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A library of systemic relations

Sevaldson, Birger

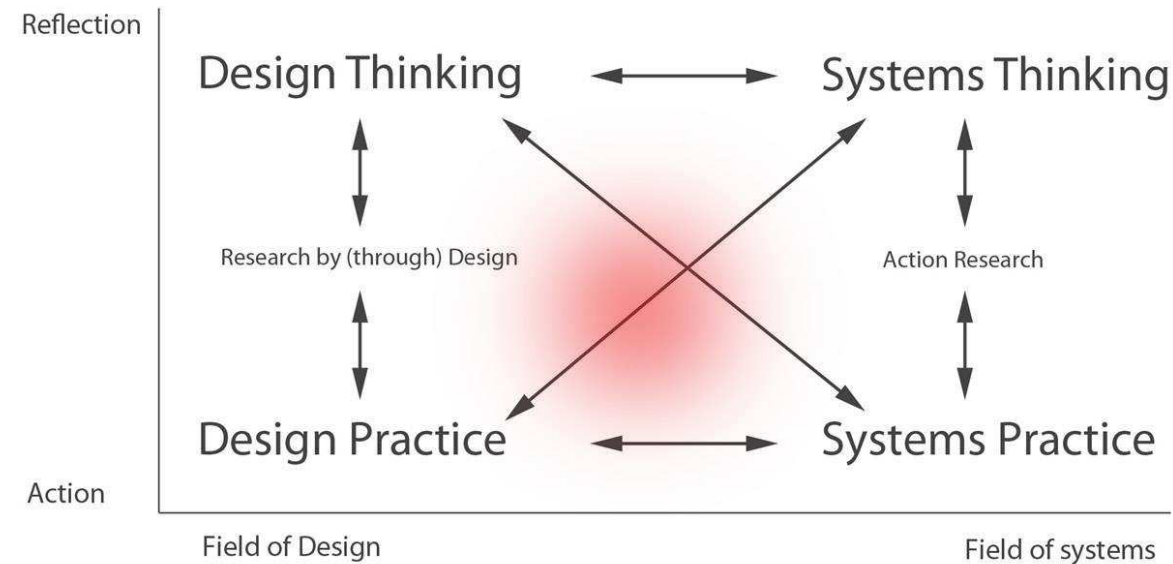# A library of Systemic Relations

Birger Sevaldson

www.systemsorienteddesign.net

Presentation

RSD5 Symposium

Systemic Design for Social Complexity

Relating Systems Thinking and Design (RSD5) Symposium
OCAD University   Toronto, Canada   October 13-15, 2016

SOD

Systems Oriented Design (SOD) is a dialect in the emerging field of Systemic Design.

It is maybe the most designerly and practice oriented approach.

The red blurry dot in the diagram below shows SOD being off center, closer to design and closer to practice.

Reflection

Design Thinking ⟷ Systems Thinking

Research by (through) Design   Action Research

Design Practice ⟷ Systems Practice

Action

Field of Design   Field of systems

(Birger Sevaldson 2013)

There are many resources on
www.systemsorienteddesign.net

The Library of Systemic Relations
and other concepts, tools and
approaches are found there.

(Birger Sevaldson 2006-)

PRAXIOLOGY

Cross, N. (1999). Design Research: A Disciplined Conversation. *Design Issues*, *15*(2), 5–10.

Praxiology in the sense I use it has its main references in practice.

Externalised practice knowledge.

Combination of theories of practice, experience, skills, tacit and explicit.

The expressed competence how to go about things in the world.

Phronesis: Practical wisdom. The ability and intellect to act in the world.

Praxiology example

Comparing the conceptions of relations from a traditional system dynamics model with a praxiology approach to relations.

Here an example of a systems dynamics model.

The relations are quantifiable. There is a limited and formalized way of describing the relations.
The basic model is the concept of positive and negative relations.
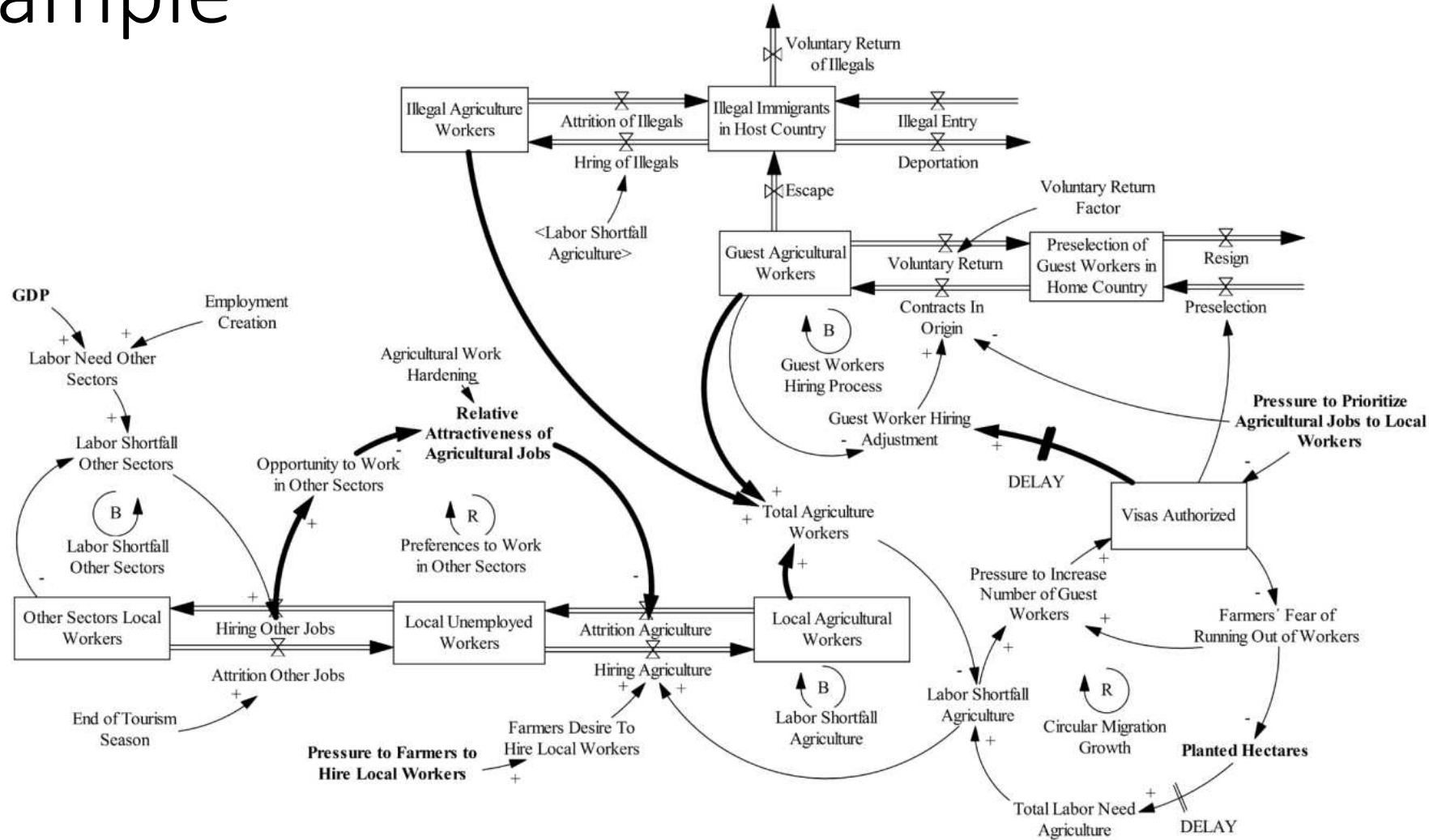
The Dynamics of Circular Migration in Southern Europe: An Example of Social Innovation - http://www.rafamara.com/blog/the-dynamics-of-circular-migration-in-southern-europe-an-example-of-social-innovation/ (

