True Value Framework

The True Value Framework (TVF) is a conceptual model designed to improve the efficiency, scope, reliability, and resolution of knowledge that populates end tools such as Confidence Accounting curves, amoeba diagrams/spider charts, and other types of sustainability mapping. It is based on semantic web technologies, which standardize and globally distribute data, resources, and algorithms to identify and evaluate relationships among True Value (TV) indicators.

The TVF will provide, and lay the foundation for, new knowledge for value, exchange, and interaction among fundamental (economic, environmental, and social) aspects.

The results of these new models will most likely be of initial benefit in planning for sustainable economies and to longer-term investors (pension funds and insurance institutions), but will also be of benefit to many of the fundamental aspect-contributing sources:

- **economic** and fiscal indicators, such as imports, exports, tax as well as GDP;
- **environmental** indicators, such as water use, carbon equivalent emissions, primary energy use, materials use, land and sea use;
- and **social** indicators, such as employment, income, education, and health.

Data from official sources, such as from a country's national accounts, can be matched with crowd-sourced data ranging from sustainability aspects that are important locally, to feedback from clients on products and services. Knowledge can be provided under a range of scenarios such as demographic developments, climate variation, differing tax regimes, and resource access and depletion. All data will be per unit dollar output, so that it can be related to economic output in monetary terms.

This information will reveal new investment opportunities, particularly for the longer term, that could not be seen as clearly, or at all previously.

The TVF responds to initial feedback from the Long Finance community about the pertinence of sustainable development knowledge for investment decisions. The TVF facilitates that every piece of information can be standardized and followed to its simplest relationship (semantic triplet). TVF algorithms can be adapted according to detailed input required by, for example, policymakers, business strategists, investors, fund managers, and guarantors.

The addition of a mutual distributed ledger (aka blockchain) to the TVF is likely to have a number of benefits, including a historical record of supply chain audits and source reliability and performance, while retaining anonymity if required.

TRUE VALUE FRAMEWORK

Version v1.1 (June 6, 2017)

ABSTRACT

The True Value Framework (TVF) is a proposed Semantic (RDF/OWL/SPARQL/etc.) conceptual model that standardizes and globally distributes data, resources, and algorithms to identify and evaluate relationships between True Value (TV) indicators.

The path to True Value (TV) addresses the concept that society's progress is better understood when considering internal, external, and longer-term values, risks, and impact of economic activity.

More specifically, TV attempts to clarify both inputs and outputs and their variable dependencies in an ever-ongoing effort to discover and develop stabilized, and therefore self-sustaining, states for any given *foundation class* (sector, resource, or location) whose stability depends on the state of all other foundation classes.

This document has been created to stimulate conversation and is not meant to propose any specific solution.

STATUS OF THIS DOCUMENT

If you wish to make comments regarding this document, please send them to secretariat@claritycoalition.net. All comments are welcome.

This document is not endorsed by any group. This is a draft document and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to cite this document as other than work in progress.

See the change history of this doc at https://github.com/baardev/truevalue/commits/master.

Applicable existing technologies and sources

The currently proposed TV model is based on three prerequisites.

1) **Network:** A trustworthy, distributed network of data resources and interactions between all known points of a supply chain and applicable resources.
2) **Data:** Unified access to existing, homogeneous, and disparate data sources. Collecting and storing of explicit and implicit crowd-sourced data.
3) **Modeling:** Dynamic relational mapping between the above and an API that allows for algorithm and application development using the above data.

Below are recommendations to satisfy each of the above requirements.

Network

Some of the challenges to the network, with potential solution discussion points, are as follows:

1. Have the ability to provide ubiquitous access to the data in as close to real time as possible.
    - Something like a blockchain could provide this. Access is extraordinarily easy. It is well defined, supported, and integrated, and globally updated in close to real time (minutes).
2. Ensure the integrity of the data on the network.
    - Blockchain confirmations provide this, but there would also be the need for some sort of peer review validation, but this would not exist on the network level.
3. Have built-in protection against monopolization.
    - This might be achievable if there was mining involved, a la Bitcoin. This item needs to be better reviewed.
4. Provide some sort of open audit trail of changes or transactions.
    - This is built into the blockchain. A transaction ledger would allow for the completely transparent auditing of how any particular value was arrived at.
5. Allow for easy development and integration into new and existing applications.
    - The majority of the network API would be compatible with Bitcoin's blockchain, or perhaps Ethereum's blockchain would be a better candidate.
6. Provide for the ability to use the network to dispatch requests for processing to the clients.
    - Ethereum-based blockchain has elements of this currently.
    - Ethereum has the advantage of a decentralized autonomous organization (DAO) allowing for a global, self-verifying network with intelligent nodes. In essence, the DAO is a global, decentralized computer. This is still a new technology, and given its rather large attack surface exposure, it is not without risk as of this moment.
    - This ability may be very useful in the network's ability to make NIRF requests (described below) via Ethereum's built in scripting language.

7. Provide some sort of symbolic value of proof-of-work to be used to enable, negotiate, and limit transactions, service requests, and data collection.

   - In short, this would be the equivalent of a dedicated TV cryptocurrency. TVCoins could be mined based on the generation of new metadata, for example, and used as a currency within the TV system much the same way pub/sub economies are used for content (Steemit, DeCent), but in this case, used for metadata.
   - Internal economy: There seems to be an opportunity to create a value exchange, a current, within TVF, that would, for example, reward the better algorithms, as well as providing a "proof of work" system that would deter abuse.

Data

The various types of data in the TVF can be classified into three types.

1. **Fact Stores**

   Both public and private sectors have numerous data sources that collect and disseminate many different types of data that can provide valuable factual input. As these data sources are effectively owned and operated by third parties, their data is not distributed, and is only as trusted as the compiling organization, and cannot be replicated.

   These are data stores typically from NGOs or governments that collect facts about industry, economics, health, etc. Examples of Fact Stores might be

   - World Bank Open Data Project (http://data.worldbank.org/)
   - CIA World Factbook (https://www.cia.gov/library/publications/the-world-factbook/).

   This data may in a traditional database format or in some type of *Symantec Store*, such as

   - http://dbpedia.org/
   - http://linkeddata.org/
   - https://data.world/

   They can even be the results of search engines, such as

   - Wolfram Alpha (https://www.wolframalpha.com/).

   The distinguishing feature of a Fact Store is that it is a source of facts that exists outside the TVF, and therefore typically read-only, and may require licensing to access.

2. **Generated Data**

   This is data that gets generated by algorithms that use the Fact Store data as input. The Generated Data may include manual editing or input from authorized editors.

   The distinguishing feature of Generated Data is that the data remains within the TVF, typically stored in triplet form.

3. **Crowd Sourced**

   This is data that is collected directly from participants, and (most likely) will be stored in the TVF like the Generated Data.

Implications of a Mutual Distributed Ledger

Some accounting systems already use blockchain integrated side ledgers (triple and other higher numbers of entry), such as Provenance, working with diamonds, gold, and timber. There is development work on this within the fishing industry as well. Most recently the shipping company Maersk, which has partnered with Chinese e-commerce provider Alibaba is now joining IBM in a widely celebrated effort to introduce blockchain technology. The supply chain process will be digitized from end to end to enhance transparency and the highly secure sharing of information among trading partners. Maersk says the process has the potential to save the industry billions of dollars.

