10. Integrity Models

Relations exist *within* a [Table], for example a set of concepts can roll up into some total, information models describe these types of relationships within one [Table]. But relations can also exist *between* [Table]s.

Integrity models express the semantic relations between the components of one [Table] and the components of another [Table]. [Table]s within an information set, be that information set within one business report or across many business reports you are comparing have relations. Proper relations makes things easier, improper relations make things harder. Modeling business information with these relations intact give your business report the proper integrity.

Many times when modelers think they have modeling choices, you actually don't have as many choices as you might believe you have. The way a modeler thinks that XBRL might work has no bearing in the process of modeling business information. XBRL works as XBRL works, no one can change that. If you could, then what good what that type of standard be? Decisions on how to model information must be based on the model which already surrounds the information you are modeling, the other model components the information you are modeling must relate to, the business rules (XBRL Formulas) which prove the model works, and other such considerations. Not providing the business rules and then believing the model works is a far too common mistake.

While the metapatterns and business use cases are helpful in that they are small, focused examples of specific modeling situations, it is also necessary to understand how one [Table] relates to another [Table]. The purpose of the comprehensive example is to do just that. See the next section.

Note that this discussion is *not* about where information needs to be presented from a financial reporting perspective, that is not relevant to this discussion. This discussion is about how information is related.

10.1. Facts Only Exist in Fact Tables

A fact table is simply defined as a set of facts which go together. A fact can only exist within the framework of a fact table, facts never exist in isolation. There are two mechanisms for grouping facts into a fact table: networks and [Table]s.

The XBRL technical syntax defines the notion of a fact. An XBRL instance is "a bag of facts". All facts have a context. The XBRL technical syntax allows facts to be filtered using the mechanism of a network. The XBRL Dimensions technical specification defines another method of establishing a set of facts, the hypercube which we are referring to as a [Table].

There are never conflicts between networks and hypercubes. Hypercubes filter facts using dimensions. The entity and period dimensions are not filtered by hypercubes.

10.2. Notion of Relations Between [Table]s

The following is a list of the spectrum of how one [Table] can be related to another [Table] within a digital financial report:

- **[Table]s which are unrelated** – a [Table] has no relation to any other [Table].

- **[Table]s related by [Line Items]** – a [Table] shares one or more [Line Items] concept with another [Table].
- **[Table]s related by [Axis]** – a [Table] shares one or more [Axis] with another [Table].
- **[Table]s related by both [Line Items] an and by [Axis]** – a [Table] shares both [Line Items] and [Axis] with another [Table].

Examples which will be provided in a moment will make the differences between the categories on the list easier to see.

10.3. Notion of Summary and Detail Related [Table]s

[Table]s which are related could fall into one of the following categories:

- **Summary [Table]s** – concepts within summary [Table]s are aggregates of information or totals.
- **Detail [Table]s** – concepts within detail [Table]s provide a number of the same concepts, differentiated using either concepts or by using [Member]s of an [Axis].

10.4. Domain Partition Aggregation Models

Recall from the prior section which discussed domain partition aggregation models which explains how information aggregates across an [Axis]. How things aggregate is not necessarily relevant in this discussion which is more about the general ways information relates.

10.5. Pulling Relations and Summary/Detail together Using Examples

Examples help show the differences between the different permutations and combinations of relationships between [Table]s. Here we show such examples.

10.5.1. No relations

An example of no relations is the document information of the comprehensive example. The relations can be seen here:

1041	**VA, Part 1: Document Information**	[Network]		
1042	**Document Information [Table]**	[Table]		
1043	**Legal Entity [Axis]**	[Axis]		
1044	Consolidated Entity [Member]	[Member]		
1045	**Report Date [Axis]**	[Axis]		
1046	Reported as of March 18, 2011 [Member]	[Member]		
1047	**Document Information [Line Items]**	[Line Items]		
1048	Document Information [Hierarchy]	[Abstract]		
1049	Document Title	[Concept] Text/String	For Period	
1050	Document Date	[Concept] Date	For Period	
1051	Document Identifier	[Concept] Text/String	For Period	
1052	Document Description	[Concept] Text/String	For Period	
1053	Document Creator	[Concept] Text/String	For Period	
1054	Document Language	[Concept] Text/String	For Period	