(Rafael Maranon)

In contrast to the Systems Dynamics and other traditional systems models, the Library of Systemic Relations is mapping out the many different types of relations we could imagine or conceptualized, without considerations if they would fit into one or the other systems model. These include quantitative and qualitative relations. The library also includes relations that are not easily depicted graphically with nodes and connectors.

The next image shows an example of using the Library. This example also demonstrates the challenges we meet when looking deeper into the nature of the connectors.
Note: The black connectors are unclassified.

1.2 SEMANTIC (Semiotic), THEMATIC, ASSOCIATIVE AND REPRESENTATIONAL RELATIONS (BLUE) (ATR)

1.2.1. Semantic relations (SR):

Semantic relations are entities being connected through a sentence where a word is forming the relation. Example: Fish - lives in - Water. Fish and water are the entities, lives in is the relation connector.

Cow - is a - mammal

See more here >>>>>

1.2.2. Categorical relations (CR):

Categorical relations are entities being part of the same thematic field or category. Themes and categories are manmade sorting devices and there is not necessarily e.g. a causal relation between members of a category.

Note: Categorization has its own problems especially with bordaer line cases and items that fit into multiple categories. See also thematic relations as the term is used in linguistics.

Example: the relation between Universal Design and Ergonomics
Example: Genres of music. There are many possible relations between genres of music but if we think of the relation between the music of the Australian aborigines and a symphony by Bach we can only think of very few like biological (music being programmed in our genes) and thematic relations (both being music).

1.2.3. Associative relations (AR):

Metaphors and analogies: These are the types of relations that pop up in brain storms by associations.

EuroVoc definition: The **associative relationship** is a relationship between two concepts which do not belong to the same hierarchical structure, although they have semantic or contextual similarities.

Example: If two people are very similar to each other in their look there is an associative relation.
Example: If I say bird, you say fish....

http://www.systemsorienteddesign.net/index.php/giga-mapping/types-of-systemic-relations

types of systemic relations

In our work we realized that we need to keep more attention to the relations. A simple line or arrow or a plus or minus like in casual loop diagrams is not sufficient. Therefor i developed this list of possible types of relations. It is probably incomplete and needs development.

The colours are suggestions for colour coding arrows or lines in a diagram. In addition to these one should use differentiation of fonts for lines and one should also label relations with descriptions.

Birger Sevaldson

greens:
structural relations hierarchical supra & sub systems

str — Structural relations (Functional relations)
Very often systems are described as the assembly of parts where the sum is more than its parts. This is not a cause effect relationship but structural relationship. Example: there is not a causal relationship between the wheels and the frames of a bicycle in the sense that e.g the frame decreases if the wheels increase. They are assembled in a structure

msr — Macro systemic relations
Relations that are caused by the entities being subsystems by the same "supra-system" but without necessarily being inn direct contact with each other. Example: Bikes and cars are related because they are sharing the same macro system: the roads. (They are related in additional ways than this) Example: The winter coat and the bikini are both part of the clothing wardrobe of the same person.

where they generate together a surplus output. The whole is more than the sum of the parts. Example: The relation in the air traffic system between the planes and the control system. The amount of planes do not automatically decrease if the control system is reduced. It only happens through institutional regulations.

misr — Micro systemic relations
Systems that are related through a sub system. Example: A Mixmaster and a hair dryer can share similar electronic parts from the same manufacturer.

blues:
associative semantic & thematic relations

tr — Thematic relations
Thematic relations are entities being part of the same thematic field or category. Themes are mammade sorting devices and there needs not necessarily to be e.g. a causal relation between members of a theme. Example: the relation between Universal Design and Ergonomics

Example: Genres of music. There are many possible relations between genres of music but if we think of the relation between the music of the Australian aborigines and a symphony by Bach we can only think of very few like biological (music being programmed in our genes) and thematic relations (both being music).

