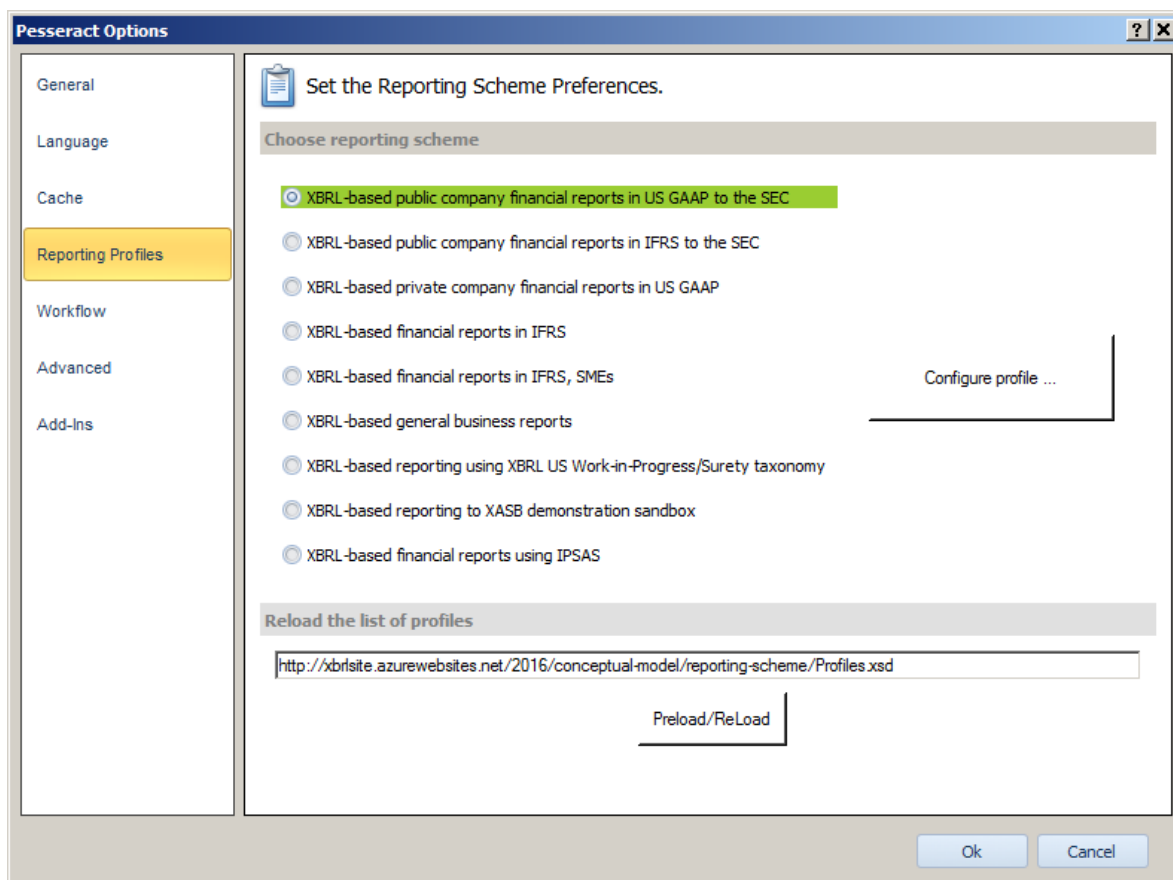
These are the rule sets for the profile used by companies creating XBRL-based reports that are submitted to the SEC using US GAAP:

Further, it is possible to dynamically configure a profile on-the-fly simply by defining the rules you want using the global standard XBRL technical syntax and the standard framework[11].