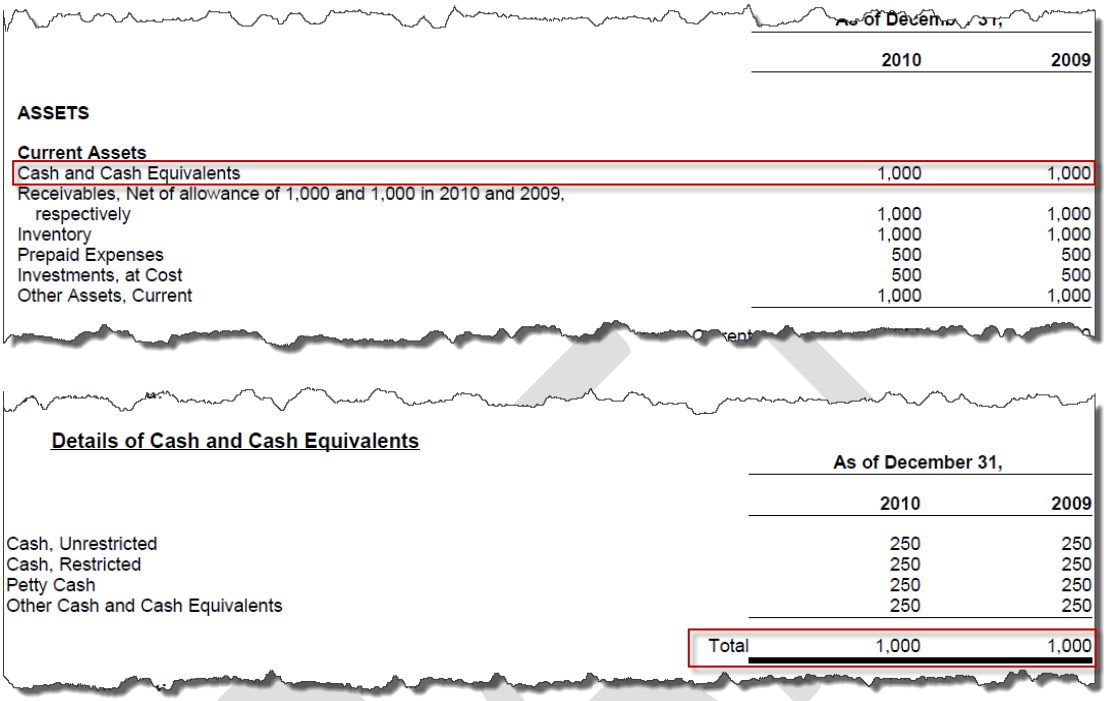
While the Document Information [Table] is related to other [Table]s via the Legal Entity [Axis] and the Report Date [Axis] it does point out the notion of no relations. The [Line Items] of the Document Information [Table] are found in no other place in the comprehensive example digital financial report.

The Document Information [Table] has two other [Axis] where it is related to other tables: the Reporting Entity [Axis] and the Period [Axis], both of which are

required on all [Table]s. Going further with this is an advanced discussion which we will not get into here. Just realize that this relation exists.

10.5.2. Detail/summary related using [Line Items]

Consider the following balance sheet fragment followed by the disclosure of the details of Cash and Cash Equivalents in the notes to the financial statement:



