Directions in modeling Land Registration and Cadastre Domain

Aspects of EULIS glossary approach, semantics and information services

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Esa Tiainen, National Land Survey of Finland
esa.tiainen@maanmittauslaitos.fi

Contents of presentation

EULIS Results

- Framework and method in terminology standardization of property rights, experiences

- **Harmonization and standardization**

- **Ontology approaches**

- **Quality assurance**

- **Modeling process**
  - Evaluation

"…the legal aspects make up the 5th dimension in the cadastral domain"

« "The thesis that an analysis of property rights is essential to an adequate analysis of the state is a mainstay of political philosophy."

« "The economy of many countries suffers, for example, due to the fact that those countries espouse property systems in which some basic ontological, geographical or cognitive aspect is flawed in such a way as to make an intelligible and efficient method of *land registration* impossible."
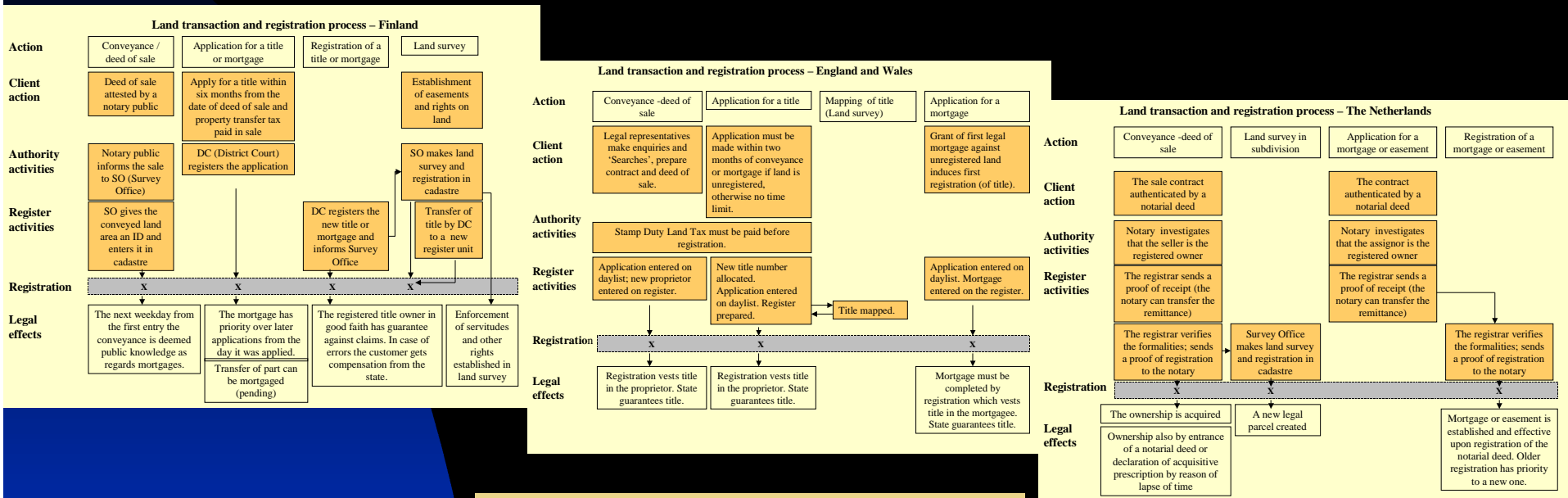
Barry Smith, Department of Philosophy, Center for Cognitive Science and NCGIA, SUNY at Buffalo (NY), USA &

Leo Zaibert, Department of Philosophy, University of Wisconsin-Parkside, USA,

"The Metaphysics of Real Estate" (pp. 1,8)

Pre-standardization

- Process-based approach with uniform diagram descriptions - legal effects included

