

access applications available berners-lee common concept control
data denoting describing description design different
enabling formats framework http human **information**
knowledge language **linked** machines **model**
open originally provide public publishing **rdf** re-use
related relationships **resource** restrictions science scientific
semantic standards subject **technologies**
term tim triple uris used w3c **web** wide world

Dr. Agis Papantoniou

Programme Manager – Semantic Technologies



Agenda and Objectives

- A lecture about Semantic Technologies and Linked Open Data
 - Experiences from the last 15 years
 - 2 important use cases – “real world projects”
- Part I: “Lightning talk” on LOD
- Part II: Use cases
 - open data
 - citizen engagement
- Part III: Insight on LOD Quality Assessment

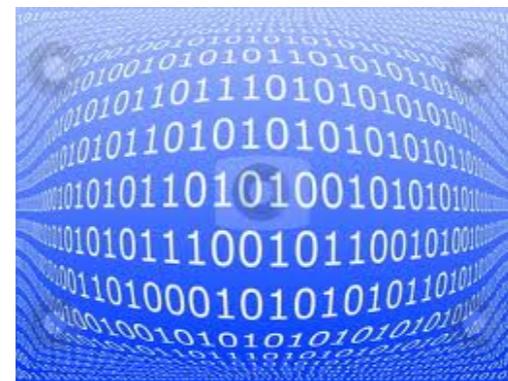
Linked



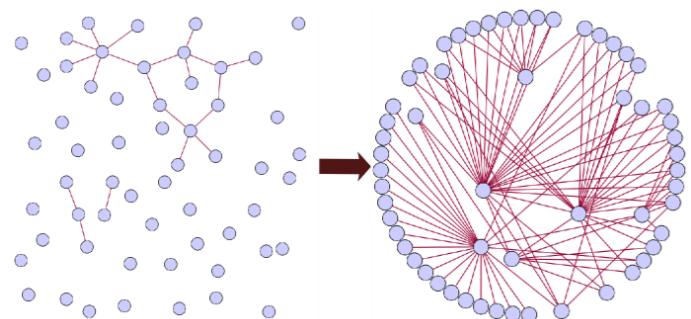
Open



Data



Get the Data connected

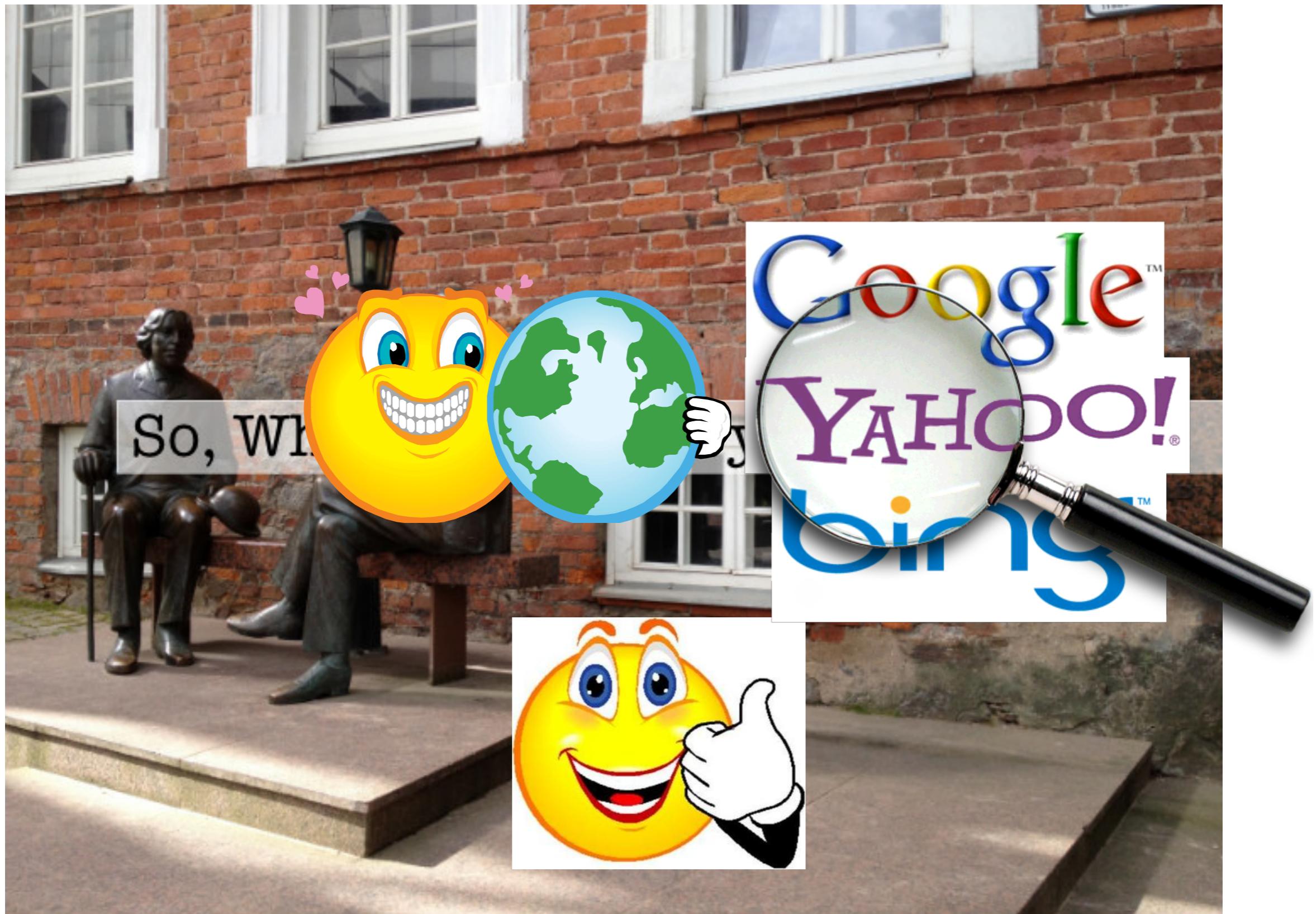


With no proprietary formats



But with structure





“What is the name of an Ancient Greek designer and architect famous for the construction of the temple of Parthenon?”



Actually they are two !

Create account  Log in

WIKIPEDIA The Free Encyclopedia

