From Terminologies to Ontologies – Advances in Knowledge Organization

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From Terminologies to Ontologies – Tools of Knowledge Organization

- Terminologies = structured (+/-) collections of concepts and terms in a certain language in a specific subject field
- Ontologies = formal, explicit (conceptual) models of object ranges in a computational representation
- Differences and commonalities
- Methods of organizing knowledge (personal and collective levels)
- Knowledge organization systems: all structured terminology system: classifications, thesauri, taxonomies, nomenclatures – they can be „ontologized“

Philosophical Foundations and Historical Origins of Terminology Studies

- 17th and 18th centuries:
- Developing German as a language of science –> Wolff


PHILOSOPHIA
PRIMA,
SIVE
ONTOLOGIA,
METHODO SCIENTIFICA
PERTRACTATA,
QUA
OMNIS COGNITIONIS
HUMANÆ PRINCIPIA
CONTINENTUR.
AUCTORE
CHRISTIANO WOLFIO,
EDITIO NOVA
PRIORI EMENDATIOR.

- Leibniz: ideal language of science

- Kant: constructionist concept theory

- 19th century: Bolzano, Hartmann, Brentano

- –> Neo-Aristotelian Epistemology

Philosophical Foundations and Historical Origins of Terminology Studies

- –> Foundations of Modern Ontology and Psychology
- Foundations of Modern Logic: Frege
- Early 20th century: Brentano's school: Husserl, Meinong, Marty –> philosophy of language and language theory
- Boltzmann, Mach, Carnap –> Logical Positivism, Vienna Circle
- Bühler (semiotic language theory, new era of thought psychology)
- New wave of internationalist normative approaches to languages (planned languages, in particular Esperanto)
- M. Dewey: new approach to universal classification systems for indexing and retrieval in libraries and early documentation centers
- Industrialization + Globalization –> generic need for standardization
- Long history of lexicography – innovations such as Schlomann

Knowledge Organization

- Processes of organizing knowledge
  - What concept of knowledge? (Process or result, implicit/explicit, knowledge, etc.) -> Theories of knowledge
  - What concept of „organization“? (Process or result? – theories of organization
- Psychological, cognitive concepts of knowledge (personal knowledge), concept theories, theories of categorization, prototype theory, etc.
- Linguistic theories (cognitive ling.), classification, computational ling.
- Cultural studies -> cultural knowledge, social theories (sociology of knowledge), organizing knowledge as a socio-economic process -> knowledge management
- Pedagogical concepts of knowledge (learning and knowledge acquisition), personal knowledge organization
- „epistemic-philosophical“ concepts of knowledge, systems theory
  - E.g. collective knowledge, knowledge as a result (Wissen vs. Erkenntnis!), objective knowledge (Karl Popper et al) – “logic of scientific discovery”, evolutionary epistemology, etc.
- Information science, library science – knowledge organization systems
- Computer science – digital libraries, ontologies, knowledge engineering
- Convergence through a cognitive turn of philosophy of science?

Knowledge (organization) systems

- Cognitive knowledge systems
- collective knowledge systems, cultural systems, social systems, language and communication systems
- Formal knowledge systems, knowledge representation systems, “semantic systems” (Semantic Web)

- Applications:
  - Knowledge organization as part of knowledge management (Nonaka, Takeuchi, et al)
  - Knowledge organization as daily practice in libraries and information systems (for more than 2000 years)
  - Knowledge organization as formal representations in collective knowledge systems -> Semantic Web applications

What is knowledge organization?

1. A part of information and library science, a part of philosophy of science and of epistemology, but also of knowledge management and knowledge engineering
   - Investigating and representing structures of knowledge
   - Epistemological aspects, cognitive science aspects
   - Linguistic and socio-cultural aspects (e.g. folk taxonomies)
   - Historical aspects (e.g. Leibniz, encyclopedism, administrative categorizations in ancient societies, history of science, etc.)
2. Practical work: creating and using knowledge organization systems (see further down)
3. Knowledge organization is also a crucial process in linguistic action (sprachliches Handeln) – Text organization both in reception and production

Theoretical basis: systems theory

- Theory of social systems (e.g. Niklas Luhmann)
  - Sense/meaning as an axiomatic concept
  - communication as system, social expectations
  - Structure/event, reduction of social complextity
- Systems theory (control, intervention, social processes) by Helmut Willke
  - Point of departure for a theory of knowledge management
- Formal systems theory by Herbert Simon
  - Contributing to the foundations of Artificial Intelligence, Informatik
- Semiotic systems theories
  - Peirce, Cassirer, Eco
  - Communication as system (linguistic theories – Saussure, Chomsky, Halliday, etc.)
- Systems theories in cultural studies
  - Cassirer, Hansen, Sperber, etc.
- Systems theory in pedagogy, etc.

Knowledge organization systems

- Covers all concept systems and terminologies used for ordering and retrieving knowledge (knowledge units, artifacts, etc.), such as
  - Classification systems
  - Thesauri
  - Indexing systems
  - Taxonomies
  - Nomenclatures
  - „Ontologies“
  - Etc.
- ..each having their own prototypical data models, purposes, traditions, but also many hybrid forms

Functions of knowledge organization systems

1. Instruments of structuring and archiving the content of large scale collections
2. Structural components of information systems
3. Support of targeted retrieval of information based on conceptual search criteria
4. Search aids, visual navigation, query languages
5. Communication support tools (cross-lingual, cross-disciplinary, cross-cultural)
6. Instruments of corporate knowledge management
7. Learning support, orientation support, didactic tools

Properties of knowledge organization systems

1. Conceptual structures (hierarchical and non-hierarchical structures)
2. Explicitation of conceptual links, definitions (mono- or multilingual)
3. Terminological and linguistic standardization
4. Increasingly formalized and digital (in particular as „ontologies“)
5. Different scales (from small KOS to large ones (more than 200.000 concepts)
6. Increasingly with visualized structures, interactive user interfaces
7. Static or *dynamic* (e.g. ontologies for modelling business processes in companies)

„Ontologies“ as formal knowledge systems

- Computer science: From Ontology as a traditional field of philosophy (theory of being, existence, theory of objects, etc.) to formal, digitally represented concept systems/ knowledge systems
- Concepts are explicitly defined – terms are assigned
- Relations between concepts are explicitated
- Terms are standardized
- Logical application rules and constraints are specified
- Ontologies as knowledge representation systems

Domain-specific knowledge organization systems

- Medicine, health, bio- and life sciences
- Business, trade
- Industry, engineering
- Natural sciences
- Administration, government
- Culture
- Pedagogy
- Linguistics
- Etc.

General trends in knowledge organization

- Dynamization, flexibilization
- Networking, contextualization
- De-hierarchization
- Visualization
- Multi-functional
- Hybridization
- Formalization, automation
- Internationalization

Problem Description

1. There is (still) a communication gap between formalized knowledge representations such as ontologies and users of information and communication systems, where such ontologies are used, also on user interfaces.
2. Although the Semantic Web has been designed primarily for machine-to-machine-communication, we need seamless natural language interaction workflows in (semantic) web services of any kind
3. While the Semantic Web is (still) essentially monolingual and the international lingua franca is English, there is a growing need for multilingual ontology resources as well as ontology-based translation services that overcome communication barriers arising from cultural-linguistic differences, lack of excellent command of English, need for high precision in communication, etc.

Need for integration of diverse methods

- As expressed in standards and implemented in technologies, the following “traditions” increasingly merge:
  - Ontology engineering standards, frameworks, technologies
    - e.g. OWL (based on RDF), SKOS (also on RDF) (W3C), DOLCE/SUMO, description logic, frame logic, unified logic, annotation
    - Types of ontologies (e.g. domain o., upper o., application o., task o.)
    - Editors such as Protégé, Altova, OntoEdit, div. merging/annotation tools
  - Translation engineering standards
    - i.e. various paradigms in machine translation and computer-assisted translation (language-based, statistical MT, Transl. Memories, patterns)
  - Terminology and language engineering standards (as the pre-requisite for and interface between ontology and translation)
    - Terminology and lexical markup frameworks: TMF, LMF (ISO)
    - Markup languages such as TBX (language industry+ISO)
    - Lexical databases/ling.ontol: WordNet, Ontowordnet, EuroWordNet
    - Linguistic enrichment of ontologies (e.g. FrameNet)
    - Interaction mechanisms, translation of ontologies
    - Integration of multilingual ontologies in machine translation processes

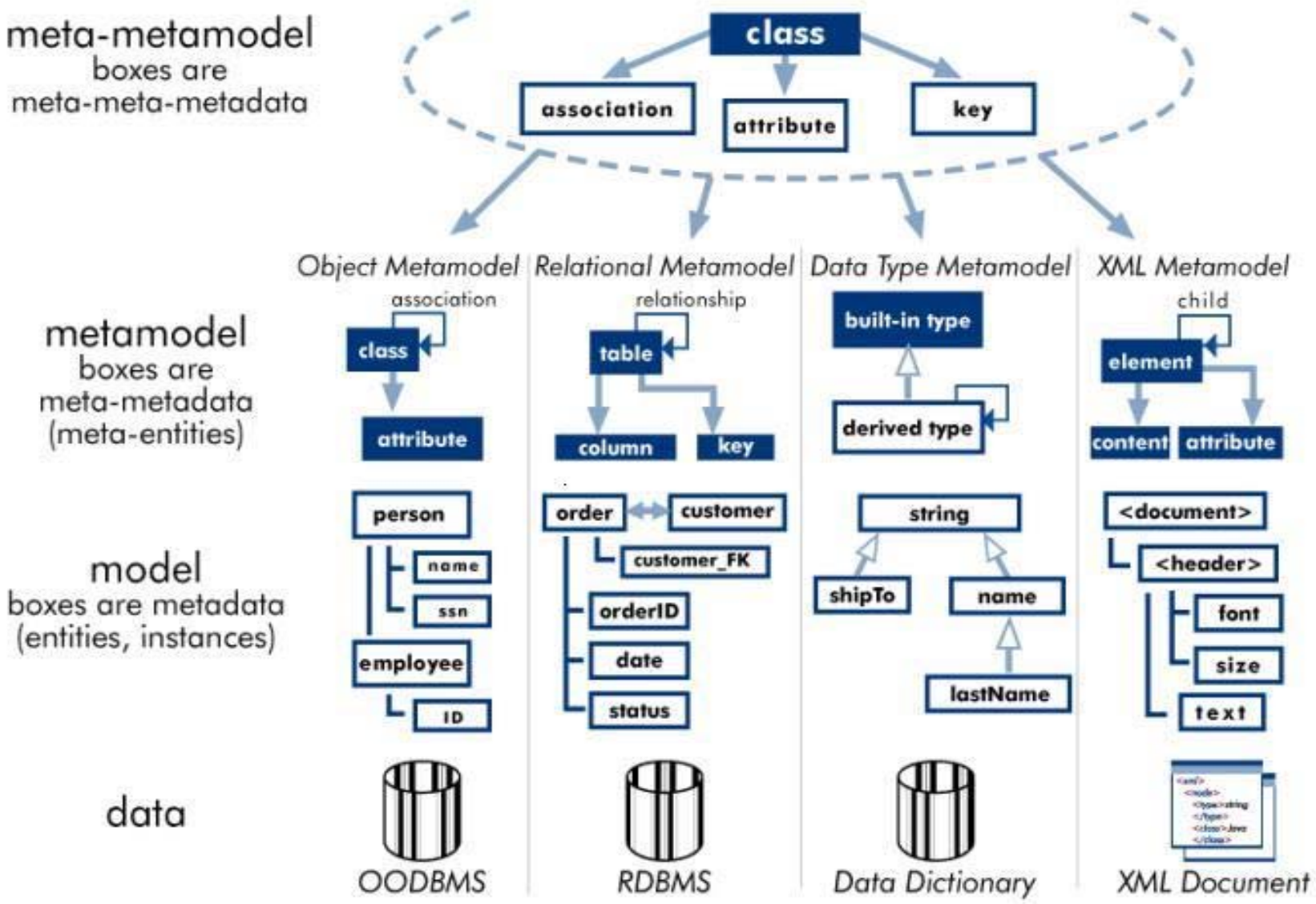
Diversity and interoperability

- Strong diversity of lexico-terminological resources
  - Data models, data structures + data semantics
  - Diversity of semantic, linguistic/cultural complexity and semantic depth/richness
- Diversity of user groups and their requirements
- Sheer quantity of resources
- Data interchange between organizations (within and across domains) as well as (distributed) data integration – early needs asking for immediate solutions

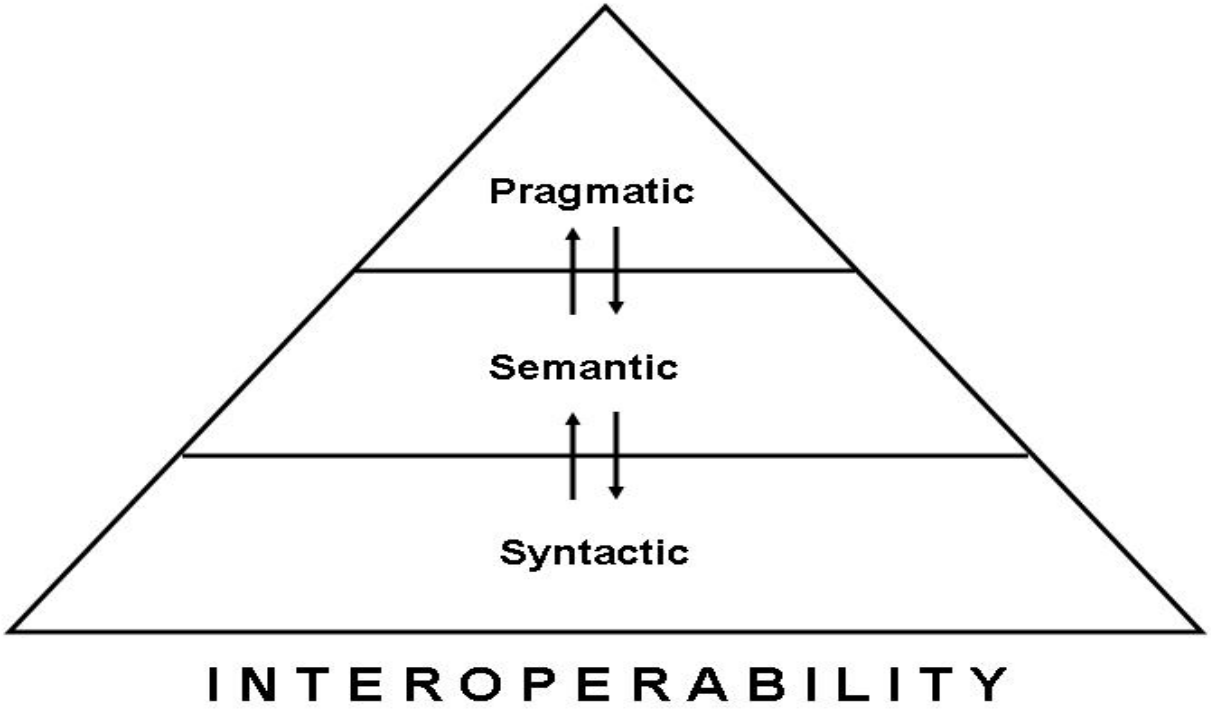
→

- History of data modeling
- History of interchange standards
- History of semantic interoperability management

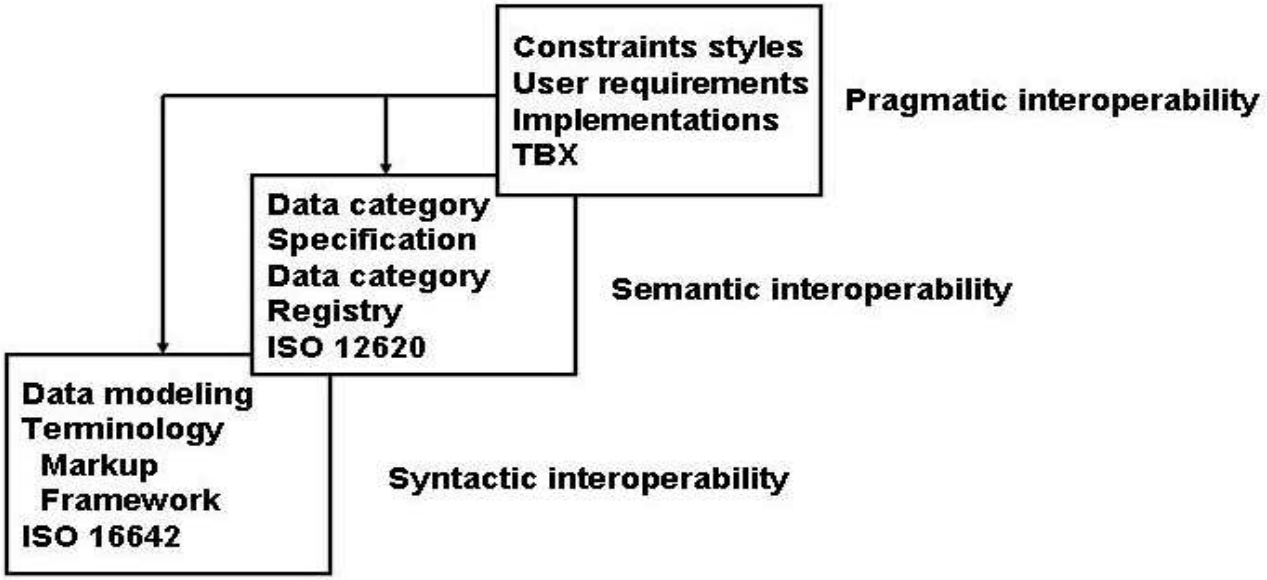
Need for multi-level modeling architectures



generic interoperability framework



terminological interoperability



Developing the Terminology Markup Framework in order to cope with this complexity-diversity

- Based on empirical studies and practical user-driven requirements analysis
- Markup/representation/modeling: XML, XMLS, RDF, UML
- Open standards strategy (ISO TC 37)
  - ISO 12620 Data categories – meta-model element + semantics registry (RDF)
  - ISO 16642 Terminology Markup Framework (TMF) – meta-model architecture and specifications (UML)
  - ISO 12200 – Terminology Markup Language (XML)
    - Instance for language industry: TBX Termbase Exchange Format (XML)
    - Instance for lexicography/publishing: LexML ISO 1951
  - Lexical Markup Framework (LMF) (UML)
  - ISO 704 and ISO 1087 (foundational level)
  - ISO 15188 (workflow and collaborative issues)
  - Alignment with ISO 11179, W3C, OASIS, etc.