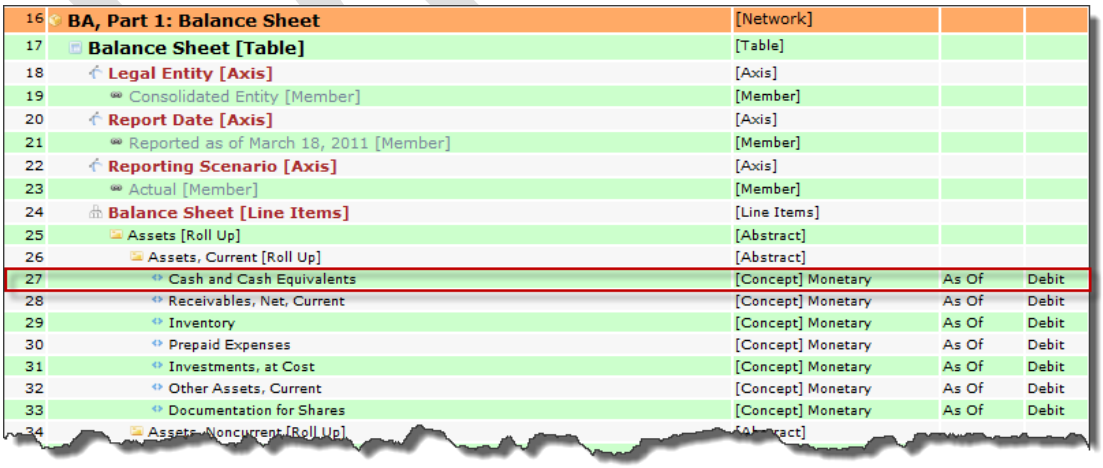
	2010	2009
ASSETS		
Current Assets		
Cash and Cash Equivalents	1,000	1,000
Receivables, Net of allowance of 1,000 and 1,000 in 2010 and 2009, respectively	1,000	1,000
Inventory	1,000	1,000
Prepaid Expenses	500	500
Investments, at Cost	500	500
Other Assets, Current	1,000	1,000

Details of Cash and Cash Equivalents

	As of December 31,	
	2010	2009
Cash, Unrestricted	250	250
Cash, Restricted	250	250
Petty Cash	250	250
Other Cash and Cash Equivalents	250	250
Total	1,000	1,000

The balance sheet can be seen as the summary table which contains the aggregate of Cash and Cash Equivalents. The disclosure which provides a breakdown of the components of Cash and Cash Equivalents is the detail. The intersection between these two items is the total of Cash and Cash Equivalents which appears on both the summary and in the detailed breakdown.

Here is a modelling of Cash and Cash Equivalents on the balance sheet followed by a modelling of the detailed breakdown from the disclosures:



16	**BA, Part 1: Balance Sheet**	[Network]		
17	**Balance Sheet [Table]**	[Table]		
18	**Legal Entity [Axis]**	[Axis]		
19	Consolidated Entity [Member]	[Member]		
20	**Report Date [Axis]**	[Axis]		
21	Reported as of March 18, 2011 [Member]	[Member]		
22	**Reporting Scenario [Axis]**	[Axis]		
23	Actual [Member]	[Member]		
24	**Balance Sheet [Line Items]**	[Line Items]		
25	Assets [Roll Up]	[Abstract]		
26	Assets, Current [Roll Up]	[Abstract]		
27	Cash and Cash Equivalents	[Concept] Monetary	As Of	Debit
28	Receivables, Net, Current	[Concept] Monetary	As Of	Debit
29	Inventory	[Concept] Monetary	As Of	Debit
30	Prepaid Expenses	[Concept] Monetary	As Of	Debit
31	Investments, at Cost	[Concept] Monetary	As Of	Debit
32	Other Assets, Current	[Concept] Monetary	As Of	Debit
33	Documentation for Shares	[Concept] Monetary	As Of	Debit
34	Assets, Noncurrent [Roll Up]	[Abstract]		

1	**JB, Part 2: Cash and Cash Equivalents, Details**	[Network]		
2	**Cash and Cash Equivalents, Details [Table]**	[Table]		
3	**Legal Entity [Axis]**	[Axis]		
4	Consolidated Entity [Member]	[Member]		
5	**Report Date [Axis]**	[Axis]		
6	Reported as of March 18, 2011 [Member]	[Member]		
7	**Reporting Scenario [Axis]**	[Axis]		
8	Actual [Member]	[Member]		
9	**Cash and Cash Equivalents, Details [Line Items]**	[Line Items]		
10	Cash and Cash Equivalents [Roll Up]	[Abstract]		
11	Cash, Unrestricted	[Concept] Monetary	As Of	Debit
12	Cash, Restricted	[Concept] Monetary	As Of	Debit
13	Petty Cash	[Concept] Monetary	As Of	Debit
14	Other Cash and Cash Equivalents	[Concept] Monetary	As Of	Debit
15	Cash and Cash Equivalents, Total	[Concept] Monetary	As Of	Debit

Note that Cash and Cash Equivalents is not only a concept in both locations, but it is actually the same concept which shows up in both [Table]s. Note that the [Axis] of both tables are the same.