Main page Contents Featured content Current events Random article Donate to Wikipedia ▾ Interaction Help

Article Talk Read Edit View history Search

Ictinus

From Wikipedia, the free encyclopedia

Ictinus (Greek: Ἰκτίνος, *Iktinos*) was an architect active in the mid 5th century BC.^{[1][2]} Ancient sources identify Ictinus and Callicrates as co-architects of the Parthenon. Pausanias identifies Ictinus as architect of the Temple of Apollo at Bassae. That temple was Doric on the exterior, Ionic on the interior, and incorporated a Corinthian column, the earliest known, at the center rear of the cella. Sources also identify Ictinus as architect of the Telesterion at Eleusis, a gigantic hall used in the Eleusinian Mysteries.

The artist Jean Auguste Dominique Ingres painted a scene showing Ictinus together with the lyric poet Pindar. The painting is known as *Pindar and Ictinus* and is exhibited at the National Gallery, London.

Wikisource has the text of the 1911 Encyclopædia Britannica article *Ictinus*.

Create account  Log in

WIKIPEDIA The Free Encyclopedia

Main page Contents Featured content Current events Random article Donate to Wikipedia ▾ Interaction Help

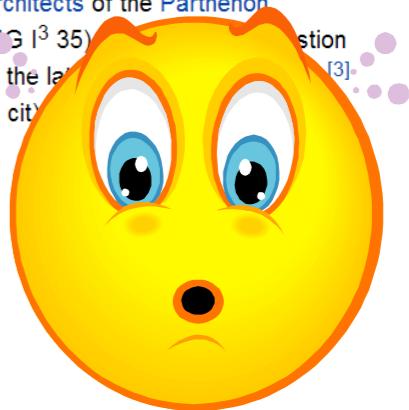
Article Talk Read Edit View history Search