Introduction to TBX

- TBX® stands for TermBase eXchange
- TBX is a Terminological Markup Framework (TMF) markup language
  - TMF is an ISO standard (16642)
- TBX is consistent with ISO 12200 (MARTIF)
- TBX is maintained by OSCAR (www.lisa.org)
- The TBX specification is free
- Serving portability of resources across proprietary terminology management systems, as well as interoperability of application-specific resources

TBX structure

- A TBX file is an XML document
- A TBX file consists of:
  - A header that describes the file
  - A set of entries, one per concept in the termbase
  - For each concept, a set of terms, grouped by language, that designate the concept
- A terminological concept entry (termEntry)
  - Can be multilingual
  - Can be monolingual

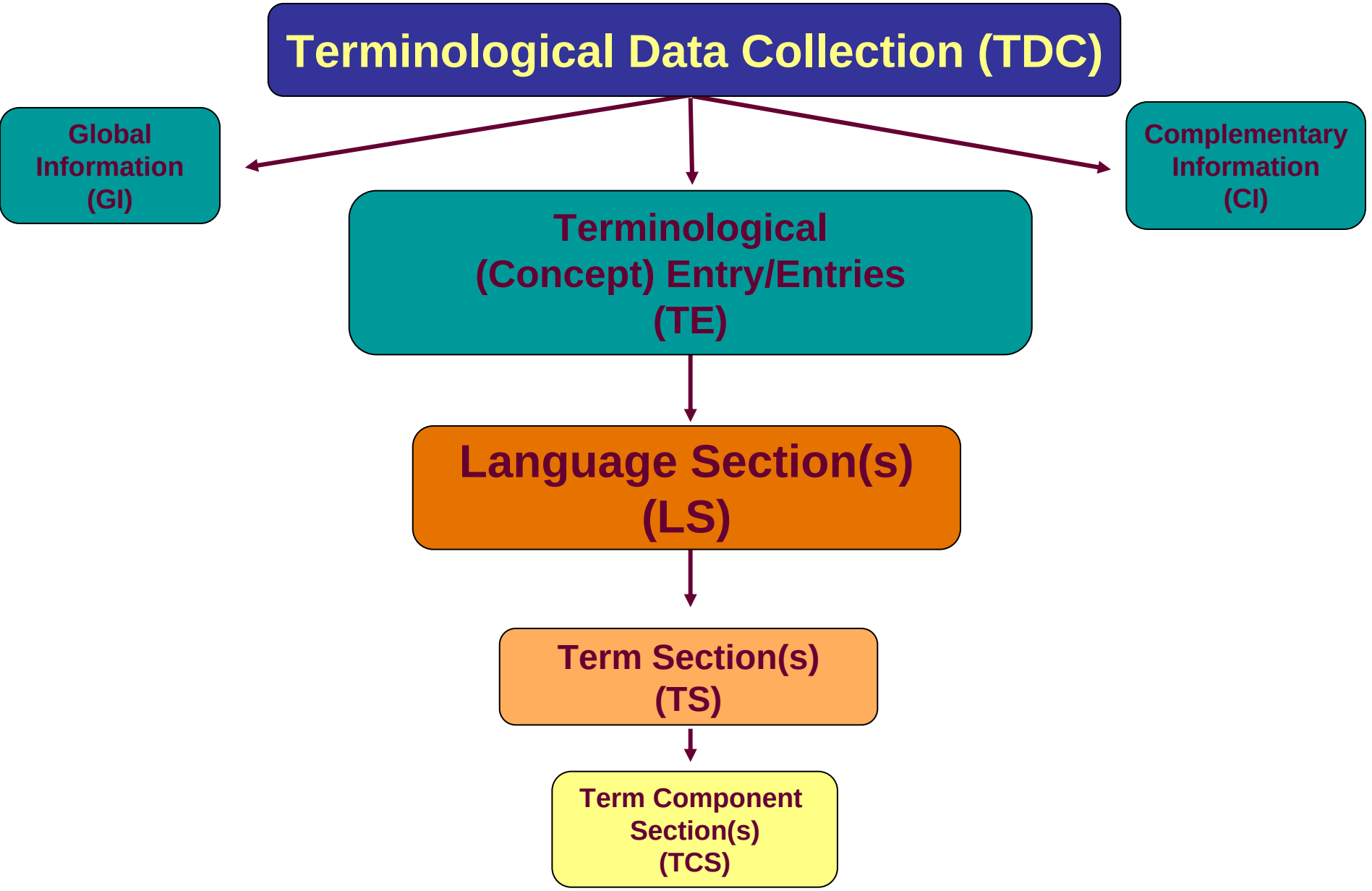
TBX and Other Standards

- (1) TBX and ISO 16642 (TMF)
- (2) TBX and ISO 12620 (Data Categories)
- (3) TBX and SKOS

1: TBX and ISO 16642

- TBX is a TML (Terminological Markup Language) of TMF (ISO 16642) (see Annex B)
- TBX maps to the TMF meta-model
  - A TBX file is a TDC (terminological data collection)
  - martifHeader provides GI (global information)
  - termEntry: TE (terminological entry)
  - langSet: LS (language section)
  - tig/ntig: TS (term section)
- A TMF DCS (Data Category Selection) in TBX is in XCS (eXtensible Constraint Specification) format
- TBX uses ISO 12200 for its XML style

TMF Metamodel



TMF and lexical resources

- In general, a terminological resource is organized into **concept entries**, each of which includes one or more terms designating a particular concept
- In general, a lexical resource is organized into **lexical entries**, each of which includes one or more senses of a particular lexical item (a word or phrase)
- A concept entry containing multiple terms can be split into multiple lexical entries, one per term, and multiple lexical entries associated with the same concept can be combined into one concept entry
- Link to Lexical Markup Framework (LMF)

2: TBX and ISO 12620

- All data categories in the default TBX DCS are taken from ISO 12620
- ISO 12620 is organized as an online registry and serves as a meta-ontology for resource modeling and for resource interoperability

3: TBX and SKOS

- A typical concept entry will contain a subject field to specify the domain of the concept.
- However, the subject field is typically some kind of hierarchy that is flattened into a string within TBX
- SKOS makes it possible to represent the subject field hierarchy as a hierarchy and then create a link within TBX

Simple Knowledge Organization System (SKOS)

- “SKOS is an area of work developing specifications and standards to support the use of knowledge organisation systems (KOS) such as thesauri, classification schemes, subject heading lists, taxonomies, other types of controlled vocabulary, and perhaps also terminologies and glossaries, within the framework of the Semantic Web.”
    - http://www.w3.org/2004/02/skos/ (Accessed on 3/17/06)

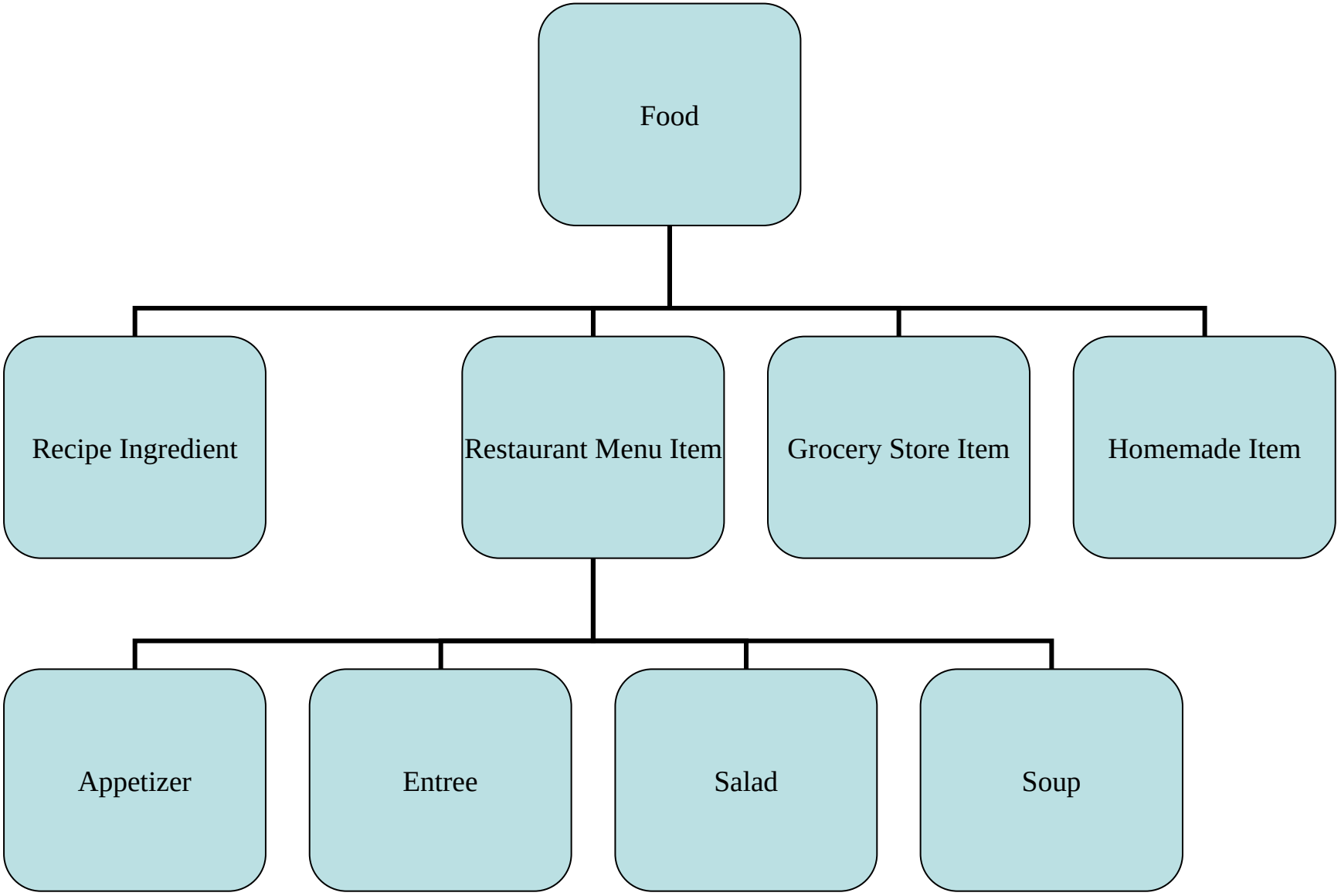
Sample SKOS

- <skos:Concept rdf:about="#s71">
- <skos:prefLabel>Food</skos:prefLabel>
- <skos:narrower rdf:resource="#s81"/>
- <skos:narrower rdf:resource="#s79"/>
- </skos:Concept>

- <skos:Concept rdf:about="#s81">
- <skos:prefLabel>Recipe Ingredient</skos:prefLabel>
- <skos:broader rdf:resource="#s71"/>
- </skos:Concept>

- <skos:Concept rdf:about="#s79">
- <skos:prefLabel>Restaurant Menu Item</skos:prefLabel>
- <skos:broader rdf:resource="#s71"/>
- </skos:Concept>

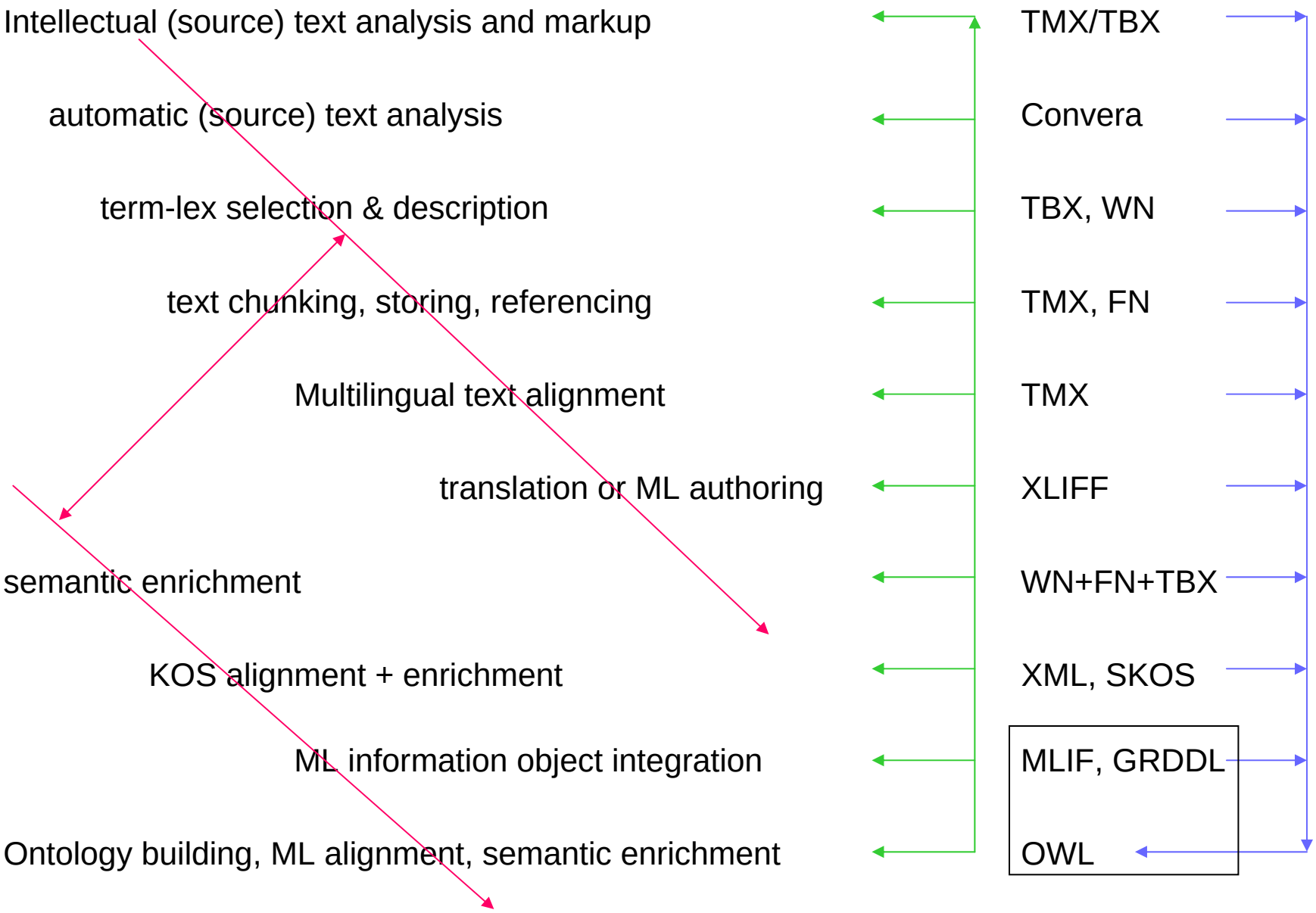
Visual Representation of SKOS



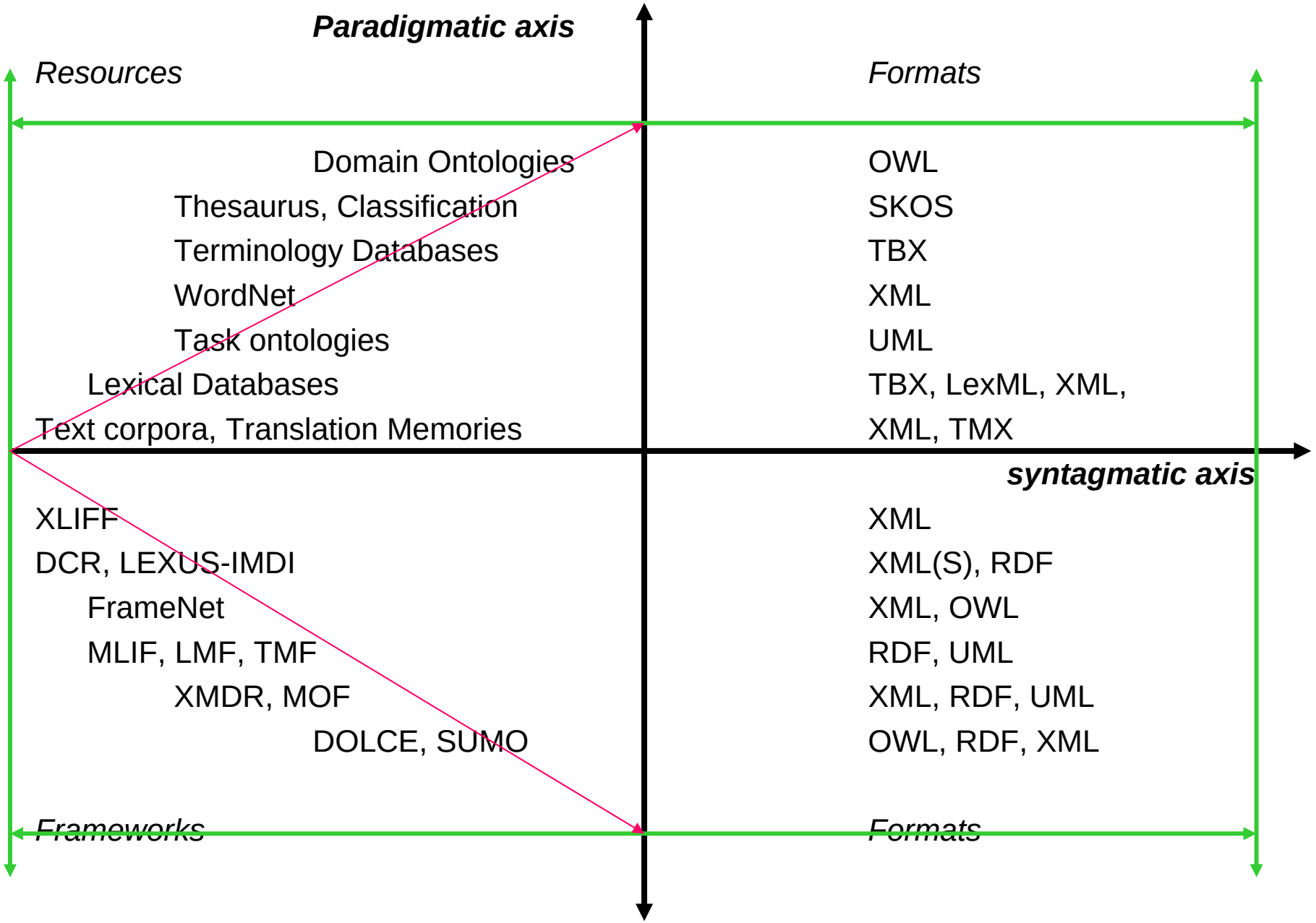
Moving up (and down) the Ontology Spectrum

- The challenge: from linguistic-cultural diversity of discourse and free-form lexical structures to a unified, formalized, axiomatized ontology – and back, to support human understanding and social processes such as collaborative learning
- The method: an integrative, multi-level modelling approach specifying the steps in a process-oriented workflow framework (with variable, combinable steps depending on concrete needs) for
  - Gradual semantic enrichment
  - Gradual semantic formalization
  - Multi- and cross-lingual referencing/alignment for text management
  - Constant interaction between full texts and lex-term resources
- The technology: a multi-component workbench (i.e. Dynamont-WB incl. ProTerm/Convera as a central element), using GRDDL, XML, RDF, OWL, SKOS, WordNet + GlobalWordnet, MLIF (containing TBX, TMX, XLIFF, LMF, TMF, etc.), FrameNet, etc.
- The advantage: full exploitation of all types of languages resources (LR) and knowledge organization systems (KOS), providing a framework not only for their semantic enrichment and formalization as ontologies but also for ontology-based multilingual authoring, text generation and translation

An Integrated Process<+>Component Model



A Multidimensional Meta-Model: Resource-Format Matrix



The global risk communication scenario

- Many projects since 1994 covering the following activities:
  - Thesaurus building
  - Creating multilingual terminology databases
  - Creating multilingual text corpora
  - Lexicographical glossary
  - Semantic enrichment (e.g. conceptual links, frame semantics)
  - Collection and analysis of relevant knowledge organization systems
  - Annotation of resources
  - Mark-up of resources (TBX, etc.)
  - Ontology building
  - Communication design

From texts and terminologies to ontologies

- Using the Risk scenario
  - Termbase
    - Export XML
    - Domain Models – meta-models -> patterns
  - Text corpus
    - Term extraction – comparative testing ProTerm, MultiTerm Extract, MultiCorpora
    - Aligning with termbase
    - Convert to RDF
  - Ontology import -> editor
  - Mappings (GMT, XML, RDF, OWL, UML, comma delimited, RDB, for different kinds of lex-term resources, FN->OWL, etc.)
- The MULTH-WIN Project as an example of methods integration:

Glossary

The following terms may help you navigate through this information kit.