For TVF, first we will make some assumptions:

- The data store does not store quantitative data, only NIRF-generated qualitative data.
- The data store stores Crowd-Sourced Data.
- The Ethereum-like data store has the ability to perform instructions, much like the way the Ethereum blockchain can execute logic with Solidity.

In addition, a mutual distributed ledger/blockchain offers the following advantages:

- Instant local real-time data from a thin client (web, desktop, mobile)
- Audit chain of data input
- Global distribution and data integrity
- Offline functionality (with thick client that mirrors blockchain)
- Verified user certification and access rights
- Some sort of transactionality with economic considerations, such as "cost of work," DRM/licensing for certain data.
- Contract settlements (mainly for local markets?)
- Relatively guaranteed not to become obsolete in the next 100 years
- Potentially self-funded
- Source of microfunding
- Third parties can create their own algorithms and reports, and have them distributed globally for either free use or pay-per-use.

Modeling

This modeling refers to how the data sources and the transaction record are both integrated and used to form meaningful indicators. Given that the data can be read-only, and the actual value and meaning of the data is both contextual and variable, what is needed is a framework that stores relationships between Generated Data or Crowd-Sourced Data.

The Resource Definition Framework (RDF) and the related Web Ontology Language (OWL) are the likely candidates as their entire purpose to store *semantic triples* — that is, two data points bound by a relationship. This semantic representation of knowledge allows the data to be unambiguously queried and reasoned about.

For example, the components of a *triple* might be SUBJECT->PREDICATE->OBJECT, so "The sky has the color blue." This consists of a subject ("the sky"), a predicate ("has the color"), and an object ("blue").

Given the resolution of this data, down to its simplest triplet form and with a number of interdependencies covered, traditional assumptions and constraints applied to business and project planning, and algorithms and footnote assumptions in financial accounts, may be refined or even eliminated.[1]

CHALLENGES

From a technical perspective, the challenge is to integrate existing data sources with a distributed transaction ledger via a framework that can represent that data in meaningful ways with regard to TV.

Various sectors have varying requirements.

- Businesses and governments need assurance of high governance standards, transparency, conflict resolution, collaboration, a model of self-governance, due diligence, demonstration of current and projected real value to stakeholders. There may be interest for long-term sustainability strategies where the financial sustainability of business models, and relevant information, is different from the wider sustainable development agenda. SMEs struggle with the cost of auditing/assurance/certification/etc. in which the TVF may need to facilitate automated self-evaluation and robust peer review.
- Identity is a fundamental enabler of trust, particularly for trade agreements, financial services, and investment decisions. Developed country regulations — e.g. Know Your Customer/Anti-Money Laundering (KYC/AML) — create burdensome challenges particularly for developing-country SMEs that are often unable to adequately prove identity and worthiness. At the opposite end of the spectrum, developed-country High Net Worth Individuals (HNWIs) struggle with the plethora of bureaucracy and paperwork involved in KYC/AML regulations. The solution to the polarized worlds of the "great undocumented" and the HNWIs may be the same — a mutual distributed ledger (aka blockchain) built on TVF to validate, record, and track TV transactions across a network of decentralized computer systems.
- Investment information needs to be in a form and scope required by investors, guarantors (including risk analysts), and traders. That is, investors and guarantors need detailed geographic information, whereas traders tend to seek information of wider coverage at global or regional levels.
- The indicators and information require inclusive work and a rational path at and between all levels, namely local, national, regional, and global governments and throughout supply chains.
- Meaningful input and output from "the crowd" needs mass interest and participation. This would most likely be achieved through applications and pub/sub economics, in that there would be a way for users to generate currency by participating, a la Steemit.
- All Generated Data requires a data and source confidence rating and an audit trail between so that all data can be traced back to its source.

[1] A topical and simple example is the standard asset debate of "unburnable carbon" in fossil fuel production. Asset values in aggregate, assuming that all carbon dioxide equivalent (CO2eq) PPM will never be met, would show up through the TVF knowledge populating Confidence Accounting ranges.

Technical Discussion

Three classes are used to create a metric capable of describing a position in the True Value Space. They are defined as LOCATION, SECTOR, and RESOURCE.

> *Note: Before continuing with these three foundation classes, it is interesting to note the similarity and interchangeability of these three classes with the three foundation classes of Game Theory, those being PLAYERS, STRATEGIES, and PAYOFFS.*
>
> *Specifically, how one can interchange LOCATION with PLAYERS, RESOURCES with PAYOFFS, and SECTORS with STRATEGIES and find remarkably similar parallels. Given the tremendous amount of Game Theory work done in economics and trade, it is not surprising to find parallels within global value indicators, and this seems to point to some potential in using Game Theory for decisions regarding TV indicators.*

Location

This describes the hierarchical tree of territories and follows the generally accepted geopolitical boundaries and authorities but can include any representation of an area, geographical coordinates, commonly accepted named for location (e.g. "Yellowstone National Park", "Disneyland"). Regions defined by an accepted parameter (e.g. "Sahara Desert", "North American Permafrost").

This is a static class in that it represents a fairly static dataset, for example, a tree of geographies.

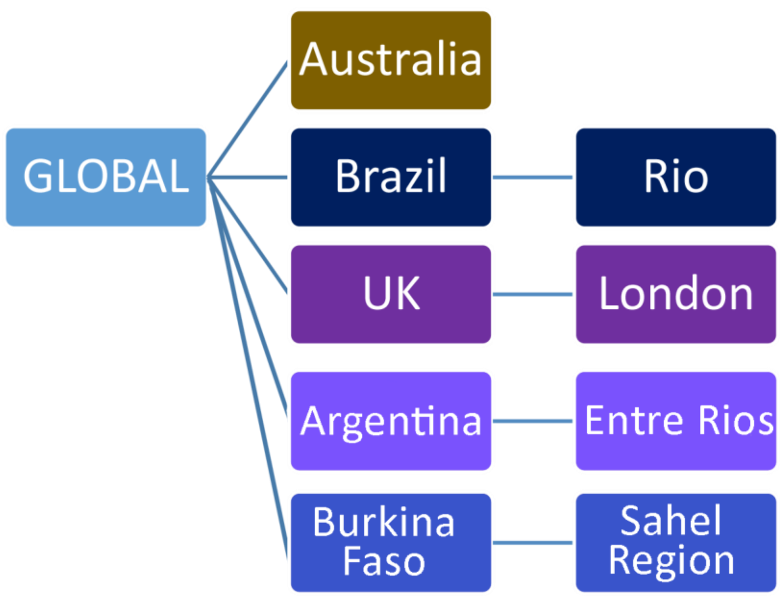


Figure 1

Product

This describes the hierarchy of various and common sectors that typically go into determining a region's GDP.

This is a static class in that it represents a fairly static dataset.