Callicrates

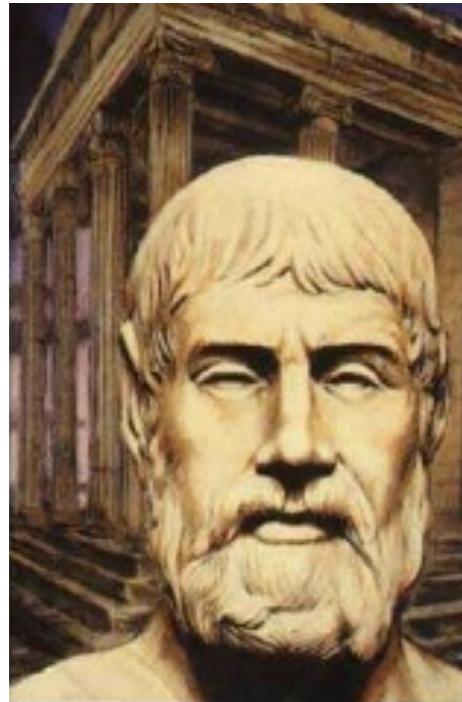
From Wikipedia, the free encyclopedia

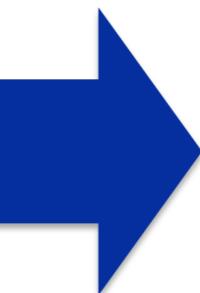
This article is about the ancient Greek architect. For the administrative plan, see Kallikratis reform. For the Cretan village, see Kallikratis. For the fictional character, see She (novel).

Callicrates (Greek: Καλλικράτης, *Kallikratēs*) was an ancient Greek architect active in the middle of the fifth century B.C. He and Ictinus were architects of the Parthenon (Plutarch, Pericles, 13).^[1] An inscription identifies him as the architect of "the Temple of Nike" in the Sanctuary of Athena Nike on the Acropolis (IG I³ 35).^[2] This question is either the amphiprostyle Temple of Athena Nike now visible on the site^[2] or a small-scale predecessor (naiskos) whose remains were found in the late 19th century.^[3] An inscription identifies Callicrates as one of the architects of the Classical circuit wall of the Acropolis (IG I³ 45), and Plutarch further states (loc cit.) that he was one of the Middle of three amazing walls linking Athens and Piraeus.