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[11] Dynamic validation testing document, http://xbrlsite.azurewebsites.net/2019/Library/DynamicValidation.pdf

Expert system for constructing a financial report, GUI or API

Essentially, the Pesseract software is an expert system for creating XBRL-based financial reports and other XBRL-based business reports. There are API level and GUI level interfaces that are provided. The fundamental architecture is that of an expert system or knowledge based system:

Business Professional User Interface

(system components are exposed to the business professional user; business professional user has transparency into facts, rules, line of reasoning, problem solving logic, problem solving method, and the plausibility of all conclusions reached)

Reasoning, Inference, Rules Engine

(machine-based line of reasoning for solving problems using some **problem solving logic** and **problem solving method** (i.e. forward chaining, backward chaining); includes capabilities to logically derive or infer new facts based on existing facts and rules, determines consistency of facts with knowledge base of rules)

Justification and Explanation Mechanism

(**explains and justifies** and provides transparency into how conclusions are reached; line of reasoning, origin of all facts and rules used to reach conclusions)

Facts Database

(machine-readable observations about some current situation or instance)

Knowledge Base of Rules

(machine-readable rules based on factual and heuristic knowledge created based on experience and practices of the best domain experts)

Knowledge Acquisition Mechanism

(power of system is proportional to the key ingredient, high-quality domain knowledge available; knowledge acquisition can be by manual creation of rules by business professionals, machine-based processes for generating rules, or a combination of the two)

Report properties

Both a semantic model and an XBRL syntactic model are provided in the application so you can view the pieces of a report per a logical model that explains the meaning of reported information or per the XBRL technical syntax artifacts.
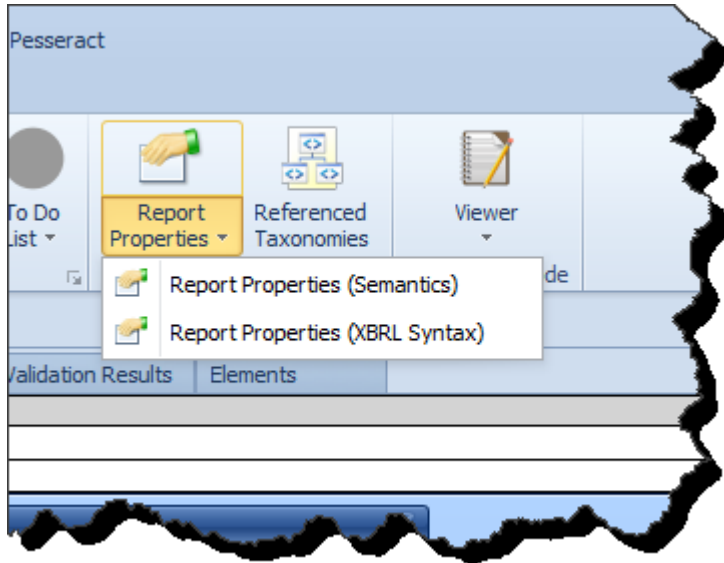
Comparisons

Comparisons of reported information can be created at any level. Comparisons are created by creating mappings and a structure for the comparison by simply creating the information model definition for the comparison you desire:

http://www.sec.gov/Archives/edgar/data/1337068/000117494716002678/mgyr-20160331.xml
http://www.sec.gov/Archives/edgar/data/1576336/000110465916120688/ajsb-20160331.xml
http://www.sec.gov/Archives/edgar/data/1390312/000110465916121296/bkj-20160331.xml
http://www.sec.gov/Archives/edgar/data/1515069/000143774916031367/crol-20160331.xml
http://www.sec.gov/Archives/edgar/data/354869/000035486916000073/fmer-20160331.xml

New comparision   ✕

| | Browse | Paste | Insert |

☑	Filename
☑	http://www.sec.gov/Archives/edgar/data/1337068/000117494716002678/mgyr-20160331.xml
☑	http://www.sec.gov/Archives/edgar/data/1576336/000110465916120688/ajsb-20160331.xml
☑	http://www.sec.gov/Archives/edgar/data/1390312/000110465916121296/bkj-20160331.xml
☑	http://www.sec.gov/Archives/edgar/data/1515069/000143774916031367/crol-20160331.xml
☑	http://www.sec.gov/Archives/edgar/data/354869/000035486916000073/fmer-20160331.xml

| OK | Cancel | Clear |

Component: (Network and Table)

