



Domain Modelling – *Understanding the things we talk about*

Erik Proper, iSee, TSS, ITIS



Background

Background

Radboud University



THE UNIVERSITY
OF QUEENSLAND
AUSTRALIA



Background



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THE *Open* GROUP
Making standards work®

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SCHOOL FOR
BUSINESS AND SOCIETY

IC Institute



ORDINA



UNIVERSITÉ
DE LORRAINE



Research community

Ulrich Frank, Nicola Guarino, Giancarlo Guizzardi,
Peter Gärdenfors, Terry Halpin, Stijn Hoppenbrouwers,
Mathias Jarke, Dimitris Karragiannis, John Krogstie,
Heinrich C. Mayr, John Mylopoulos, Oscar Pastor,
Monique Snoeck, Bernhard Thalheim, ...

Agenda – Domain modelling

Role

Foundations

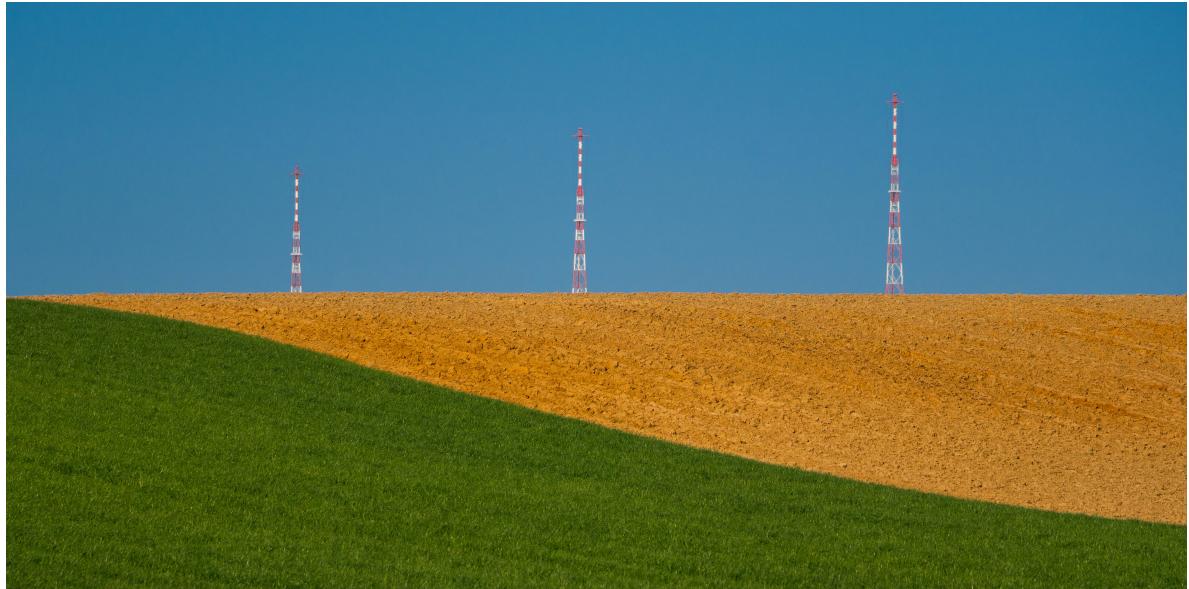
Challenges

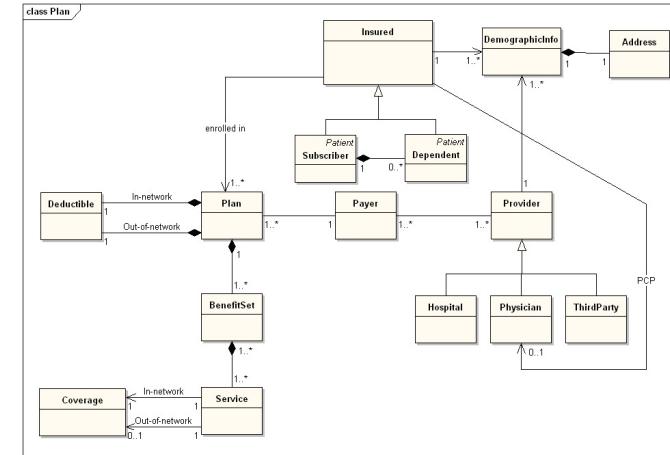
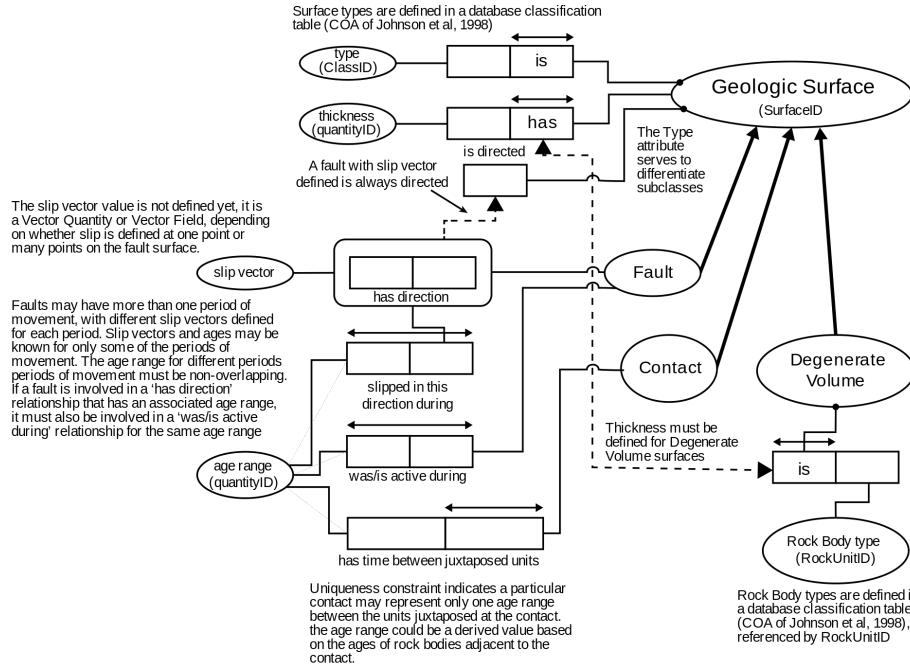
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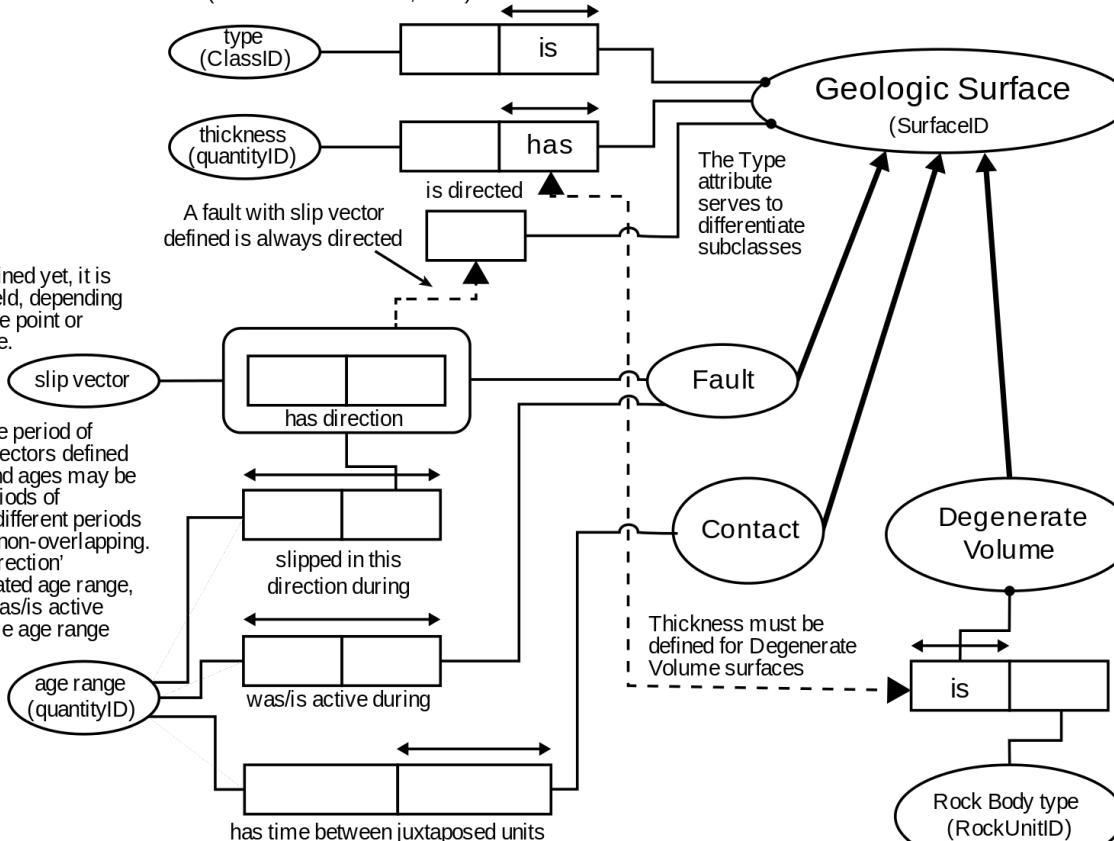
Foundations