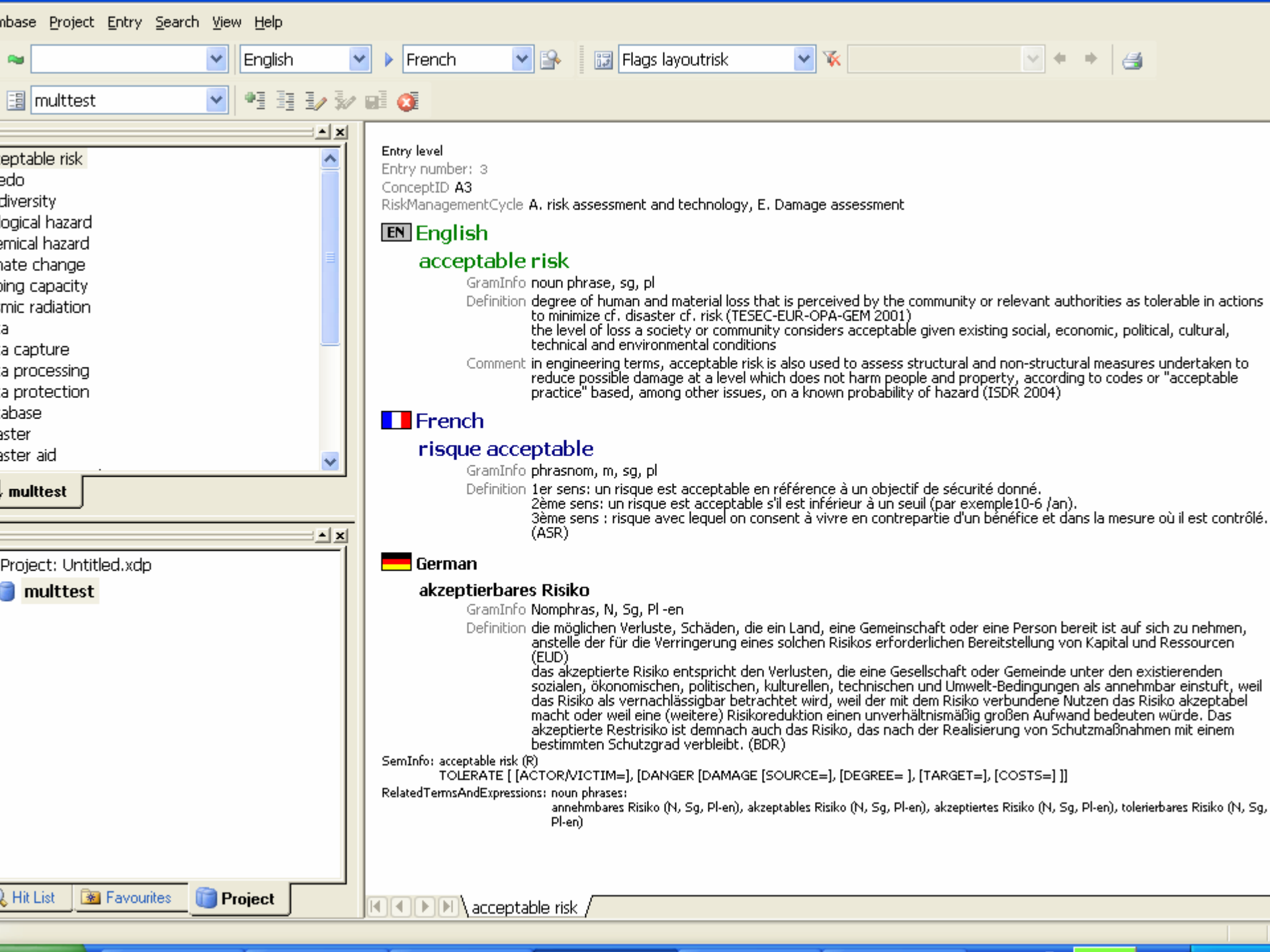
Climate change
Refers to a statistically significant variation in either the mean state of the climate or in its variability, persisting for an extended period (typically decades or longer).

Disaster
A serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses which exceed the ability of the affected community or society to cope using its own resources.

A disaster is a function of the risk process. It results from the combination of hazards, conditions of vulnerability and insufficient capacity or measures to reduce the potential negative consequences of risk.

Disaster risk reduction (disaster reduction)
The conceptual framework of elements considered with the possibilities to minimize vulnerabilities and disaster risks throughout a society, to avoid (prevention) or to limit (mitigation and preparedness) the adverse impacts of hazards, within the broad context of sustainable development.

Early warning
The provision of timely and effective information, through identified institutions, that allow individuals exposed to a hazard, to take action to avoid or reduce their risk and prepare for effective response.


mbase Project Entry Search View Help
English
French
Flags layoutrisk
multtest
eptable risk
edo
diversity
logical hazard
emical hazard
nate change
ping capacity
mic radiation
a
a capture
a processing
a protection
abase
aster
aster aid
multtest
Project: Untitled.xdp
multtest
Hit List
Favourites
Project
Entry level
Entry number: 3
ConceptID A3
RiskManagementCycle A. risk assessment and technology, E. Damage assessment
EN English
acceptable risk
GramInfo noun phrase, sg, pl
Definition degree of human and material loss that is perceived by the community or relevant authorities as tolerable in actions to minimize cf. disaster cf. risk (TESEC-EUR-OPA-GEM 2001)
the level of loss a society or community considers acceptable given existing social, economic, political, cultural, technical and environmental conditions
Comment in engineering terms, acceptable risk is also used to assess structural and non-structural measures undertaken to reduce possible damage at a level which does not harm people and property, according to codes or "acceptable practice" based, among other issues, on a known probability of hazard (ISDR 2004)
French
risque acceptable
GramInfo phrasnom, m, sg, pl
Definition 1er sens: un risque est acceptable en référence à un objectif de sécurité donné.
2ème sens: un risque est acceptable s'il est inférieur à un seuil (par exemple10-6 /an).
3ème sens : risque avec lequel on consent à vivre en contrepartie d'un bénéfice et dans la mesure où il est contrôlé. (ASR)
German
akzeptierbares Risiko
GramInfo Nomphras, N, Sg, Pl -en
Definition die möglichen Verluste, Schäden, die ein Land, eine Gemeinschaft oder eine Person bereit ist auf sich zu nehmen, anstelle der für die Verringerung eines solchen Risikos erforderlichen Bereitstellung von Kapital und Ressourcen (EUD)
das akzeptierte Risiko entspricht den Verlusten, die eine Gesellschaft oder Gemeinde unter den existierenden sozialen, ökonomischen, politischen, kulturellen, technischen und Umwelt-Bedingungen als annehmbar einstuft, weil das Risiko als vernachlässigbar betrachtet wird, weil der mit dem Risiko verbundene Nutzen das Risiko akzeptabel macht oder weil eine (weitere) Risikoreduktion einen unverhältnismäßig großen Aufwand bedeuten würde. Das akzeptierte Restrisiko ist demnach auch das Risiko, das nach der Realisierung von Schutzmaßnahmen mit einem bestimmten Schutzgrad verbleibt. (BDR)
SemInfo: acceptable risk (R)
TOLERATE [[ACTOR/VICTIM=], [DANGER [DAMAGE [SOURCE=], [DEGREE=], [TARGET=], [COSTS=]]]
RelatedTermsAndExpressions: noun phrases:
annehmbares Risiko (N, Sg, Pl-en), akzeptables Risiko (N, Sg, Pl-en), akzeptiertes Risiko (N, Sg, Pl-en), tolerierbares Risiko (N, Sg, Pl-en)
acceptable risk

History Options Help

ch Word: risk Redisplay Over

ches for risk: Noun Verb Senses:

ses of risk

e 1

rd, jeopardy, peril, **risk**, endangerment -- (a source of danger; a possibility of incurring loss or misfortune; "drinking alcohol is a health hazard")
=> danger -- (a cause of pain or injury or loss; "he feared the dangers of traveling by air")
=> causal agent, cause, causal agency -- (any entity that produces an effect or is responsible for events or results)
=> physical entity -- (an entity that has physical existence)
=> entity -- (that which is perceived or known or inferred to have its own distinct existence (living or nonliving))

e 2

peril, danger -- (a venture undertaken without regard to possible loss or injury; "he saw the rewards but not the risks of crime"; "there was a danger he would do the
g thing")
=> venture -- (any venturesome undertaking especially one with an uncertain outcome)
=> undertaking, project, task, labor -- (any piece of work that is undertaken or attempted; "he prepared for great undertakings")
=> work -- (activity directed toward making or doing something; "she checked several points needing further work")
=> activity -- (any specific behavior; "they avoided all recreational activity")
=> act, human action, human activity -- (something that people do or cause to happen)
=> event -- (something that happens at a given place and time)
=> psychological feature -- (a feature of the mental life of a living organism)
=> abstraction -- (a general concept formed by extracting common features from specific examples)
=> abstract entity -- (an entity that exists only abstractly)
=> entity -- (that which is perceived or known or inferred to have its own distinct existence (living or nonliving))

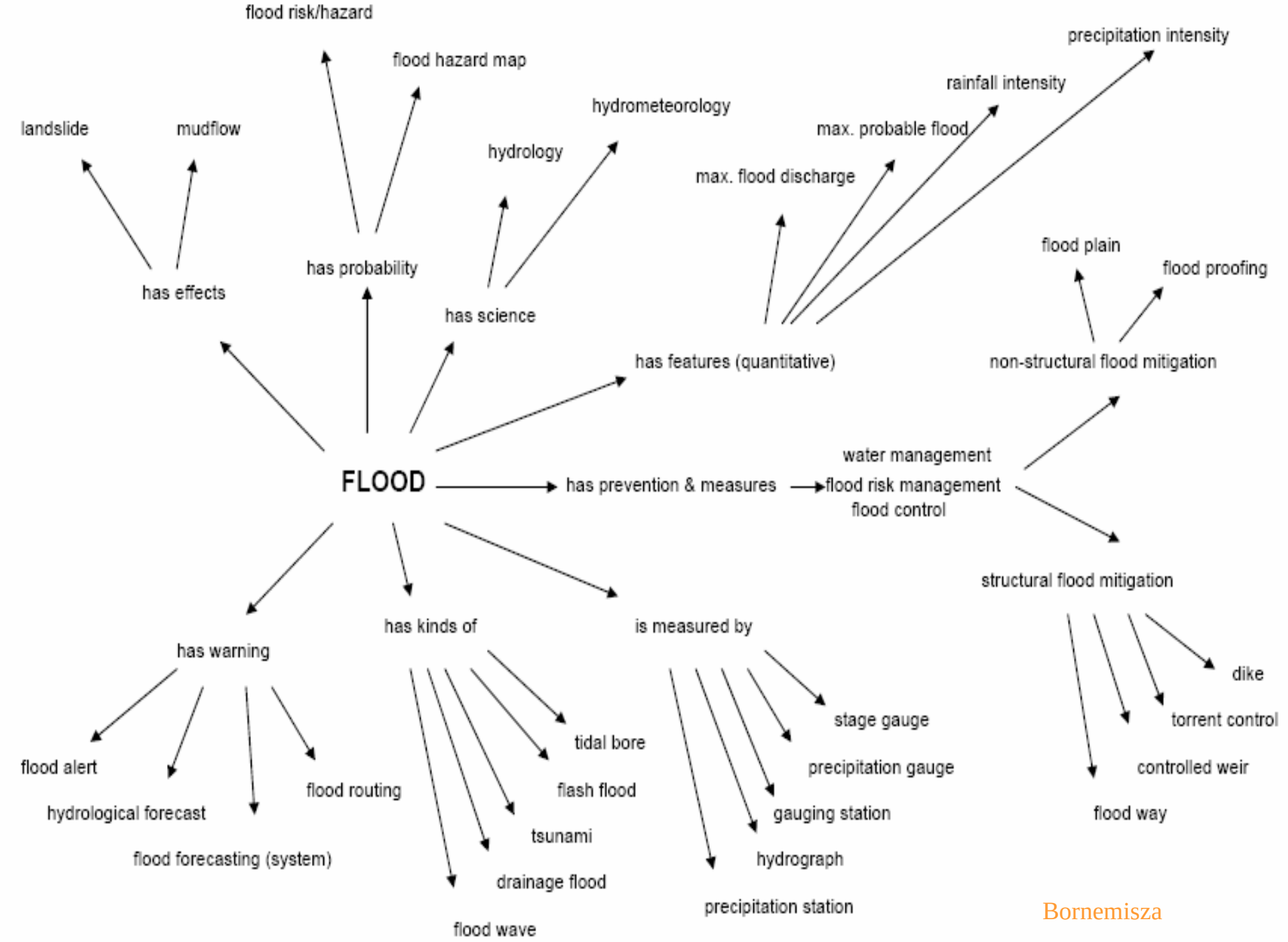
e 3

risk of infection -- (the probability of becoming infected given that exposure to an infectious agent has occurred)
=> probability, chance -- (a measure of how likely it is that some event will occur; a number expressing the ratio of favorable cases to the whole number of cases possibl
"the probability that an unbiased coin will fall with the head up is 0.5")
=> measure, quantity, amount -- (how much there is of something that you can quantify)
=> abstraction -- (a general concept formed by extracting common features from specific examples)
=> abstract entity -- (an entity that exists only abstractly)
=> entity -- (that which is perceived or known or inferred to have its own distinct existence (living or nonliving))

e 4

risk of exposure -- (the probability of being exposed to an infectious agent)
=> probability, chance -- (a measure of how likely it is that some event will occur; a number expressing the ratio of favorable cases to the whole number of cases possibl
"the probability that an unbiased coin will fall with the head up is 0.5")

ernyms (this is a kind of...)" search for noun "risk"


flood risk/hazard
flood hazard map
landslide
mudflow
hydrometeorology
hydrology
precipitation intensity
rainfall intensity
max. probable flood
max. flood discharge
flood plain
flood proofing
has probability
has effects
has science
has features (quantitative)
non-structural flood mitigation
FLOOD
has prevention & measures
water management
flood risk management
flood control
structural flood mitigation
has warning
has kinds of
is measured by
dike
torrent control
controlled weir
flood way
stage gauge
precipitation gauge
gauging station
hydrograph
precipitation station
tidal bore
flash flood
tsunami
drainage flood
flood wave
flood alert
hydrological forecast
flood forecasting (system)
flood routing
Bornemisza

Terminological frame semantics

- INTERVENTION (ACTOR(S), ACTIVITIES/PHASES):
- **RISK DETECTING (PRE-EVENT)**
- **- R-ASSESSMENT**
- - R-PERCEPTION (*X is risk*)
- - EXPERIENCE (statistics, case studies)
- - OBSERVATION (monitoring)
- - METHOD
- - SATELLITE
- - PROGNOSES
- - R-ANALYSIS
- - R-FEATURES
- - SITUATION/CONTEXT (danger/hazard)
- - SIMULATION (course of events)
- - PROBALISTIC METHODS (safety)
- - RELIABILITY
- - R-IDENTIFICATION (DAMAGE)
- - R-SOURCE
- - DAMAGE CAUSE
- - VULNERABILITY (DAMAGE TARGET)
- - SUSCEPTABILITY (capacity/people)