Current Web is Poor on Context



http:// 

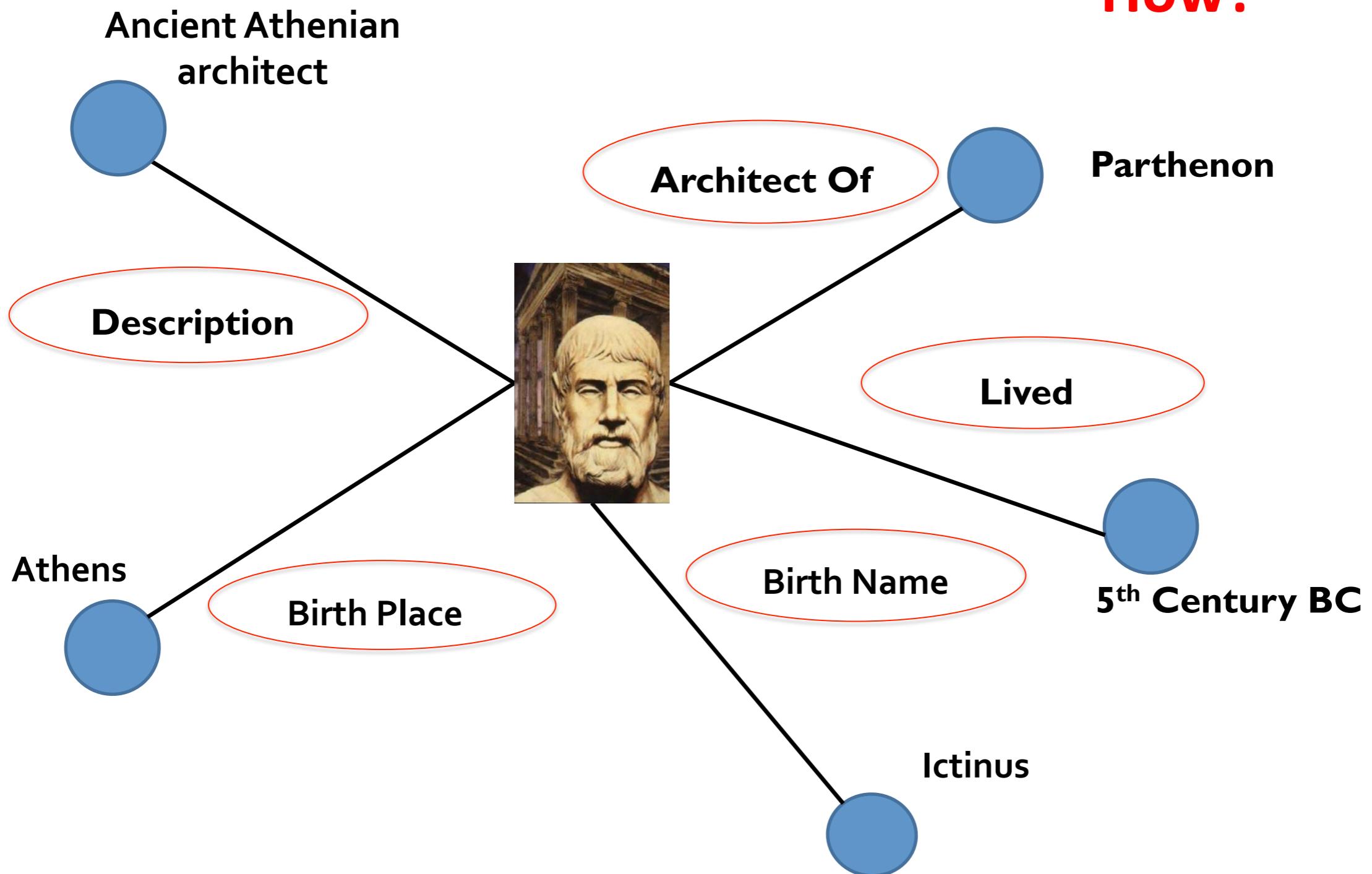


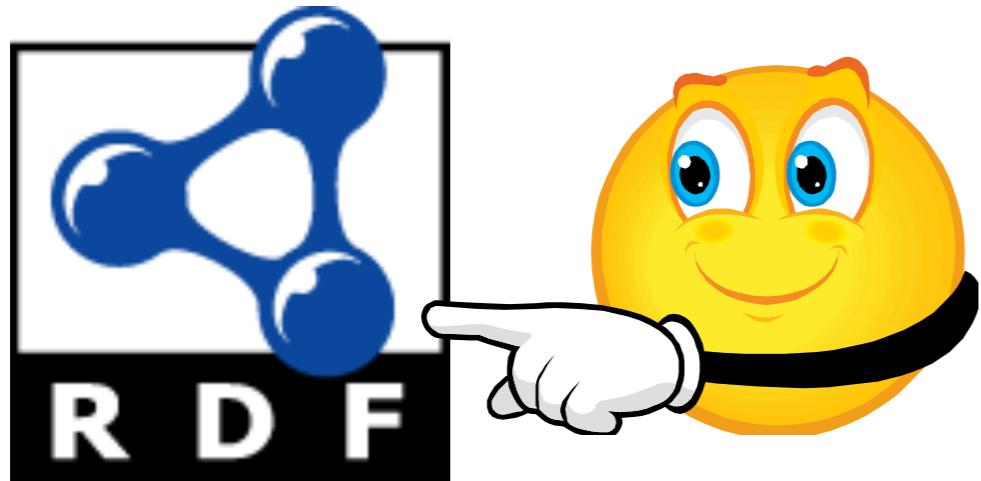
Parthenon	
Παρθενών (Greek)	
	
