SEMIC.EU

Semantic Interoperability Centre Europe

Semantics-Aware Data Exchange in the Context of SEMIC.EU

İDABC
European
eGovernment Services

Methodology Workshop 2009
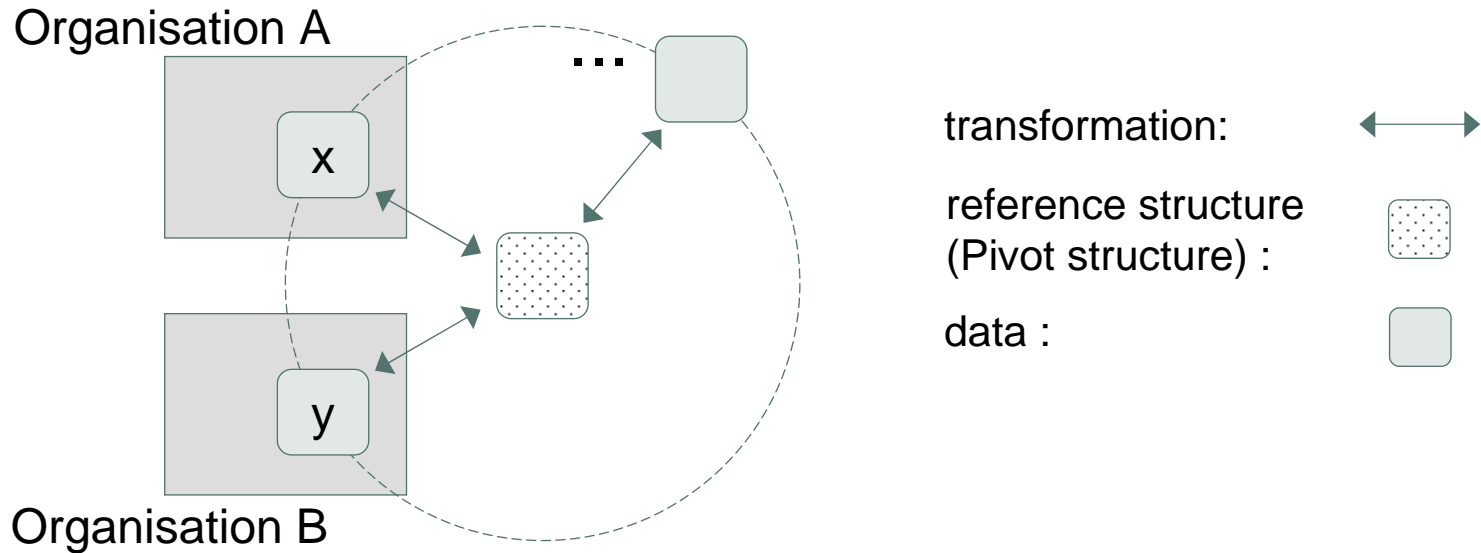
Andreas Billig, Fraunhofer ISST

Observations

→ European member states specify data models (schemata)

  → for their own usage in different local organisations

  → for usage in different organisations on a pan-European level

→ Data according to these models are/have to be exchanged between these organisations and adapted to the local environment

→ SEMIC.EU aims at supporting organisations by providing a platform for publishing data models by means of semantic interoperability assets

  → But how to ensure (efficient) semantic interoperability ?

First step: efficiency by pivot structures

Organisation A

x

· · ·

transformation:

reference structure
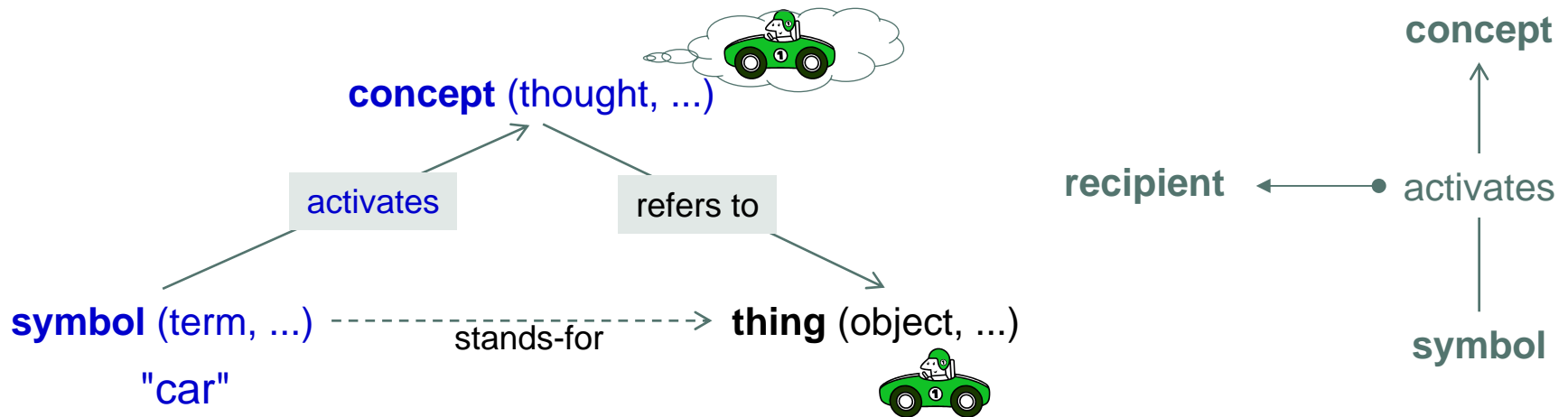(Pivot structure) :