Terminological frame semantics

I. Pre-event B. Public awareness and planning, II. In-event: C. Events and response

afflux/Hochwasser durch Aufstau

BE [[TYPE=flood], [PLACE=], [TIME=]],

HAVE [CAUSE [[ORIGIN=], [NIEDERSCHLAG [TYPE=]], [STAU [TYPE= *Aufstau*]]]],

DAMAGE [TARGET=, SOURCE=, DEGREE=]],

HAPPEN [STATES=, PROCESSES=]]

backwater/Rückstau

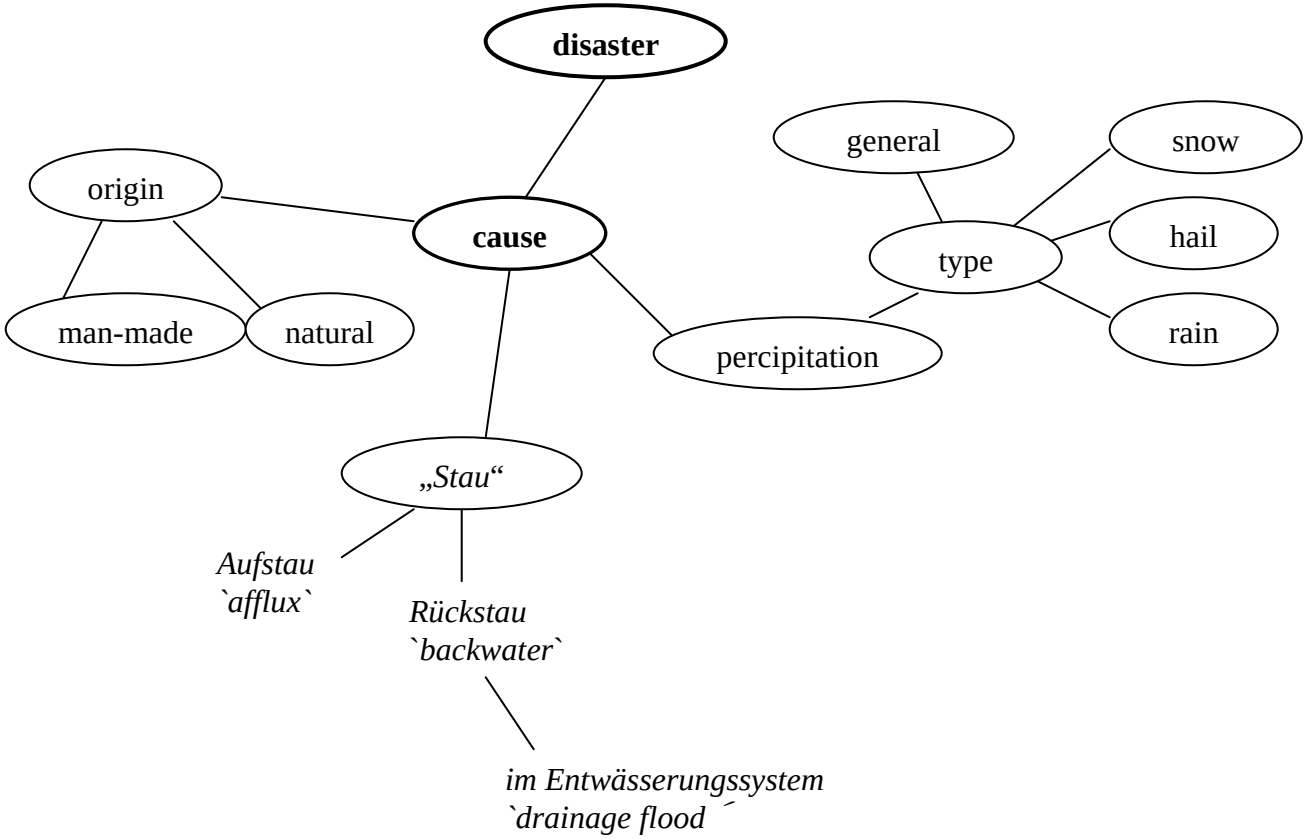
BE [[TYPE=flood], [PLACE=], [TIME=]],

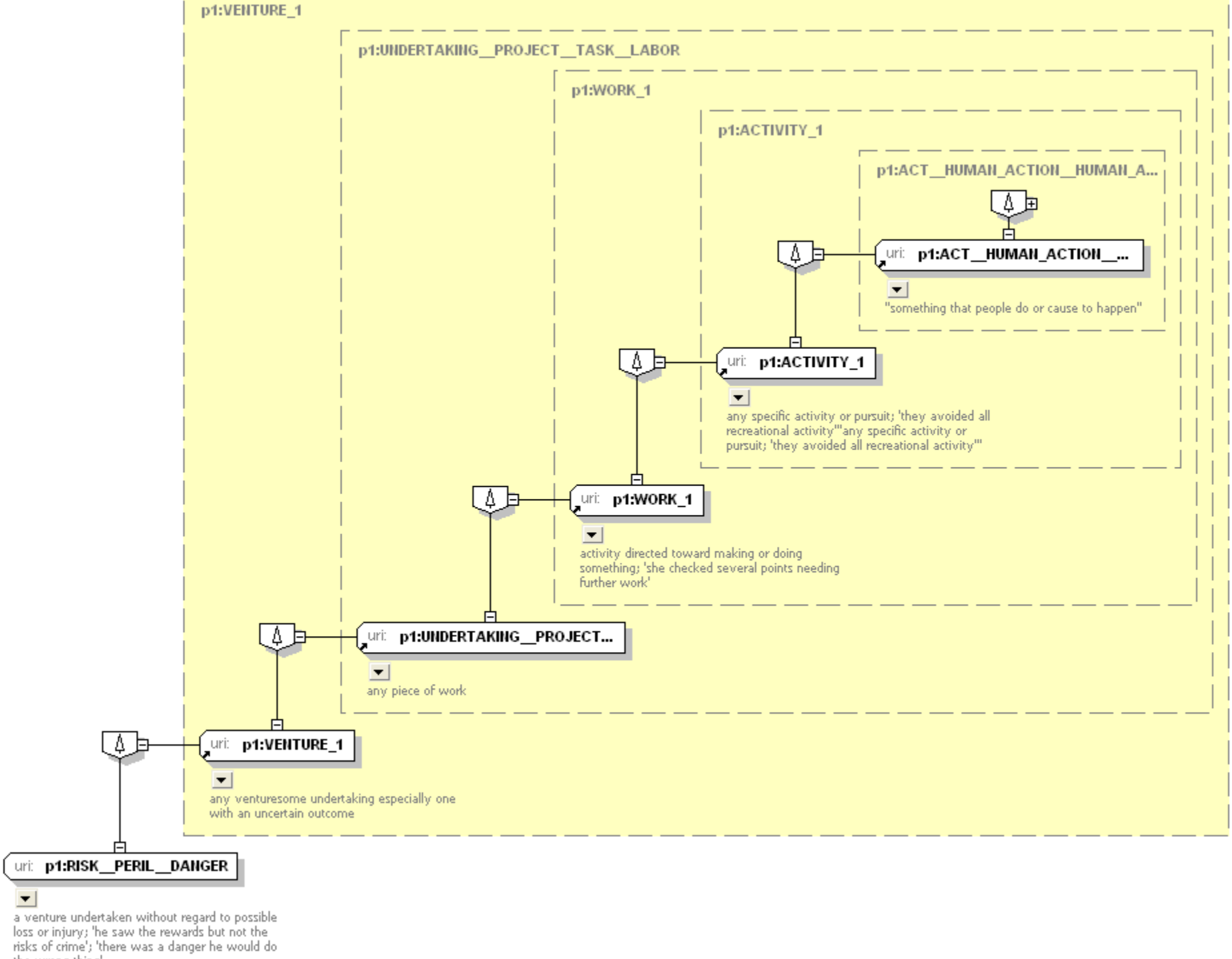
HAVE [CAUSE [[ORIGIN=], [NIEDERSCHLAG [TYPE=]], [STAU [TYPE= *Rückstau*]]]],

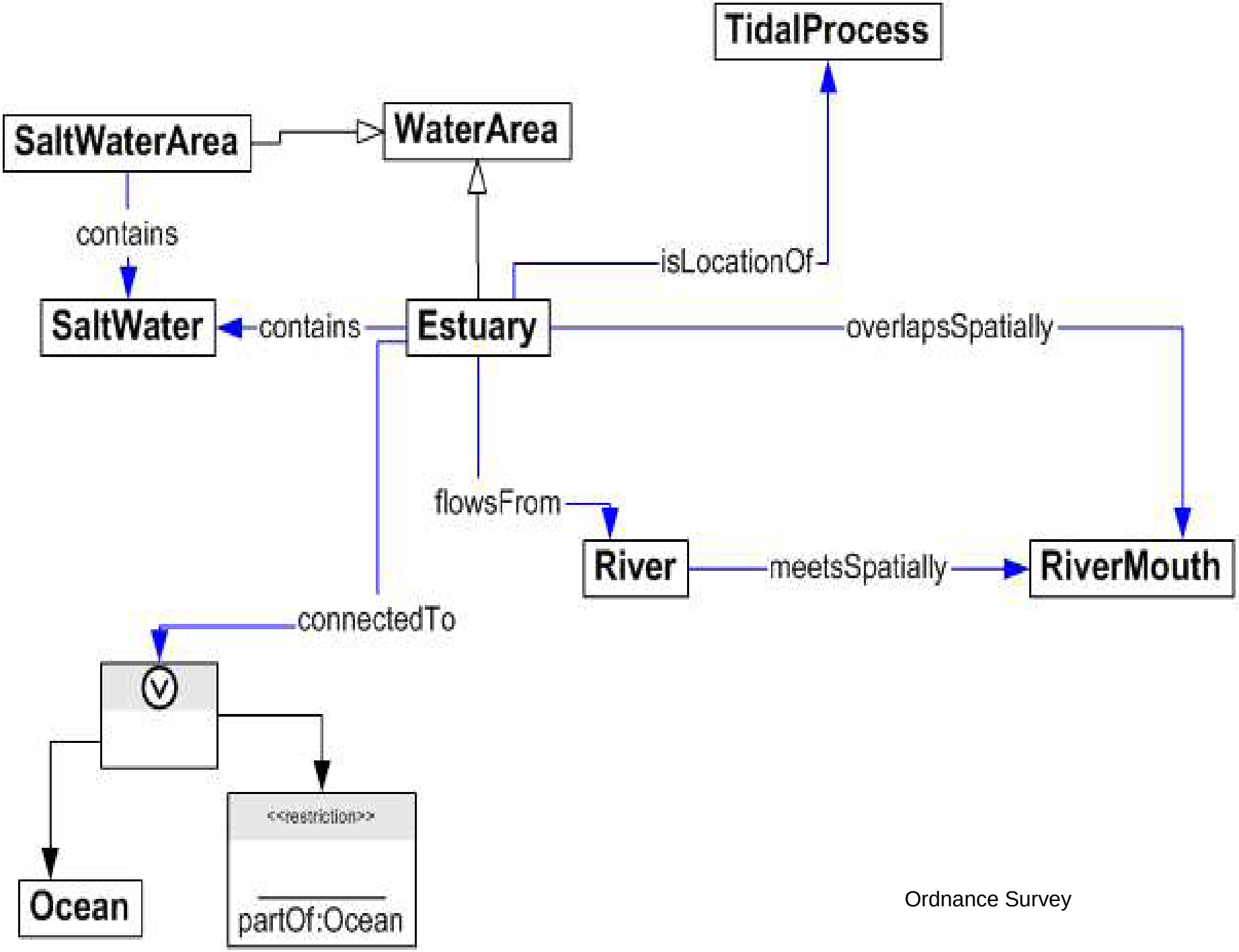
DAMAGE [TARGET=, SOURCE=, DEGREE=]],

HAPPEN [STATES=, PROCESSES=]]

Relationship modeling




p1:VENTURE_1
p1:UNDERTAKING__PROJECT__TASK__LABOR
p1:WORK_1
p1:ACTIVITY_1
p1:ACT__HUMAN_ACTION__HUMAN_A...
uri: p1:ACT__HUMAN_ACTION__...
"something that people do or cause to happen"
uri: p1:ACTIVITY_1
any specific activity or pursuit; 'they avoided all recreational activity""any specific activity or pursuit; 'they avoided all recreational activity'"
uri: p1:WORK_1
activity directed toward making or doing something; 'she checked several points needing further work'
uri: p1:UNDERTAKING__PROJECT...
any piece of work
uri: p1:VENTURE_1
any venturesome undertaking especially one with an uncertain outcome
uri: p1:RISK__PERIL__DANGER
a venture undertaken without regard to possible loss or injury; 'he saw the rewards but not the risks of crime'; 'there was a danger he would do


TidalProcess
SaltWaterArea
WaterArea
contains
isLocationOf
SaltWater
contains
Estuary
overlapsSpatially
flowsFrom
River
meetsSpatially
RiverMouth
connectedTo
<<restriction>>
partOf:Ocean
Ocean

```
- <rdfs:subClassOf>
  - <owl:Restriction>
      <owl:onProperty rdf:resource="#connectedTo"/>
    - <owl:someValuesFrom>
      - <owl:Class>
        - <owl:unionOf rdf:parseType="Collection">
          - <owl:Restriction>
              <owl:onProperty rdf:resource="#partOf"/>
              <owl:allValuesFrom rdf:resource="#Ocean"/>
            </owl:Restriction>
            <owl:Class rdf:about="#Ocean"/>
          </owl:unionOf>
        </owl:Class>
      </owl:someValuesFrom>
    </owl:Restriction>
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</owl:Class>
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<owl:Class rdf:ID="SaltWater"/>
```

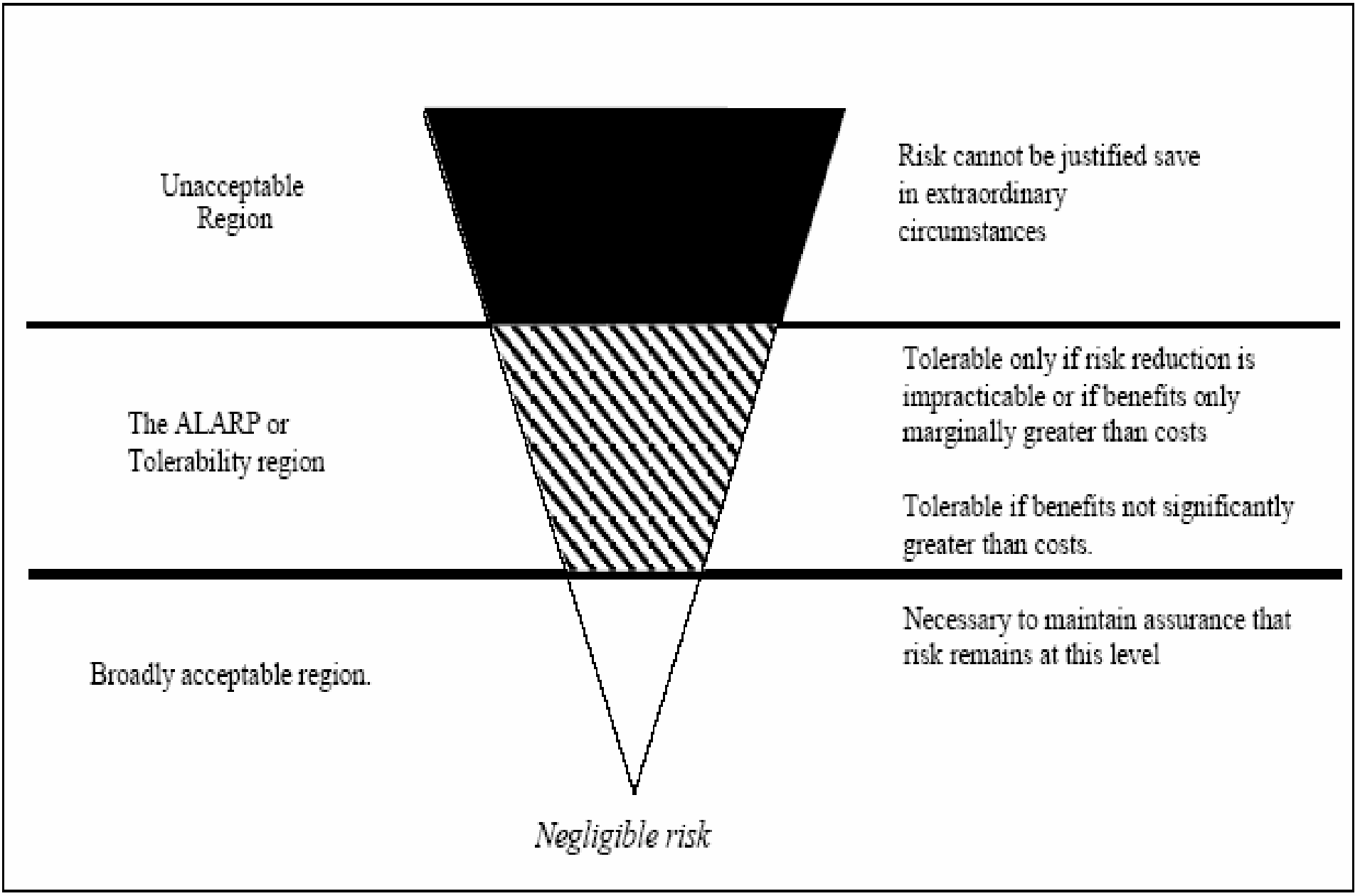
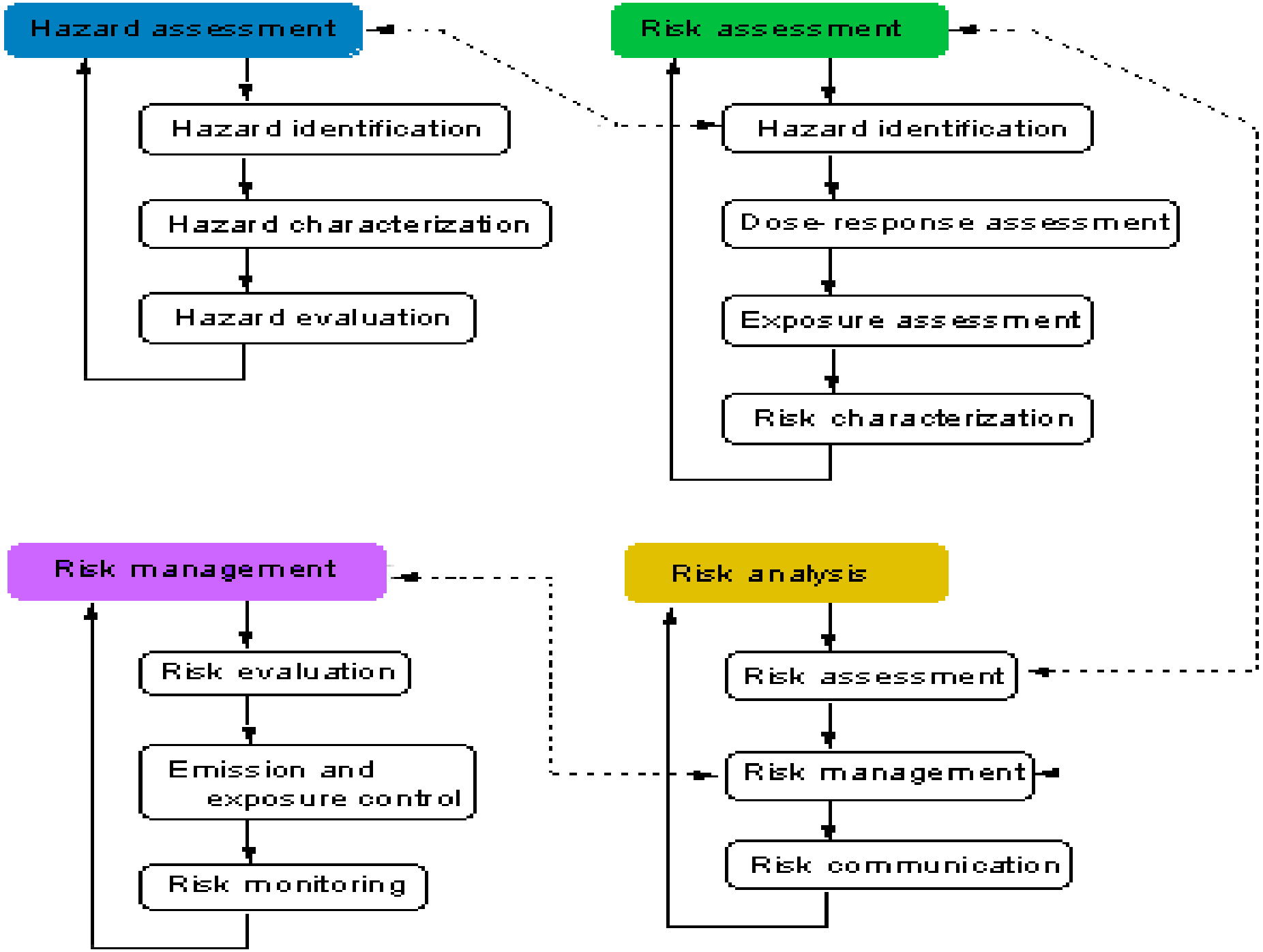
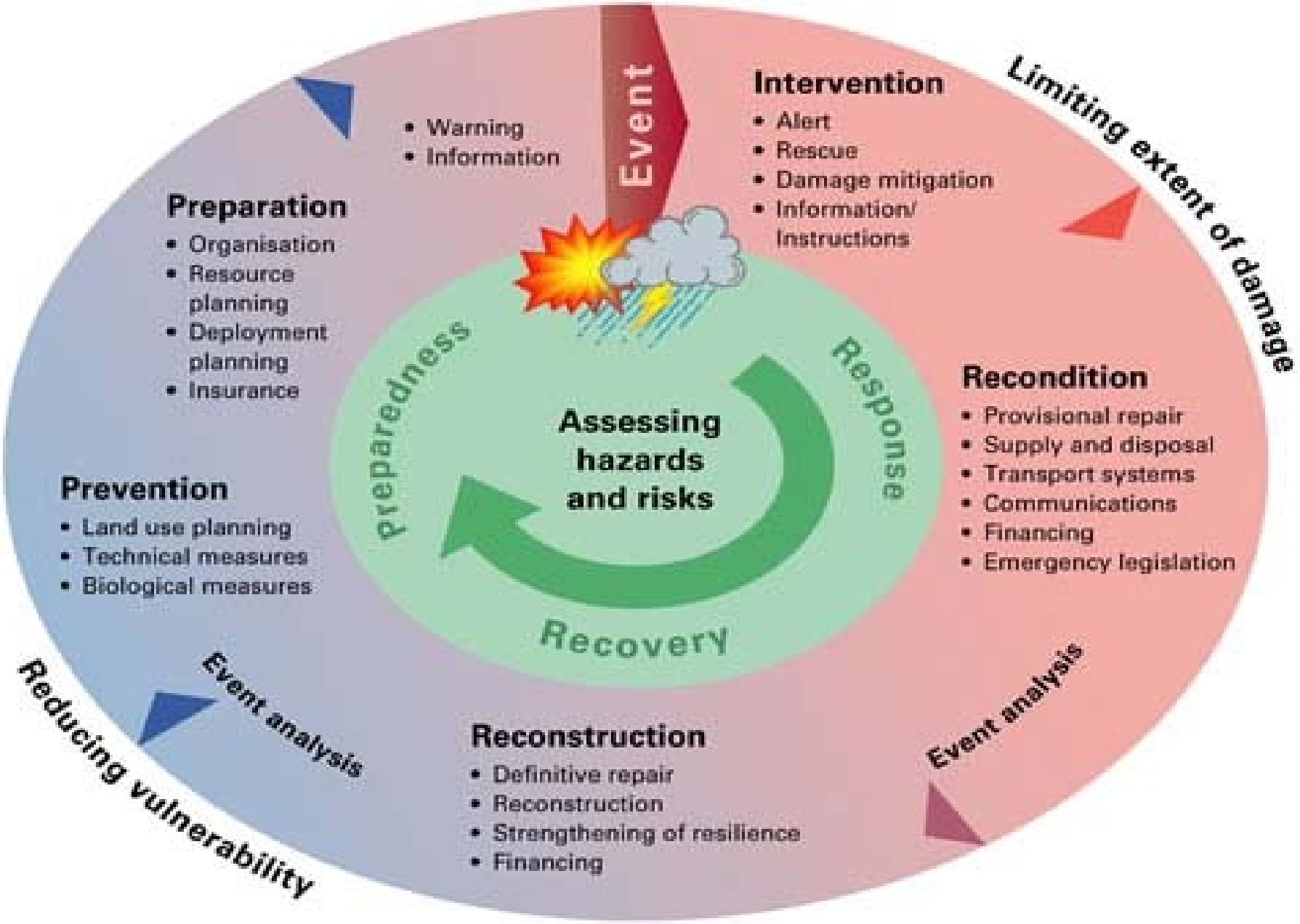
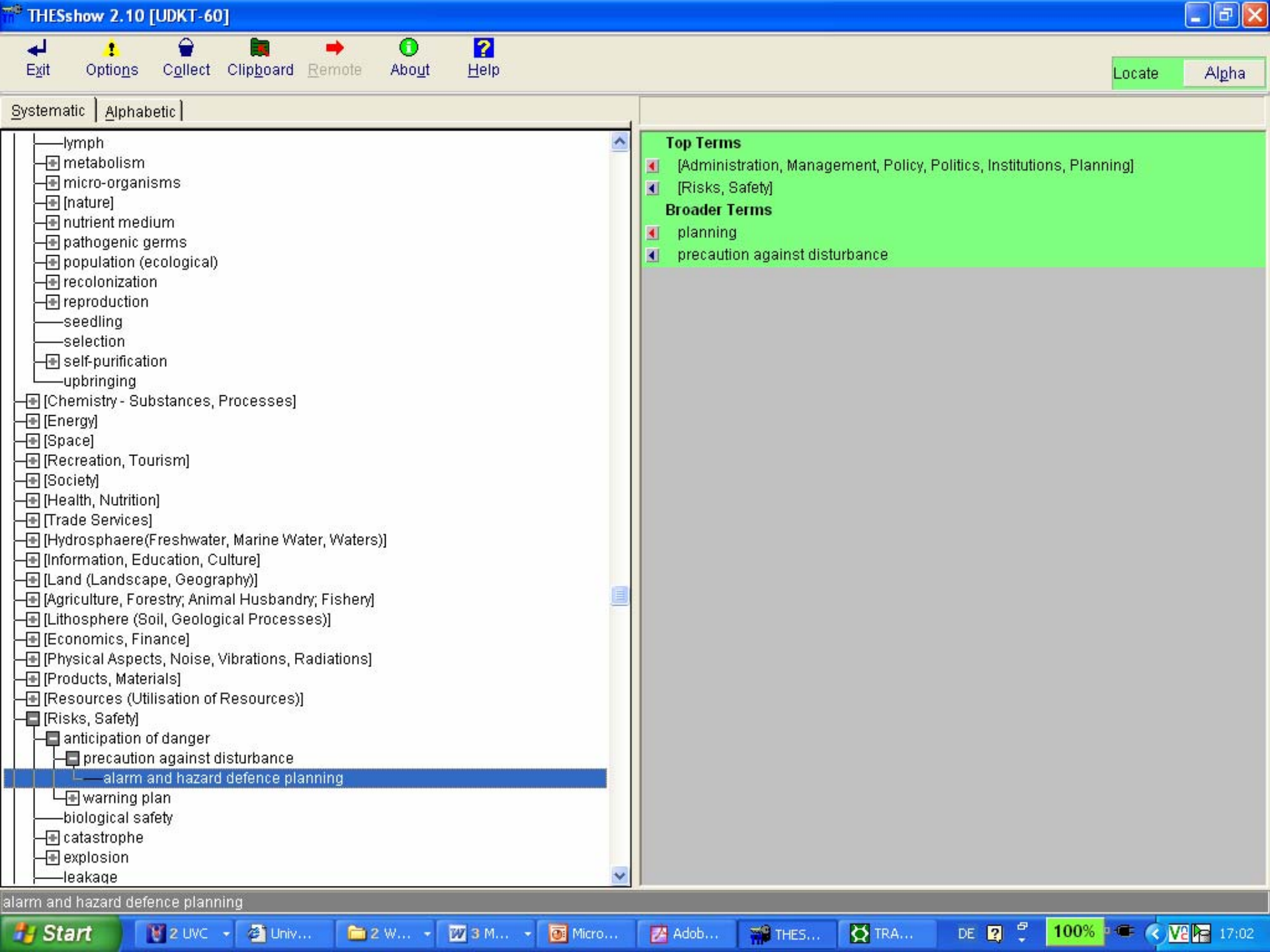