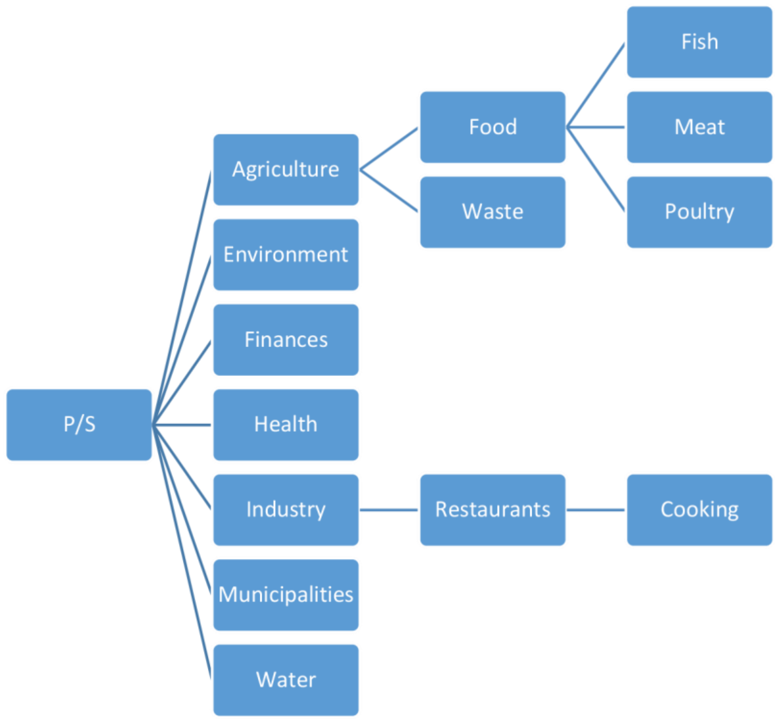


Figure 2

Indicators

This class represents the indicators that are used to measure various aspects of the Product/Location class pairs.

This is a dynamic class in that it represents data that is constantly changing.

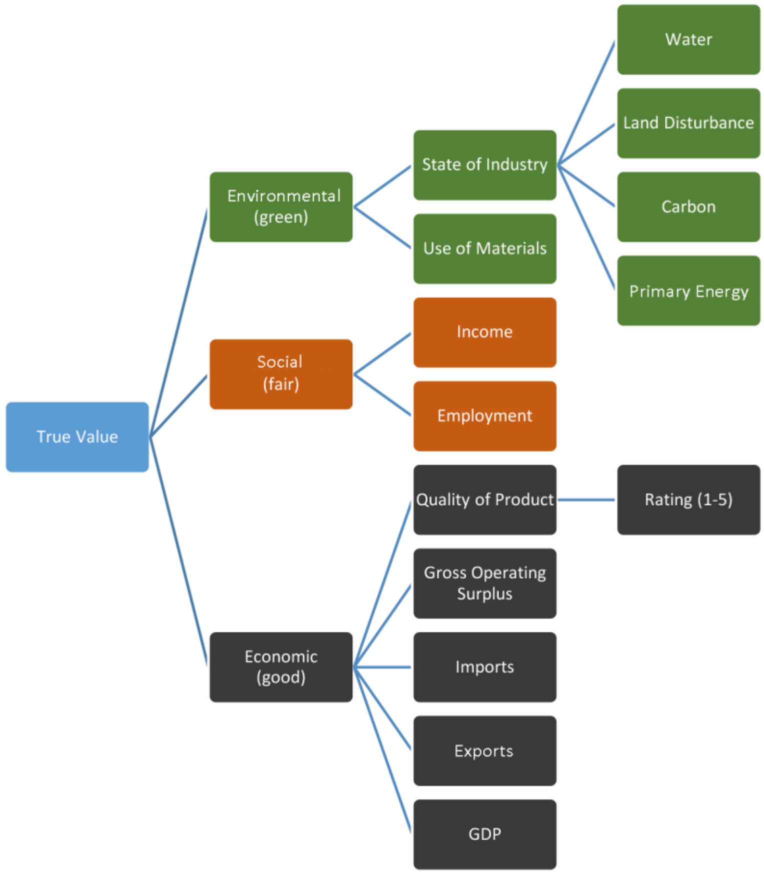


Figure 3

These can be reduced to three concepts, or classes. A typical RDF/OWL diagram might be:

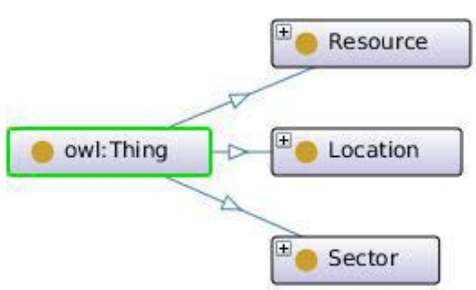


Figure 4

These classes can be instantiated to represent the real world. For example:

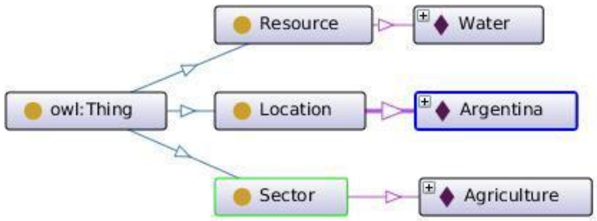


Figure 5

Or perhaps better, visually:

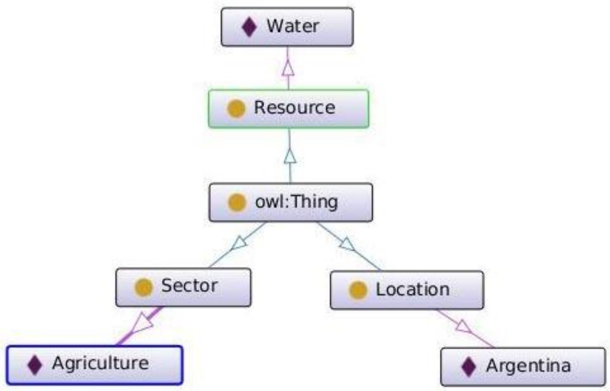


Figure 6

Relationships exist between classes and instances. For example:

`LOCATION produces SECTOR (which) consumes RESOURCE (which is) availableTo LOCATION`

And the inverse relationships

`LOCATION has RESOURCE (which is) consumedBy SECTOR (which is) producedIn LOCATION`

These relations would now look like (here I am using the RDFS classes but the RDF predicates):

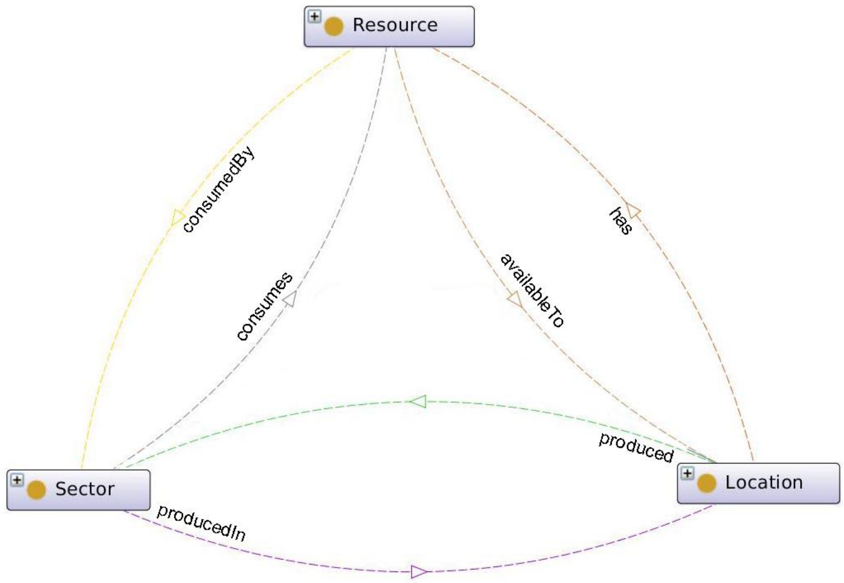


Figure 7

Or alternatively (here I use the proper RDFS ranges and RDF predicates):