rr — Representational relations
Images, representation, videos, simulations, AR
Example: The relation between a map and a landscape

ar — Associative relations
Metaphors and analogies: These are the types of relations that pop up in brain storms by associations.
Example: If two people are very similar to each other in their look there is an associative relation. Example: If I say bird, you say fish....

yellows:
social relations

ssr — Structural social relations
Example: Family, friends etc

isr — Institutional social relations
Example: Work, municipality, nation, culture, language etc.

asr — Actions
Social relations created through action
Example: Sharing political interests.

reds:
hard relations, casual relations, flows etc

cr — Causal relations
Cause and effect models: The nodes depict what entities causes an effects and what entities are being affected while the relations (normally arrows) depict the effect. Example: If the heat is turned on the kettle starts to boil Example: If the tolls for entering the city by car increases the passengers on public transportation go up.

qcr — Qualitative Causal Relation
The amount or intensity will not be influenced but the quality will be changed Example: The relation between architectural space and micro climate

crt — Tools
Tools are typically modifying and influencing the relations and not the entities directly. Example: AR used to increase cultural understanding of biological systems.

fhs — Associative relations
1.3.2. Flows in human systems
These are the concrete flows of values in our society. They are driven by needs and economic forces.
Examples related to human society: Material flows, Energy flows, Information flows, Economic flows. Stock markets. Examples: Traffic flow, crowding of people.

fns — Flows in natural systems
These are driven by pressure differences (field conditions) and/ or by nuclear processes. On the high level these might be understood as causal relations, but on a detailed level they need to be understood as differentiations in uniform fields, like e.g. flows in water. They are caused by heat

ncr — Negative relation
If node A increases, node B decreases
Examples: The fox and rabbit example, (this tends to a self stabilizing system)

pcr — Positive relations
If node A increases, the node B increases or if node A decreases node B decreases:
Example: The increase of profit on the stock market leads to the increase of the amount of traders.

impact causing internal differentiation of pressure, but the shapes of the flows themselves are generated by internal chaotic principles resisting simple cause effect analyses.
Examples related to natural phenomena: water, air, magma, cosmic particle flows etc.

SYSTEMS ORIENTED DESIGN
OCEAN Design Research Association

AHO — Arkitektur - og designhøgskolen i Oslo

(Young Eun Choi, Birger Sevaldson, 2013)

One of the most common misconception is that there is only one relation between two nodes. Normally we can identify several connections between two nodes.

As designers we can exploit graphics to distinguish relations and to describe different features of the relations.

Line weight can indicate importance.

Dashed lines could indicate relations that are not always active. A gradient could indicate unequal importance of a relation. (Your relation to your bank might be important to you but hardly makes a difference for the bank)

Also Boundary conditions could be treated graphically to indicate resistance and other qualitative features of the nodes
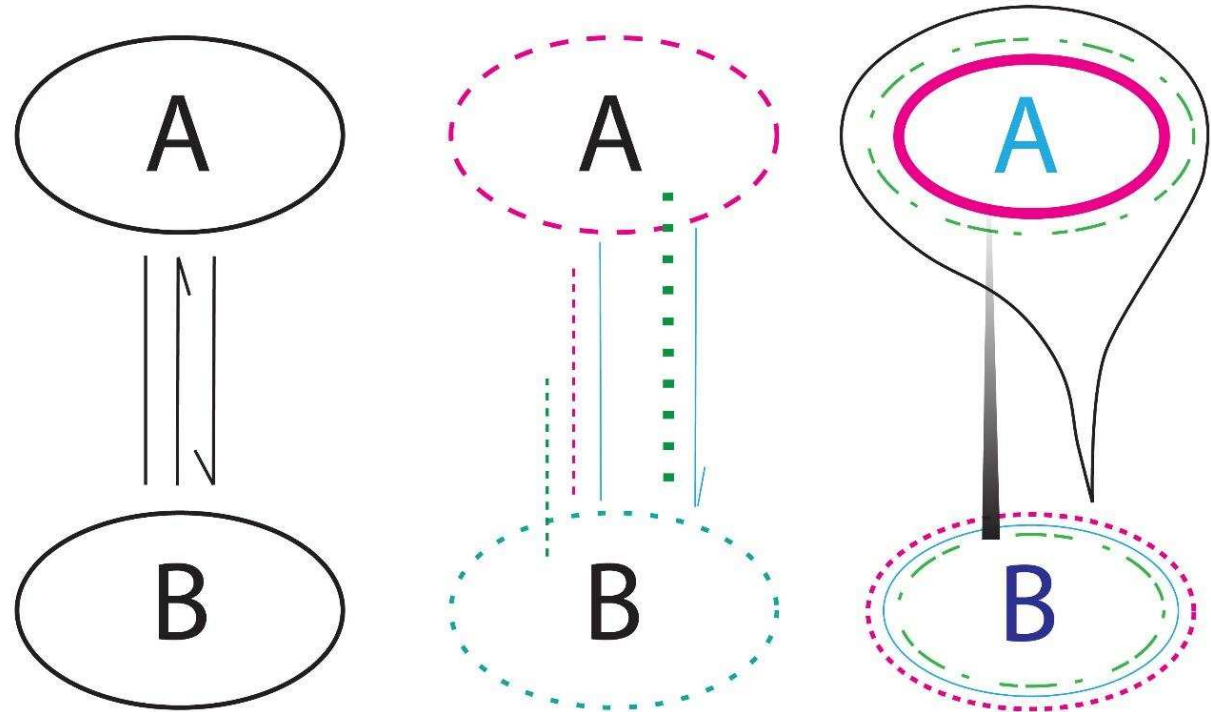
(Birger Sevaldson 2001- 2013)

The "Grandmother Diagram"

Obviously a mutual relation

(Birger Sevaldson 2016)
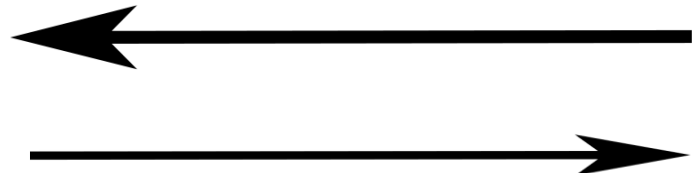
But is it balanced?

