

SBRM Primer

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The purpose of this document is to provide an SBRM primer. Note that this primer is intended to help the reader understand the SBRM. This primer is not intended to help the reader learn the XBRL technical syntax, the RDF technical syntax, the OWL technical syntax, or any other technical syntax that might be used. Documentation for the specific technical format used should be leveraged to help the reader use that syntax effectively to represent information using the SBRM method which relates to effectively representing the necessary semantics of a business report.

Overview of SBRM

A business report is a logical system. A logical system (a.k.a.) logical theory is made up of a set of *models, structures, terms, associations, assertions, and facts*. In very simple terms,

- **Logical theory:** A *logical theory* is a set of models that are consistent with and permissible per that logical theory.
- **Model:** A *model* is a set of structures. A model is a permissible interpretation of a theory.
- **Structure:** A *structure* is a set of statements which describe the structure.
- **Statement:** A statement is a proposition, claim, assertion, belief, idea, or fact about or related to the universe of discourse to which the logical theory relates. There are four broad categories of statements:
 - **Terms:** Terms are statements that define ideas used by the logical theory such as “assets”, “liabilities”, and “equity”.
 - **Associations:** Associations are statements that describe permissible interrelationships between the terms such as “assets is part-of the balance sheet” or “operating expenses is a type-of expense” or “assets = liabilities + equity” or “an asset is a ‘debit’ and is ‘as of’ a specific point in time and is always a monetary numeric value”.
 - **Assertions:** Assertions are statements that describe what tend to be IF...THEN...ELSE types of relationships such as “IF the economic entity is a not-for-profit THEN net assets = assets - liabilities; ELSE assets = liabilities + equity”.
 - **Facts:** Facts are statements about the numbers and words that are provided by an economic entity within a business report. For example, the financial report , a type of business report, might state “assets for the consolidated legal entity Microsoft as of June 20, 2017 was \$241,086,000,000 expressed in US dollars and rounded to the nearest millions of dollars.

A logical system can have high to low **precision** and high to low **coverage**. *Precision* is a measure of how precisely the information within a logical system has been represented as contrast to reality for the universe of discourse. *Coverage* is a measure of how completely information in a logical system has been represented relative to the reality for a universe of discourse.

If the models, structures, terms, associations, assertions, and facts have high precision and high coverage, the logical system can be proven to be properly functioning.

It is this set of models, structures, terms, associations, assertions, and facts that would be represented within some technical syntax to represent some business report logical system with precision and coverage.

Very Basic Example

The following provides a very basic example of using SBRM to represent a business report. An example from financial reporting is used to provide this very basic example. Most business professionals are familiar with the accounting equation¹ which is “Assets = Liabilities and Equity” and represents the high-level financial elements that would appear within a balance sheet.

We will use this very short list of terms and the equation to demonstrate how SBRM would be used to create a provably properly functioning logical system.

The first step would be to represent the terms, associations between the terms, assertions, structures, and then express a set of facts. Here is this information in the form of statements which define the pieces of this business report logical system:

- **Terms:**
 - Assets is-a simple term.
 - Liabilities is-a simple term.
 - Equity is-a simple term.
 - Balance sheet is-a functional term.
- **Associations:**
 - Assets has-property balance of debit.
 - Liabilities has-property balance of credit.
 - Equity has-property balance of credit.
 - Assets has-property period of instant.
 - Liabilities has-property period of instant.

¹ Wikipedia, *Accounting Equation*, https://en.wikipedia.org/wiki/Accounting_equation

- Equity has-property period of instant.
- **Structure**
 - Balance sheet has-part Assets.
 - Balance sheet has-part Liabilities.
 - Balance sheet has-part Equity.
- **Assertions:**
 - $\text{Assets} = \text{Liabilities} + \text{Equity}$
- **Facts:**
 - ABC Company is an economic entity.
 - Assets for December 31, 2019 for ABC Company is \$5,000 US Dollars.
 - Liabilities for December 31, 2019 for ABC Company is \$1,000 US Dollars.
 - Equity for December 31, 2019 for ABC Company is \$4,000 US Dollars.

The statements are not machine readable, but they could be². So above you see all of the statements that exist within this very basic example of a financial report that is comprised of a balance sheet that reports high-level facts that relate to the accounting equation.

Per all the statements, the logical system appears to be properly functioning. All the terms are defined as are associations, assertions, and facts. To be sure the point is being understood consider making two changes to the existing logical system.