Figure 3.2 Acceptable risk levels and the ALARP principle

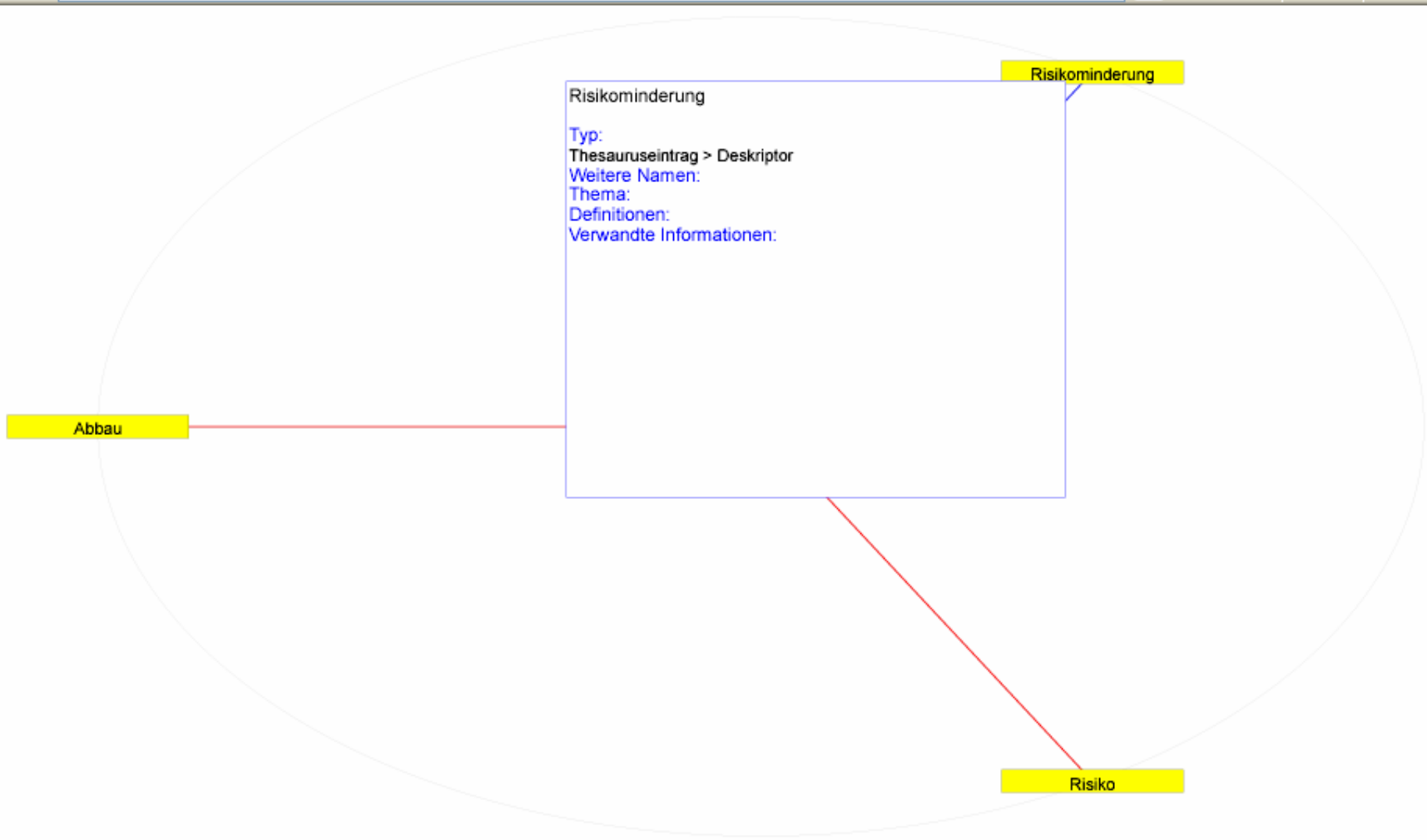

Hazard assessment
Hazard identification
Hazard characterization
Hazard evaluation
Risk assessment
Hazard identification
Dose-response assessment
Exposure assessment
Risk characterization
Risk management
Risk evaluation
Emission and exposure control
Risk monitoring
Risk analysis
Risk assessment
Risk management
Risk communication


Event
• Warning
• Information
Intervention
• Alert
• Rescue
• Damage mitigation
• Information/ Instructions
Limiting extent of damage
Preparation
• Organisation
• Resource planning
• Deployment planning
• Insurance
preparedness
Response
Assessing hazards and risks
Recovery
Recondition
• Provisional repair
• Supply and disposal
• Transport systems
• Communications
• Financing
• Emergency legislation
Prevention
• Land use planning
• Technical measures
• Biological measures
Event analysis
Reducing vulnerability
Event analysis
Reconstruction
• Definitive repair
• Reconstruction
• Strengthening of resilience
• Financing


THESshow 2.10 [UDKT-60]
Exit
Options
Collect
Clipboard
Remote
About
Help
Locate
Alpha
Systematic
Alphabetic
lymph
metabolism
micro-organisms
[nature]
nutrient medium
pathogenic germs
population (ecological)
recolonization
reproduction
seedling
selection
self-purification
upbringing
[Chemistry - Substances, Processes]
[Energy]
[Space]
[Recreation, Tourism]
[Society]
[Health, Nutrition]
[Trade Services]
[Hydrosphaere(Freshwater, Marine Water, Waters)]
[Information, Education, Culture]
[Land (Landscape, Geography)]
[Agriculture, Forestry; Animal Husbandry; Fishery]
[Lithosphere (Soil, Geological Processes)]
[Economics, Finance]
[Physical Aspects, Noise, Vibrations, Radiations]
[Products, Materials]
[Resources (Utilisation of Resources)]
[Risks, Safety]
anticipation of danger
precaution against disturbance
alarm and hazard defence planning
warning plan
biological safety
catastrophe
explosion
leakage
Top Terms
[Administration, Management, Policy, Politics, Institutions, Planning]
[Risks, Safety]
Broader Terms
planning
precaution against disturbance
alarm and hazard defence planning
Start
2 UVC
Univ...
2 W...
3 M...
Micro...
Adob...
THES...
TRA...
DE
100%
17:02

RISKS, SAFETY

hazard	S:5207	. safety measure
. environmental hazard	S:5208	. . air safety
. hazard of pollutants	S:5209	. . biosafety
. . pollutant exposure	S:5210	. . civil safety
. natural hazard	S:5211	. . disaster contingency plan
. navigational hazard	S:5212	. . . environmental contingency planning
. nuclear hazard	S:5213	. . disaster relief
. . radiation exposure	S:5214	. . . disaster cleanup operation
. technological hazard	S:5215	. . . disaster control service
. . biotechnological hazard	S:5216	. . drought control
risk	S:5217	. . emergency plan
. cancer risk	S:5218	. . . risk exposure plan
. chemical risk	S:5219	. . . warning plan
. environmental risk	S:5220	. . emergency relief
. major risk	S:5221	. . . emergency relief measure
. natural risk	S:5222	. . environmental security
. nuclear risk	S:5223	. . flood control
. pollution risk	S:5224	. . industrial safety
. residual risk	S:5225	. . nuclear safety
. technological hazard	S:5226	. . occupational safety
. . biotechnological hazard	S:5227	. . prevention measure
		. . . damage prevention
		. . . disaster prevention



Anzeige aktualisieren Tiefe 1

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OWL Full

sses | Properties | Instances | allDifferent | Ontologies

owl:ObjectProperty	http://ontology.ip.rm.cnr.it/ontologies/DOLCE-Lite#ABSTRACT-LOCATION
owl:ObjectProperty	http://ontology.ip.rm.cnr.it/ontologies/DOLCE-Lite#ABSTRACT-LOCATION-OF
owl:ObjectProperty	http://ontology.ip.rm.cnr.it/ontologies/DOLCE-Lite#ATOMIC-PART
owl:ObjectProperty	http://ontology.ip.rm.cnr.it/ontologies/DOLCE-Lite#ATOMIC-PART-OF
owl:ObjectProperty	http://ontology.ip.rm.cnr.it/ontologies/DOLCE-Lite#COMPONENT
owl:ObjectProperty	http://ontology.ip.rm.cnr.it/ontologies/DOLCE-Lite#COMPONENT-OF
owl:ObjectProperty	http://ontology.ip.rm.cnr.it/ontologies/DOLCE-Lite#CONCEPTUAL-RELATION
owl:ObjectProperty	http://ontology.ip.rm.cnr.it/ontologies/DOLCE-Lite#CONSTANT-PARTICIPANT
owl:ObjectProperty	http://ontology.ip.rm.cnr.it/ontologies/DOLCE-Lite#CONSTANT-PARTICIPANT-IN
owl:ObjectProperty	http://ontology.ip.rm.cnr.it/ontologies/DOLCE-Lite#CONSTITUTED-BY
owl:ObjectProperty	http://ontology.ip.rm.cnr.it/ontologies/DOLCE-Lite#CONSTITUTES
owl:ObjectProperty	http://ontology.ip.rm.cnr.it/ontologies/DOLCE-Lite#DEPEND-ON-OF
owl:ObjectProperty	http://ontology.ip.rm.cnr.it/ontologies/DOLCE-Lite#DEPEND-ON-SPATIAL-LOCATION-OF
owl:ObjectProperty	http://ontology.ip.rm.cnr.it/ontologies/DOLCE-Lite#DEPENDS-ON
owl:ObjectProperty	http://ontology.ip.rm.cnr.it/ontologies/DOLCE-Lite#DEPENDS-ON-SPATIAL-LOCATION
owl:ObjectProperty	http://ontology.ip.rm.cnr.it/ontologies/DOLCE-Lite#DESCRIPTIVE-DEPEND-ON-OF
owl:ObjectProperty	http://ontology.ip.rm.cnr.it/ontologies/DOLCE-Lite#DESCRIPTIVELY-DEPENDS-ON
owl:ObjectProperty	http://ontology.ip.rm.cnr.it/ontologies/DOLCE-Lite#DURATION
owl:ObjectProperty	http://ontology.ip.rm.cnr.it/ontologies/DOLCE-Lite#DURATION-OF
owl:ObjectProperty	http://ontology.ip.rm.cnr.it/ontologies/DOLCE-Lite#E-TEMPORAL-LOCATION
owl:ObjectProperty	http://ontology.ip.rm.cnr.it/ontologies/DOLCE-Lite#E-TEMPORAL-LOCATION-OF

mains for Property

http://ontology.ip.rm.cnr.it/ontologies/DOLCE-Lite#Non-Physical-Endurant

xt | RDF/OWL

OLCE2.0-Lite-v3.owl.rdf

iew

Errors

This ontology is well-formed.

CAP NUM

Concept Relations - some typologies

- Domain approaches
  - UMLS
  - Biomedical ontologies
  - SNS
  - FAO
- Generic approaches

  In terminological knowledge engineering

UMLS

- isa
- associated_with
  - physically_related_to
    - part_of
    - consists_of
    - contains
    - connected_to
    - interconnects
    - branch_of
    - tributary_of
    - ingredient_of
  - spatially_related_to
    - location_of
    - adjacent_to
    - surrounds
    - traverses
  - functionally_related_to
    - affects
      - manages
      - treats
      - disrupts
      - complicates
      - interacts_with
      - prevents
    - brings_about
      - produces
      - causes

- [associated_with] (continued)
  - [functionally_related_to] (continued)
    - performs
      - carries_out
      - exhibits
      - practices
    - occurs_in
      - process_of
    - uses
    - manifestation_of
    - indicates
    - result_of
  - temporally_related_to
    - co occurs_with
    - precedes
  - conceptually_related_to
    - evaluation_of
    - degree_of
    - analyzes
      - assesses_effect_of
    - measurement_of
    - measures
    - diagnoses
    - property_of
    - derivative_of
    - developmental_form_of
    - method_of
    - conceptual_part_of
    - issue_in

Biomedical ontologies

- Barry Smith et al.
- OBO and related initiatives

- Three levels (binary relations):
  - <class, class>: for example, the *is_a* relation obtaining between the class *SWR1 complex* and the class *chromatin remodeling complex*, or between the class *exocytosis* and the class *secretion*;
  - <instance, class>: for example, the relation **instance_of** obtaining between this particular vesicle membrane and the class *vesicle membrane*, or between this particular instance of mitosis and the class *mitosis*;
  - <instance, instance>: for example, the relation of instance-level parthood (called **part_of** in what follows), obtaining between this particular vesicle membrane and the endomembrane system in the corresponding cell, or between this particular M phase of some mitotic cell cycle and the entire cell cycle of the particular cell involved.