data :

y

Organisation B
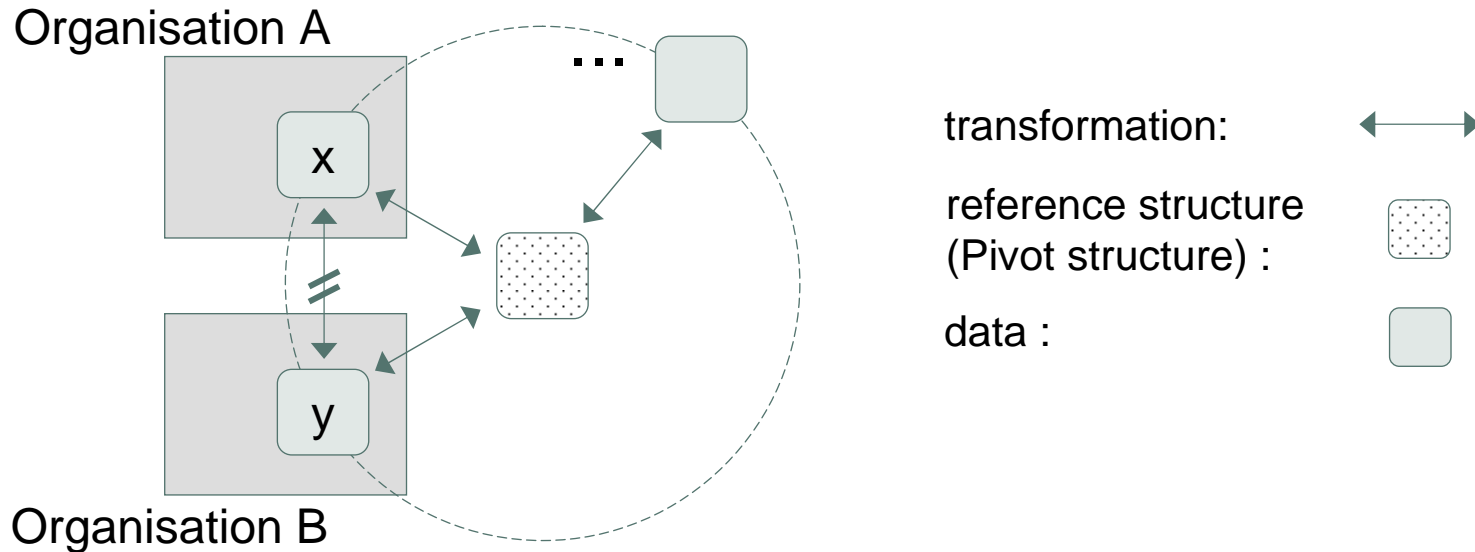
→ Avoiding the costs of multiple bidirectional mappings (combinatorial explosion when many members are involved)

→ Assumption: more than three members are involved

# First step: efficiency by pivot structures

Organisation A

Organisation B

transformation:

reference structure (Pivot structure) :

data :

→ But what's about **semantic** interoperability ?

Semiotic Triangle

concept (thought, ...)

activates   refers to

symbol (term, ...) - - - - - - - - - - - → **thing** (object, ...)
        stands-for

"car"

concept

recipient ←—— • activates

symbol

→ **Symbol**: designation of a defined concept in a special language by a linguistic expression [ISO 1087]

→ **Concept**: a unit of thought constituted through abstraction on the basis of properties common to a set of objects [ISO 5963]

→ **Thing**: any part of the perceivable or conceivable world [ISO 1087]; objects can be material or immaterial