Network	401 - Unknown -**Cash Flow Statement**
Table	Cash Flow Statement [Table]

Unit [Axis]	USD				

Period [Axis] ▾	Reporting Entity [Axis] ▴				
			2016-01-01/2016-03-31		2015-10-01/2016-03-31
Cash Flow Statement [Line Items]	0000354869 http://www.sec.gov/CIK	0001390312 http://www.sec.gov/CIK	0001515069 http://www.sec.gov/CIK	0001576336 http://www.sec.gov/CIK	0001337068 http://www.sec.gov/CIK
Net Cash Flow [Roll Up]					
Net Cash Flow from Operating Activities [Roll Up]					
Net Cash Flow from Operating Activities, Continuing	35,748,000	1,776,000	132,254	113,000	4,224,000
Net Cash Flow from Operating Activities, Discontinued	0	0	0	0	0
Net Cash Flow from Operating Activities	35,748,000	1,776,000	132,254	113,000	4,224,000
Net Cash Flow from Investing Activities [Roll Up]					
Net Cash Flow from Investing Activities, Continuing	(183,668,000)	(4,002,000)	32,229	7,231,000	(12,554,000)
Net Cash Flow from Investing Activities, Discontinued	0	0	0	0	0
Net Cash Flow from Investing Activities	(183,668,000)	(4,002,000)	32,229	7,231,000	(12,554,000)
Net Cash Flow from Financing Activities [Roll Up]					
Net Cash Flow from Financing Activities, Continuing	444,000,000	(10,431,000)	3,767,908	(2,217,000)	11,150,000
Net Cash Flow from Financing Activities, Discontinued	0	0	0	0	0
Net Cash Flow from Financing Activities	444,000,000	(10,431,000)	3,767,908	(2,217,000)	11,150,000
Exchange Gains (Losses)	0	0	0	0	0
Net Cash Flow	296,080,000	(12,657,000)	3,932,391	5,127,000	2,820,000

Create/edit mode

The rules that are created to validate the report are watching over the user of the software to inform the user of any errors that occur as the report is created.

Component: (Network and Table)		
Network	30000 - Unknown - **Property, Plant, and Equipment, by Component**	
Table	Property, Plant and Equipment, by Component [Table]	

Reporting Entity [Axis]	SAMP http://www.SampleCompany.com	
Legal Entity [Axis]	Consolidated Entity [Member]	
Unit [Axis]	USD	

	Period [Axis]	
Property, Plant and Equipment, by Component [Line Items]	2010-12-31	2009-12-31
Property, Plant and Equipment, Net [Roll Up]		
Land	5,347,000	1,147,000
Buildings, Net	244,508,000	366,375,000
Furniture and Fixtures, Net	34,457,000	34,457,000
Computer Equipment, Net	4,169,000	5,313,000
Other Property, Plant and Equipment, Net	6,702,000	6,149,000
Property, Plant and Equipment, Net, Total	295,183,000	413,441,000

If you change a value, you are immediately informed of mathematical inconsistencies that are introduced into the report. The notification goes away once the inconsistency is rectified:

Component: (Network and Table)		
Network	30000 - Unknown - **Property, Plant, and Equipment, by Component**	
Table	Property, Plant and Equipment, by Component [Table]	

Reporting Entity [Axis]	SAMP http://www.SampleCompany.com	
Legal Entity [Axis]	Consolidated Entity [Member]	
Unit [Axis]	USD	

	Period [Axis]	
Property, Plant and Equipment, by Component [Line Items]	2010-12-31	2009-12-31
Property, Plant and Equipment, Net [Roll Up]		
Land	100	1147000
Buildings, Net	244,508,000	366,375,000
Furniture and Fixtures, Net	34,457,000	34,457,000
Computer Equipment, Net	4,169,000	5,313,000
Other Property, Plant and Equipment, Net	6,702,000	6,149,000
Property, Plant and Equipment, Net, Total	295,183,000	413,441,000