Land transaction and registration process – Finland

Action	Conveyance / deed of sale	Application for a title or mortgage	Registration of a title or mortgage	Land survey
Client action	Deed of sale attested by a notary public	Apply for a title within six months from the date of deed of sale and property transfer tax paid in sale		Establishment of easements and rights on land
Authority activities	Notary public informs the sale to SO (Survey Office)	DC (District Court) registers the application		SO makes land survey and registration in cadastre
Register activities	SO gives the conveyed land area an ID and enters it in cadastre		DC registers the new title or mortgage and informs Survey Office	Transfer of title by DC to a new register unit
Registration	x	x	x	x
Legal effects	The next weekday from the first entry the conveyance is deemed public knowledge as regards mortgages.	The mortgage has priority over later applications from the day it was applied. Transfer of part can be mortgaged (pending)	The registered title owner in good faith has guarantee against claims. In case of errors the customer gets compensation from the state.	Enforcement of servitudes and other rights established in land survey

Land transaction and registration process – England and Wales

Action	Conveyance -deed of sale	Application for a title	Mapping of title (Land survey)	Application for a mortgage
Client action	Legal representatives make enquiries and 'Searches', prepare contract and deed of sale.	Application must be made within two months of conveyance or mortgage if land is unregistered, otherwise no time limit.		Grant of first legal mortgage against unregistered land induces first registration (of title).
Authority activities	Stamp Duty Land Tax must be paid before registration.			
Register activities	Application entered on daylist; new proprietor entered on register.	New title number allocated. Application entered on daylist. Register prepared.	Title mapped.	Application entered on daylist. Mortgage entered on the register.
Registration	x	x		x
Legal effects	Registration vests title in the proprietor. State guarantees title.	Registration vests title in the proprietor. State guarantees title.		Mortgage must be completed by registration which vests title in the mortgagee. State guarantees title.

Land transaction and registration process – The Netherlands

Action	Conveyance -deed of sale	Land survey in subdivision	Application for a mortgage or easement	Registration of a mortgage or easement
Client action	The sale contract authenticated by a notarial deed		The contract authenticated by a notarial deed	
Authority activities	Notary investigates that the seller is the registered owner		Notary investigates that the assignor is the registered owner	
Register activities	The registrar sends a proof of receipt (the notary can transfer the remittance)		The registrar sends a proof of receipt (the notary can transfer the remittance)	
	The registrar verifies the formalities; sends a proof of registration to the notary	Survey Office makes land survey and registration in cadastre		The registrar verifies the formalities; sends a proof of registration to the notary
Registration	x	x		x
Legal effects	The ownership is acquired	A new legal parcel created		Mortgage or easement is established and effective upon registration of the notarial deed. Older registration has priority to a new one.
	Ownership also by entrance of a notarial deed or declaration of acquisitive prescription by reason of lapse of time			

Property and cadastre information modeling method

- Metamodel level –Identifying basic similarities to define the common (domain generic) definitions

- Conceptual level – Recognizing the differences - country specific features - versus common definitions

EU·LIS

Metamodel - framework for finding similarities

Approach:

Land transactions and registration process

n **Uniform process diagram – dynamic view:**

§ Identical phases

§ Authorities / other parties involved (public/private)

§ Essential (temporal) stages and legal effects

n **Conformity of legal effects:**

§ Priorities and rights gained through registration

§ Which property can be mortgaged and when (whether registration be required for property objects)

§ Public knowledge - security against third parties

§ State guarantee; responsibility of register authorities to compensate for losses incurred - trustworthiness

EULIS

Pre-harmonization

§ Generic (EULIS) definitions discovered and used as semantic bridges for national terms

- National specification explains the deviations of national terms compared to common definitions

Concept (EULIS)	Definition (EULIS)	National synonym	National description
Guarantee for register information	Responsibility of register authorities to compensate for losses incurred.	Rätt till ersättning av staten i vissa fall/skadeståndsansvar vid fel i vissa fall	In Land Code Chap 18 Section 4 the rightful owner is entitled to compensation from the State for his loss. Bona fide acquisition by virtue of title is possible due to Land Code Chap 18 section 1
Mortgage	A right in property granted as security for the payment of a debt.	Inteckning	In Sweden a registration of the mortgage refers always to the property. When a mortgage has been granted, a mortgage certificate shall be issued on the basis of mortgage. The right of lien is granted by the property owner surrendering the mortgage certificate as security for the claim or through registration in the mortgage certificate register.