The Parthenon	
General information	
Type	Greek temple
Architectural style	Classical
Location	Athens, Greece
Current tenants	Museum
Construction started	447 BC ^{[1][2]}
Completed	438 BC ^{[1][2]}
Destroyed	Partly on 26 September 1687
Owner	Greek government
Height	13.72 m (45.0 ft)
Technical details	
Size	69.5 by 30.9 m (228 by 101 ft)
Other dimensions	Cella: 29.8 by 19.2 m (98 by 63 ft)
Design and construction	
Architect	Iktinos, Kallikrates

How can we build some semantic relations?

Providing Context About Ictinus

Meaningful relations –
How?





RDF (Resource Description Framework)

- A simple model of describing Data as graphs
- It's a World Wide Web Standard
- What's the real benefit?

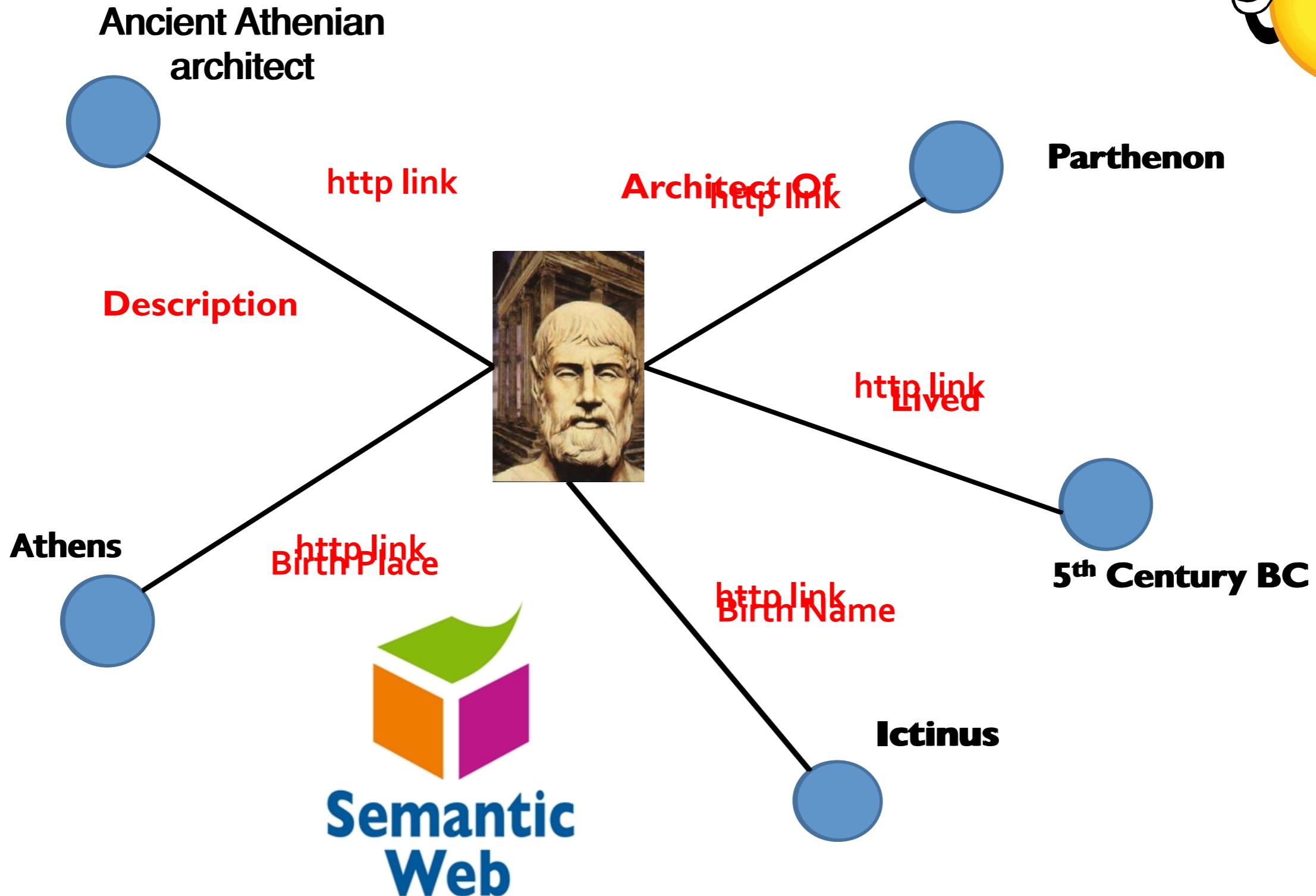
“What is the name of an Ancient Greek designer and architect famous for the construction of the temple of Parthenon?”