Genetic Relation

Emotional Relation
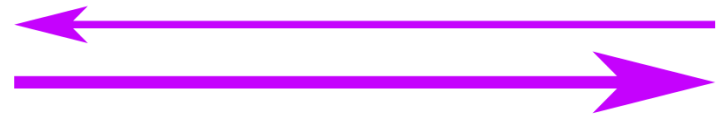
Emotional Relations might
be unbalanced

Economic Relation:
Grandmother helps grandson
with his studies

Grandson helps grandma and brings flowers
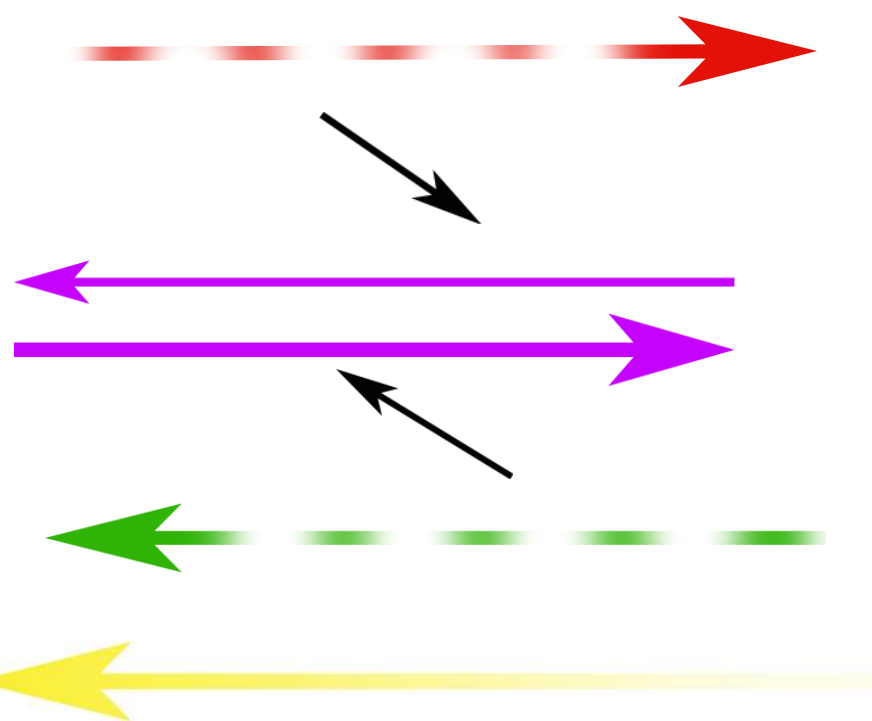
Relations are interconnected and operate in networks of relations. They can reinforce or weaken each other.

Can we quantify this?

Some things we can count directly.

Count the amount of money
The frequency of visits etc.

Other things can be measured in various ways.

Questionnaires regarding emotions etc.
Ethnographic studies etc.

But these only indirectly indicate the state and content of the relations them selves.

No singular type of relation (or systemic model) is sufficient to explain the interplay between things in the world
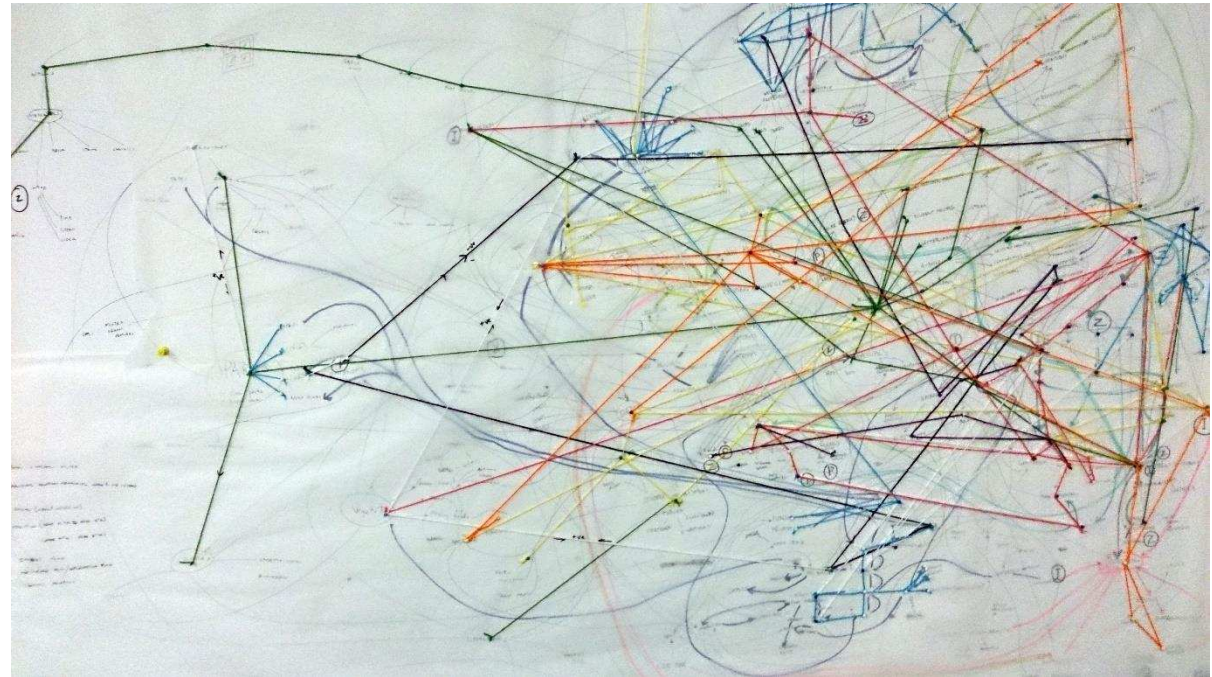
Karin Backlund, Maxwell Kevin Otieno, Evelina Peterson, 2015