EULIS

Method for specifying differences

n **From similarities to "semantic bridges"**

    u Similarities of different implementations identified to semantically harmonic and common concepts

Also

    u Level of semantic integration recognized

    u Description of property right transactions made in an *objective way*

    u Semantic translations of national legislation for generic concepts and definitions produced

>> A roadmap to universal glossary?

EU·LIS

Contents of EULIS Glossary

EULIS Glossary consists so far about 50 terms and their definitions as well as national descriptions concerning issues like

§Real property and register units, and their identifiers

§Land survey acts and reallotments

§State guarantee for register information

§Different qualities of ownership or title

§Restrictions of possession or ownership

§Unregistered interests

§Routines in conveyance

§Routines in mortgaging

Translate from:

Swedish

the term:

Rätt till ersättning av s..

into:

Finnish

Rekisterinpitäjän vastuu (tietojen luotettavuus)

The state compensates the losses due to false entry in Land Register except for conveyances. Claims shall

EULIS

Problems and information gaps

- Conceptual view inadequate – insufficient analysis
- Difficult to recognize the differences?
- Short of consistency
- Deficiency of comparative view
- Difficult to update?

Tasks for terminology standardization

- Including a semantic model through conceptualization (analysis and iteration circles)
- Defining the actual level of harmonization in legislation
- Multipurpose (-use) cadastre -view

Stepwise standardization-harmonization

INSPIRE steps

From discovery → to Full Interoperability

Standardisation
- Metadata
- Discovery Service
- Data Policies
- Licensing Framework
- Coordinating structures
- …

Harmonisation
- Geodetic Framework
- Seamless data
- Quality insurance
- Certification
- Data model
- …

Integration
- Catalog Services
- View Service
- Query Service
- Object Access Service
- Generalisation Services
- Geo-Processing services
- …

"The fourth and last step will build upon the previous steps and concentrate on completing the common models and on providing the services to fully integrate data from various sources and various levels…" (http://inspire.jrc.it/)

§ Cadastral Domain Model, INSPIRE and EULIS… Need of **continuity** ... Implying**:**

§ The cadastral development …incremental in societies. Swift changes are not possible because of legal, structural, financial, information service and other reasons.

§ …**harmonization** needs to be **of technical nature in the initial stage**

§ Interoperability is achieved **by explicitly considering contextual knowledge** in the (translation) process of data exchange