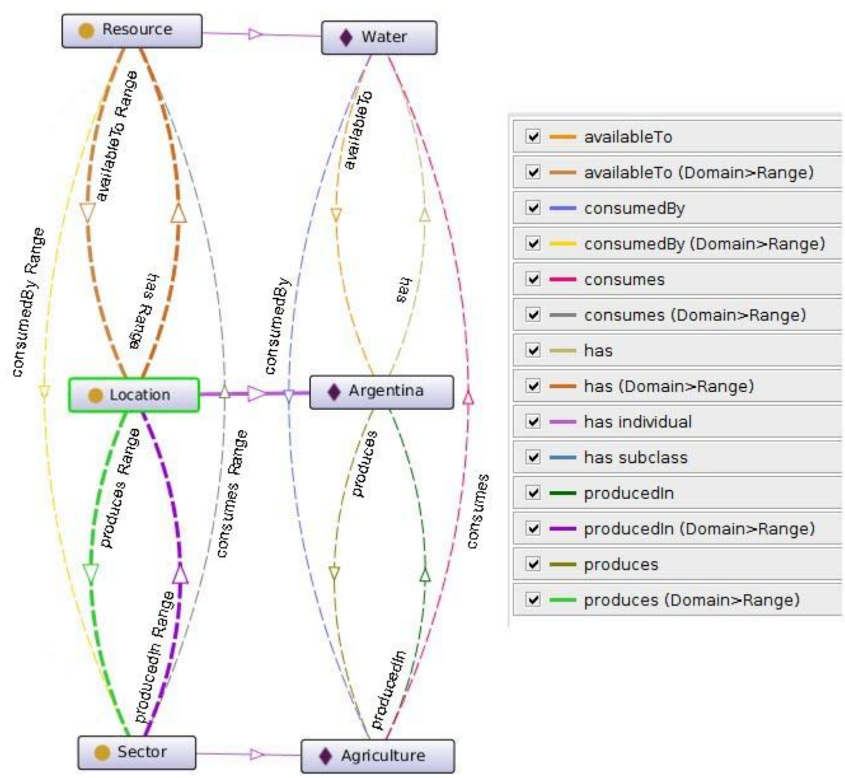


Figure 8

With these three classes, we can describe a True Value Indicator as the factorial product of three interdependent factorial products of [S]ector x [L]ocation x [R]esource.

The (turtle) definition then looks like:

```
:Argentina              :produces             :Agriculture.
:Agriculture            :consumes             :Water.
:Water                  :availableTo          :Argentina.
:Argentina              :has                  :Water.
:Water                  :consumedBy           :Agriculture.
:Agriculture            :producedIn           :Argentina.
```

Data values in the form of a rating (see below for more on the meaning of ratings) are assigned to data attributes of the same name as the predicate.

```
:Argentina              :produces             3.
:Agriculture            :consumes             4.
:Water                  :availableTo          2.
:Argentina              :has                  3.
:Water                  :consumedBy           5.
:Agriculture            :producedIn           2.
```

These ratings are the result of algorithms and moderators (discussed further below).

Running the basic following SPARQL query…

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX : <http://clarity.org/truevalue#>

SELECT DISTINCT ?s ?p ?o
WHERE {
        ?s :produces ?o
}
```

will produce the results…

```
Argentina               Agriculture
Argentina               3
```

However, within this trigram of triplets, statements can be made regarding any two of the three classes. We can make a statement about `(water OR agriculture) AND Argentina`, but we cannot say anything about `(water AND agriculture AND Argentina)` because any two classes are always out of scope to one necessary predicate.

To solve this, we take the two debiting predicates for Class X and apply them as inverse predicates to the credited class of each predicate, respectively (see Appendix A for more details).

```
:Argentina     :consumes      :Water
:Water         :produces      :Agriculture
:Agriculture   :availableTo   :Argentina
:Argentina     :consumedBy    :Agriculture
:Agriculture   :has           :Water
:Water         :producedBy    :Argentina
```

And these would have their associated ratings. For example:

```
:Argentina     :consumes      3.
:Water         :produces      5.
:Agriculture   :availableTo   1.
:Argentina     :consumedBy    2.
:Agriculture   :has           4.
:Water         :producedBy    2.
```

Running the same query as above, we now get