Continuants vs. Processes, classes vs. instances

C, *C*1, ... to range over continuant classes;

P, *P*1, ... to range over process classes;

c, *c*1, ... to range over continuant instances;

p, *p*1, ... to range over process instances;

r, *r*1, ... to range over three-dimensional spatial regions;

t, *t*1, ... to range over instants of time.

Primitive instance level

- *c* **instance_of** *C* **at** *t* - a primitive relation between a continuant instance and a class which it instantiates at a specific time
- *p* **instance_of** *P* - a primitive relation between a process instance and a class which it instantiates holding independently of time
- *c* **part_of** *c*1 **at** *t* - a primitive relation between two continuant instances and a time at which the one is part of the other
- *p* **part_of** *p*1, *r* **part_of** *r*1 - a primitive relation of parthood, holding independently of time, either between process instances (one a subprocess of the other), or between spatial regions (one a subregion of the other)
- *c* **located_in** *r* **at** *t* - a primitive relation between a continuant instance, a spatial region which it occupies, and a time
- *r* **adjacent_to** *r*1 - a primitive relation of proximity between two disjoint continuants
- *t* **earlier** *t*1 - a primitive relation between two times
- *c* **derives_from** *c*1 - a primitive relation involving two distinct material continuants *c* and *c*1
- *p* **has_participant** *c* **at** *t* - a primitive relation between a process, a continuant, and a time
- *p* **has_agent** *c* **at** *t* - a primitive relation between a process, a continuant and a time at which the continuant is causally active in the process

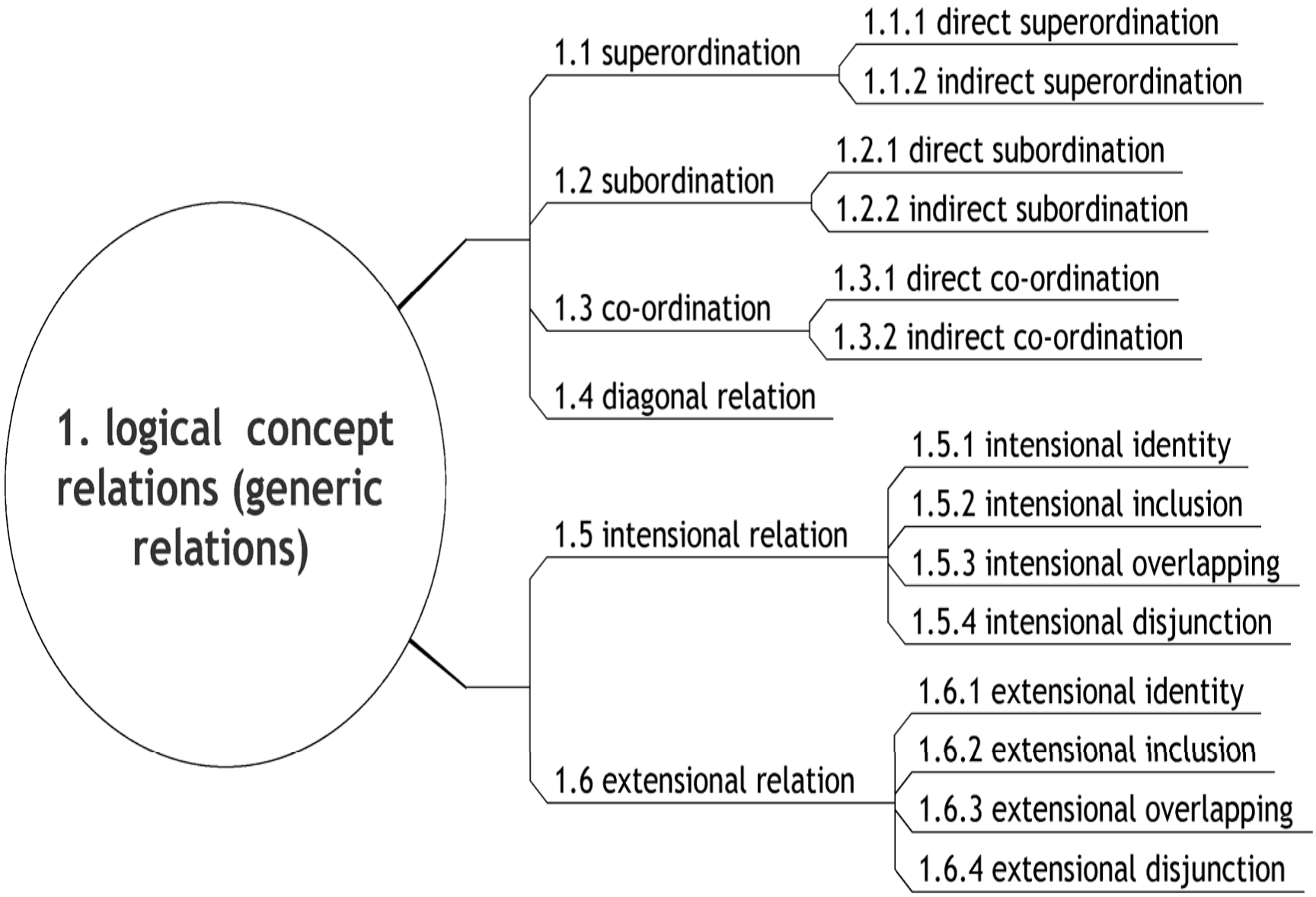
SEMANTIC RELATION IN EUROWORDNET:	EXAMPLE:
SYNONYMY & ANTONYMY	
near_synonym (not in same synset)	tool <> instrument
antonym	good <> bad
HYPONYMY	
has_hyponym	vehicle > car
has_hyperonym	car > vehicle
PART-WHOLE RELATIONS	
has_meronymy	(for underspecified cases such as: has as parts)
has_holonymy	(for underspecified cases such as : is a part of)
has_mero_part	hand > finger
has_mero_member	fleet > ship
has_mero_made_of	book > paper
has_mero_portion	bread > slice
has_mero_location	desert > oasis
has_holo_part	finger > hand
has_holo_member	ship > fleet
has_ holo_made_of	paper > book
CAUSE RELATIONS	
is_caused_by	(for underspecified cases)
causes	(for underspecified cases)
results_in	to kill > to die
for_purpose_of	to search > to find
enables_to	vision > to see
SUBEVENT RELATIONS	
is_subevent_of	to snore > to sleep
has_subevent	to sleep > to snore
INVOLVED/ROLE RELATIONS	
involved_agent	to bark > dog
role_agent	dog > to bark
involved_patient	to teach > learner
role_patient	learner > to teach
involved_instrument	to paint > paint-brush
role_instrument	paint-brush > to paint
involved_location	to swim > water
role_location	water > swim
involved_source_direction	to disembark > ship
role_source_direction	ship > disembark
involved_target_direction	rincasarse > casa
role_target_direction	casa > rincasarse
involved_result	to freeze > ice
role_result	ice > to freeze
involved_manner	shout > loudly
role_manner	loudly > shout

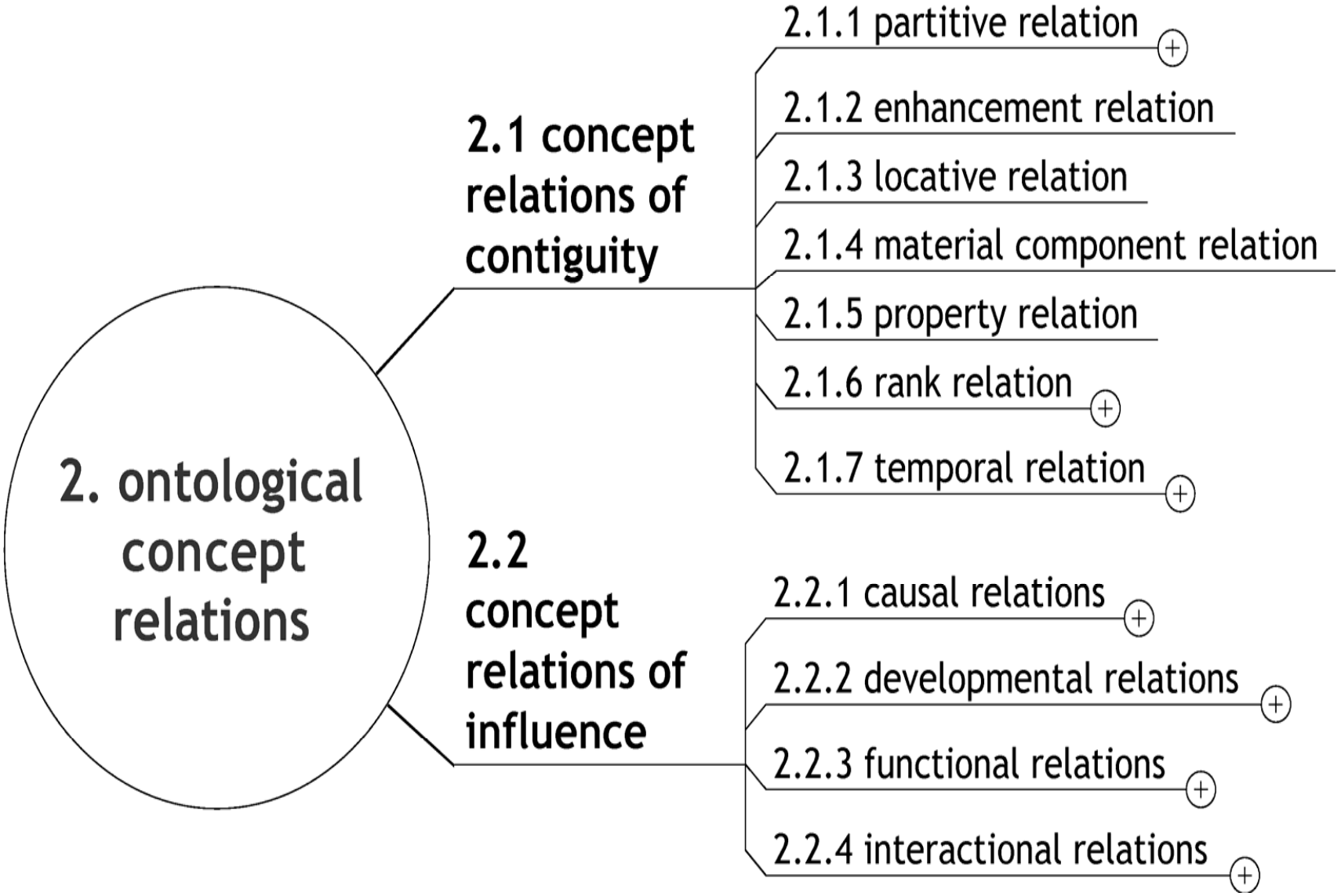
Semantic Relations In SIMPLE	Examples
Formal Relations	
is_a	(yacht, boat)
Constitutive Relations	
is_a_member_of	(senator, senate)
has_as_member	(flock, bird)
is_a_part_of	(head, body)
has_as_part	(airplane, wings)
instrument	(paint, brush)
relates	(kinship, brother)
resulting state	(die, dead)
is_a_follower_of	(marxist, marxism)
made_of	(bread, flour)
is_in	(oasis, dessert)
has_as_colour	(lemon, yellow)
constitutive activity	(bird, fly)
produces	(bird, egg)
produced_by	(honey, bee)
property of	(intelligence, intelligent)
concerns	(hepatitis, lever)
contains	(wineglass, wine)
quantifies	(bottle, liquid)
measured_by	(temperature, degree)
related_to	(second, two)
successor_of	(two, one)
has_as_effect	(storm, thunder)
typical_of	(distemper, dog)
causes	(measles, fever)
Telic Relations	
indirect_telic	(eye, see)
purpose	(send, receive)
object_of_the_activity	(book, read)

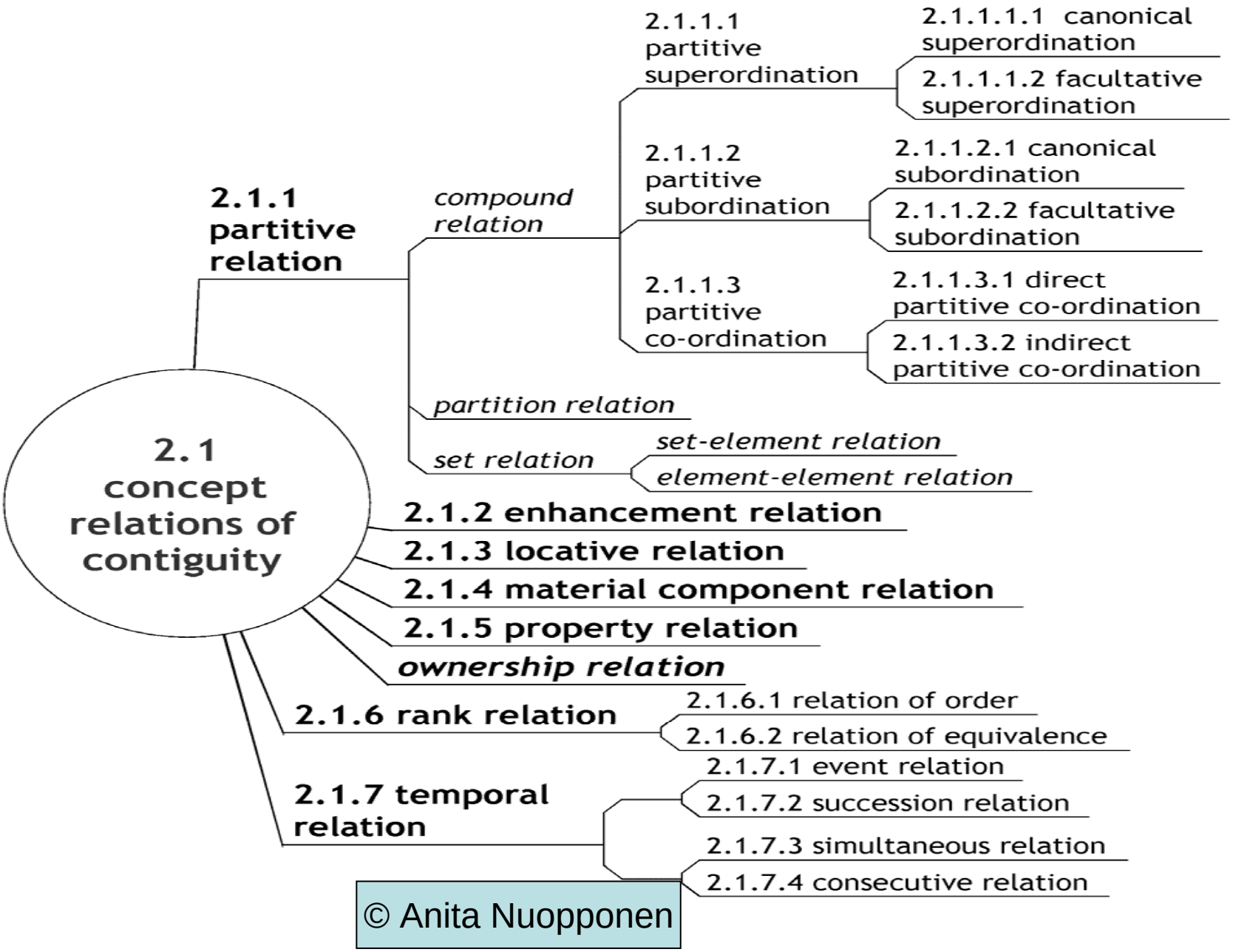
Cont.

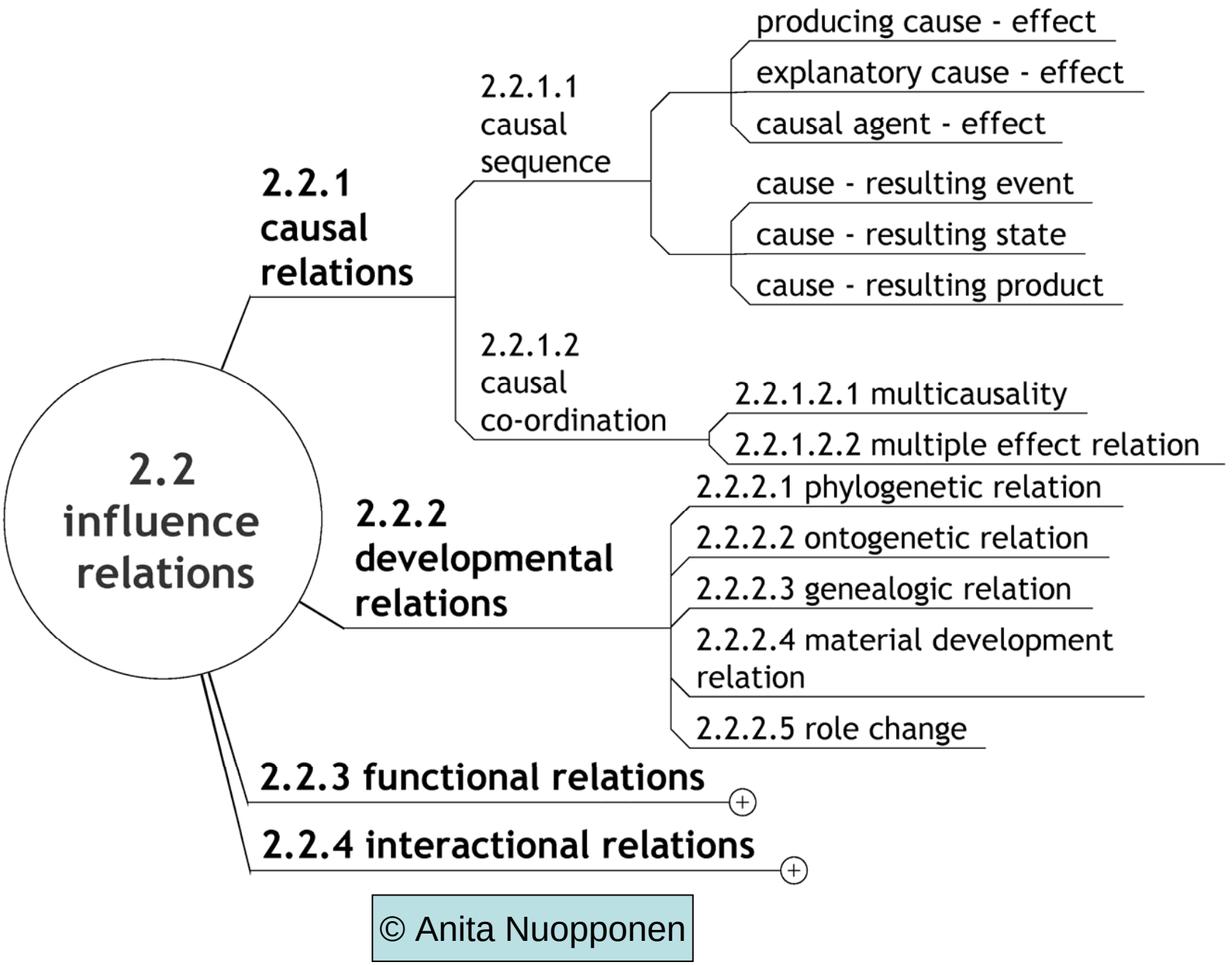
is_the_activity_of	(doctor, heal)
is_the_ability_of	(painter, pain)
is_the_habit_of	(smoker, smoke)
used_for	(crane, lift)
used_by	(lancet, surgeon)
used_against	(chemoterapi, cancer)
used_as	(wood, material)
Agentive Relations	
result_of	(loss, loose)
agentive_prog	(pedestrian, walk)
agentive_experience	(fear, feel)
caused_by	(infection, bacterion)
source	(law, society)
created_by	(book, write)
derived_from	(petrol, oil)