§*Hence need for semantic translators and ontology approaches emerge*

Semantic translators and interoperability
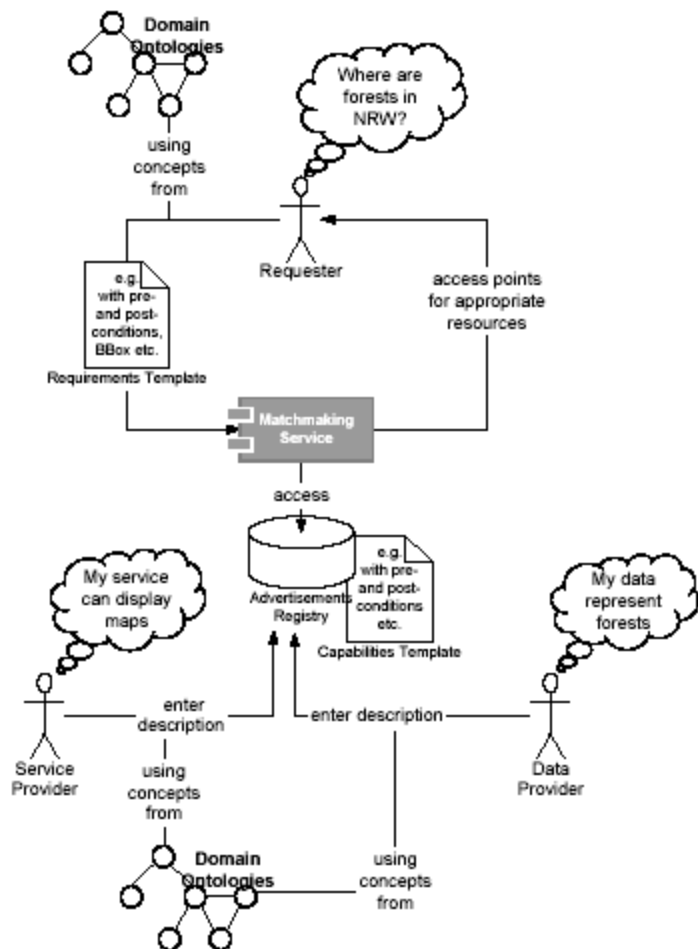
Automatic matchmaking with formal metadata (level E)   Lutz, Riedemann, Probst 2003
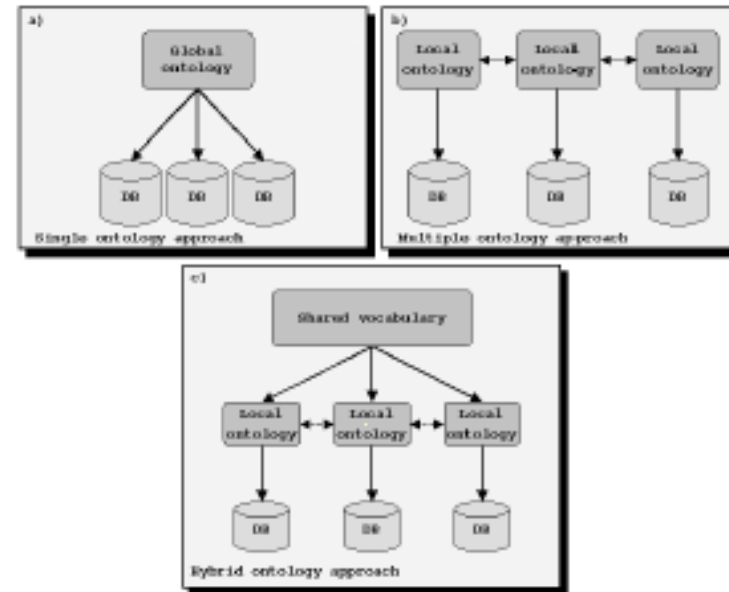
The three possible ways for using ontology for content explication (Visser, Stuckenschmidt, Schlieder, Wache and Timm 2002 p.2 or Stuckenschmidt, Harmelen 2004)

Simple features as semantic elements

(Visser, Stuckenschmidt, Schuster & Vögele 2002)
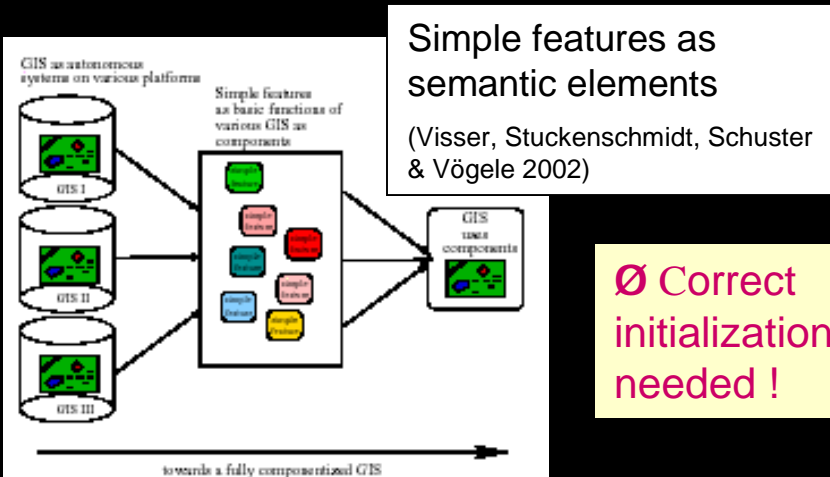
Ø Correct initialization needed !