Suppose that the value for the fact “Assets” was changed to say \$5,500. If that were the case, because there is an assertion that specifies that “Assets = Liabilities + Equity” and because of the values of Liabilities and Equity, the logical system would NOT be functioning properly. This is because $\$5,500 = \$1,000 + \$4,000$ is inconsistent with other supporting statements within the logical system. If that provided assertion, “Assets = Liabilities + Equity” did not exist, then the logical system would not be considered “complete” but the inconsistency would not be detected by automated processes.

However, since all the statements are provided and the statements are consistent with one another we can say that the logical system that is used to represent this very basic business report is precise and complete because (a) it does reflect reality given the statements provided and (b) no statement seems to be missing from the logical system.

Above we have verified the logical system using human-readable statements and the rules of logic. Now, let’s do the same thing using machine-readable information using the XBRL technical syntax.

² Wikipedia, *Attempto Controlled English*, https://en.wikipedia.org/wiki/Attempto_Controlled_English

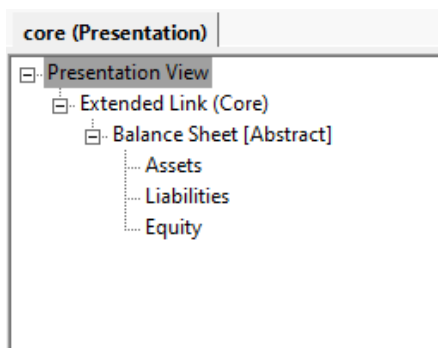
Here are the same statements provided above represented in XBRL including the facts³, terms⁴, associations⁵, and assertions⁶. There is not a 100% correlation to keep the example easy to follow. The XBRL can be processed using global standard off-the-shelf software. In fact, two completely different XBRL processing tools were used created by different software vendors and each software application provides the same results.

Software #1:

Terms and property associations: (provided by UBmatrix Taxonomy Designer, a commercially available product)

Prefix	Label /	Name	Data Type	Abstr...	Substitutio...	Balance	Period Type
core	Assets	Assets	Monetary	False	xbri:item	Debit	Instant
core	Balance Sheet [Abstract]	BalanceSheetAbstract	String	True	xbri:item		Instant
core	Equity	Equity	Monetary	False	xbri:item	Credit	Instant
core	Liabilities	Liabilities	Monetary	False	xbri:item	Credit	Instant

Structure: (provided by UBmatrix Taxonomy Designer, a commercially available product)



XBRL syntax validation report⁷:

XBRL Validation Report	
Severity	Count
Error	0
Warning	0
Inconsistency	0
Best Practice	0
Information	0
Total	0

³ XBRL instance, <http://xbrlsite.azurewebsites.net/2019/Core/core-audit/instance.xml>

⁴ XBRL taxonomy schema, <http://xbrlsite.azurewebsites.net/2019/Core/core-audit/core.xsd>

⁵ XBRL presentation relations, <http://xbrlsite.azurewebsites.net/2019/Core/core-audit/core-presentation.xml>

⁶ XBRL formula, <http://xbrlsite.azurewebsites.net/2019/Core/core-audit/core-formula.xml>

⁷ XBRL validation report provided by the commercial product XBRL Cloud, http://xbrlsite.azurewebsites.net/2019/core/core-audit/audit_validation_XRun.html

Assertions validation: (provided by UBmatrix XPE 4.0, a commercially available product)

Summary

Formulas Compiled	Formula Fired	Assertions Compiled	Assertions Fired	Assertions Satisfied	Assertions Not Satisfied
0	0	1	1	1	0

Assertion Report

Value Assertions

id	satisfied	message
ASSERTION_CORE_Equality_AccountingEquation (evaluation 1)	satisfied	\$Assets=5000 = \$Liabilities=1000 + \$Equity=4000

Software #2: (provided by XBRL Cloud Evidence Package which is a commercially available product)

Human readable representation⁸:

Balance Sheet [Abstract]	Period [Axis]
	2020-12-31
Balance Sheet [Abstract]	
Assets	5,000
Liabilities	1,000
Equity	4,000

Terms and associations⁹:

#	Label	Report Element Class	Period Type	Balance	Name
1	Core [Table]				(Implied)
2	Balance Sheet [Abstract]	[Abstract]			core:BalanceSheetAbstract
3	Assets	[Concept] Monetary	As Of	Debit	core:Assets
4	Liabilities	[Concept] Monetary	As Of	Credit	core:Liabilities
5	Equity	[Concept] Monetary	As Of	Credit	core:Equity

Facts¹⁰:

⁸ Human readable rendering, <http://xbrlsite.azurewebsites.net/2019/Core/core-audit/evidence-package/contents/index.html#Rendering-Core-Implied.html>

⁹ Human readable model structure, <http://xbrlsite.azurewebsites.net/2019/Core/core-audit/evidence-package/contents/index.html#NetworkStructure-Core-Implied.html>