```
Argentina               Agriculture
Argentina               3
Water                   Agriculture
Water                   5
```

We know that the `3` applies to `Agriculture` because the only `:produces` predicate that connects to `Argentina` is `Agriculture`, therefore the only `:produces` data value that connects to `Argentina` must also apply to `Agriculture`.

We end up with the following graphs of debits and credits for each class. Note: This demonstrates only the resulting triplets from the original and first transformations as described, but not the third or fourth transformation, to save space.

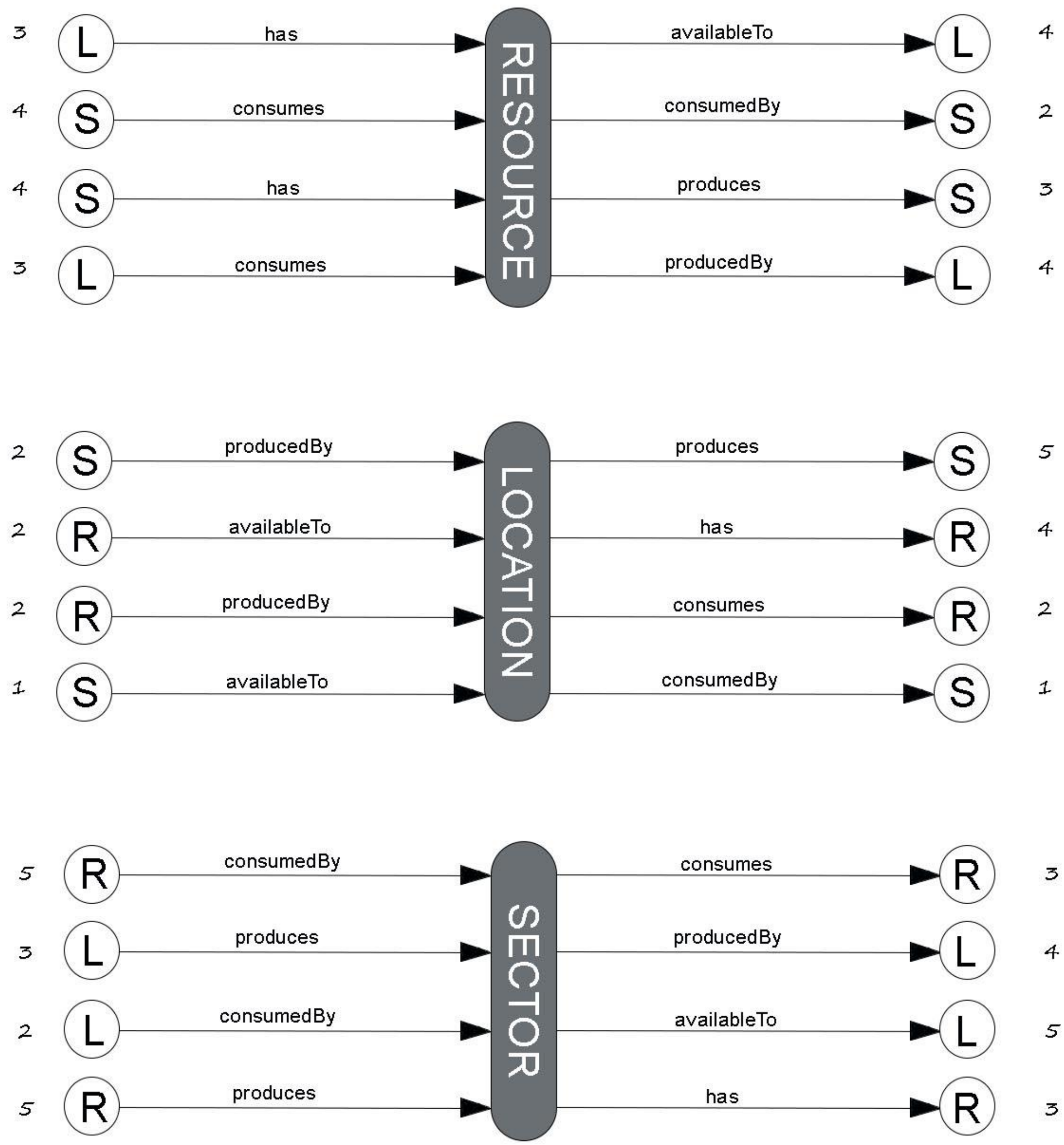


Figure 9

The italic values are examples of ratings that might be used for specific instances, such as RESOURCE=Water, LOCATION=Argentina, SECTOR=Agriculture.

A ‘2’ next to (L) → consumedBy → [SECTOR] would represent the rating given to how a location is consumed by a sector, such as how Argentina is consumedBy Agriculture (via land use and disruption, water use, etc.). These rating values are elaborated on below.

Now we can do some simple math. For example, we can apply an algorithm (in this case, a simple subtraction for column values and addition for rows) to all the grid values for all three classes.

LOCATION

SEC	2	5	-3
RES	2	4	-2
RES	2	2	0
SEC	1	1	0
	7	12	-5

RESOURCE

LOC	3	4	-1
SEC	4	2	2
SEC	4	3	1
LOC	3	4	-1
	14	13	1

SECTOR

RES	5	3	2
LOC	3	4	-1
LOC	2	5	-3
RES	5	5	0
	15	17	-2

We can see from the above that

- LOCATION = Argentina as in relation to SEC and RES = -5
- RESOURCE = Water as in relation to LOC and SEC = 1
- SECTOR = Agriculture as in relation to RES and LOC= -2

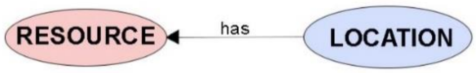
We now have three values we can use to get our answer**, 1-5-2 = -6**, which is the rating of **“water use in Argentina for Agriculture.”**

Were the parameters that define a value to be ordered according to a pattern, values outside the explicitly defined rating values (in this example, the numbers 1-5) could/would have implicit meanings. For example, “organelles” would be the natural precursor to the order of “cells, tissues, organs, organisms,” and “ecosystems” and “biospheres” would be natural succession.

Ergo, this -6 is not simply a grade. It represents a solid reasoning behind every step of the factoring process which can be audited, in that we can trace back the -6 to 1-5-2, and likewise trace each of those numbers back (1=(2-1+1-1), -5=(0-0-3-2), -2=(2-1-3-0)), and then again those to their component ratings. This is especially useful if a value is not a result of direct subvalues for a class; for example, if we did not have a direct value for water use in Argentina, but had to rely on the sum/average of all the values of water use in each province of Argentina in order to get a number for the whole of Argentina. This same logic applies to the elements of a province producing the value of a province’s rating for water use.

Zero Sum, Triple Entry

Each class pair is connected by a pair of predicates, which are inverse to one another. For example:



In this example, the predicates "has" and "availableTo" are inverse pairs. Each of these predicates has at least two values — `:realValue` and `:perceivedValue`. For now, we'll just focus on the `:realValue` data.

Question: Is it better to go zero-sum or high payoff? If combined, then a high payoff must equate to a low payoff for something.

Given the rating are values, then we have a simple double entry accounting system for each triplet, in that the `:realValue` for `:has` is a credit to RESOURCE and a debit to LOCATION. Likewise, the `:realvalue` for `:availableTo` is a debit to RESOURCE and a credit to LOCATION.

	DEBIT	CREDIT	
:has	LOC -4	RES +4	0
:availableTo	RES +4	LOC -4	0
	0	0	0

Each triplet needs to have its own rating scale such that the values used in the rating properly reflect the context of the triplet.

(The scope and complexity of rating systems can't be delved into here. See more in Appendix C, "Rating Systems.")

The ideal situation then is that the sum total of all debits and credits equals 0 (zero), in the same way a standard double entry accounting system is based on a zero-sum total. (This is already in place with Z/Yen and the external accounting system they have set up with blockchain.)

Any deviation from 0 will highlight an imbalance in either a triplet instance and/or the rating system for that triplet, and a 0 will represent what could be called a "Nash Equilibrium," which is Game Theory speak for a condition that is in no one's better interest to change.

In this example below (and a poor one at that, as I am not qualified to make such a scale), I have assigned the definition of the rating value 0 to 5. These are highlighted in green, and represent the only values that are allowed to be explicitly used to rate something, anything. The red highlighted values are those that can be the factored results. It is impossible to state in advance what the values of negative ratings would be (and I use clearly ridiculous examples here) as they would require observation of the actual consequences. However, it is worth noting that in the best/worst-case second-order factorials, there is a range of -60 to 60.