Some types of relations

Structural relations

Root node

Branches

Non-terminal node

Terminal node
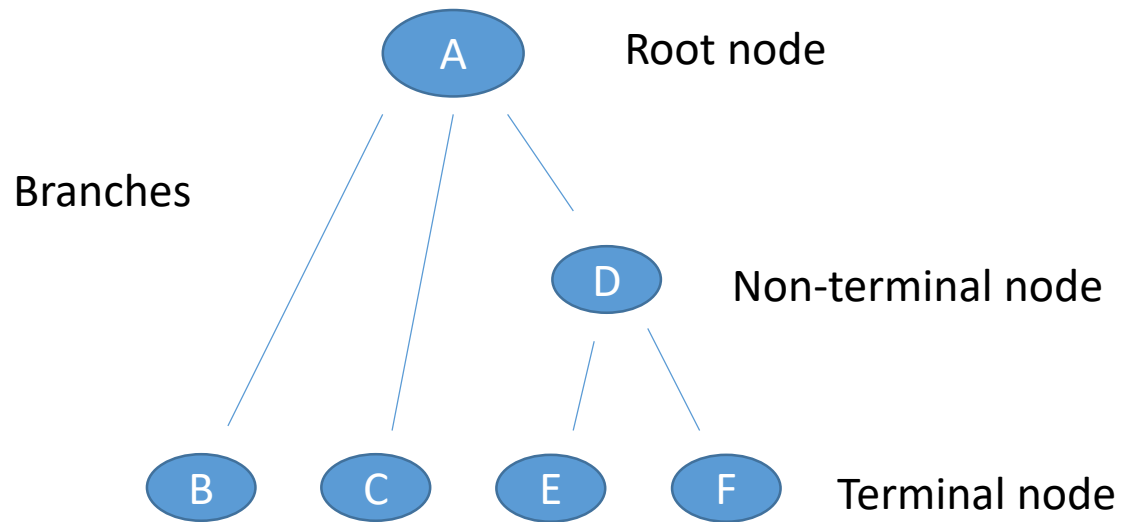
Hierarchical Structure
(Closed and ordered structure)

Nodes,
Objects
Actors

Relations,
Directional actions
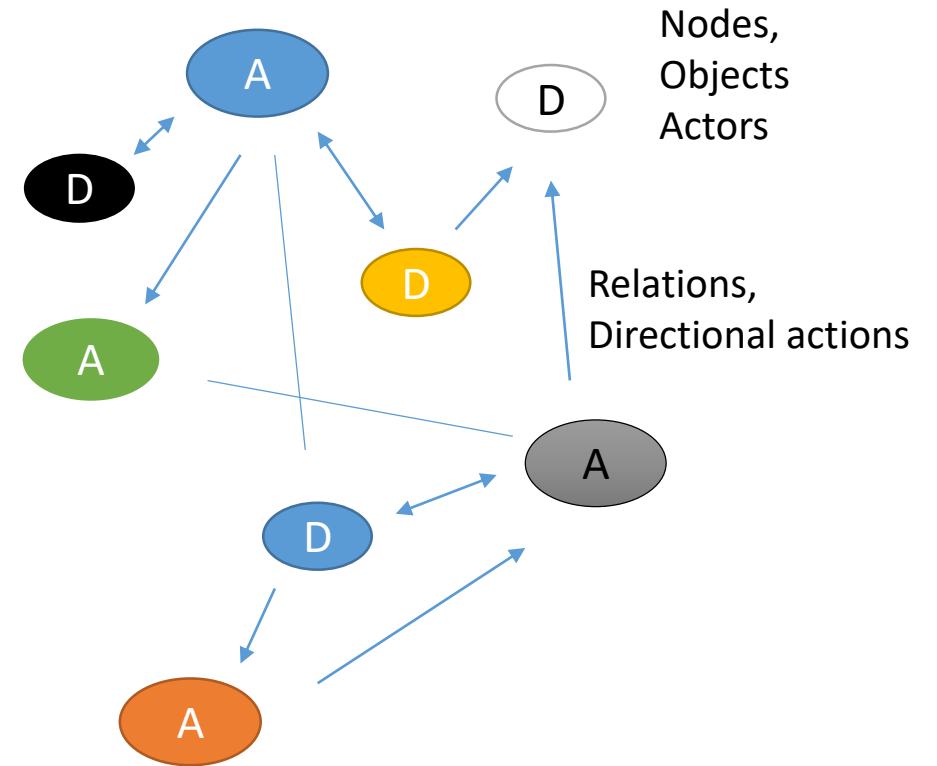
Non-hierarchical structure
(Open and "messy" structure)

(Birger Sevaldson 2016)