OGC semantic modeling approach

- n The approach of OGC is useful in (high-level) semantic standardization in specifying how to handle different user views

- n It is using concepts (notions) of information communities, project worlds and sub-worlds, where integrity is achieved by testing (the unambiguity of) properties or property/value pairs

Definition: Let S1 and S2 be two Project Worlds in A. Let S2* be the Project World obtained by extending the physical extent of Project S2 (if necessary) until it covers the extent of Project S1. We say S1 is a subworld of S2 if there are three functions, R1, R2, and R3, that behave as follows:

i. R1 is a one-to-one change-of-spatial-reference from the reference system of S1 to that of S2*
ii. R2 is a mapping from the feature instances of S1 into those of S2* such that F is a feature of S1 occupying a point P if and only if R2(F) is a feature of S2* occupying R1(P),
iii. R3 is a mapping from the set of property/value pairs of all features in S1 into the set of property/value pairs of all features of S2* that preserves semantics, and is canonical with R2.
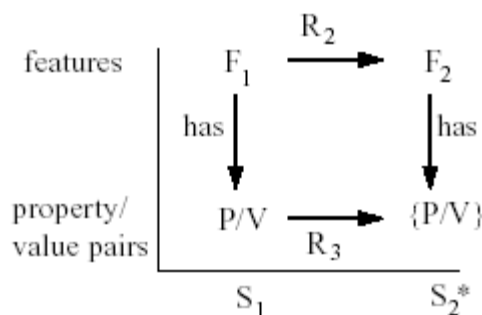

Figure 2-1. The canonical map.

Quality labeling of information

- **n** A challenging task is to identify specific user views as universal standards (through necessary user surveys)

- **n** Properties and property values also reflect quality if the semantic explication displays objectivity adequately, so It is possible to *measure the quality against user needs*

- **n** The examples in table offer only a hint of the possibilities of using property/property value categories for evaluation:

Concept	Property/value	Concept	Property/value
Mortgage	- No mortgages - Transferable - Priority / 1…n - …	**Owner**	- Not yet registered (buyer) - Registered titleholder - Reg. cad. unit owner / not yet titled, title transferred... - (Registered leasehold / temporal extend of lease, classification for other extend of lease) - …
Parcel (Register unit)	- Not yet registered (transfer of part) - Titled, not yet registered as cadastral unit - Cadastral unit with valid title / not yet valid title / title transferred… - (Registered leasehold unit) - With other holding rights…	**Boundary type**	- General boundaries - Boundary marks fixed, coordinate approximation / ISO classification for positional accuracy estimation - Coordinate fixed / ISO classification for positional accuracy estimation - …

Quality labeling of services

- n Another stage of quality labeling might be giving quality labels for cadastral information services based on the predefined standard views of different user communities or user segments

- n In this manner the user would be able to determine immediately if a certain logical set of information is available online, through data transfer or some other way

- n The table below shows an extract of such a predefined standard view:

Parcel (Register unit)	- Titled, not yet registered as cadastral unit, **or** - Cadastral unit with valid title, **or** - (Registered leasehold unit)
Mortgage	- No mortgages, **or** - Transferable mortgages

Roadmap to semantic harmonization; steps 1-3...

1. Semantic pre-standardization

n   A high-level semantic pre-standardization view shall be developed and agreed upon and on sufficiently high objectivity level (meta-model level). The level of objectivity can be improved by high-level description of services or the very technology processes.