These values can be either absolute or relative. In the latter case they could map to standard measurements from, for example, "Business as Usual" (Sustainable Development Goals) for climate trajectories (see http://www.cjwalsh.ie/tag/business-as-usual-bau-trajectory/).

5 = Resources replenished

4 = Best practices in place

3 = Modern realization procedures

2 = Industrial development level realization

1 = Pre-industrial realization

0 = No attempt or effort to realize resource

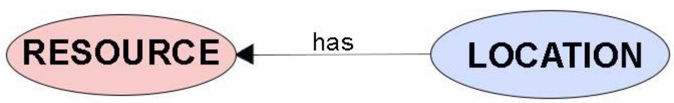
-1 = Existence of resource causing minor problems

-2 = Resource causing social, political, economic challenges

-3 = Resource threatening existence of state

-4 = Resource making people extremely stupid

-5 = Resource turning people into brain-eating zombies



5 = Resource undepletable

4 = Primary source of resource

3 = Secondary source of resource

2 = Resource realizable

1 = Resource too slight to realize

0 = Resource does not exist in location

-1 = Existence of resource should be discouraged

-2 = Resource will result in social, political, economic challenges

-3 = Resource could spur conflict

-4 = Resource known to make people extremely stupid

-5 = Resource should be exported to enemy states

Where do these grades come from?

Ideally, people or agencies with the knowledge and skill to produce such a grading scale will help to not only create such a scale, but also to apply the rating to the triplet in question.

> *Note: This is one area where the blockchain might come in handy to store triplets and their rating. A rating, which will be represented as a transaction, will be associated with an address, and that address can point back to the person, party, or algorithm responsible for that rating. Of course other stores could do this, but there is a clear advantage in the open transaction records on the blockchain, as well as the idea of an exchange in value for each of these transactions.*

This data can then be displayed over time or in numerous ways to shed light on critical factors. For example, in Figure 10 below, we show two values that change over time — the yellow band represents the quantitative data accumulated from the systems described here, and the green data represents the public's perceptions (from semantically queryable sources like social media, and explicate and implicate sources) of that same data — thereby showing the delta between the reality and the perception of the True Value indicator.

Figure 10: Example of data over time

Where does this data come from?

The data that makes up these grades comes from the many existing data stores, some previously mentioned, that hold volumes and volumes of data, much of it untapped. This data is queryable via APIs, DR2Q interfaces, SPARQL endpoints, and other methods.

The problem is less about getting the quantitative data from the family farmer to a country, although that still poses a challenge of scale, but what the qualitative values of that data mean.

Using a set of rules, assumptions, algorithms, and other techniques, we can return a value that is represented on a scale specifically created for that which is being measured, referring back to the rating scale mentioned above. The values that are returned from the functions that use various inputs would then represent the normalized values for various indicators.

NIRFS

A NIRF (Normalized Indictor Return Function) is a function that queries relevant data, processes that data, and returns a normalized value contextually relevant to the rating or analysis system that the TVF uses. Typically, these queries would use a combination of a query language (such as SPARQL and SPARQL endpoints) and a programming language (such as PROLOG), which can perform logic and possibly incorporate some AI-like features. A NIRF is essentially a REST API call, with the URL being stored as a property that applies to the context in the TVF.

These functions should exist in the blockchain itself, so as to be incorporated into the globally distributed processing capabilities of an Ethereum-like network.

An example of this might be, in determining the quality of water use for growing potatoes in Argentina, a NIRF could discover, from official sources, the amount of water used in an area and the amount of potatoes harvested, and thus determine the amount of water used per potato. The NIRF could then compare that number from both the reported national average and the calculated national average. It could also look at the change in availability of water, cost of water, type of water used (green, blue, or gray), and other factors, to obtain a single value selected from a predetermined scale. An example of such a scale might be similar to the one used by Pisces RFR, a rating system created to gauge the sustainability and quality of England's fishing industry.

API

Using the trigram allows for a standardized HTTP API nomenclature that is quite simple.