Semantic Relations

Semantic networks
Categorical relations
Associative relations
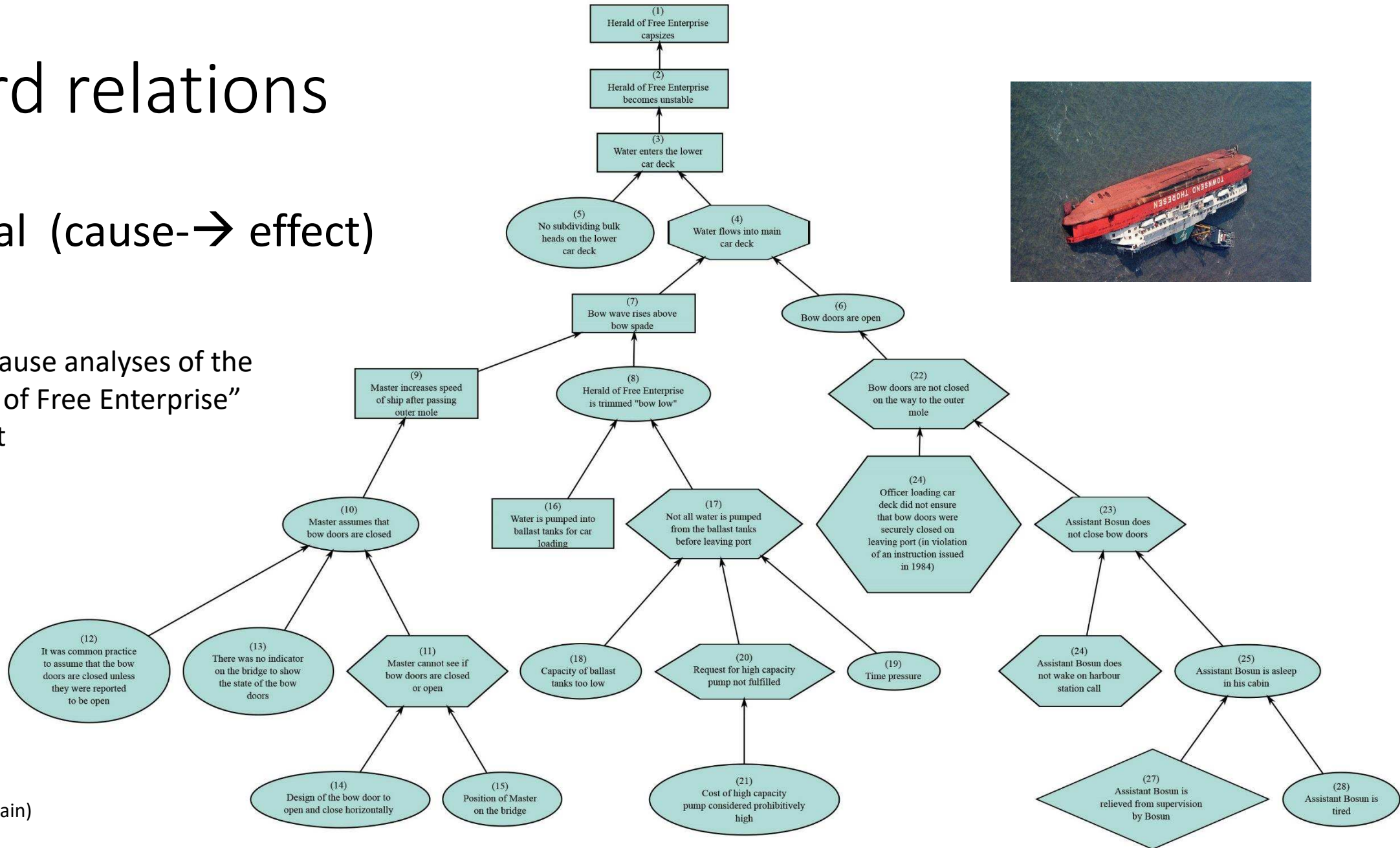Representational relations
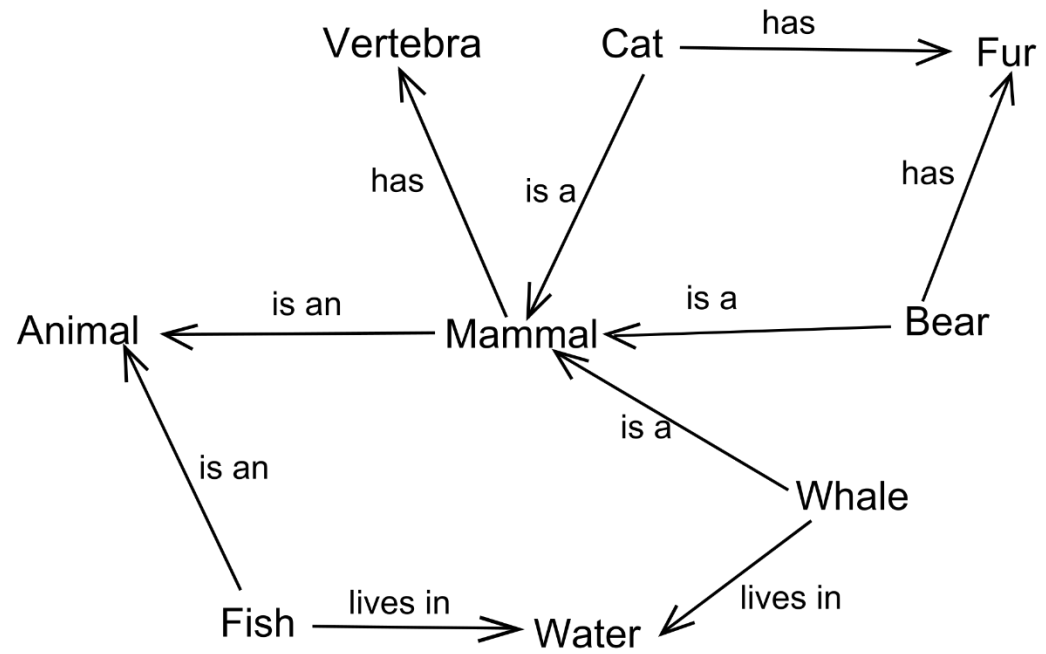
A Semantic Network

(Public Domain)