Challenges





Surface types are defined in a database classification table (COA of Johnson et al, 1998)



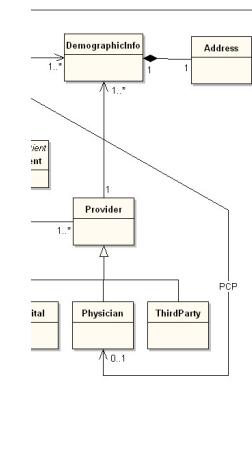
The slip vector value is not defined yet, it is a Vector Quantity or Vector Field, depending on whether slip is defined at one point or many points on the fault surface.

Faults may have more than one period of movement, with different slip vectors defined for each period. Slip vectors and ages may be known for only some of the periods of movement. The age range for different periods of movement must be non-overlapping. If a fault is involved in a 'has direction' relationship that has an associated age range, it must also be involved in a 'was/is active during' relationship for the same age range

age range (quantityID)

Uniqueness constraint indicates a particular contact may represent only one age range between the units juxtaposed at the contact. the age range could be a derived value based on the ages of rock bodies adjacent to the contact.

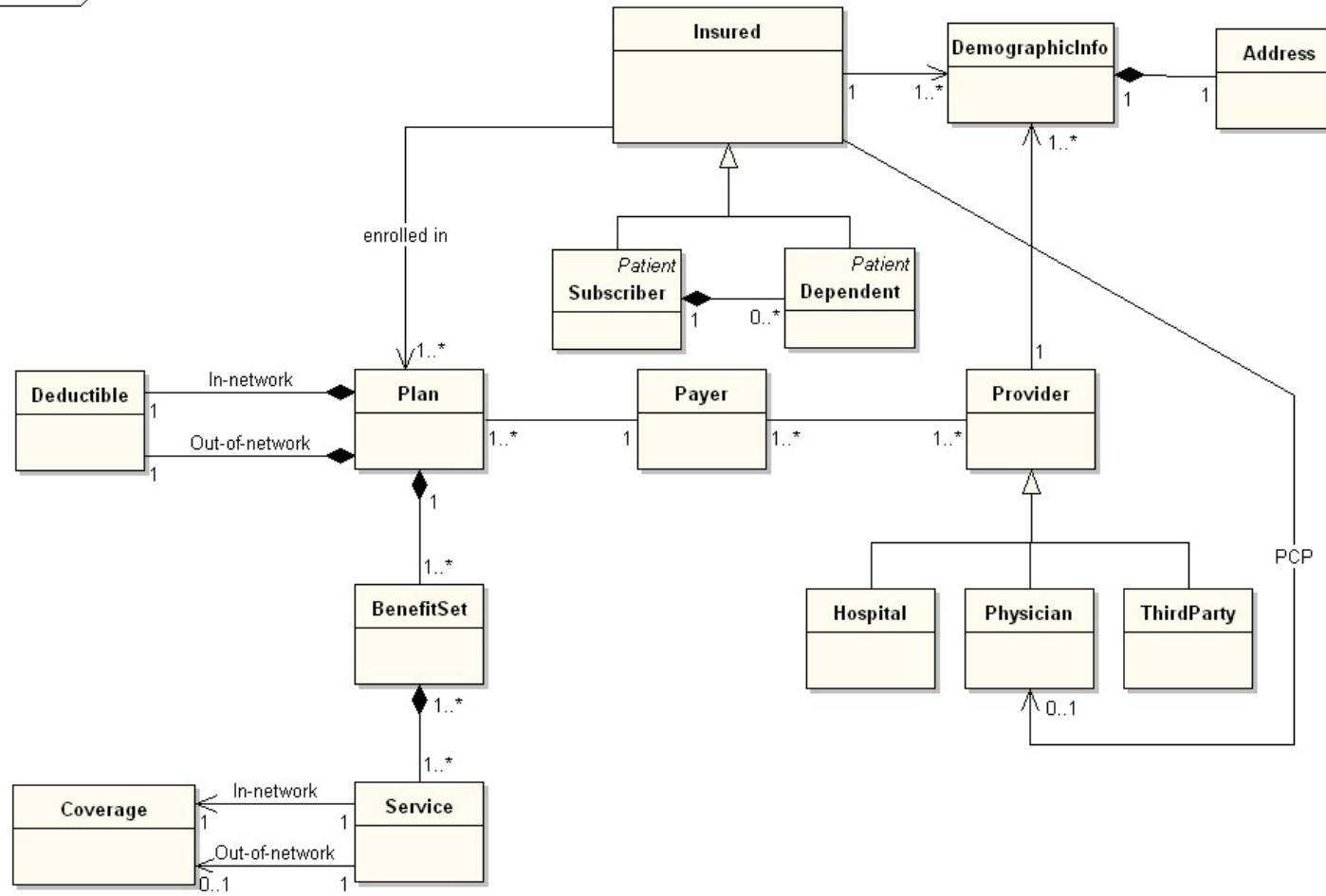
Rock Body types are defined in a database classification table (COA of Johnson et al, 1998), referenced by RockUnitID



class Plan

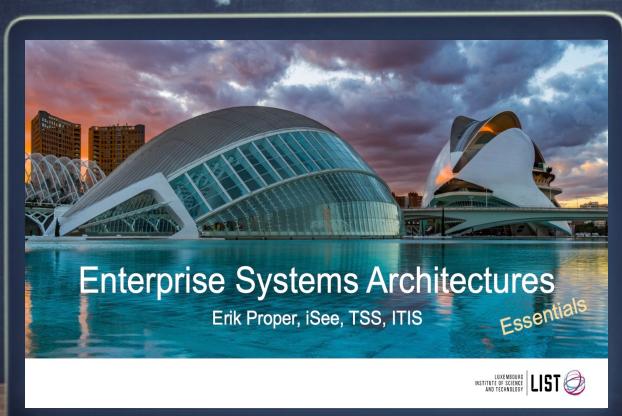
The slip vector value is not defined for a Vector Quantity or Vector Field on whether slip is defined at or many points on the fault surface

Faults may have more than one movement, with different slip values for each period. Slip vectors are known for only some of the periods of movement. The age range for periods of movement must be defined if a fault is involved in a 'has dependency' relationship that has an association. It must also be involved in a 'during' relationship for the same reason.



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A.40 IT systems are sustainable

Type of information: technology

Quality attributes: efficiency

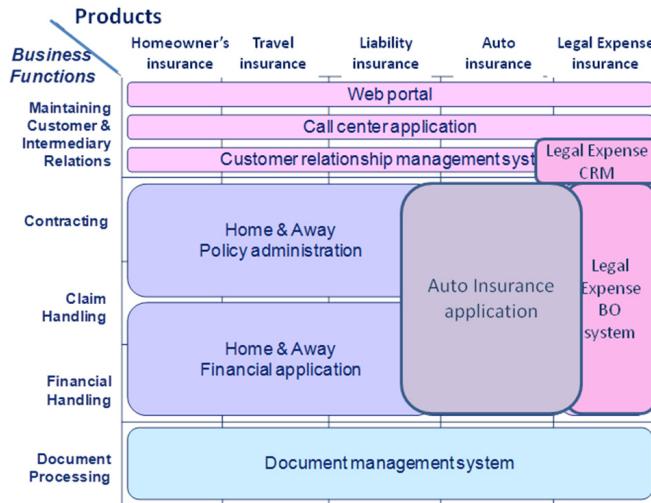
Rationale:

- IT contributes significantly to the pollution of the Earth due to energy consumption and the generation of waste.
- There is a general awareness that measures need to be taken to protect our natural resources and prevent global warming as much as we can.