```
Protocol://domain/service/SECTOR/LOCATION/RESOURCE
```

```
http://clarity.com/APIO/potatoes/water/argentina
```

It should not matter in what order the instances are placed, so the following URLs should all result in the same return values.

```
http://clarity.com/APIO/potatoes/water/argentina

http://clarity.com/APIO/water/argentina/potatoes

http://clarity.com/APIO/argentina/potatoes/water
```

Ambiguity

The problem with the above example is that there is seeming ambiguity as to which "subject" is being referred to. For example, "poultry" will exist in a number of paths, such as "land disturbance" and "water."

In the cases where ambiguity exists, the NIRF will consolidate all the "poultry" nodes that are relevant to "carbon" and "London."

NEXT STEPS

1. Get feedback from Malcolm MacGarvin and Project Fish Face (automated fisheries data collection via video cameras and AI), for possible TVF initial trials.
2. Get Informal feedback from Michael Mainelli (http://www.zyen.com/now-and-zyen/5-people/67-michael-mainelli.html): Are we on the same page? Would ChainZy-Metrognomo benefit from adaptation as above if the blockchain part of Metrognomo is not Ethereum?
3. Get ideas from Matias (Bitcoin developer, AR/BTC bank interface) about potential for building cryptocurrency into TVF "knowledge bank" value.
4. Get informal feedback from industry leaders in semantics (such as http://www.cambridgesemantics.com/about-us/team/sean-martin) including TVF versus commercial interface.
5. Get feedback from the Clarity Coalition project leaders to incorporate TVF development into projects aimed at:
    - Institutional investors (Focus Energy, Water, Cities and Communities)
    - West African economies (Focus Energy, Water, Food Nexus, local FNS)
    - Fisheries and food industry (automated data collection and chef/peer evaluation)
    - India's Development Alternatives (job creation through green technologies).
6. Set third meeting with World Bank, as partner to approach IBM.

APPENDIX A — IMPLICIT INTEGRITY

For example, the two debiting predicates for `SECTOR` are `producedIn` and `consumes`. Therefore, we apply them as inverse predicates to the credited class of each predicate, respectively, such that `consumes` credits `RESOURSE` and therefore must debit `LOCATION`. Likewise, `producedIn` is applied as a credit to `LOCATION`, and therefore must debit `RESOURSE`, so we apply the `consumes` predicate as a credit to `RESOURCE` but from `LOCATION`.

The reasoning behind this is as follows.

We have three classes, L, S, and R, which for simplicity in some examples we will refer to as 1, 2, and 3. We have three neutral predicates A, B, and C, each of which has two inverse meanings, which we will refer to as A and A_1, B and B_1, C and C_1. Each pair represents a debt and a credit to either the subject or the object that they are predicates for.

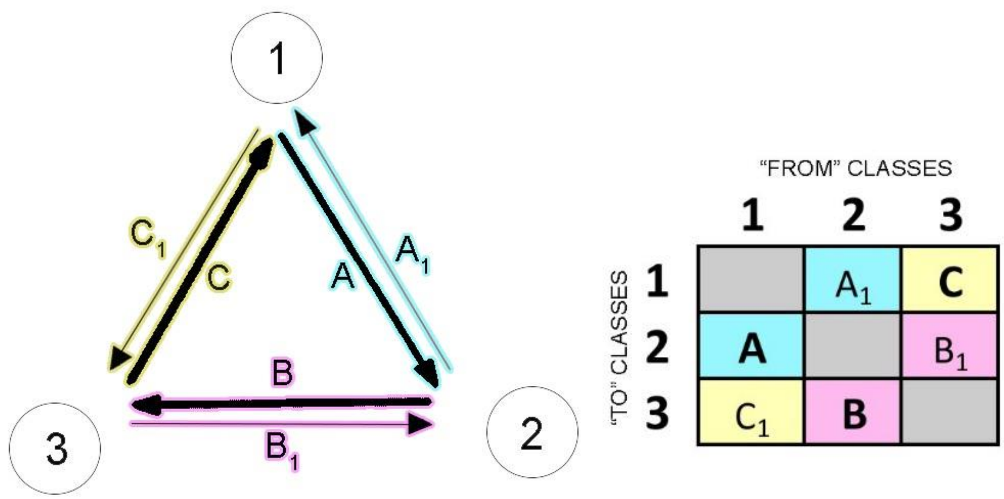
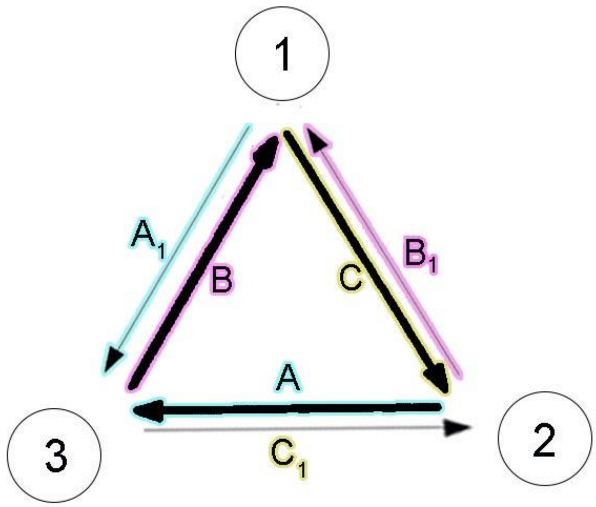


Figure 11: Original trigram (trx-1)

It can be seen that there exist classes that have no predicate relating them, and predicates that cannot "see" other classes. These are "blind predicates" that prevent all the classes from interrelating with one another.

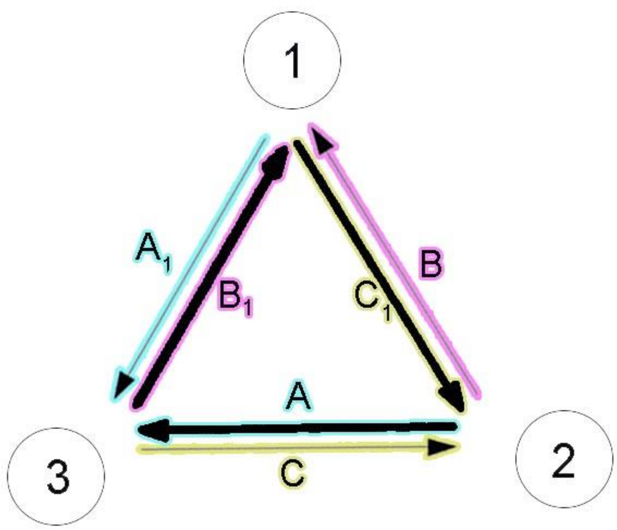
If we then apply the above rule described at the beginning of Appendix A, we get another order of relationships expressed as the following.



"FROM" CLASSES

"TO" CLASSES	1	2	3
1		B_1	B
2	C		C_1
3	A_1	A	

Figure 12*: First transformation (trx2)*

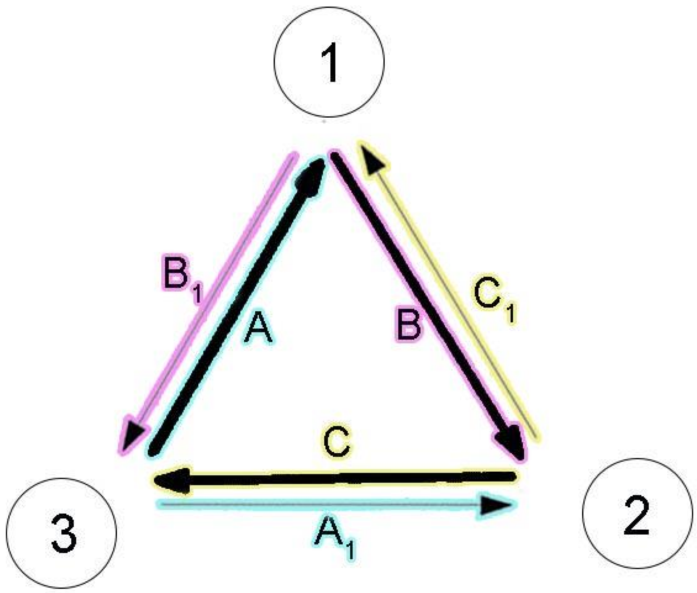


"FROM" CLASSES

"TO" CLASSES	1	2	3
1		B	B_1
2	C_1		C
3	A	A_1	

Figure 13: Second transformation (trx-3)

Consequently, to get all the predicates (or at least one predicate (A/A_1,) of a super-predicate ([A]), from which the other predicates can be deduced), we need the following transformation.



"TO" CLASSES \ "FROM" CLASSES	1	2	3
1		**C_1**	**A**
2	**B**		**A_1**
3	**B_1**	**C**	

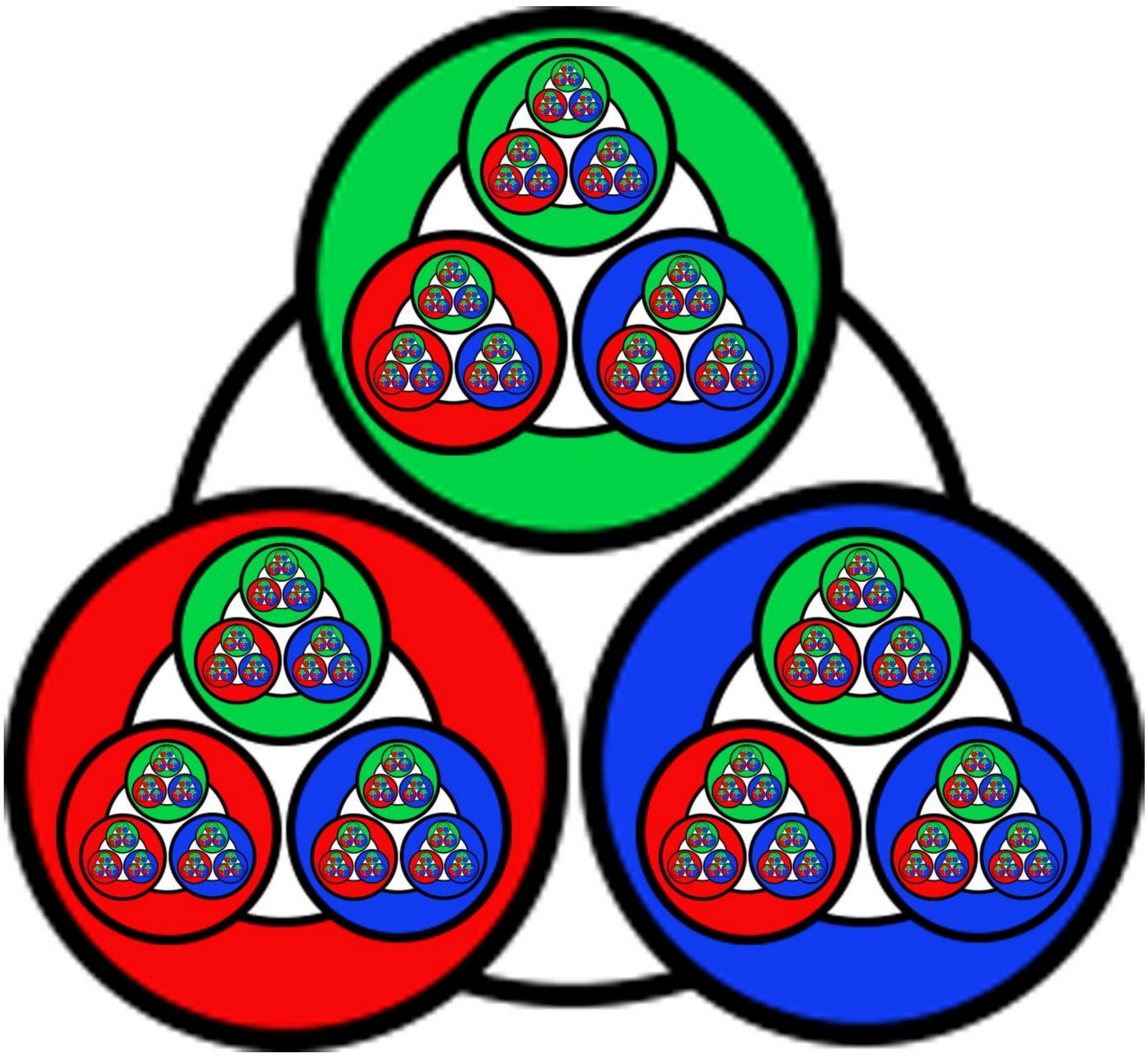
Figure 14: Resulting trx to obtain all predicate exposure (trx-4)

Combined, we get a grid that covers all possibilities.

	1	**2**	**3**
1		A_1 **B** **C**	A_1 B1 **C**
2	**A** B_1 C_1		**A** B_1 **C**
3	**A** B_1 **C**	A_1 **B** C_1	

APPENDIX B — GRAPHIC MAP

Because we have a self-similar map of the same three classes, we end up with a very fractal description of what I refer to as a Trigram Map, displayed below.



