Semantics – Interoperability – Integration
A multi-faceted problem

Ioannis Kotsiopoulos

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Who are we?

EUROPEAN DYNAMICS: a leading European ICT service provider and software developer.
International operation: Athens, Brussels, Luxembourg and elsewhere

Client base:
- The Council of the European Union
- The European Commission
- The European Parliament
- The European Court of Auditors
- The United Nations
- Eurocontrol
- Interpol
- The Office for the Harmonisation of the Internal Market (OHIM)
- The European Police Office (EUROPOL)
- The European Chemicals Agency (ECHA)
- The European Centre for Disease Prevention and Control (ECDC)
- The European Patents Office (EPO)
- National governments
Interoperability started early 2000 by TAXUD

Implemented though the exchange of structured messages between Member States applications via the private CCN/CSI network

Semantics are defined as part of complex functional and technical specifications

Currently at least four major functional areas are covered (e.g. transit, export, import etc)

Important areas such as risk analysis are not covered.
Common Communication Network (CCN/CSI) Interoperability

- **XML & EDIFACT messages defined by TAXUD**
- **Although message formats are well-defined, semantics are only indirectly defined via separate documents**
  - e.g. same entities appear under different names and information structures
- **Semantics today are incorporated in individual application logics developed by the Member States**
- **Despite those problems CCN/CSI does perform its basic function**
Risk analysis and fraud detection

Interchange of risk-related information is critical for customs processes as it is related to public safety and health.

So far there have been no structured standard messages for the exchange of risk-related information at semantic level:

- What is a “suspicious trader”, “a suspicious route”, etc?
- Risk entities: financial and statistical information
- No behavioral models

Only abstract common risk criteria have been defined

The need:

- Definition of risk-related entities
- Semantic identification by machines
Is semantic interoperability and integration difficult?

- **YES!**

- **Database interoperability, cross-database search and integration of web services:** Ontologies: formally logical axioms that relate predicates of interest
  - a higher level of abstraction for data modelling
  - data export, translation, queries, unification across independently developed database designs (logical or physical)

- **However: when data integration is sought limitations emerge***:
  - Datasets with semantics given by different ontologies require integration of ontologies (ontology mapping, merging, top-level vocabularies, etc)
  - Integration of ontologies: integration of logics in which they are expressed and of schemas describing structure in different languages and different underlying data models (relational, object-oriented, etc)
  - Need for rigorous foundations not tied to any specific representational (e.g. category theory) or logical formalism (e.g. theory of institutions)

Then what?

Policy  Technology  Research