Implications:

- Energy consumption and the usage of environment-friendly materials are criteria in the acquisition of new IT systems.
- Energy consumption is explicitly taken into account in the design of IT environments such as data centers.





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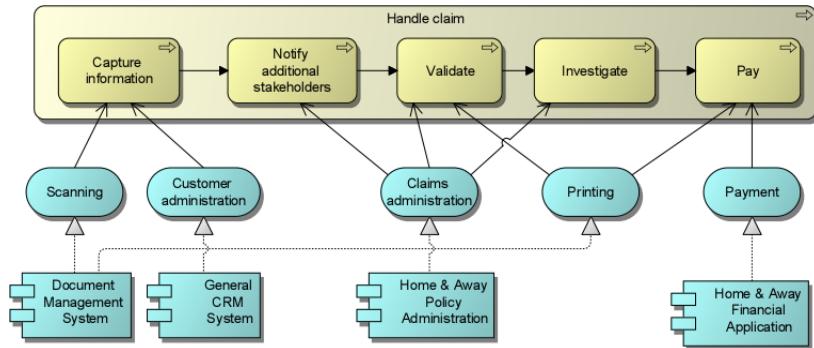
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Pivotal role of domain models in SE&A

Understand

Assess

Diagnose

Design

Realise

Operate

Regulate

Rich variety of domain models

Not always in terms of boxes and lines

Not always in terms of an explicit modelling language

Rich variety of domain models

Not always in terms of boxes and lines

Not always in terms of an explicit modelling language



Rich variety of domain models

Not always in terms of boxes and lines

Not always in terms of an explicit modelling language

Example situations ...





What colour is your car ...?



MARIN



A boat propellor?



Your home insurance policy



SECTION 1. DEFINITIONS

The following definitions will have the meaning stated below wherever they appear in bold and capitalised throughout this **Policy** unless otherwise shown for any **Policy** section.

Accidental Damage

Damage caused suddenly and unexpectedly from an outside force.

Buildings

The private dwelling used for domestic purposes only located at the **Risk Address** and all domestic offices, stables, garages and outbuildings used solely in connection therewith and on the same premises, the fixtures and fittings therein and the patios, terraces, footpaths, walls, gates and fences around and pertaining there to.

Risk Address

The address on the **Schedule** of where **Your** insured risk is located.

Swiss Re wins World Trade Center case



Swiss Re said on Wednesday that a New York appeals court had ruled in its favour in a compensation dispute with the leaseholder of the World Trade Center (WTC).

October 19, 2006 - 00:05

It said the court had confirmed that the destruction of the WTC in the September 11, 2001 terrorist attacks was a **single** event and not a **double** one as the leaseholder claimed. The ruling ends a long legal battle.

AI^x

Artificial Intelligence needs explanation

WHY AND HOW TRANSPARENCY INCREASES
THE SUCCES OF AI SOLUTIONS

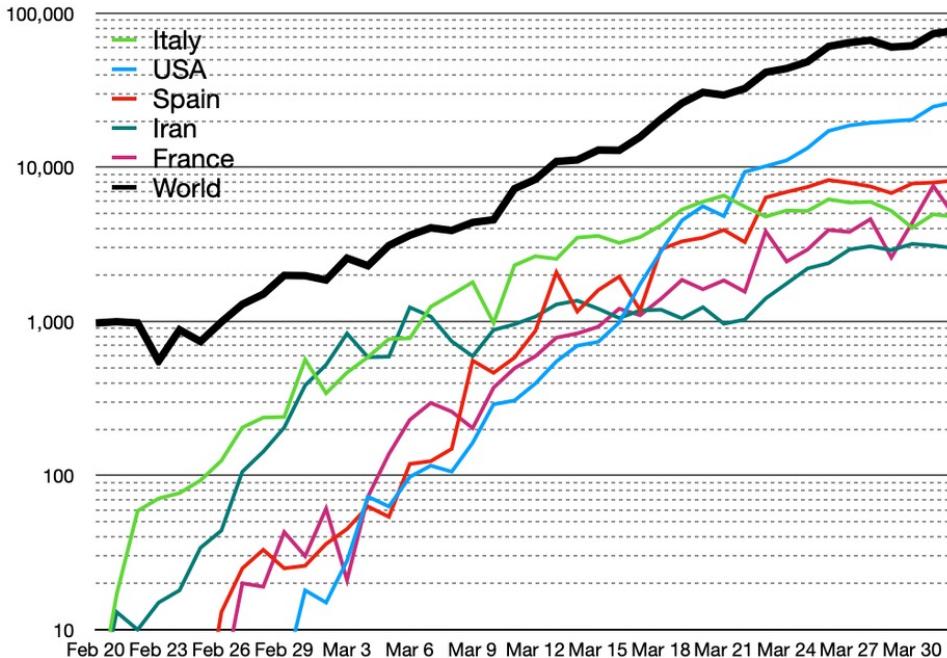
S. Spreeuwenberg



Silvie Spreeuwenberg:

1. Get a shared understanding of the domain
2. Understand the task and select the right scope
3. Collect the right data and improve its quality
4. Select AI techniques that deliver results
5. Generate good explanations
6. Evolve the system over time

Coronavirus: country comparisons are pointless unless



Source: <https://theconversation.com/coronavirus-country-comparisons-are-pointless-unless-we-account-for-these-biases-in-testing-135464>

Original Article | Published: 23 May 2018

Big Data Semantics

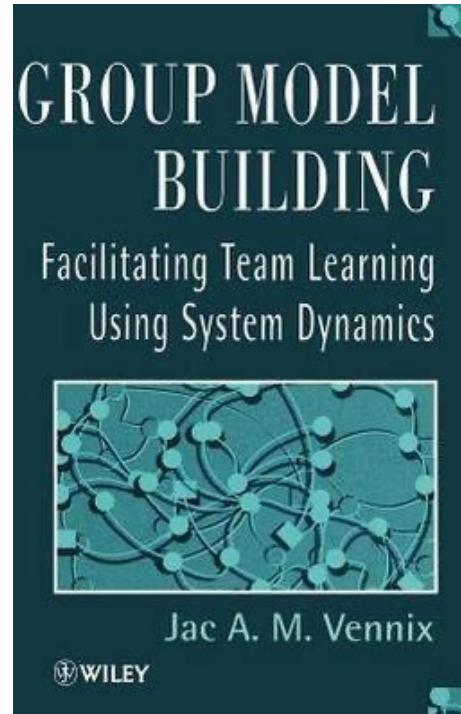
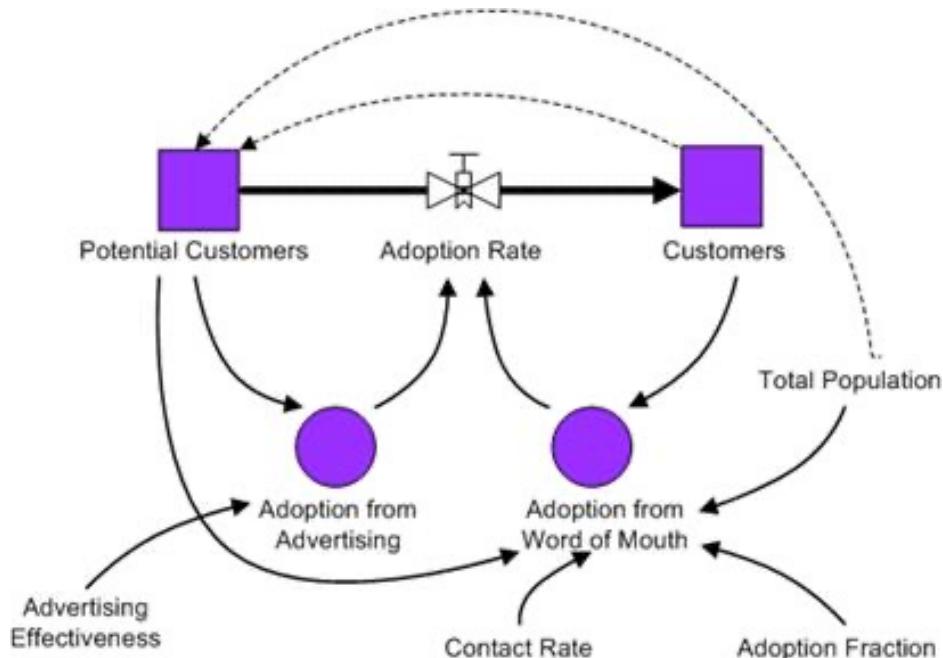
[Paolo Ceravolo](#) , [Antonia Azzini](#), [Marco Angelini](#), [Tiziana Catarci](#), [Philippe Cudré-Mauroux](#), [Ernesto Damiani](#), [Alexandra Mazak](#), [Maurice Van Keulen](#), [Mustafa Jarrar](#), [Giuseppe Santucci](#), [Kai-Uwe Sattler](#), [Monica Scannapieco](#), [Manuel Wimmer](#), [Robert Wrembel](#) & [Fadi Zaraket](#)