Social relations

- Individual social relations (Family, friends)
- Professional relations (Workplace, profession)
- Institutionalized social relations, (Sharing religion, citizen of a nation)
- Political relations (Sharing or not sharing political beliefs)
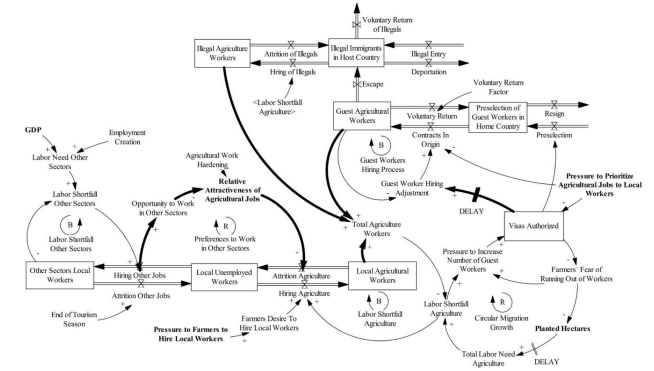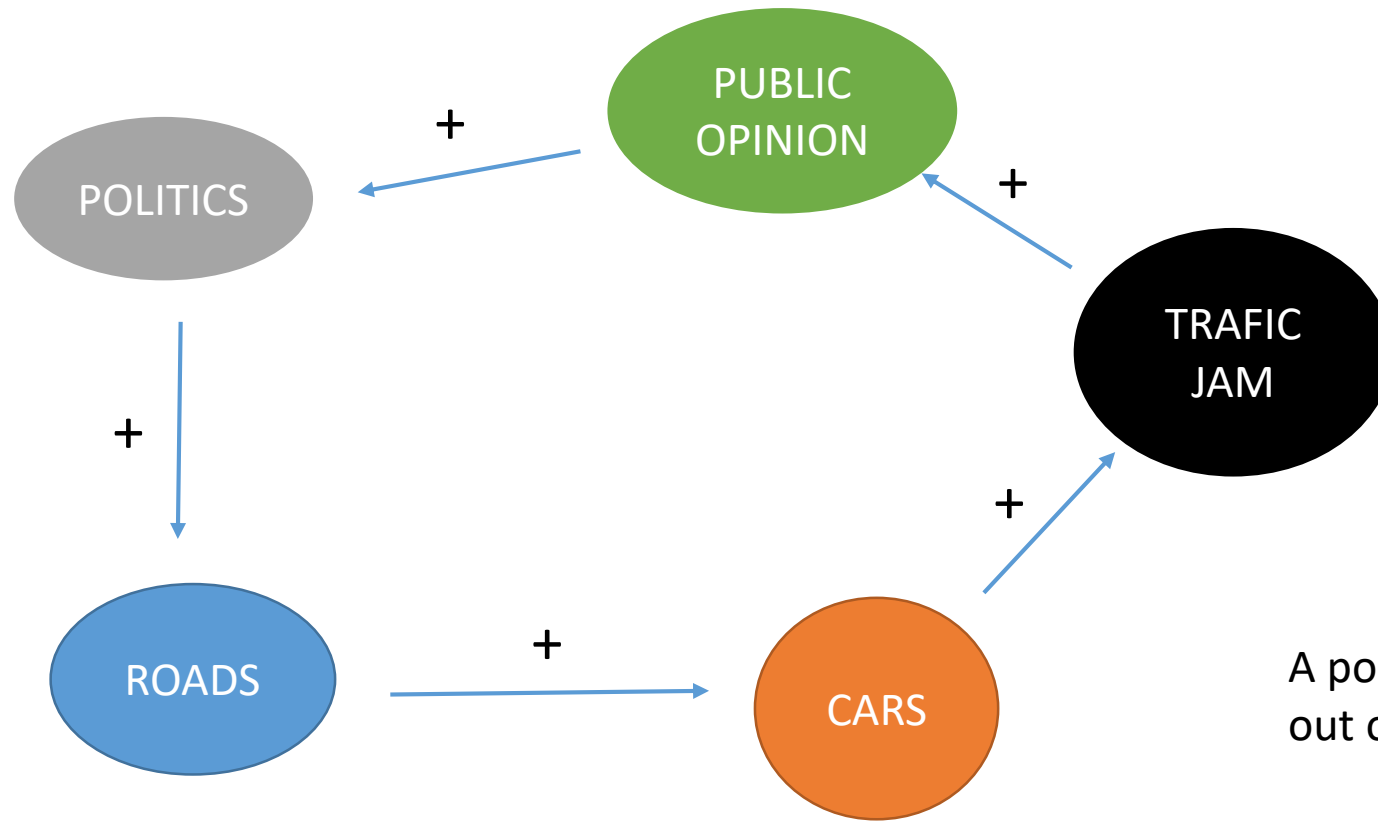- Action relations (Social relations emerging form common activities)

Hard relations

Causal (cause-→ effect)

A root cause analyses of the "Herald of Free Enterprise" accident

(Public domain)

(1) Herald of Free Enterprise capsizes

(2) Herald of Free Enterprise becomes unstable

(3) Water enters the lower car deck

(5) No subdividing bulk heads on the lower car deck

(4) Water flows into main car deck

(7) Bow wave rises above bow spade

(6) Bow doors are open

(9) Master increases speed of ship after passing outer mole

(8) Herald of Free Enterprise is trimmed "bow low"

(22) Bow doors are not closed on the way to the outer mole

(10) Master assumes that bow doors are closed

(16) Water is pumped into ballast tanks for car loading

(17) Not all water is pumped from the ballast tanks before leaving port

(24) Officer loading car deck did not ensure that bow doors were securely closed on leaving port (in violation of an instruction issued in 1984)

(23) Assistant Bosun does not close bow doors

(12) It was common practice to assume that the bow doors are closed unless they were reported to be open

(13) There was no indicator on the bridge to show the state of the bow doors

(11) Master cannot see if bow doors are closed or open

(18) Capacity of ballast tanks too low

(20) Request for high capacity pump not fulfilled

(19) Time pressure

(24) Assistant Bosun does not wake on harbour station call

(25) Assistant Bosun is asleep in his cabin

(14) Design of the bow door to open and close horizontally

(15) Position of Master on the bridge

(21) Cost of high capacity pump considered prohibitively high

(27) Assistant Bosun is relieved from supervision by Bosun

(28) Assistant Bosun is tired

Feedback loops

PUBLIC OPINION

+ POLITICS

+ TRAFIC JAM

+ ROADS

+ CARS

+

A positive feedback loop will spin out of control.