You can get more information about this modelling approach by examining the *Simple Roll Up* business use case.

What is going on in this example may not yet seem obvious. However, when it is compared to the next approach what we are trying to explain will become more clear.

10.5.3. Detail/summary related using [Members] of an [Axis]

Consider the following balance sheet fragment which shows Property, Plant and Equipment, Net:

Noncurrent Assets			
Property, Plant and Equipment, Net			
Land		1,000	1,000
Buildings, Net		1,000	1,000
Furniture and Fixtures, Net		1,000	1,000
Other Property, Plant, and Equipment, Net		1,000	1,000
	Property, Plant, and Equipment, Net	4,000	4,000
Investment in Affiliates		0	0
Other Assets, Noncurrent		3,000	1,000

One approach to modelling this information is to follow the approach used in the section above, modelling each class of Property, Plant and Equipment, Net as a concept as shown below:

19	Assets, Non[illegible]t [Roll Up]	[Abstract]		
20	Property, Plant, and Equipment, Net [Roll Up]	[Abstract]		
21	Land	[Concept] Monetary	As Of	Debit
22	Buildings, Net	[Concept] Monetary	As Of	Debit
23	Furniture and Fixtures, Net	[Concept] Monetary	As Of	Debit
24	Other Property, Plant, and Equipment, Net	[Concept] Monetary	As Of	Debit
25	Property, Plant, and Equipment, Net, Total	[Concept] Monetary	As Of	Debit
26	[illegible] Affiliates	[Concept] Monetary	As Of	Debit

However, an alternative approach is to model each class of Property, Plant, and Equipment as a [Member] of an [Axis] which can be seen below:

1	**Property, Plant, and Equipment, by Component**	[Network]		
2	**Property, Plant and Equipment, by Component [Table]**	[Table]		
3	**Legal Entity [Axis]**	[Axis]		
4	Consolidated Entity [Member]	[Member]		
5	**Class of Property, Plant and Equipment [Axis]**	[Axis]		
6	All Classes of Property, Plant and Equipment [Member]	[Member]		
7	Land [Member]	[Member]	For Period	
8	Buildings [Member]	[Member]	For Period	
9	Furniture and Fixtures [Member]	[Member]	For Period	
10	Computer Equipment [Member]	[Member]	For Period	
11	Other Property, Plant and Equipment [Member]	[Member]	For Period	
12	**Property, Plant and Equipment, by Component [Line Items]**	[Line Items]		
13	Property, Plant and Equipment, Net [Hierarchy]	[Abstract]		
14	Property, Plant and Equipment, Net	[Concept] Monetary	As Of	Debit

Above you can see that each class of Property, Plant and Equipment is modelled as a [Member] of the [Axis] Class of Property, Plant and Equipment [Axis].

You can examine this model more closely by taking a look at the business use case *Classes*. Contrast that to the business use case *Simple Roll Up*.

Continuing on with the examples will further reveal the pros and cons of different alternative modelling options.

10.5.4. Related by [Axis] and [Members]

The following two fragments of policies and disclosures will help understand one very significant difference between modelling details using [Line Items] and concepts as contrast to modelling details leveraging an [Axis] and [Member]s. Consider these policies and disclosures of Property, Plant and Equipment:

Property, Plant and Equipment Policies

Class	Valuation Basis	Depreciation Method	Estimated Useful Life
Land	Mauris tincidunt cursus est	NA	NA
Buildings	Sed dapibus venenatis ipsum	Etiam porttitor	20 years
Furniture and Fixtures	Nunc congue	Maecenas tincidunt	10 years
Computer Equipment	Suspendisse potenti	Maecenas tincidunt	5 years
Other	Phasellus eleifend	Maecenas tincidunt	5 years

Property, Plant, and Equipment, Net, Components

	2010	2009
Land	5,347	1,147
Buildings, Net	244,508	366,375
Furniture and Fixtures, Net	34,457	34,457
Computer Equipment, Net	4,169	5,313
Other Property, Plant, and Equipment, Net	6,702	6,149
Property, Plant and Equipment, Net, Total	295,183	413,441

Here you can see two things. First, Property, Plant and Equipment has multiple sets of information expressed in different areas of a financial report and second, that the presentation of the information looks different.