Semantics-Preserving Data Exchange

schema of A

pivot schema
at SEMIC.EU

schema of B

A

P

B
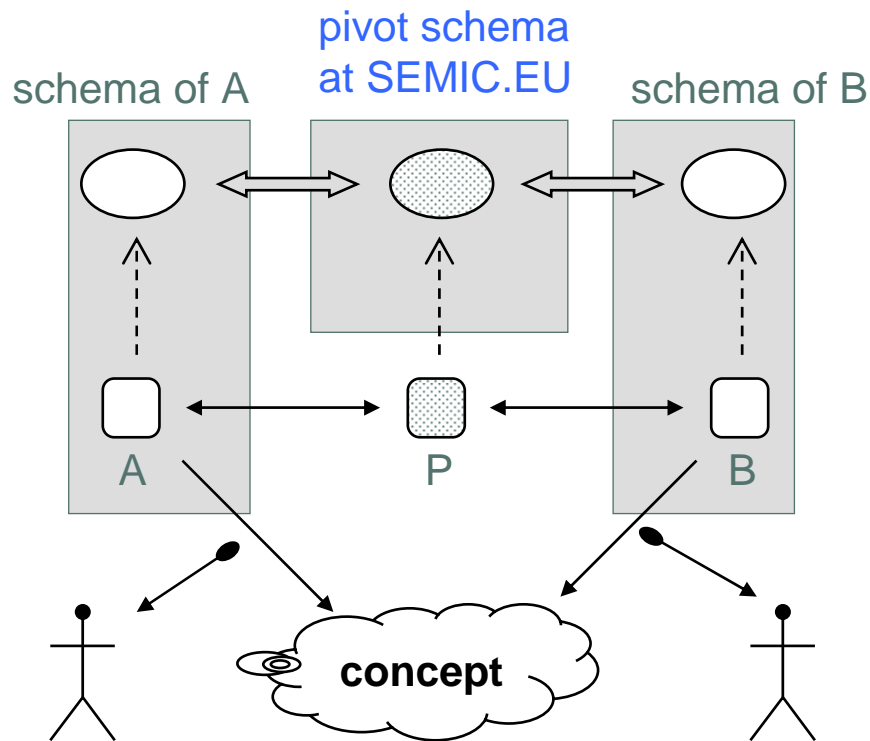
concept

→ **Mappings** are defined between the local schemata and the pivot schema

→ According to mapping definitions **transformations** are performed between data items A and B via P

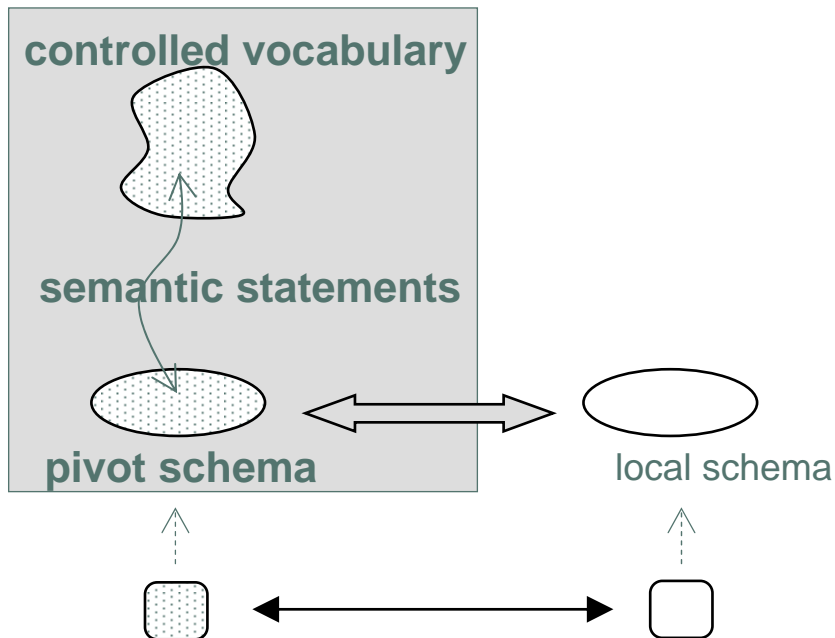→ **Semantics** are preserved when **same concepts** are activated

⟺ : mapping definition

----> : instance

But how to describe the semantics of pivot schemata ?

Semantics of Pivot Schemata

SEMIC.EU

controlled vocabulary

semantic statements

pivot schema   local schema

→ Issue: terms within schemata do not sufficiently clarify semantics

→ Controlled vocabularies (ranging from glossaries to full-fledged ontologies) determine semantics of terms

→ Semantic enrichment by linking schema terms with vocabularies via semantic statements

Controlled Vocabularies

A → glossaries

assigning descriptions to concepts

B → taxonomies ∩

genus / species relation over concepts

C → ontologies

arbitrary relations + data modelling + logic

increasing complexity

A

...

B

C

property p
C ⊆ D
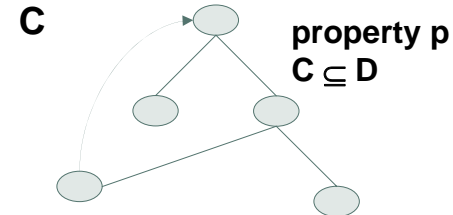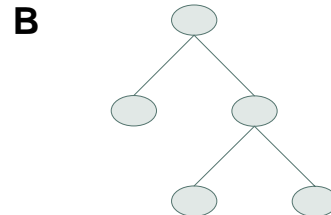
Languages (Standards) for Controlled Vocabularies

→ Thesauri

→ ANSI/NISO
Z39.19

monolingual controlled

vocabularies

→ ISO 2788

monolingual thesauri

→ ISO 5964

multilingual thesauri

→ Ontologies

→ RDF

basic

metadata/conceptual

modelling

→ OWL

reasoning over

concepts/instances

→ TOPIC-MAPS

enhanced occurrence

management

Controlled vocabularies in the SEMIC.EU context

e.g., ontologies

→   referred by "semantic statements"

→   used for asset classification

→   as artefacts

→   used for ("modern") schema mappings

Thank you for your attention