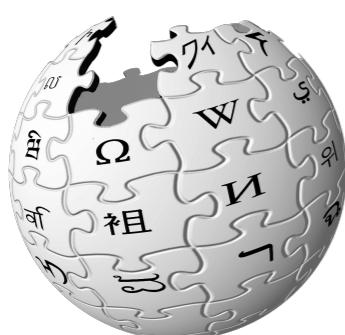
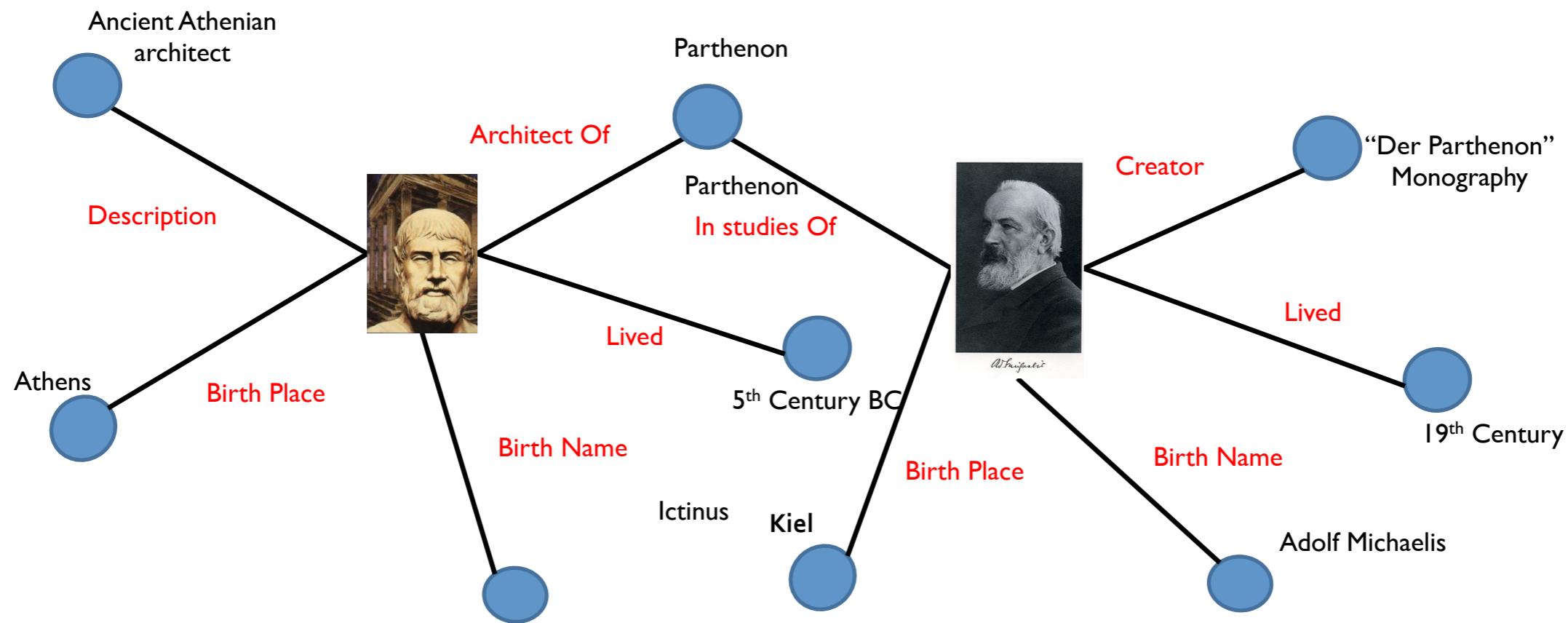
```
SELECT distinct ?name WHERE
{?person dcterms:subject
<http://dbpedia.org/resource/C...k_architects> .
<http://dbpedia.org/resource/Parthenon> dbpedia-owl:architect ?person .
?person foaf:name ?name .}
```