2. Semantic pre-harmonization

n   This step is to compile a shared and harmonized vocabulary (respectively the EULIS Glossary as a simple example). This step provides the basis for universal modeling and explication and may result in the standardization or (semantic) harmonization of data.

3. Semantic translation process

§   *Annotation of information sources*

w   Annotation means here that the conceptual space or hierarchy of an information source is extracted and each concept is described and analyzed, even on property/value level.

An annotation tool applicable with different repositories of vocabularies according to different domains of interest is needed.

Step 3 to continue...

Roadmap to semantic harmonization, steps 3... - 6

Step 3...continue

§ *Semantic translation of information entities*

w The new concept term describing the type of an information entity in the target information source is determined automatically by a classifier that uses ontology of source and target structures as classification knowledge. In this way ontology may be used as a surrogate for information sources.

4. <u>Quality labeling for cadastral information</u> (Standardization stage)

n This step implies explication for classification of data quality with labels by properties or property values adapting the OGC semantic modeling approach. User surveys for evaluation are valuable.

5. <u>Quality labeling for information services</u>

n Quality labeling for information services is made based on standard views of different user communities or segments and multi-purpose cadastre. User participation and (reusable) surveys for evaluation may be added.

6. <u>Conceptual integration – Harmonization stage</u>

§ *Conceptual integration methods can be used for harmonization and to enhance steps 4 and 5, and the results of all previous steps.*