Journal on Data Semantics 7, 65–85(2018) | [Cite this article](#)

1118 Accesses | 13 Citations | 1 Altmetric | [Metrics](#)

Abstract

Big Data technology has discarded traditional data modeling approaches as no longer applicable to distributed data processing. It is, however, largely recognized that Big Data impose novel challenges in data and infrastructure management. Indeed, multiple components and procedures must be coordinated to ensure a high level of data quality and accessibility for the application layers, e.g., data analytics and reporting. In this paper, the third of its kind co-authored by members of IFIP WG 2.6 on Data Semantics, we propose a review of the literature addressing these topics and discuss relevant challenges for future research. Based on our literature review, we argue that methods, principles, and perspectives developed by the Data Semantics community can significantly contribute to address Big Data challenges.



shift[®] Obesity System Influence Diagram

Full Map

Click-drag to scroll
Double-click to zoom in/out

Clusters

Core Loop

Individual Psychology

Social Psychology

Individual Activity

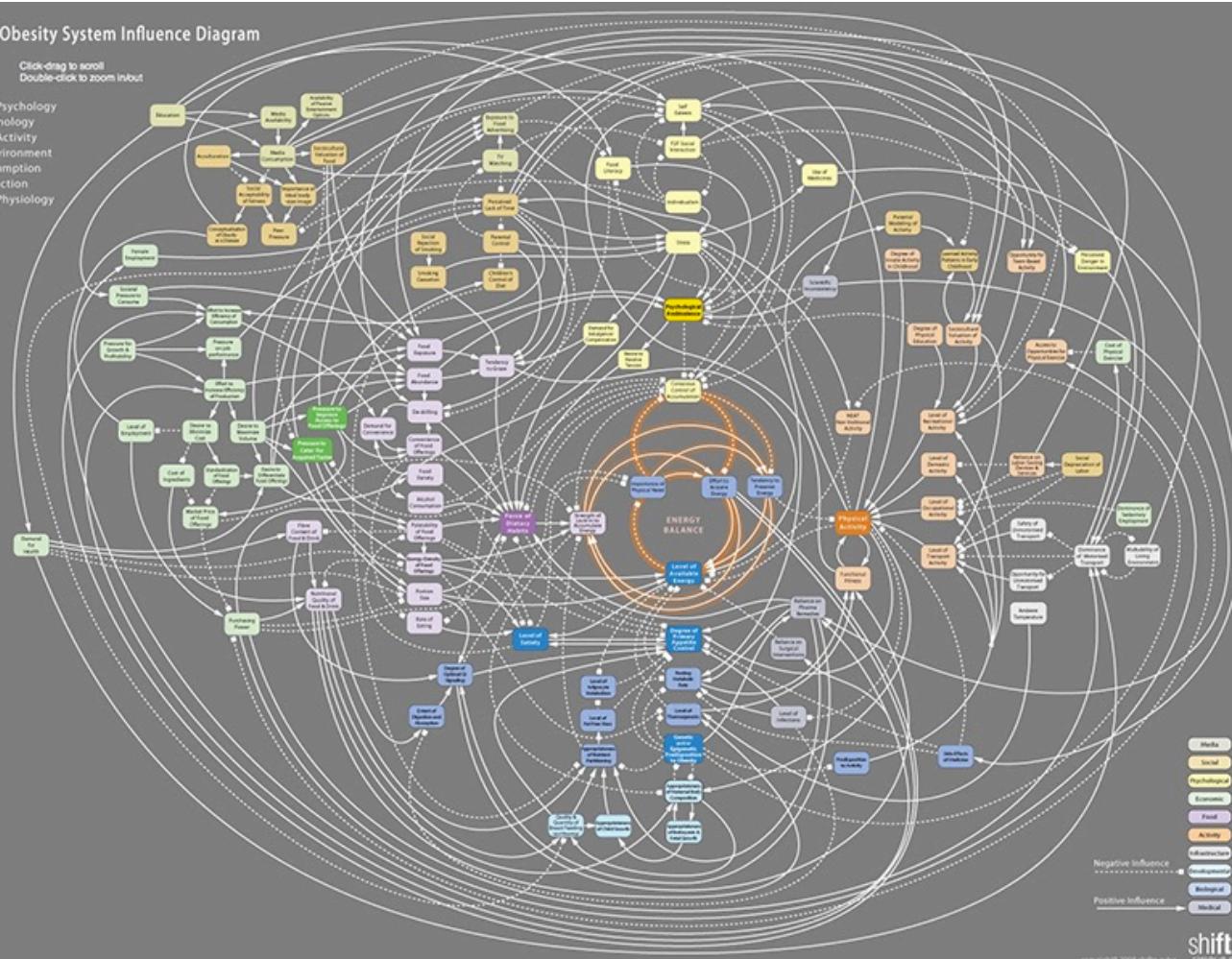
Activity Environment

Food Consumption

Food Production

Individual Physiology

Physiology



Negative Influence
Positive Influence
shift[®] clarity in complexity
copyright 2008 shiftin.com

Domain models

Define the concepts of a domain and their relations

What are we talking about?

Capture knowledge about the domain

What do we know about the domain?

Key in creating shared understanding

Are we really on the same page?

Domain models

A critical, yet often neglected, knowledge resource

Depending on the specific goal of a domain model, different forms and languages can be used

From highly specific and mathematically formalised, to more global and indicative

Domain models

Domain models, as artefacts, may go by different names:

Information, process, etc, ... models

Knowledge graphs, RDF graphs, ...

Ontology, taxonomy, ...

Also depends on the purpose for which the model is needed

Agenda – Domain modelling

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Do we understand domain modelling?

Ample research has been / is being done into (some of the) applied domains of modelling:

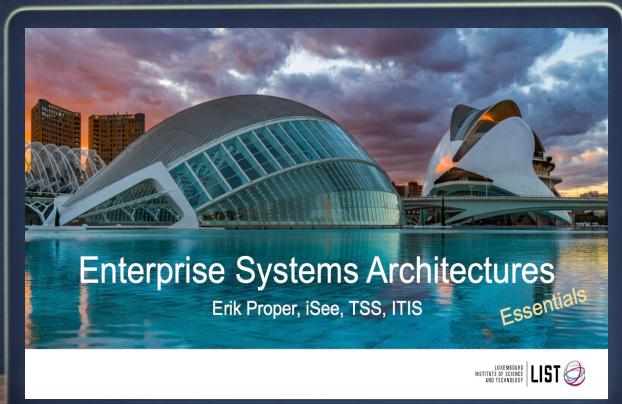
- Information modelling
- business process modelling,
- ...