Name	Description
Ictinus	Ancient Athenian Architect
Kallikrates	Ancient Athenian Architect

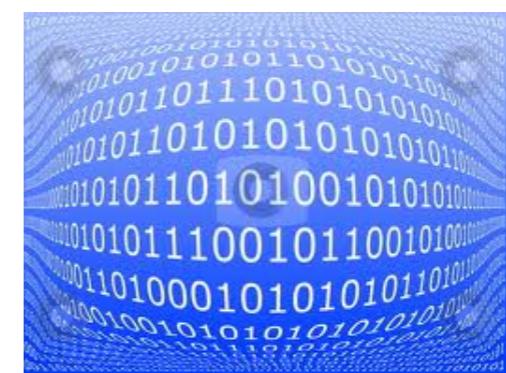
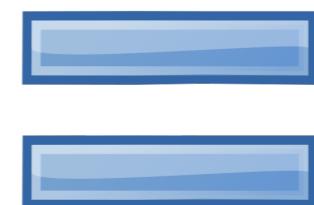
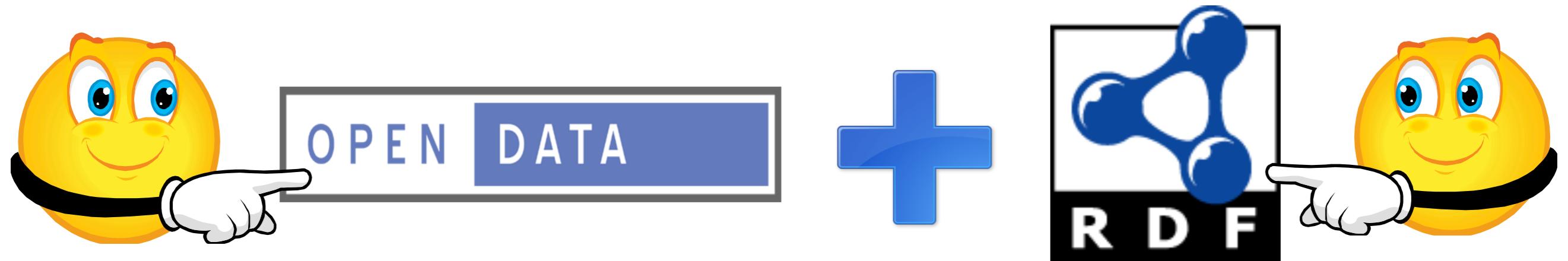
First Conclusions