Note: See Dr. Mesquita's research on the Game Theory prediction and AI.

APPENDIX C — RATING SYSTEMS

Initiatives to measure indicators, and distinguish and rate performance of countries, industries, companies, products, and services have been evolving for decades. Mainstream investment decisions, most importantly from institutional investors such as pension funds and insurance institutions, are largely driven by credit ratings AAA and below, assessed by agencies such as Standard and Poor's, and Moody's.

In turn, entire economies are affected, through access to low interest credit, which generally decreases as the rating decreases. Both environmental and social certification schemes, such as Fair Trade[2], FSC[3], and the Rainforest Alliance[4] (for paper and other wood products), and MSC[5] (for fish), require indictors for industry performance to reach a 'best practice' level to achieve a Trade/Eco label. More recently, global data analysis on resource use and environmental impact such as by the Global Footprint Network, collaborated with the United Nations Environment Programme Finance Initiative (UNEP FI) on the incorporation of environmental, social, and governance factors (or ESG) in risk analyses and credit rating — a concept UNEP FI[6] pioneered in the 1990s.

At a local level, partners of the Clarity Coalition have embraced the rating of sustainability from a multidisciplinary perspective as well as the recognition that consumer choices, and thus business decisions, are still largely driven by issues such as quality of experience for the client, value for money, and the lowest price.

One example project is *Pisces RFR*[7], started and by Clarity's Malcolm MacGarvin in 2004. *Pisces RFR* rates the quality, environmental sustainability, and fair trade of freshly caught fish from inshore fishing boats in the UK, and sold to London sushi and other restaurants. The scoring (rating system) applies a simple 1 to 5 worst to best five-point score for categorizing both quantitative and qualitative data and information.

The Sustainable Tourism Distinction System (STDC), pioneered for Patagonia by the environmental organization WWF and ING Bank in 2006, and led by Clarity's Sarah Jones, did a comprehensive review of all certification and rating systems at the time. The system combines important economic, fiscal, social, and environmental indicators that correspond to global reporting and within legal frameworks, but also draws on locally important information of culture and economic/social/environmental tradeoffs to choose locally important indicators. A further aspect of the STDC is the process and due diligence of data collection and assessment (self-assessment, peer review, third-party auditing, governance, etc.). A key aspect of due diligence is cost for SMEs, e.g. of external auditing, where a framework to provide traceable peer review may be preferable and even economically critical.

In 2012, PricewaterhouseCoopers — a leading member of the World Business Council for Sustainable Development (WBCSD), as well as Clarity's partner for the project *Future Business, Long Finance* —

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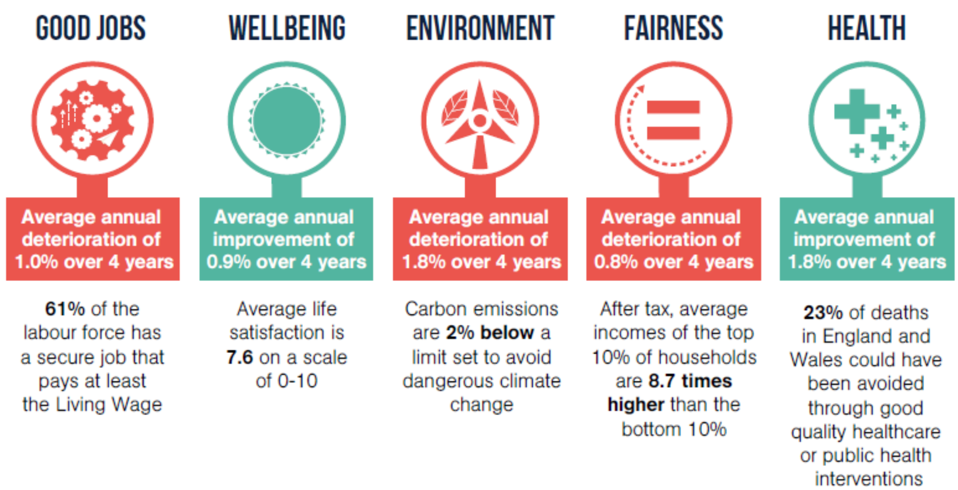
[2] https://www.fairtrade.net/
[3] https://ic.fsc.org/en
[4] http://www.rainforest-alliance.org/business/forestry/certification
[5] https://www.msc.org/
[6] http://www.unepfi.org/
[7] http://www.pisces-rfr.org/UK/Home.html

developed a Total Impact Measurement and Management Framework for achieving multi-sectoral knowledge for economic, environmental, social, and fiscal (tax) performance.

Finally, the New Economics Foundation (NEF) proposed "Five Headline Indicators of National Success,"[8] shown below.



Related Links

- Ontology for FAO: http://www.fao.org/faostat/en/#data
- Clarity's Allograph server: http://hd23324.mine.nu:10035/
- Clarity's SPARQL endpoint: http://hd23324.mine.nu:3030/
- MVP Indicator spider chart: http://hd23324.mine.nu/gui.php
- Time delay of spider chart: https://github.com/baardev/truevalue/blob/master/images/timespider2.gif

Further Research

- "Linking the Semantic Web with Existing Sources": https://pdfs.semanticscholar.org/098e/0b6a16f397837a31be9331820ffd4e075ccd.pdf
- Karma: A Data Integration Tool: http://usc-isi-i2.github.io/karma/

[8] http://neweconomics.org/2015/10/five-headline-indicators-of-national-success/