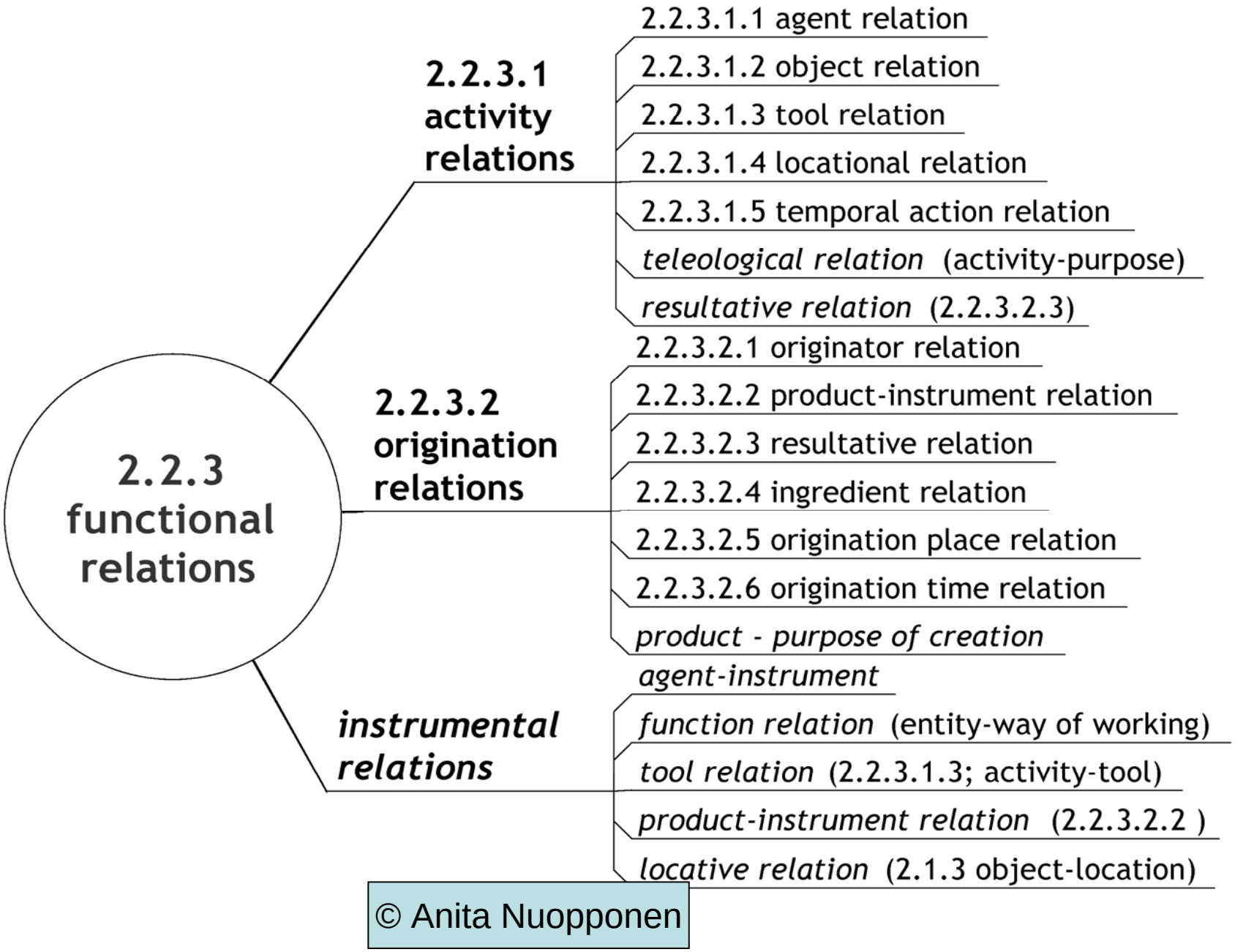
Terminological concept relation	Example
0. associative relation (unspecified relation)	motorist - pedestrian
1. generic relation (hyponymy)	vehicle - bicycle
2. partitive relation	
2.1 subpart-relation	bicycle - wheel
2.2 partition relation	bread - slice
2.3 material relation	book - paper
2.4 set-element relation	firm - employee
3. location relation	nacelle - control system
4. temporal relation	issue - acceptance - endorsemenet - payment
5. development relation	frogs egg - tadpole
6. causal relation	blow-deformation
7. purpose	brake - speed reduction ventilator - ventilation
8. origin relation	translator - translation bakery - bread drawer - draft
9. instrumental relation	
9.1 instrument-use	coffee machine – coffee making
9.2 instrument-result	coffee making - coffee
10. transmission relation (sender-receiver)	drawer - drawee

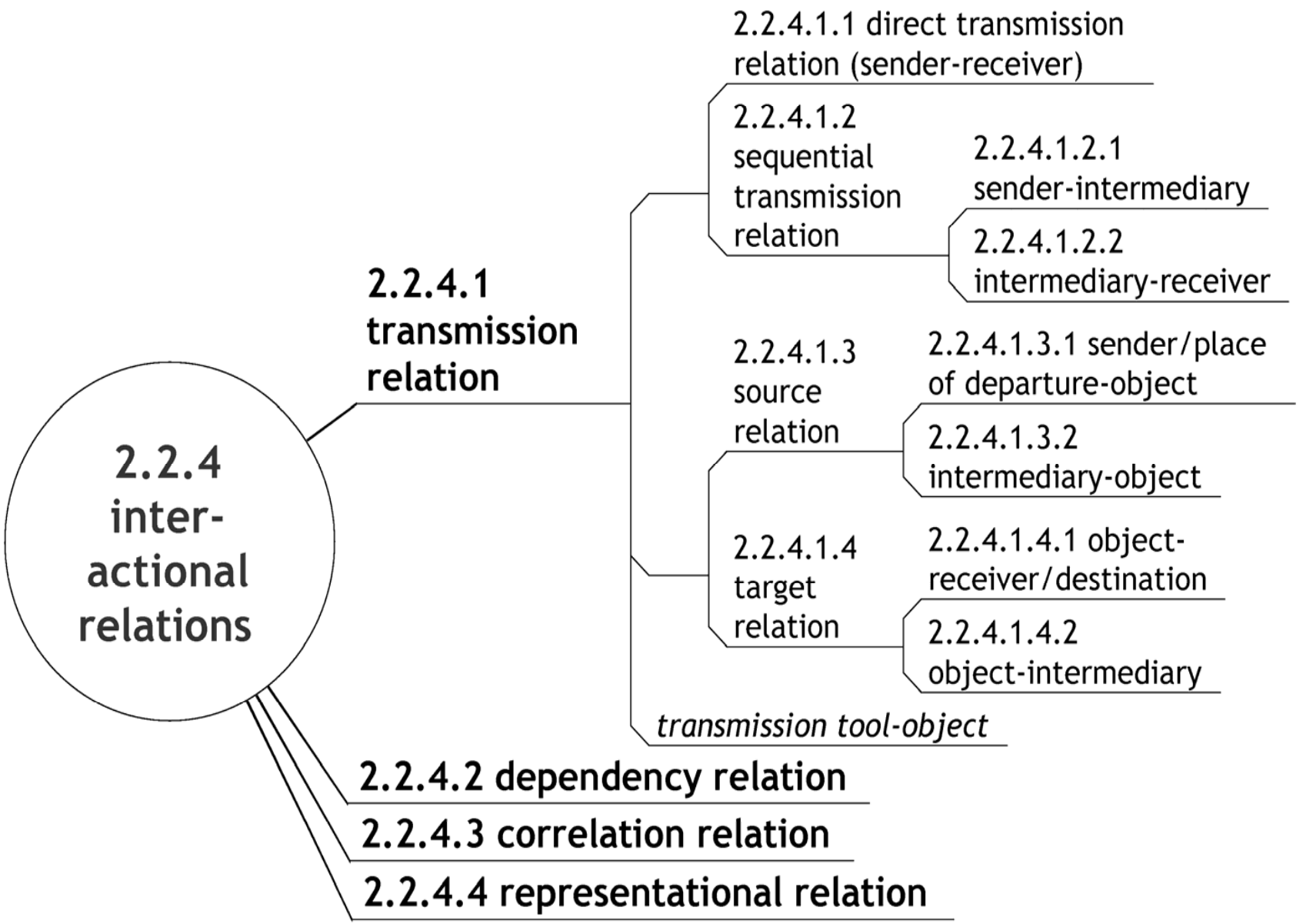


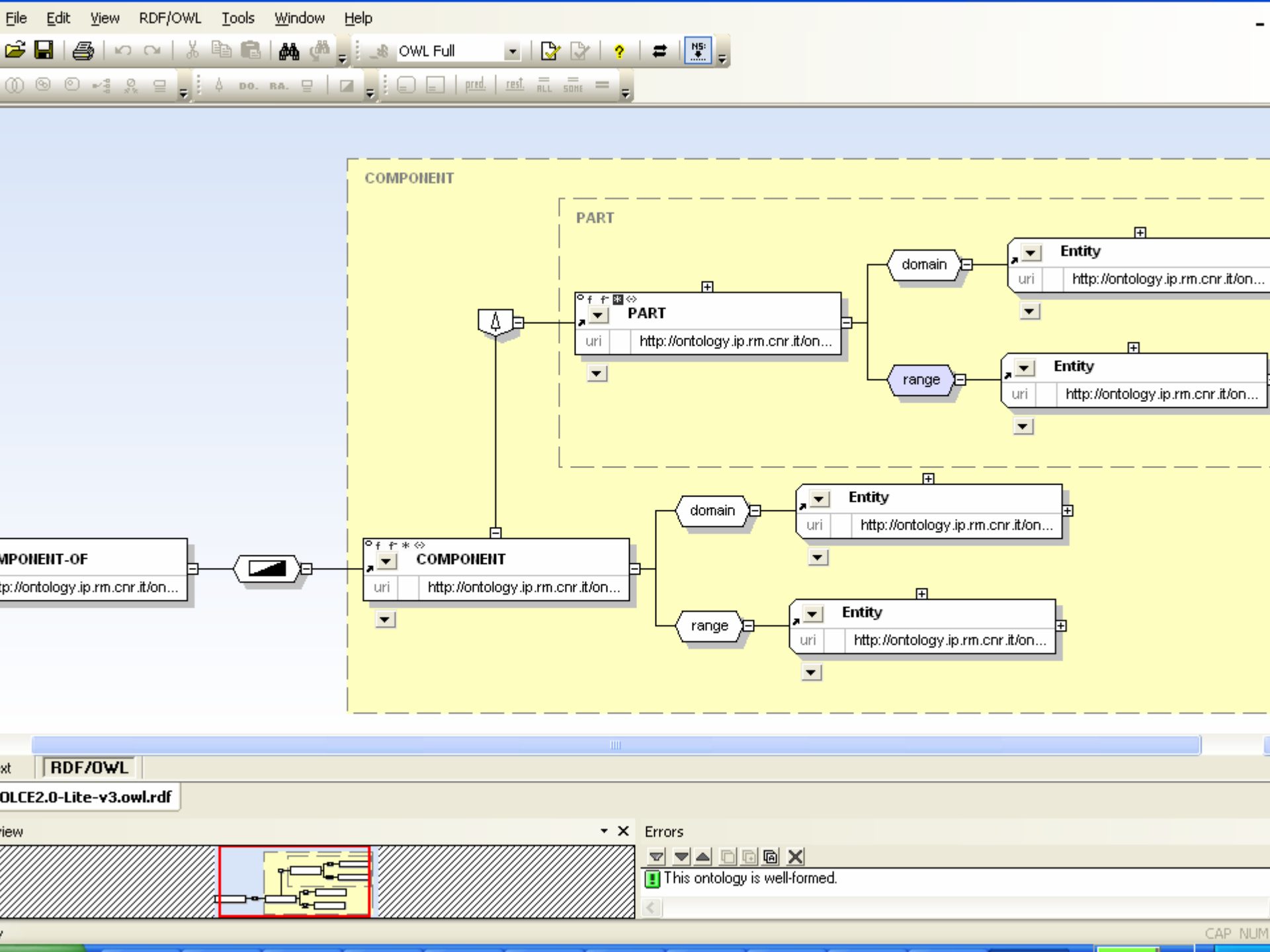











File
Edit
View
RDF/OWL
Tools
Window
Help
OWL Full
COMPONENT
PART
PART
uri
http://ontology.ip.rm.cnr.it/on...
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Entity
uri
http://ontology.ip.rm.cnr.it/on...
range
Entity
uri
http://ontology.ip.rm.cnr.it/on...
MPONENT-OF
tp://ontology.ip.rm.cnr.it/on...
COMPONENT
uri
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domain
Entity
uri
http://ontology.ip.rm.cnr.it/on...
range
Entity
uri
http://ontology.ip.rm.cnr.it/on...
RDF/OWL
OLCE2.0-Lite-v3.owl.rdf
Errors
This ontology is well-formed.

ESA - EO Ontology Approach

- Specify at high level the EO reality: EO Ontology
- Add classification vs. other domains: Multi-domain Ontology
- Derive a simplified, more abstract Classification Ontology
  - Supporting multiple domains
  - Providing equal visibility of all concepts
  - Using fixed concepts and relations
  - Permitting an implementation
    - as an “isolate” Web Service
    - with limited dependency from evolving reality / dynamic changes
- Verify its applicability (also to non-EO domains)