Modeling inter-discipline domain

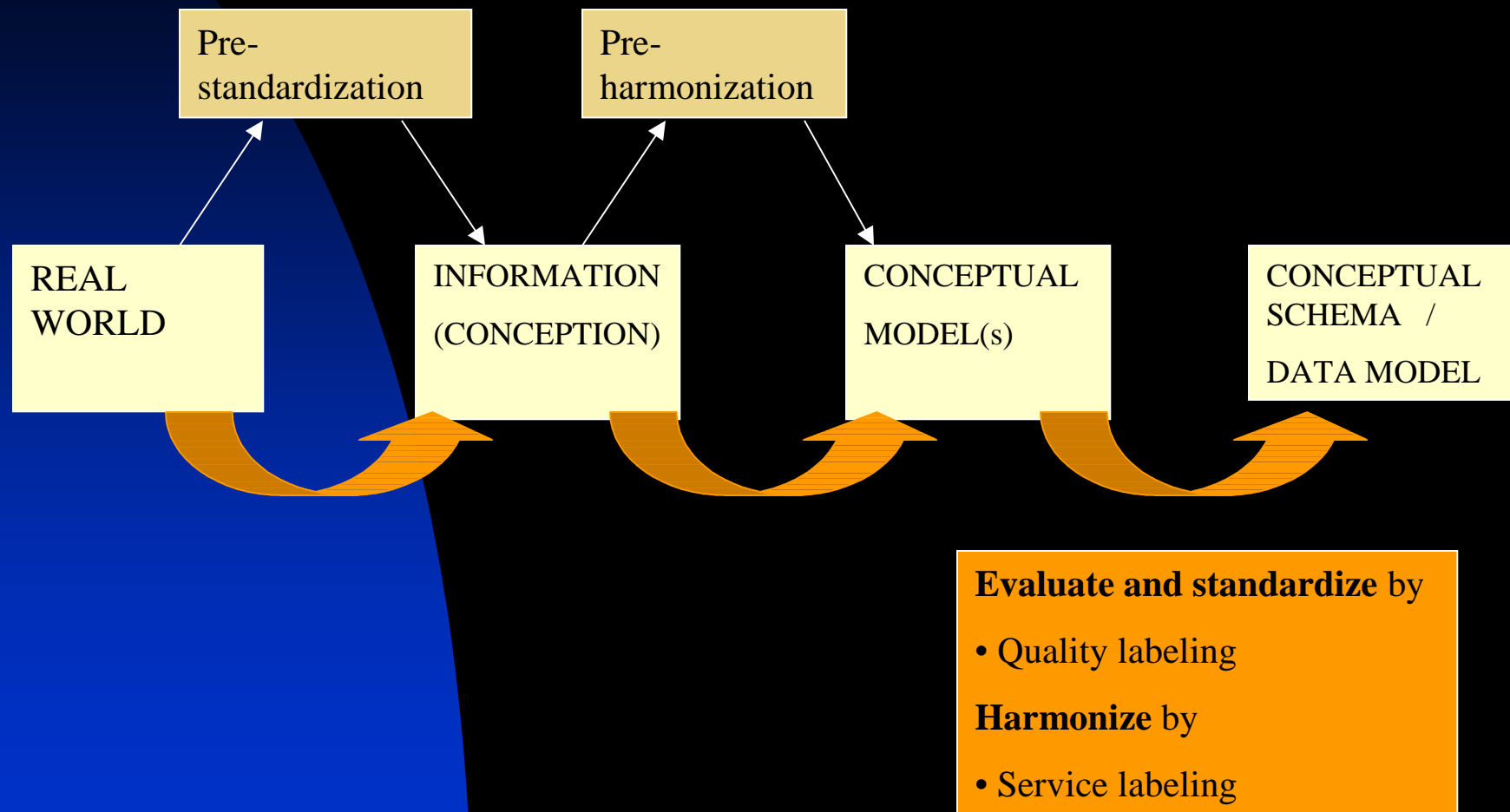| REAL WORLD | | INFORMATION | | CONCEPTUAL MODEL | | DATA MODEL |

- Information contents often predefined and application specific
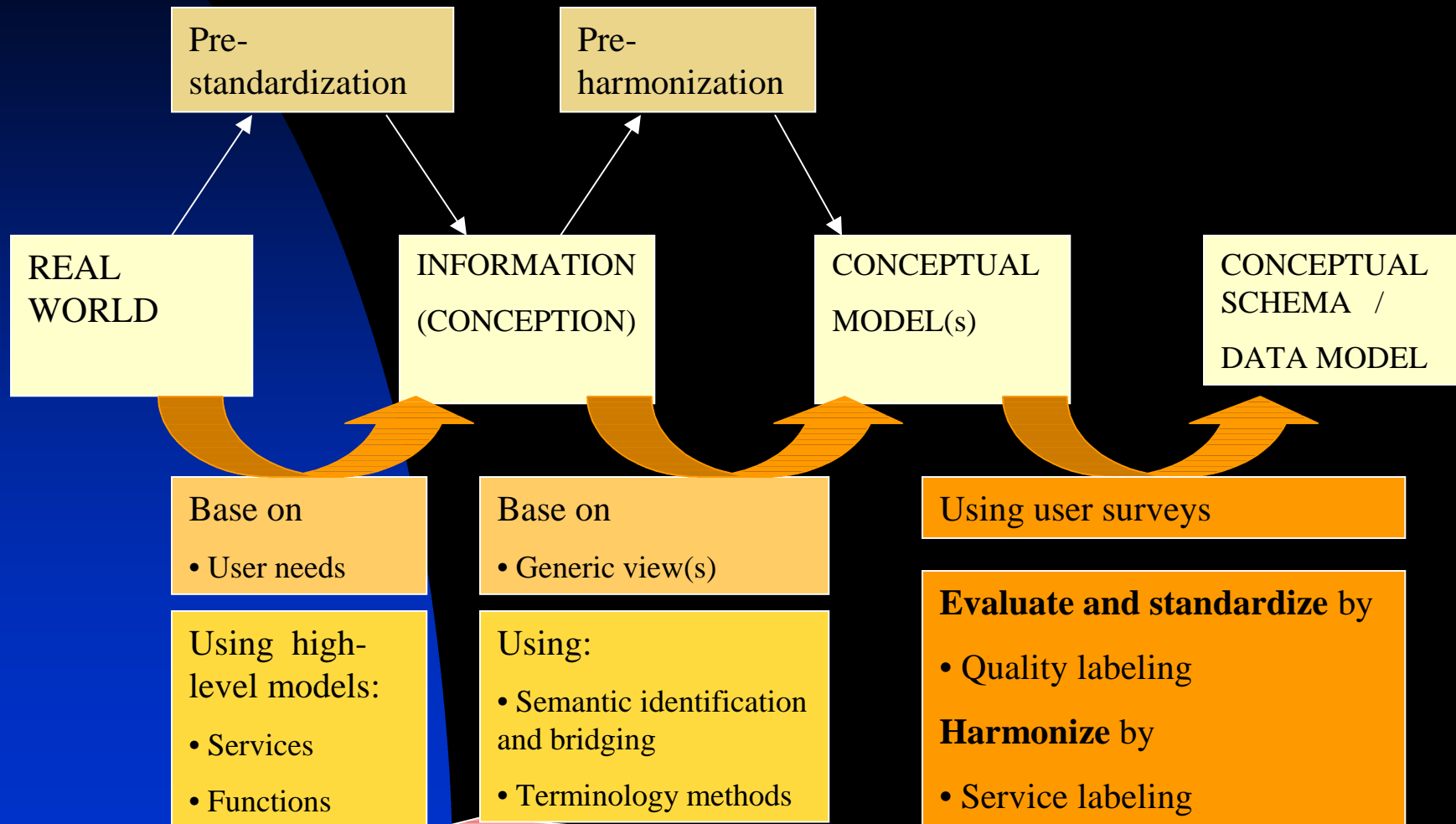- Concepts and terms used are often predefined