Editing the information model definition in one place and what you edited is updated throughout the report.
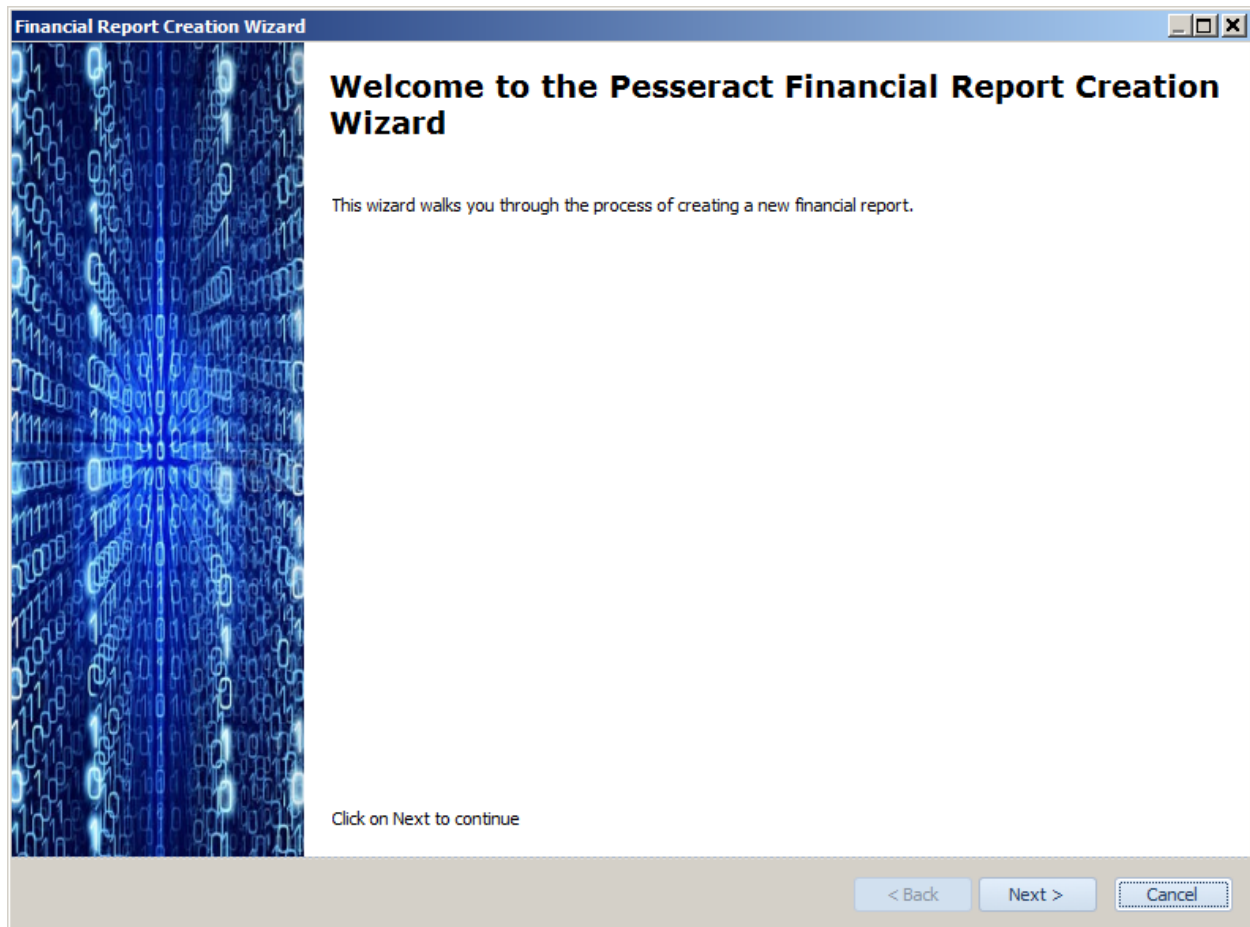
Rendering:

Model structure:

Financial report creation wizard

The financial report creation wizard leads you through the sometimes complex task of setting up a report correctly:

Disclosure creation wizard

Similar to the financial report creation wizard, complex tasks involved in creating a disclosure are made easier through the use of wizards.