Here is the modelling of both the polices and breakdown of Property, Plant and Equipment:

1	**Property, Plant, and Equipment, Policies**	[Network]		
2	**Property, Plant and Equipment, Policies [Table]**	[Table]		
3	**Legal Entity [Axis]**	[Axis]		
4	Consolidated Entity [Member]	[Member]		
5	**Class of Property, Plant and Equipment [Axis]**	[Axis]		
6	All Classes of Property, Plant and Equipment [Member]	[Member]		
7	Land [Member]	[Member]		
8	Buildings [Member]	[Member]		
9	Furniture and Fixtures [Member]	[Member]		
10	Computer Equipment [Member]	[Member]		
11	Other Property, Plant and Equipment [Member]	[Member]		
12	**Property, Plant and Equipment, Policies [Line Items]**	[Line Items]		
13	Property, Plant and Equipment, Policies [Hierarchy]	[Abstract]		
14	Valuation Basis	[Concept] Text/String	For Period	
15	Depreciation Method	[Concept] Text/String	For Period	
16	Estimated Useful Life	[Concept] Text/String	For Period	

1	**Property, Plant, and Equipment, by Component**	[Network]		
2	**Property, Plant and Equipment, by Component [Table]**	[Table]		
3	**Legal Entity [Axis]**	[Axis]		
4	Consolidated Entity [Member]	[Member]		
5	**Class of Property, Plant and Equipment [Axis]**	[Axis]		
6	All Classes of Property, Plant and Equipment [Member]	[Member]		
7	Land [Member]	[Member]		
8	Buildings [Member]	[Member]		
9	Furniture and Fixtures [Member]	[Member]		
10	Computer Equipment [Member]	[Member]		
11	Other Property, Plant and Equipment [Member]	[Member]		
12	**Property, Plant and Equipment, by Component [Line Items]**	[Line Items]		
13	Property, Plant and Equipment, Net [Hierarchy]	[Abstract]		
14	Property, Plant and Equipment, Net	[Concept] Monetary	As Of	Debit

Common between the two models is the Class of Property, Plant and Equipment [Axis]. That [Axis] can be used to "glue" the two [Table]s together, using both the disclosure of the balances of each class of Property, Plant and Equipment and the policies.

If only [Line Items] were used to model both the balances and disclosures, basically not using the [Axis], one would simply repeat the [Line Item] for each class; for example creating "Land, Valuation Basis", "Buildings, Valuation Basis", and so on. Two things would result. First, a much larger taxonomy and second, no connection between for example, "Buildings, Valuation Basis", "Buildings, Depreciation Method", "Buildings, Estimated Useful Life", and "Buildings, Net". They may seem connected to a human due to the common term "Buildings"; but a computer could not formally make this connection. Hacks could be employed to attempt to create a connection using the common term "Buildings", but it would be exactly that, a hack.

To examine the detailed taxonomies and instances in more detail, see the *Class Properties* business use case.

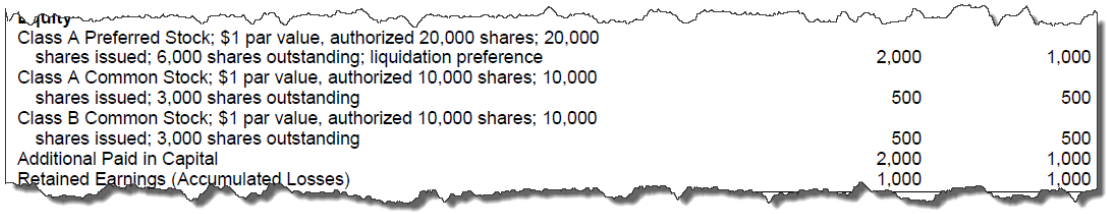
10.5.5. Detail/summary related using [Members] of an [Axis] with properties

We want to now bring the concept of "properties" into clearer focus. Consider this example of information about the classes of common stock:

Classes of Common Stock

Class	Par Value	Share Subscriptions	Shares Authorized	Shares Issued	Shares Outstanding	Amount 2010	Amount 2009
company:ClassACommonStockMember	1	10000	10000	10000	3000	500	500
company:ClassBCommonStockMember	1	10000	10000	10000	3000	500	500
				Total all Classes	6000	1,000	1,000