Less so into the foundational aspects of modelling

Generic challenges; generic solutions

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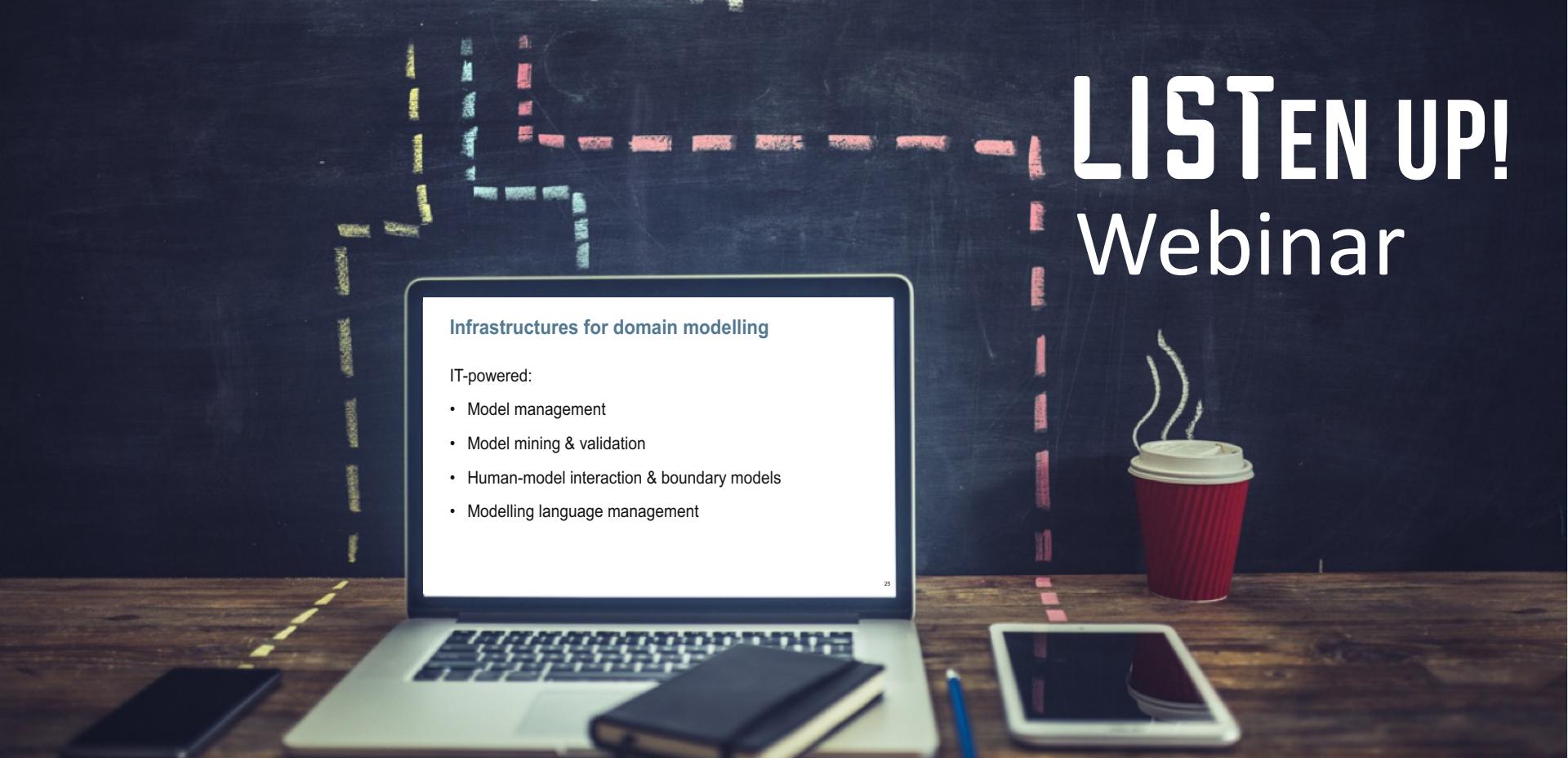
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Infrastructures for domain modelling

IT-powered:

- Model management
- Model mining & validation
- Human-model interaction & boundary models
- Modelling language management



Infrastructures for domain modelling

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Foundations of domain modelling

1. the essence of what a model is
2. the act of modelling (creation, use, ...)
3. the role of (modelling) languages

Domain model

an artefact that is:

acknowledged by an observer

as representing

an abstraction

of some domain

for a particular purpose

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Domain model

Stachowiak, 1973:

Representation feature

Abstraction feature

Pragmatic feature

Domain model

Stachowiak, 1973:

Representation feature

Abstraction feature

Pragmatic feature

purpose

Domain model

Stachowiak, 1973:

Representation feature

modified by the purpose

Abstraction feature

modified by the purpose

Pragmatic feature

purpose

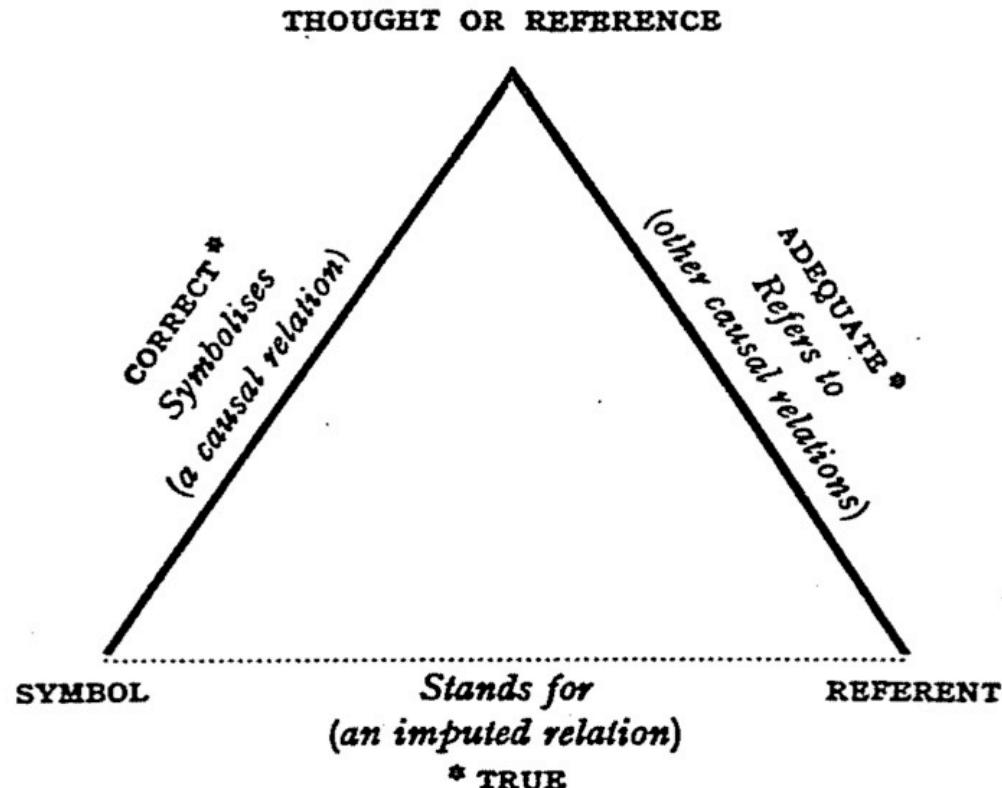
Conceptual domain model

A model where the **purpose** of the model is dominated by the ambition to remain as-true-as-possible to the domain