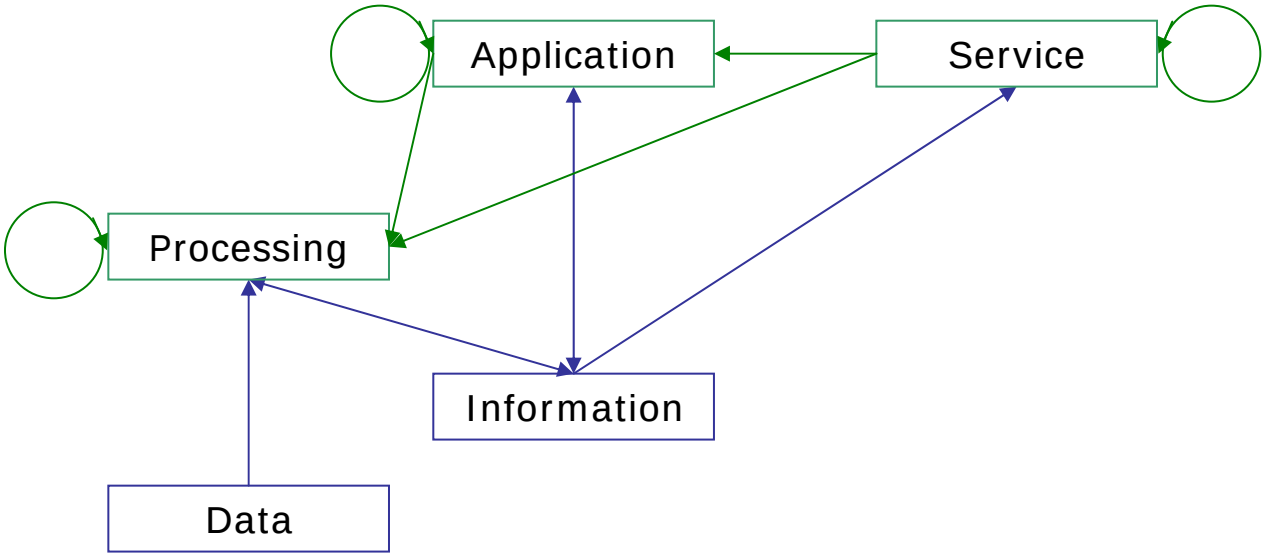
EO Ontology

Concepts

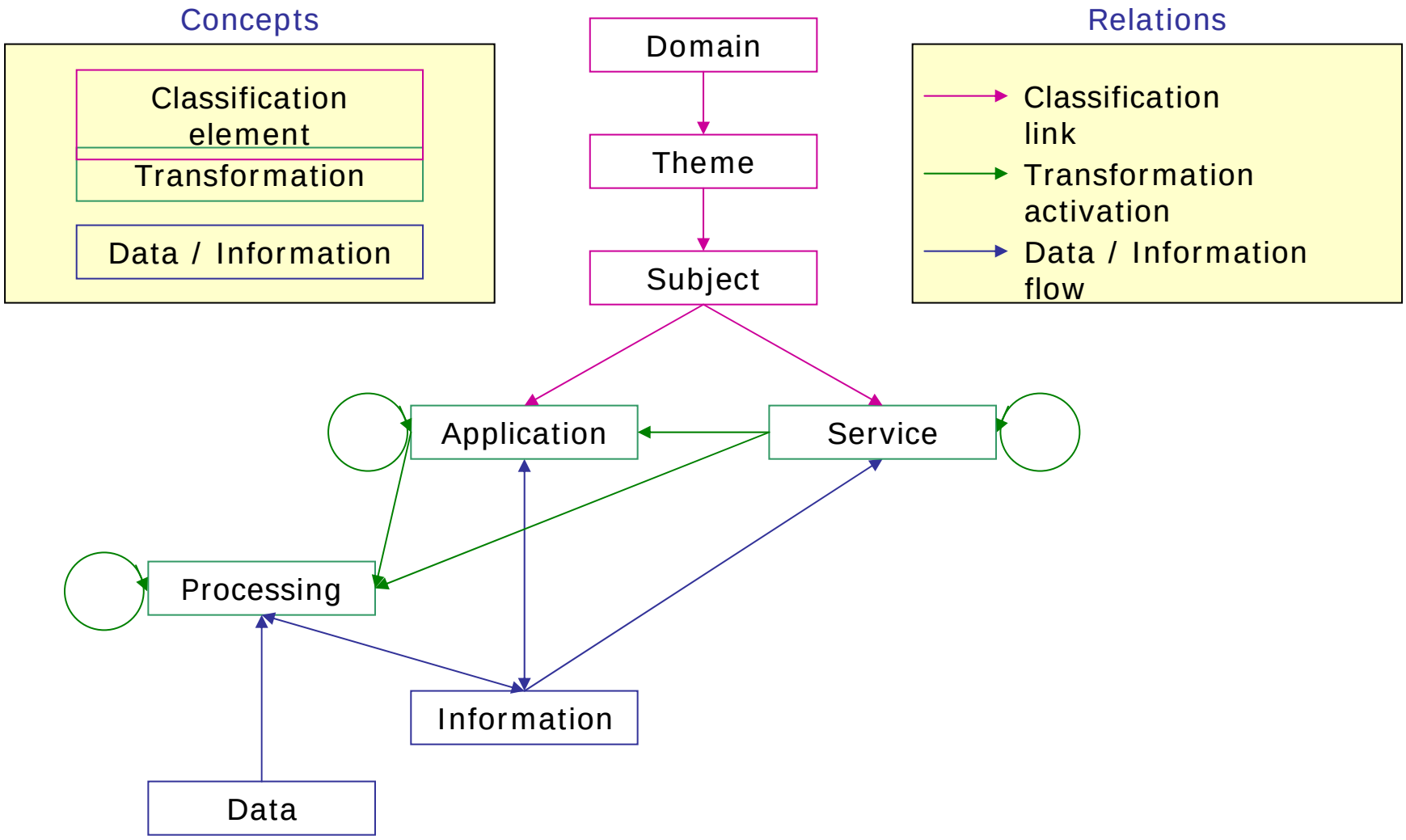
- Transformation
- Data / Information

Relations

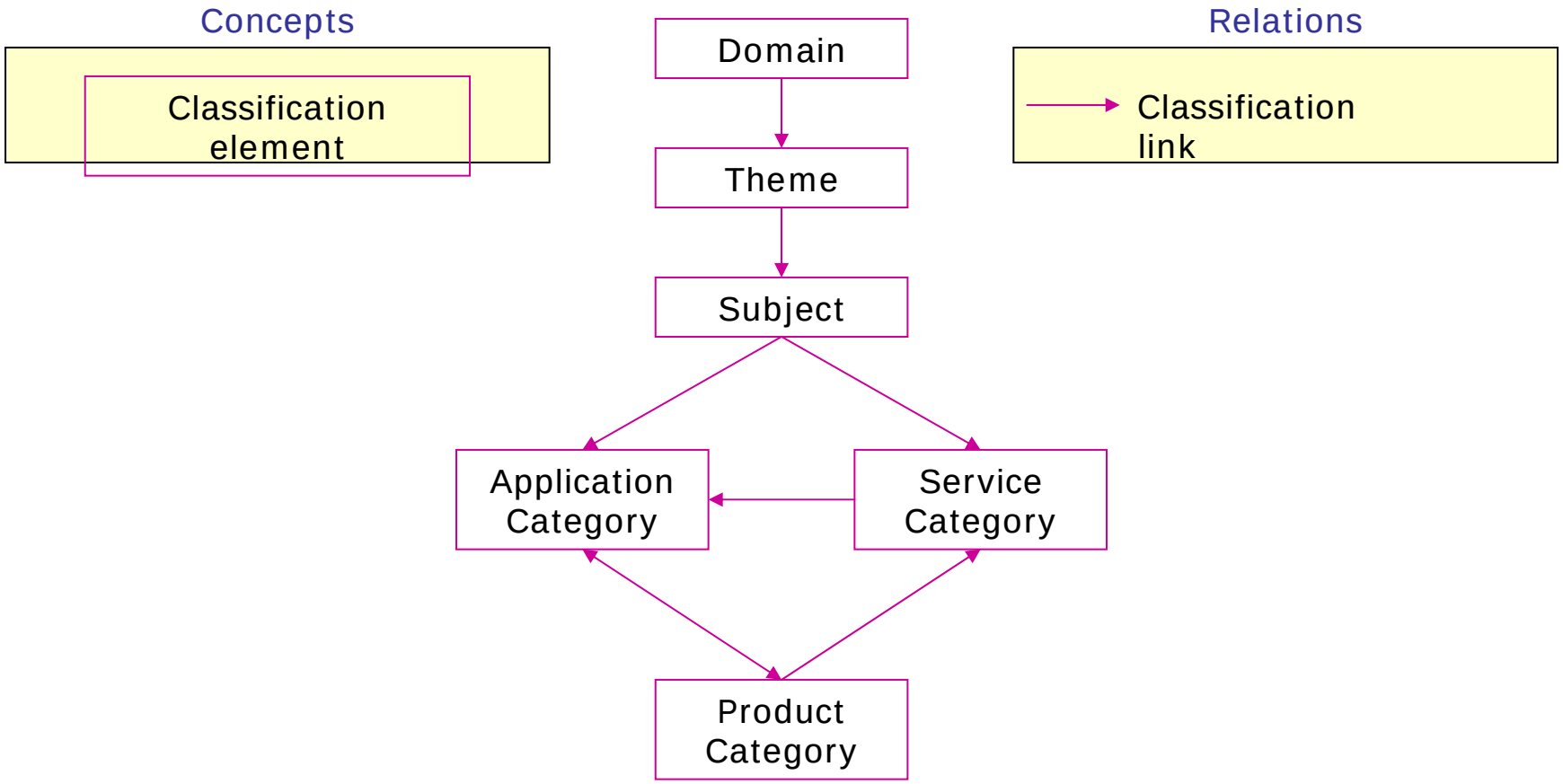
- Transformation activation
- Data / Information flow



Multi-domain Ontology



Classification Ontology



protégé

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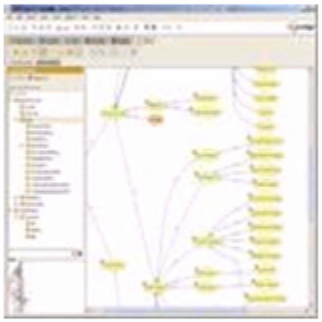
Protégé is a free, open source ontology editor and knowledge-base framework.

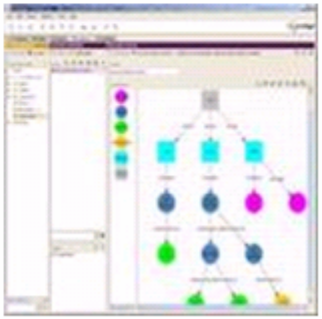
The Protégé platform supports two main ways of modeling ontologies via the Protégé-Frames and Protégé-OWL editors. Protégé ontologies can be exported into a variety of formats including RDF(S), OWL, and XML Schema. (more)

Protégé is based on Java, is extensible, and provides a plug-and-play environment that makes it a flexible base for rapid prototyping and application development. (more)

Protégé is supported by a strong community of developers and academic, government and corporate users, who are using Protégé for knowledge solutions in areas as diverse as biomedicine, intelligence gathering, and corporate modeling.



go to protégé-owl



go to protégé-frames

news

18th June 2009
Protégé 3.4.1 patch release
(download)

16th June 2009
Protégé 4.0 released!
read more) | (download)

protégé

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All Properties
All Templates
All Forms
Ontology Library
Plugin Library
Multi-upload
Help
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What links here

Welcome to the Protege Ontology Library!

This page is organized into the following groupings:

- OWL ontologies
- Frame-based ontologies
- Ontologies in other formats (e.g., DAML+OIL, RDF Schema, etc.)

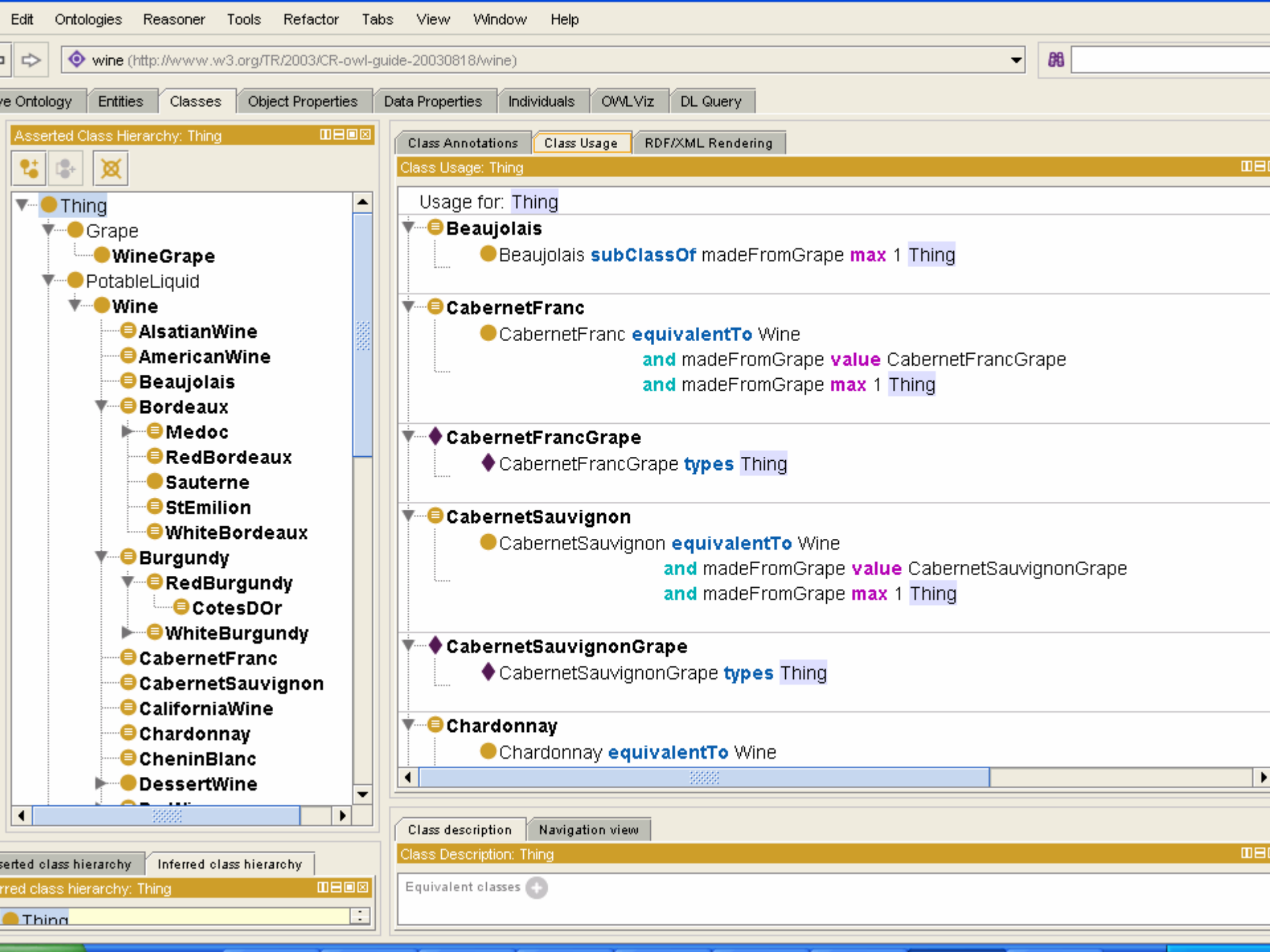
If your ontology is available in multiple formats, please feel free to link to it from multiple sections.

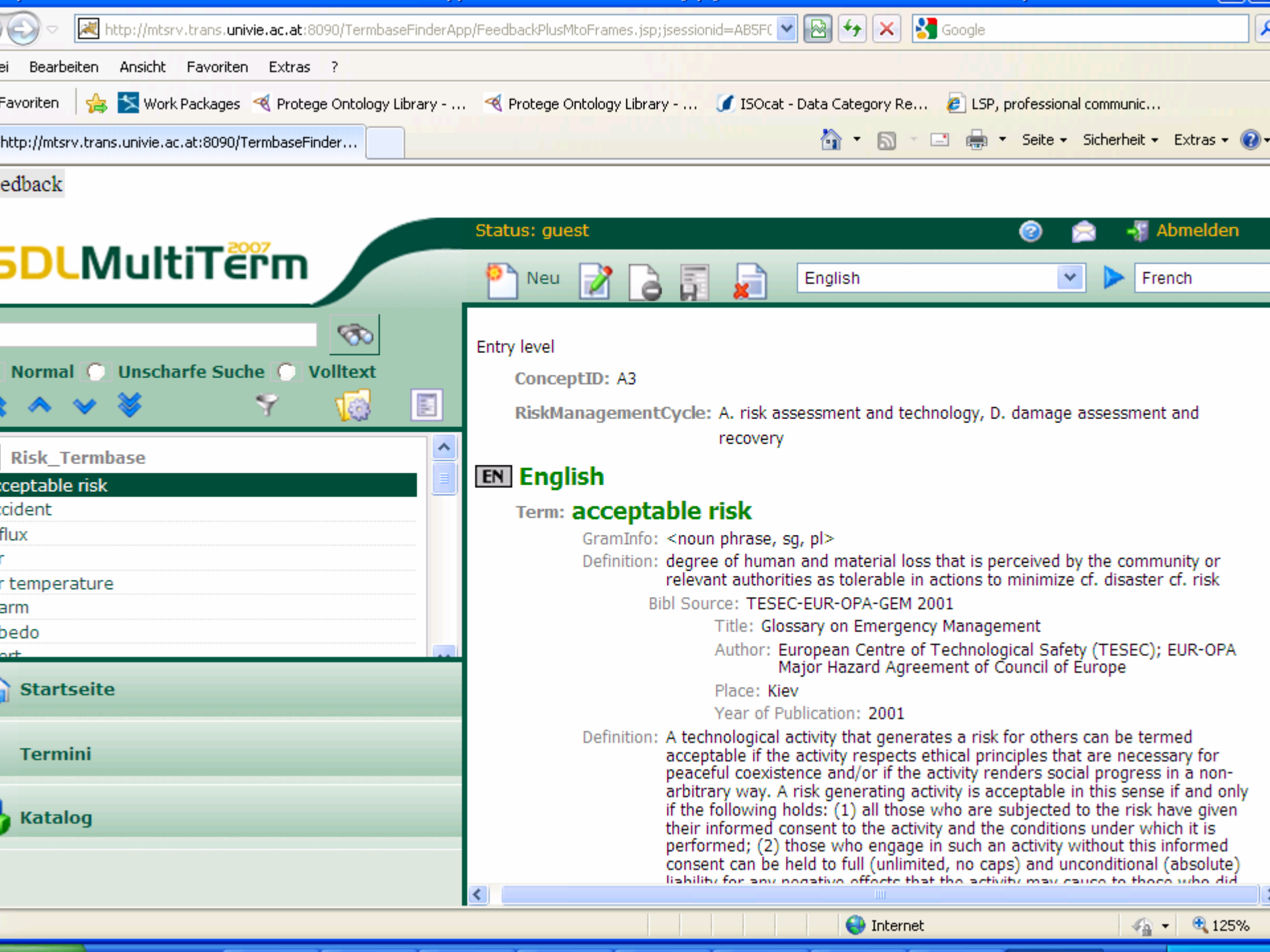
Please make insertions in alphabetical order. Thank you !!!

OWL ontologies

Information on how to open OWL files from the Protege-OWL editor is available on the main Protege Web site. See the Creating and Loading Projects section of the Getting Started with Protege-OWL Web page. Other ways to search for OWL ontologies include using Google: http://www.google.com/search?q=filetype:owl+owl, or the new Semantic Web search engine called Swoogle.

- AIM@SHAPE Ontologies: Ontologies pertaining to digital shapes. Source: AIM@SHAPE NoE -


Edit Ontologies Reasoner Tools Refactor Tabs View Window Help
wine (http://www.w3.org/TR/2003/CR-owl-guide-20030818/wine)
Entities Classes Object Properties Data Properties Individuals OWLViz DL Query
Asserted Class Hierarchy: Thing
Thing
Grape
WineGrape
PotableLiquid
Wine
AlsatianWine
AmericanWine
Beaujolais
Bordeaux
Medoc
RedBordeaux
Sauterne
StEmilion
WhiteBordeaux
Burgundy
RedBurgundy
CotesDOr
WhiteBurgundy
CabernetFranc
CabernetSauvignon
CaliforniaWine
Chardonnay
CheninBlanc
DessertWine
Inferred class hierarchy
Class Annotations Class Usage RDF/XML Rendering
Class Usage: Thing
Usage for: Thing
Beaujolais
Beaujolais subClassOf madeFromGrape max 1 Thing
CabernetFranc
CabernetFranc equivalentTo Wine
and madeFromGrape value CabernetFrancGrape
and madeFromGrape max 1 Thing
CabernetFrancGrape
CabernetFrancGrape types Thing
CabernetSauvignon
CabernetSauvignon equivalentTo Wine
and madeFromGrape value CabernetSauvignonGrape
and madeFromGrape max 1 Thing
CabernetSauvignonGrape
CabernetSauvignonGrape types Thing
Chardonnay
Chardonnay equivalentTo Wine
Class description Navigation view
Class Description: Thing
Equivalent classes


http://mtsrv.trans.univie.ac.at:8090/TermbaseFinderApp/FeedbackPlusMtoFrames.jsp;jsessionid=AB5F(
Google
Bearbeiten
Ansicht
Favoriten
Extras
?
Favoriten
Work Packages
Protege Ontology Library - ...
Protege Ontology Library - ...
ISOcat - Data Category Re...
LSP, professional communic...
http://mtsrv.trans.univie.ac.at:8090/TermbaseFinder...
Seite
Sicherheit
Extras
edback
SDLMultiTerm 2007
Status: guest
Abmelden
Neu
English
French
Normal
Unscharfe Suche
Volltext
Risk_Termbase
ceptable risk
ccident
flux
r temperature
arm
bedo
Startseite
Termini
Katalog
Entry level
ConceptID: A3
RiskManagementCycle: A. risk assessment and technology, D. damage assessment and recovery
EN English
Term: acceptable risk
GramInfo: <noun phrase, sg, pl>
Definition: degree of human and material loss that is perceived by the community or relevant authorities as tolerable in actions to minimize cf. disaster cf. risk
Bibl Source: TESEC-EUR-OPA-GEM 2001
Title: Glossary on Emergency Management
Author: European Centre of Technological Safety (TESEC); EUR-OPA Major Hazard Agreement of Council of Europe
Place: Kiev
Year of Publication: 2001
Definition: A technological activity that generates a risk for others can be termed acceptable if the activity respects ethical principles that are necessary for peaceful coexistence and/or if the activity renders social progress in a non-arbitrary way. A risk generating activity is acceptable in this sense if and only if the following holds: (1) all those who are subjected to the risk have given their informed consent to the activity and the conditions under which it is performed; (2) those who engage in such an activity without this informed consent can be held to full (unlimited, no caps) and unconditional (absolute)
Internet
125%

For more information on ontologies, knowledge organization systems, on our projects mentioned above, on further reading, related tools, etc.

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