¹⁰ Human readable facts, <http://xbrlsite.azurewebsites.net/2019/Core/core-audit/evidence-package/contents/index.html#NetworkFacts-Core-Implied.html>

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#	Reporting Entity [Axis]	Period [Axis]	Concept	Fact Value	Unit	Rounding	Parenthetical Explanations
1	GH259400TOMPUOLS65II (http://standards.iso.org/iso/17442)	2020-12-31	Assets	5000	USD	INF	
2	GH259400TOMPUOLS65II (http://standards.iso.org/iso/17442)	2020-12-31	Liabilities	1000	USD	INF	
3	GH259400TOMPUOLS65II (http://standards.iso.org/iso/17442)	2020-12-31	Equity	4000	USD	INF	

XBRL technical syntax validation¹¹:

Verification Summary		
	A	M
XBRL Technical Syntax Rules	OK	OK
Model Structure Rules	OK	OK
Business Rules	OK	OK
Roll Up Rules	NS	NS
Other Manual Review Tasks	NS	NS
Other Rules and Best Practice Tasks	OK	OK

Assertions validation¹²:

#	Label	Result	
1	Accounting Equation (Assets = Liabilities and Equity) (ASSERTION_CORE_Equality_AccountingEquation)	Pass	\$Assets = \$Liabilities + \$Equity

While a complete description of the logical model of a business report is provided in a complete narrative, we will explain the key highlights of the logical model using this very basic report to provided a high-level overview of the logical conceptualization of a business report.

An **information model description** is created for the **report**:

#	Label	Report Element Class	Period Type	Balance	Name
1	Core [Table]				(Implied)
2	Balance Sheet [Abstract]	[Abstract]			core:BalanceSheetAbstract
3	Assets	[Concept] Monetary	As Of	Debit	core:Assets
4	Liabilities	[Concept] Monetary	As Of	Credit	core:Liabilities
5	Equity	[Concept] Monetary	As Of	Credit	core:Equity

This very basic report has one **fact set**:

#	Reporting Entity [Axis]	Period [Axis]	Concept	Fact Value	Unit	Rounding	Parenthetical Explanations
1	GH259400TOMPUOLS65II (http://standards.iso.org/iso/17442)	2020-12-31	Assets	5000	USD	INF	
2	GH259400TOMPUOLS65II (http://standards.iso.org/iso/17442)	2020-12-31	Liabilities	1000	USD	INF	
3	GH259400TOMPUOLS65II (http://standards.iso.org/iso/17442)	2020-12-31	Equity	4000	USD	INF	

¹¹ Human readable report properties including validation, <http://xbrlsite.azurewebsites.net/2019/Core/core-audit/evidence-package/contents/index.html#ReportProperties.html>

¹² Business rules summary, <http://xbrlsite.azurewebsites.net/2019/Core/core-audit/evidence-package/contents/index.html#BusinessRulesSummary.html>

The fact set contains three **facts**. The facts are distinguished from one another using three **aspects**: reporting entity, period, and concept. The **fact value** is numeric and described by the **unit** and **rounding property**. The rendering is created

Balance Sheet [Abstract]	Period [Axis]
	2020-12-31
Balance Sheet [Abstract]	
Assets	5,000
Liabilities	1,000
Equity	4,000

CONSISTENT, PRECISE, AND COMPLETE:

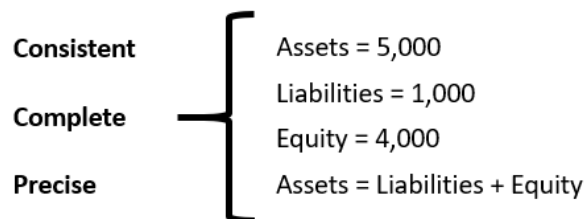
The logical system can be called properly functioning because all of the statements are **consistent** with one another, there are no contradictions, it can be established that the logical system created **precisely** reflects the reality of the logical system and all the statements seem to be included within the logical system so it is **complete**.