i.e. a conceptualisation of the domain

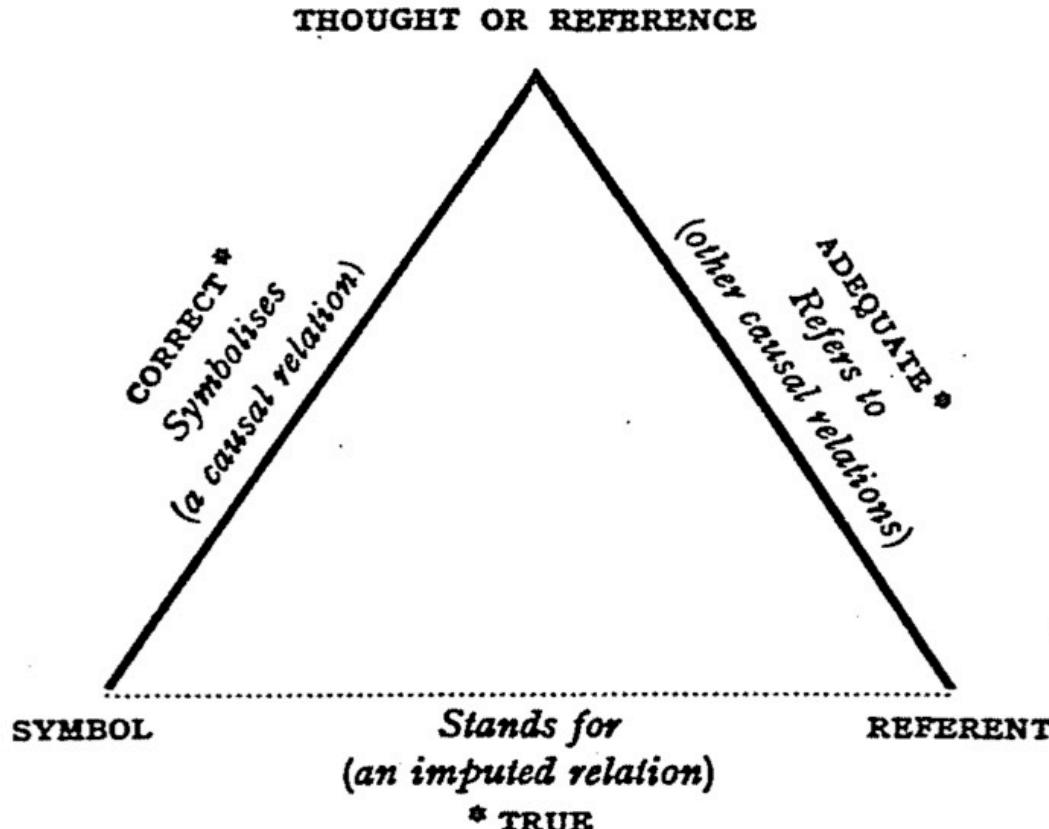
For simulation / execution / computational **purposes**, the conceptual quality of a model might be compromised