(Birger Sevaldson 2016)

SYSTEMIC RELATIONS THAT RESIST THE MODEL OF NODES AND CONNECTORS

Proximity: A school and a petrol station situated close to each other will influence each other.
Observation from a Oslo primary school show how the petrol station is used by students in
their free quarters. The rhythm of the school influences the rhythm of the petrol station.
(Images are not from the observed location, because in the meantime the petrol station is gone)

No direct connection

Proximity is not a connection in its self. But it might trigger connections.

Particular emergent relations that are triggered by proximity.

Attractor

Rythm

Economic

Conflict
Synergi
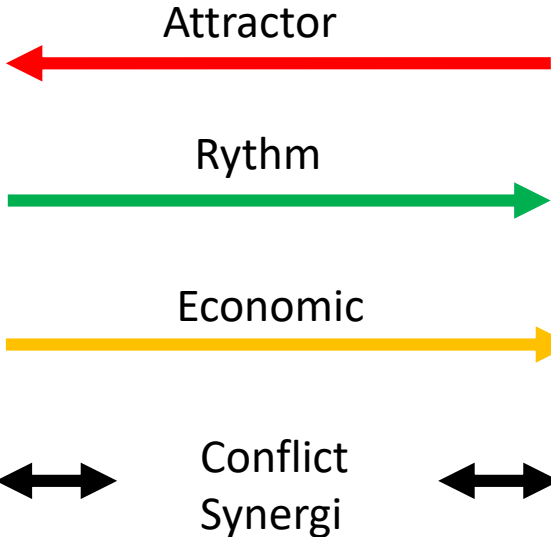
Spatial distributions (intensity) is in a sense one object itself.
It is not easily described in a network of nodes and connectors, though singular links might be abstracted.
The abstraction into nodes and connectors is insufficient to capture the dynamic interplay that might take place in a field condition.

Fields:
E.g. interactions are getting so intertwined and entangled as well as ubiquitous that they operate more as fields rather than singular interaction.
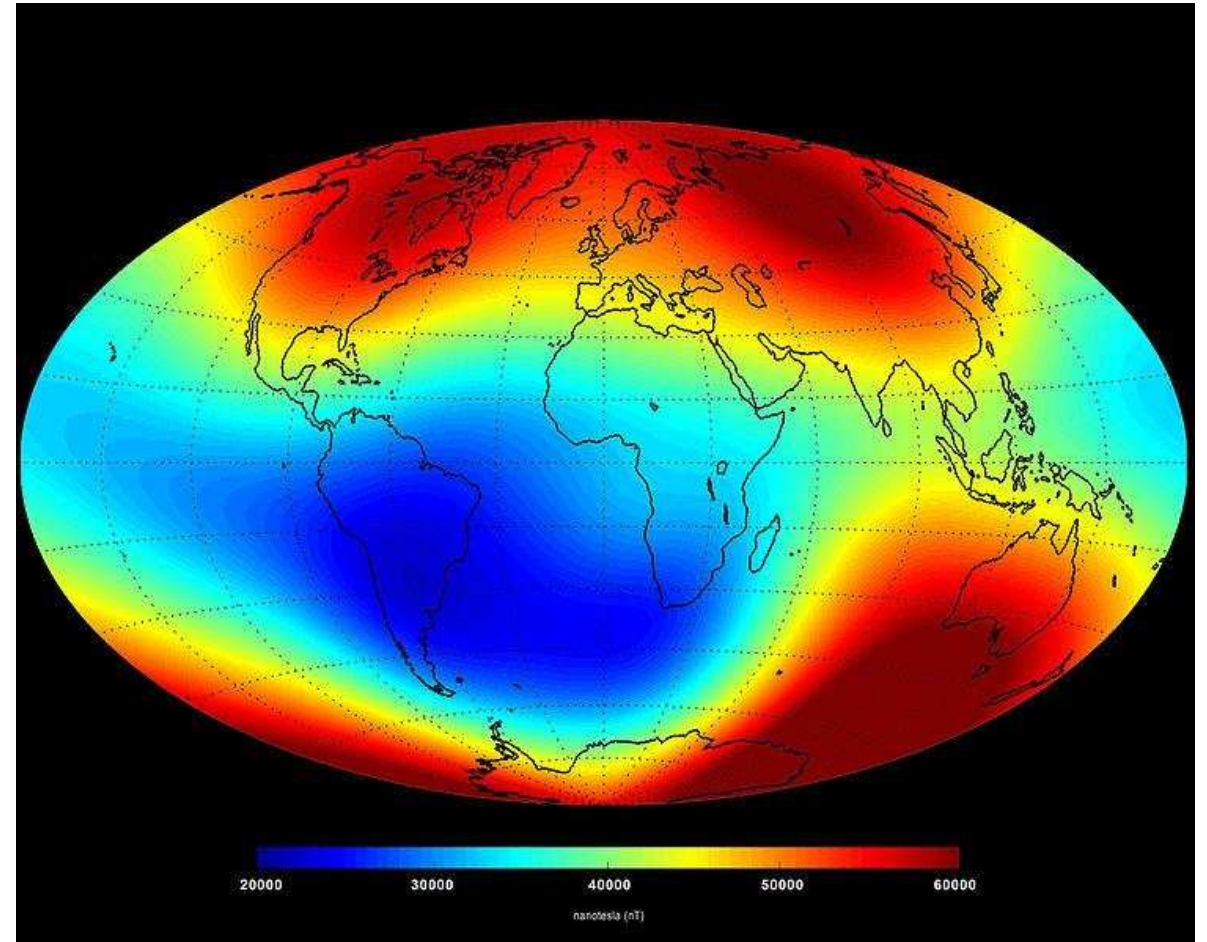
Magnetic Field (Public domain)

Read more about the library of Systemic Relations on

http://systemsorienteddesign.net/index.php/giga-mapping/types-of-systemic-relations

Feedback? Suggestions to improve the library?
Please write me an email
Birger.Sevaldson@aho.no