Modeling cross-discipline domains

ØModeling steps introduced

Modeling cross-discipline domains

ØModeling methods introduced

Pre-standardization	Pre-harmonization

REAL WORLD	INFORMATION (CONCEPTION)	CONCEPTUAL MODEL(s)	CONCEPTUAL SCHEMA / DATA MODEL

Base on

• User needs

Using high-level models:

• Services

• Functions

Base on

• Generic view(s)

Using:

• Semantic identification and bridging

• Terminology methods

Using user surveys

Evaluate and standardize by

• Quality labeling

Harmonize by

• Service labeling

Modeling cross-discipline domains

Pre-standardization	Pre-harmonization	Conceptual integration

REAL WORLD	INFORMATION (CONCEPTION)	CONCEPTUAL MODEL(s)	CONCEPTUAL SCHEMA / DATA MODEL

Base on • User needs	Base on • Generic view(s)	*Standardize* by § Modeling	*Harmonize* and evaluate using:
Using high-level models: • Services • Functions	Using: • Semantic identification and bridging • Terminology methods	Using: • UML, Quality labeling of features / properties (OGC app..) •Ontology methods	Conceptual integration & User surveys for • Service labeling • Quality labeling

Contextual framework

n **The product is service – including the semantics of multiuse cadastre**

n **Possibility and necessity to base on real world and essential user needs**

n **Widen the scope to cross-discipline domain**

n **Better transparency and trustworthiness**

Ø Harmonization implies conceptual integration

Ontology or metaphysics of modern cadastre

» "European" institution in modern times

« Originates to Egypt, China (?) in their golden era

« From fiscal background to support permanency of property rights and economical growth / decline

« Supporting stability in societies

« Economical integration in Europe / globalization implies better transparency of property rights

» Task for standardization consequently

- Legal dimension constitutes the profound context of a cadastre
  – registration carries the legislation

- Make this dimension a visible and comprehensible, easy-to-understand part in the information community & domain model
  – national systems might feel like one system

- User needs represent the real world – tool for evaluation!

Thank you for your perception

n   Contacts: esa.tiainen@maanmittauslaitos.fi

NATIONAL LAND SURVEY OF FINLAND

n   esa.do@kolumbus.fi