Semiotic triangle

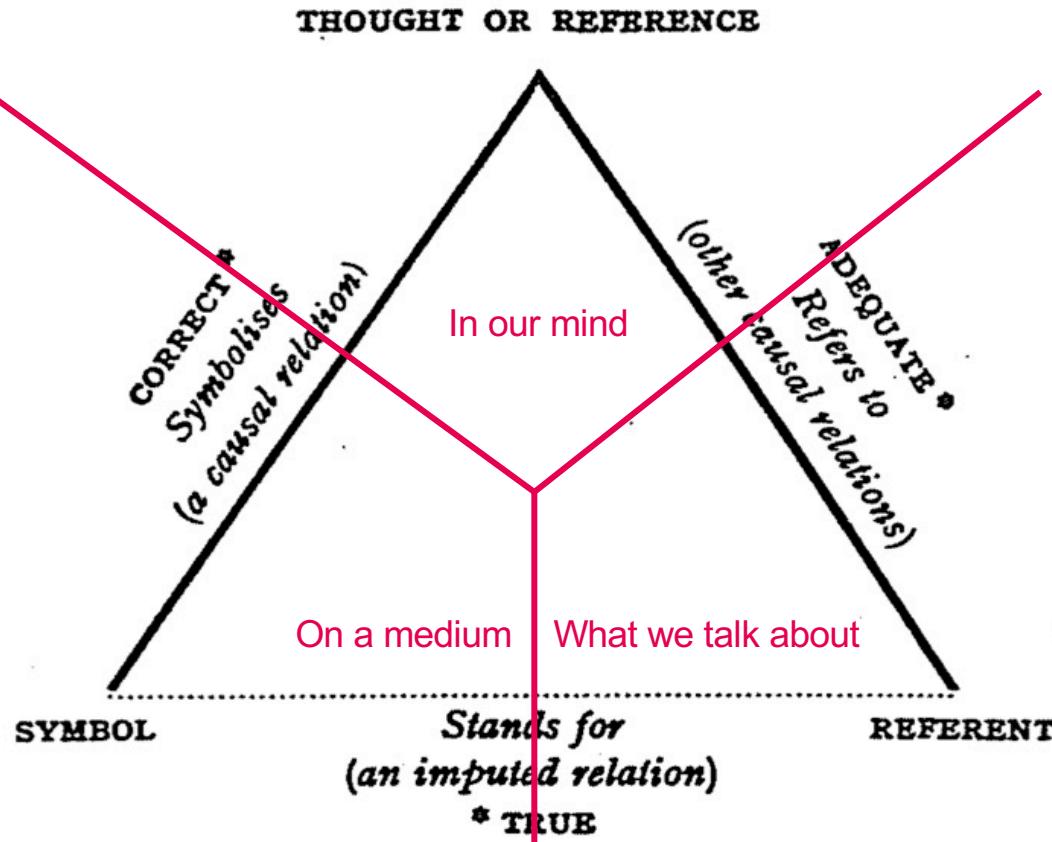


Ogden and Richards, 1923

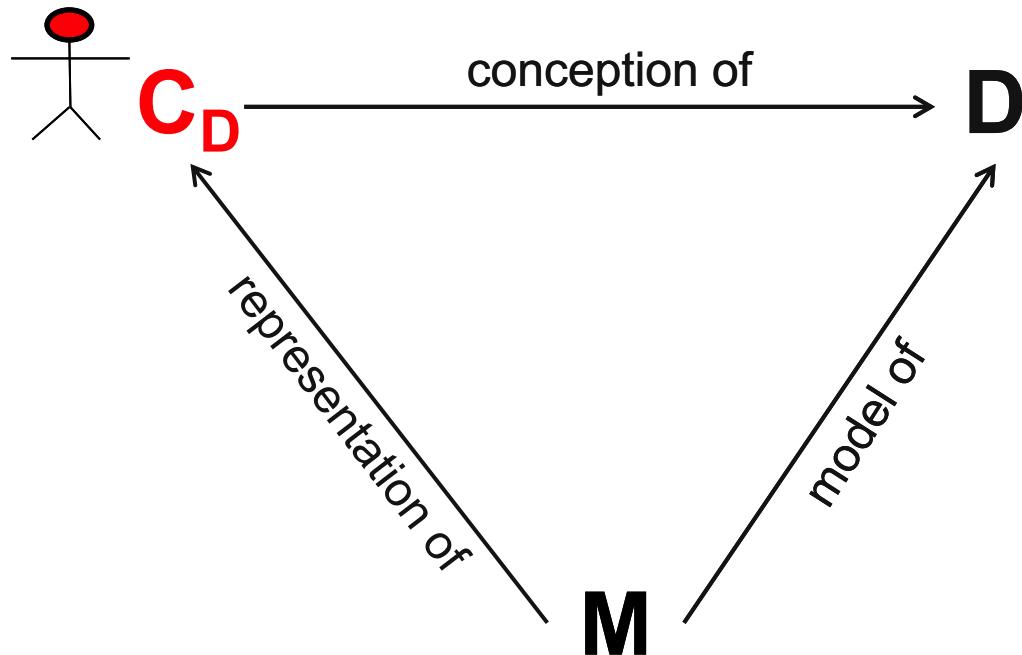
Semiotic triangle



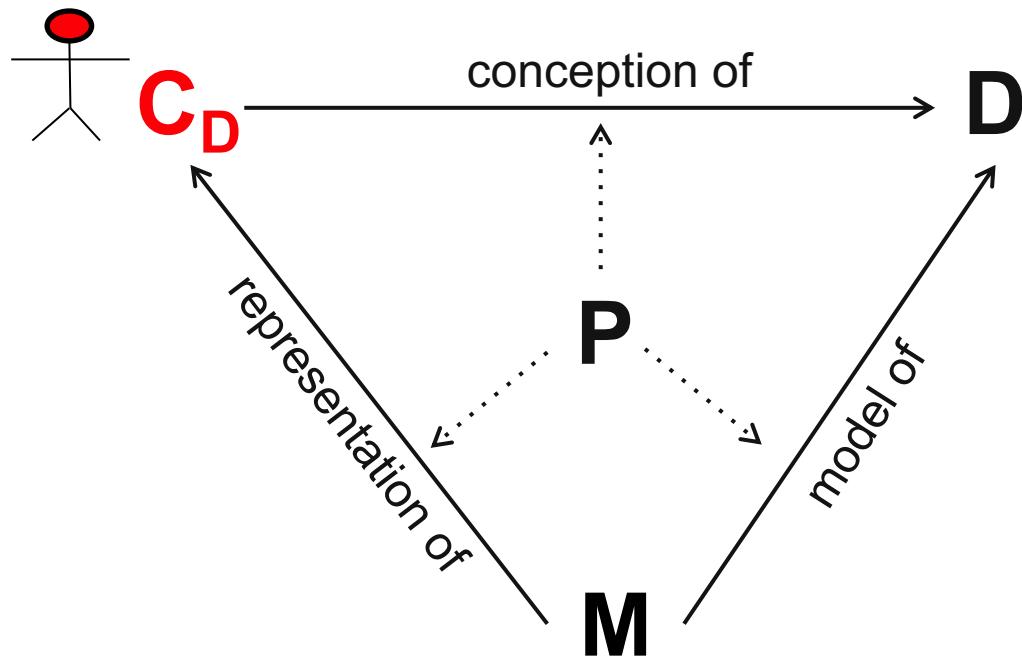
Semiotic triangle



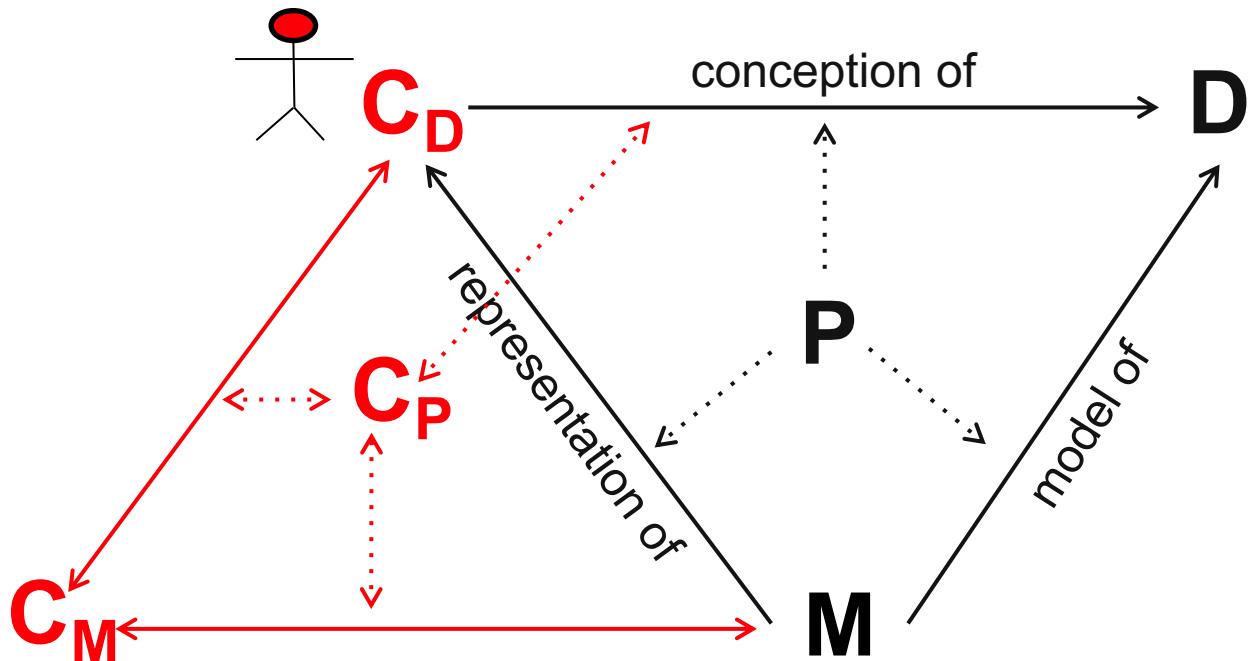
Domain modelling



Domain modelling



Domain modelling

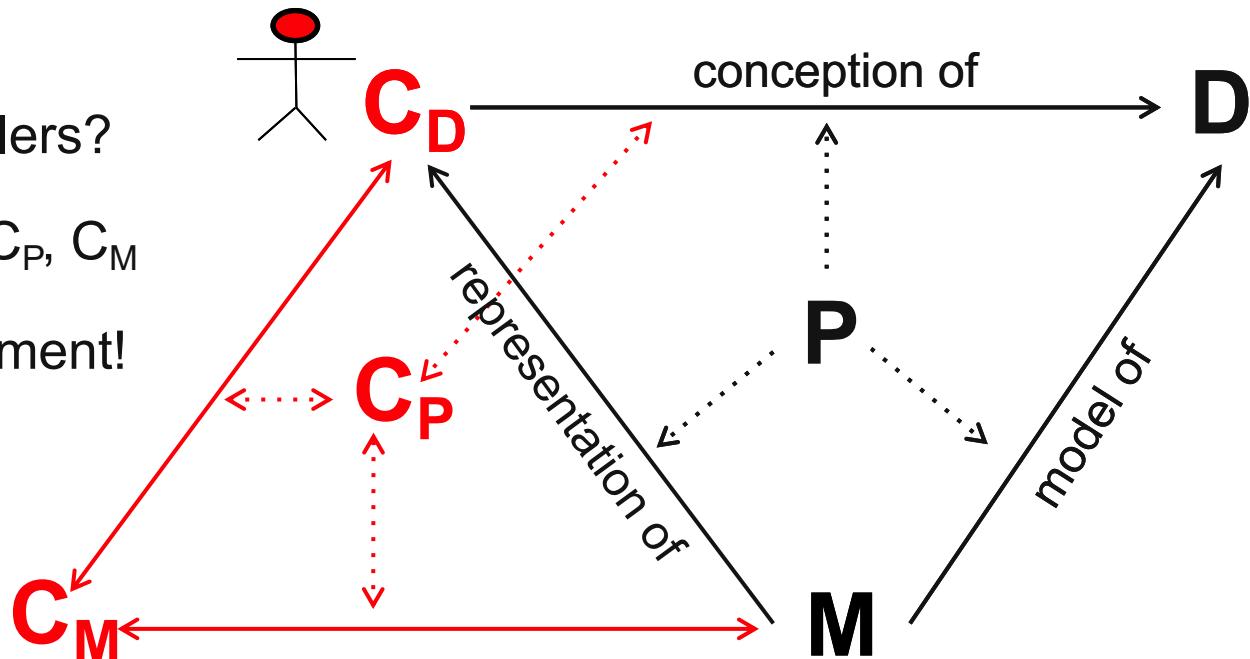


Domain modelling

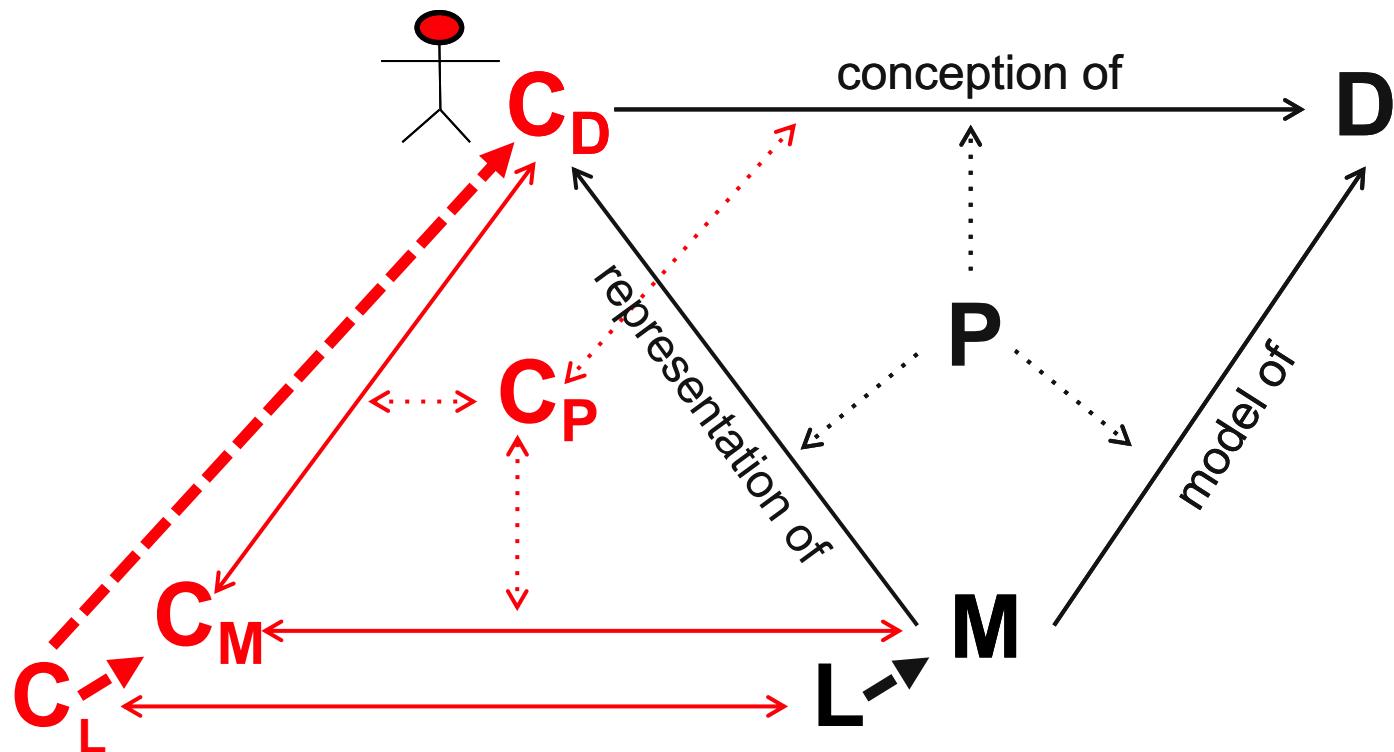
Multiple modellers?

Each has C_D , C_P , C_M

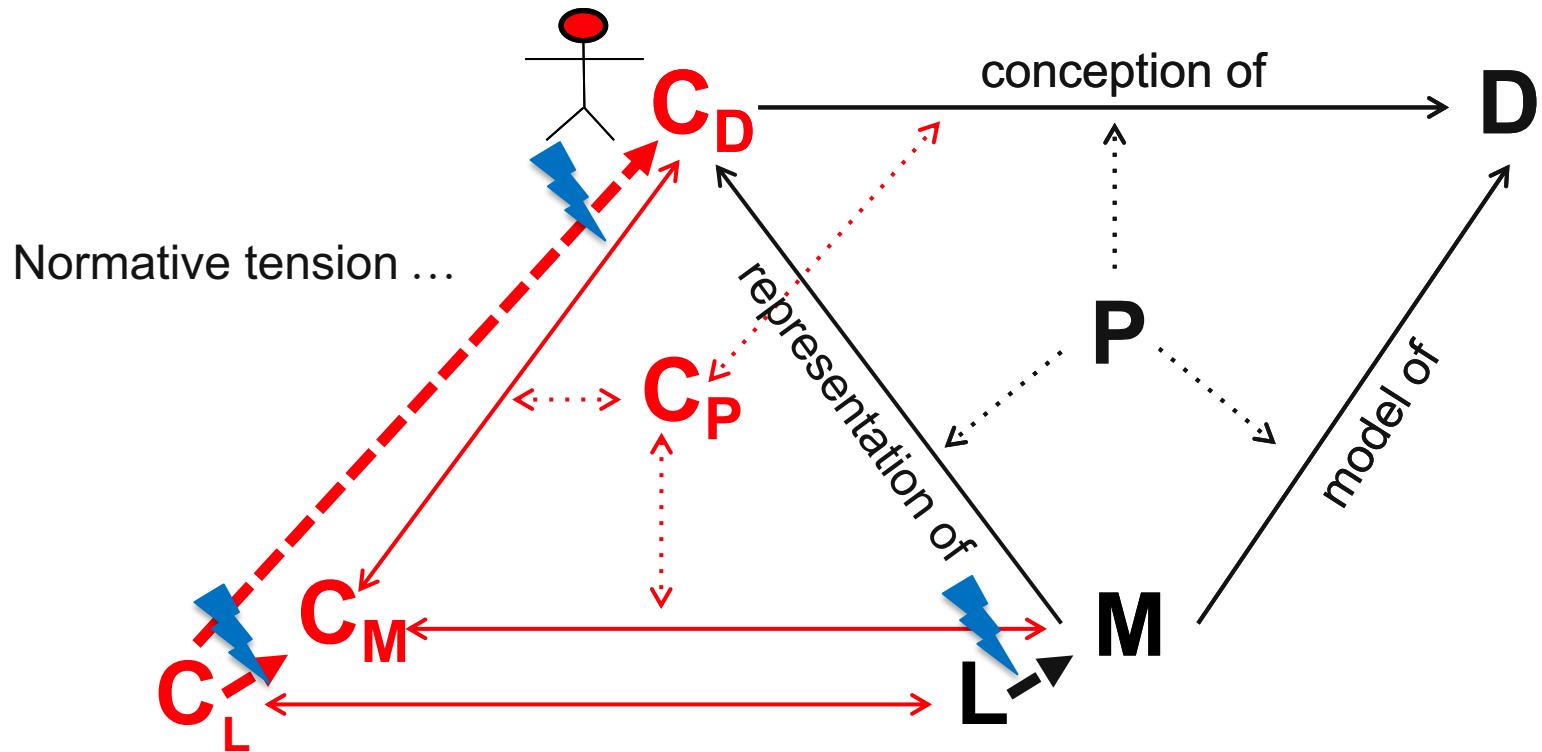
Requires alignment!



Role of modelling languages / medium



Normative tension



Normative frames (in modelling)

That what, consciously or subconsciously, restricts us when creating a model

Could be beneficial: focus, scoping, ...

Could be harmful: framing, black swans, tunnel vision, ...

Examples of normative frames

Modelling languages: UML, ArchiMate, BPMN, ...

Design frameworks: Zachman, ArchiMate, DEMO, UML, ...

Foundational ontologies: BWW, UFO, ...

Self interests, due to goals, stakes, ...

Cognitive biases, due to upbringing, training, ...

Philosophical stance: objectivist, subjectivist, ...

Agenda – Domain modelling

Role

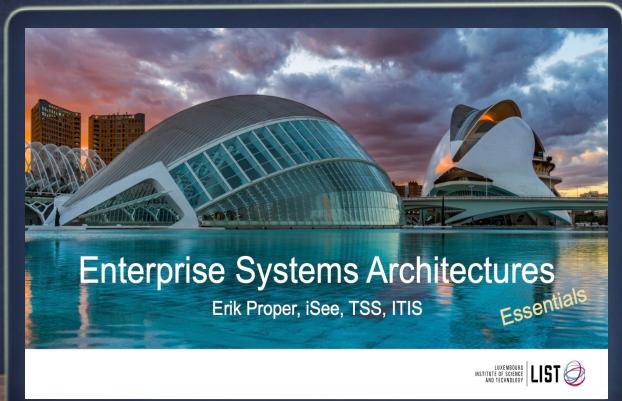
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Challenges – Shared focus

1. *How to ensure that different creators / readers of a model relate it to the same domain?*
2. *How to ensure that different creators / readers of a model have the same understanding (thought) of the model, assuming they relate it to the same domain?*

Challenges – Shared purpose

1. *How to make the (intended) purpose of a model explicit?*
2. *How to tune a model's representation and abstraction features to its (intended) purpose?*
3. *How to ensure that all actors involved in the creation and / or use of a model have the same understanding about, and agree to, its purpose?*

Challenges – Normative frames

1. *Which normative frames exist?*
2. *What are the positive and / or negative impacts of the normative frame(s) on the resulting models (in relation to its purpose)?*
3. *How to manage (mitigate / optimise) these impacts?*

Challenges – Just enough, just in time, language

1. *How to make modelling languages more flexible?*
2. *How to find the right balance between standardisation and purpose-specific extensions?*
3. *How to support the emergence of modelling concepts?*

Agenda – Domain modelling

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Challenges



QUESTION

ANSWER

QUESTION

ANSWER

QUESTION

ANSWER

QUESTION