A number of important points can be made by looking at the set of information above. First, information is not commonly presented to the user in this way. Commonly this information is presented on the balance sheet as shown below:



Equity		
Class A Preferred Stock; $1 par value, authorized 20,000 shares; 20,000 shares issued; 6,000 shares outstanding; liquidation preference	2,000	1,000
Class A Common Stock; $1 par value, authorized 10,000 shares; 10,000 shares issued; 3,000 shares outstanding	500	500
Class B Common Stock; $1 par value, authorized 10,000 shares; 10,000 shares issued; 3,000 shares outstanding	500	500
Additional Paid in Capital	2,000	1,000
Retained Earnings (Accumulated Losses)	1,000	1,000

The information for each class is presented as part of the balance sheet line item as compared to the tabular format. Second, the total is not presented on the balance sheet. Further, if the shares outstanding were different between the current and prior period, that fact would need to be presented in the line item description. Finally, as pointed out in the prior examples, which say Cash and Cash Equivalents has no additional "properties" associated with them, Property, Plant and Equipment can as can the disclosures for a class of stock.

10.5.6. Detail/summary with only one detailed item

This example focuses on one specific point. As you can see in the screenshot below of information about classes of preferred stock and common stock; the common stock has two classes whereas the preferred stock has only one:

Classes of Preferred Stock

Class	Par Value	Share Subscriptions	Shares Authorized	Shares Issued	Shares Outstanding	Amount 2010	Amount 2009
company:ClassAPreferredStockMember	1	20000	20000	20000	6000	2,000	1,000
				Total all Classes	6000	2,000	1,000

Classes of Common Stock

Class	Par Value	Share Subscriptions	Shares Authorized	Shares Issued	Shares Outstanding	Amount 2010	Amount 2009
company:ClassACommonStockMember	1	10000	10000	10000	3000	500	500
company:ClassBCommonStockMember	1	10000	10000	10000	3000	500	500
				Total all Classes	6000	1,000	1,000

How would or should having only one [Member] in a breakdown impact the modelling of information? The question should not really be about whether one specific company has one class of two or more classes of something; but rather modelling should be driven by the possibility of ever having either only one or one-to-many [Member]s of some class of information.

The point here is that an entity could have more than one class of preferred stock and a class of preferred stock can have a number of properties. Both the details of the class and the total of all classes, in the case shown above the total and the class are the same because there is only one member within the class; however, the total and the amount for each class are two different pieces of information.

10.5.7. Master/detail by [Axis] and [Members]

The notion of "master/detail" is commonly communicated using the example of an invoice which has information applicable to the entire invoice such as the involce number and date; and detail information which is associated with the line items of the invoice such as the product number, the quantity and the amount. An invoice always has one number and date, but it can have one or many line items.

A similar pattern occurs within a financial report as shown by the related party and related party transactions disclosure below:

NOTE 16. RELATED PARTY TRANSACTIONS

The following is a summary of related party of the company and transactions with those related parties:

Related Parties

Name of Related Party	Type of Relationship	Nature of Relationship
company:RelatedParty1Member	Parent	This is other descriptive information about the relationship.
company:RelatedParty2Member	JointVenture	This is other descriptive information about the relationship.

Transactions with Related Parties

Party	Transaction Description	Pricing Policy	Amount
company:RelatedParty1Member	Transaction 1 description	Cost	1000
company:RelatedParty1Member	Transaction 2 description	Cost	1000
company:RelatedParty2Member	Transaction 1 description	Cost	1000
company:RelatedParty2Member	Transaction 2 description	Cost	1000

This disclosure shows two related parties and a total of four related party transactions, two each for the two related parties.

This information can be modelled as shown below in first the modelling of the related parties and the then the modelling of the related party transactions.