A software application can take all of the statements made within the machine-readable version of this logical system and perform work. Below you see a human-readable rendering of a balance sheet:

Balance Sheet [Abstract]	Period [Axis]
	2020-12-31
Balance Sheet [Abstract]	
Assets	5,000
Liabilities	1,000
Equity	4,000

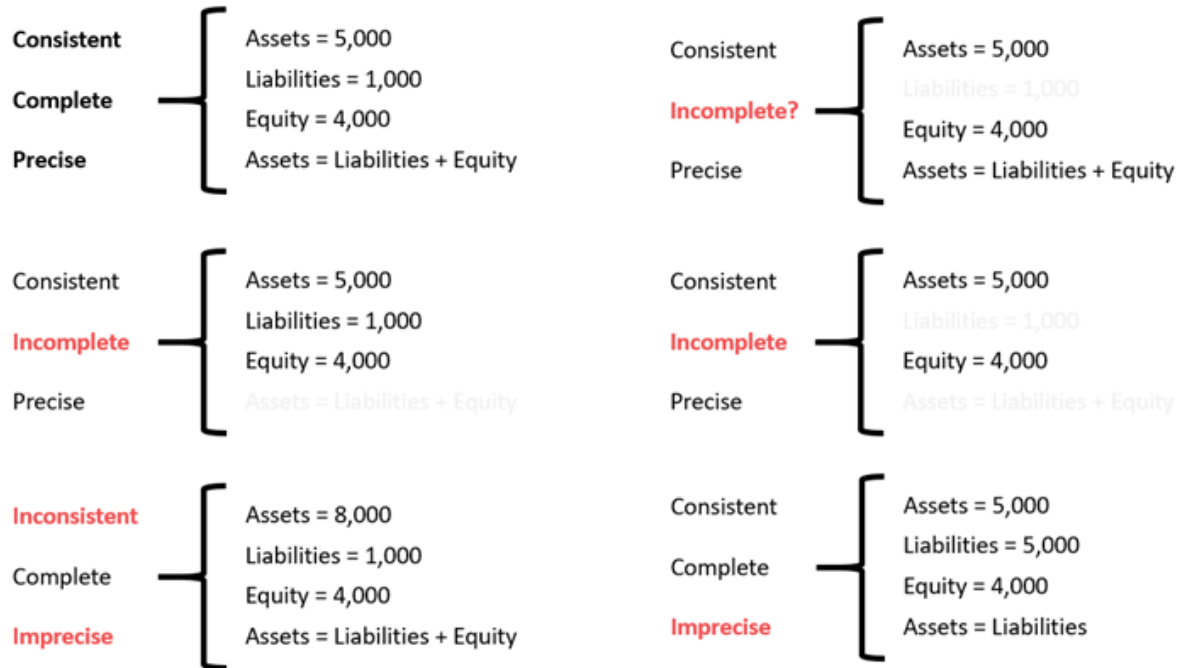
Result	Rule
Pass	$\$Assets = \$Liabilities + \$Equity$

The logical system of the accounting equation in this case is precise and complete because all the statements are consistent with one another:



Properly and Improperly Functioning Logical Systems

Below you can see examples of possible states of the accounting equation logical system. If a statement is left out, if one statement contradicts another statement, if statements are imprecise, etc.; the logical system is impacted.



Same Results Using SWI-Prolog

The same results were obtained when running the statements through an online Prolog processor, SWI-Prolog as can be seen below¹³.

Term	Entity	Period	Value	
<i>term(asset)</i>	<i>entity(id_GH259400TOMPUOLS65II)</i>	<i>period(2017)</i>	241086000000	1
<i>term(liabilities)</i>	<i>entity(id_GH259400TOMPUOLS65II)</i>	<i>period(2017)</i>	168692000000	2
<i>term(equity)</i>	<i>entity(id_GH259400TOMPUOLS65II)</i>	<i>period(2017)</i>	72394000000	3

<i>fact(Term, Entity, Period, Value).</i>	
<i>does_balance_sheet_balance(id_GH259400TOMPUOLS65II, 2017).</i>	
true	1

¹³ SWI-Prolog, <https://swish.swi-prolog.org/>

The following is the syntax used for the SWI-Prolog application:

```
term(asset).
term(liability).
term(equity).
structure(balanceSheet).
entity(id_GH259400TOMPUOLS65II).
period(2017).
assertion(does_balance_sheet_balance).

fact(term(asset), entity(id_GH259400TOMPUOLS65II), period(2017), 241086000000).
fact(term(liabilities), entity(id_GH259400TOMPUOLS65II), period(2017),168692000000).
fact(term(equity), entity(id_GH259400TOMPUOLS65II), period(2017),72394000000).

% rule Assets = Liabilities + Equity %
does_balance_sheet_balance(Entity, Period) :-
    fact(term(asset),entity(Entity),period(Period),Asset),
    fact(term(liabilities),entity(Entity),period(Period),Liabilities),
    fact(term(equity),entity(Entity),period(Period),Equity),
    Asset is Liabilities + Equity.

% QUESTION does_balance_sheet_balance(id_GH259400TOMPUOLS65II, 2017). %
% QUESTION fact(Term, Entity, Period, Value). %
```