1	**Related Parties**	[Network]		
2	**Related Parties [Table]**	[Table]		
3	**Legal Entity [Axis]**	[Axis]		
4	Consolidated Entity [Member]	[Member]		
5	**Related Party Name [Axis]**	[Axis]		
6	Related Party 1 [Member]	[Member]	For Period	
7	Related Party 2 [Member]	[Member]	For Period	
8	**Related Parties [Line Items]**	[Line Items]		
9	Related Party [Hierarchy]	[Abstract]		
10	Related Party, Type of Relationship	[Concept]	For Period	
11	Related Party, Nature of Relationship	[Concept] Text/String	For Period	

1	**Related Party Transactions**	[Network]		
2	**Related Party Transactions [Table]**	[Table]		
3	**Legal Entity [Axis]**	[Axis]		
4	Consolidated Entity [Member]	[Member]		
5	**Related Party Name [Axis]**	[Axis]		
6	Related Party 1 [Member]	[Member]	For Period	
7	Related Party 2 [Member]	[Member]	For Period	
8	**Related Party Transaction Type [Axis]**	[Axis]		
9	Related Party Transaction Type, All [Member]	[Member]	For Period	
10	Agency Arrangements with Related Party [Member]	[Member]	For Period	
11	Leasing Arrangements with Related Party [Member]	[Member]	For Period	
12	Purchase or Sale of Goods with Related Party [Member]	[Member]	For Period	
13	Purchase or Sale of Property or Other Assets with Related Party [Member]	[Member]	For Period	
14	**Related Party Transaction [Line Items]**	[Line Items]		
15	Related Party Transaction [Hierarchy]	[Abstract]		
16	Related Party Transaction, Description	[Concept] Text/String	For Period	
17	Related Party Transaction, Pricing Policy	[Concept] Text/String	For Period	
18	Related Party Transaction, Amount	[Concept] Monetary	For Period	Debit

Common between the two tables is the Related Party Name [Axis]. It is that [Axis] which connects the related party disclosure with the transactions for each related party.

While in this case there is no aggregation which connects the two [Table]s, the two [Table]s are connected. The related party transactions [Table] has another

[Axis] used to differentiate the different transactions associated with a related party.

For more detailed information, see the *Nested Compound Fact* business use case.

10.6. Avoid Mixing Modeling Approaches

If one is not conscious of what they are modelling, there is a good probability that you switch between alternative modelling approaches within the same [Table] and don't even realize it. Arbitrarily shifting from one modelling approach to another modelling approach in the same [Table] simply will not work.

For example, if a balance sheet is modelled using concepts throughout the entire balance sheet, and then you choose to add detail which is supposed to show up on the balance sheet but express that detail using [Member]s of an [Axis] the balance sheet will likely not work correctly in some area; either the calculation relations expressed will not foot, the business rules will not work or will seem inconsistent with other similar types of rules, it will not render correctly or some other problem may occur.

As such, be conscious, create all components, and if all the components work correctly all things considered, your modelling is fine.

10.7. Choosing Between Alternative Modeling Approaches

Many times a modeller has no choice as to which approach to use to break down details. For example, if the Property, Plant and Equipment details were shown on the face of the balance sheet, then the [Line Items] approach must be used because otherwise the details would not render on the balance sheet and the balance sheet would not foot. As such, the details must be modelled as additional [Line Items].

Whereas, if a modeller needs to connect additional properties to a concept to communicate relationships between concepts, creating an [Axis] and articulating the a breakdown using [Member]s of that [Axis] has advantages.

Modelling information can involve tradeoffs. Establishing and following a set of principles and communicating those principles followed to users of a taxonomy can be helpful to users of that taxonomy.

10.8. US GAAP Taxonomy Examples

To better understand the different types of relations the US GAAP Taxonomy can be of help. The following are a few examples which help you understand the differences between the different categories of [Table] relations:

- Nonmonentary Transactions [Table] is not related to any other [Table] in the entire US GAAP taxonomy nor in any SEC XBRL financial filing; it ties to nothing. It is stand alone.
- Subsequent Events [Table]. Likewise unrelated.
- Balance Sheet [Table] and the Property, Plant and Equipment Components [Table] are related in that the total of PPE is on the balance sheet and that total PPE also serves as the intersection to the detailed breakdown, whether these concepts are expressed using [Member]s of an [Axis] or if they are expressed as concepts (XBRL items) within [Line Items].
- Property, Plant and Equipment Components [Table] and the Property, Plant and Equipment Estimated Useful Lives [Table] are related by the Class of Property, Plant and Equipment [Axis].

- Income statement [Table] is related to the Business Segment Breakdown [Table] and the Geographic Areas Breakdown [Table].