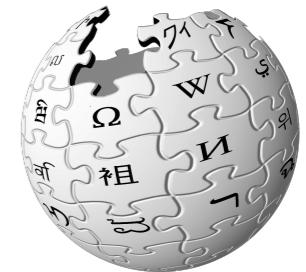


WIKIPEDIA
The Free Encyclopedia





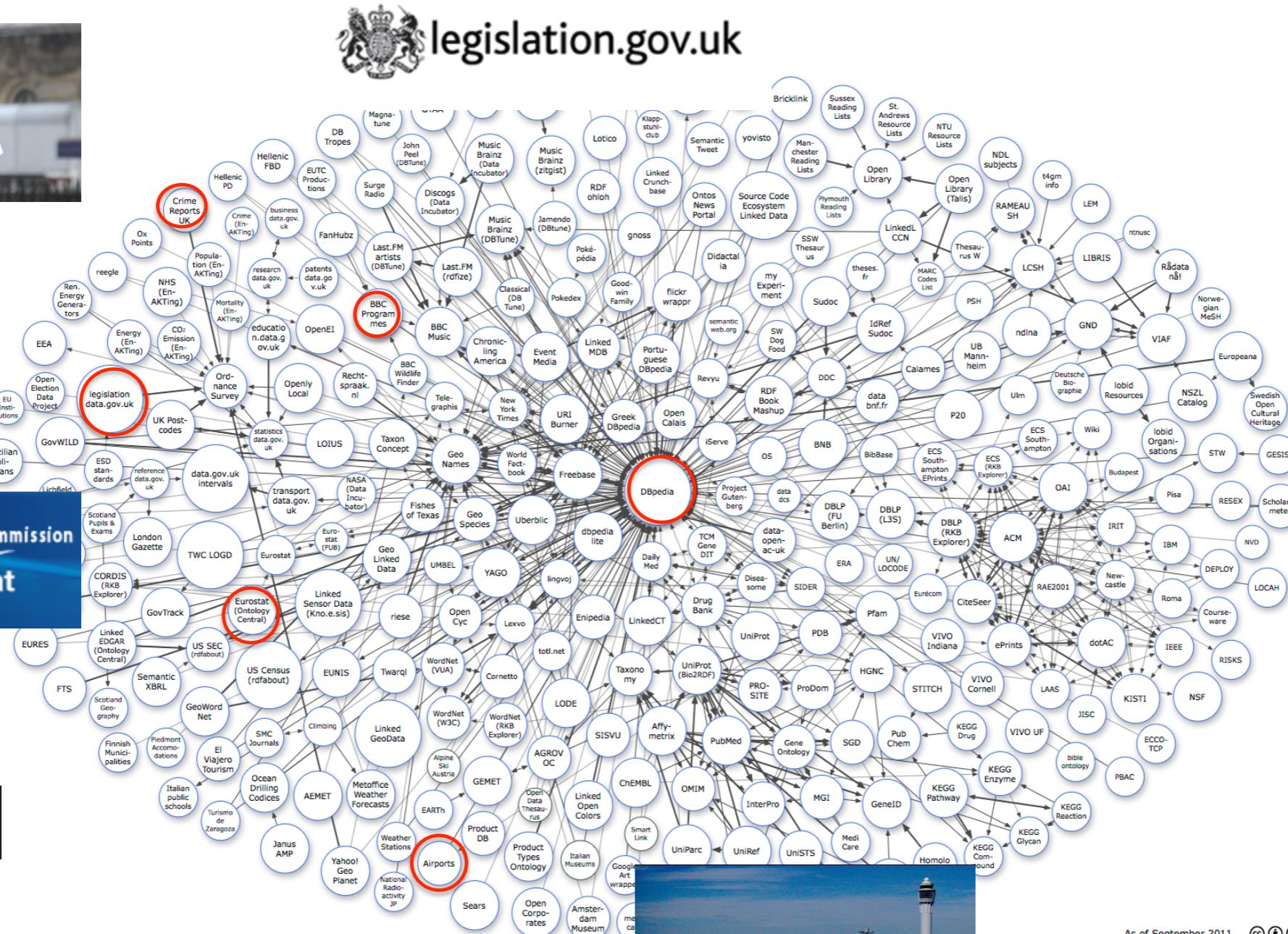
The World Wide Web as a Giant Global Database



WIKIPEDIA
The Free Encyclopedia



BBC



As of September 2011

Linking Open Data cloud diagram, by Richard Cyganiak and Anja Jentzsch.
<http://lod-cloud.net/>

Case studies

Case study I: ESCO

Legal notice | Cookies | Contact | Search on Europa | English (en) ▾

 ESCO
European Skills, Competences, Qualifications and Occupations

European Commission > ESCO > Home

Home ESCOpedia Browse ESCO Download ESCO Get involved

Search



Occupations

Skills/competences

Qualifications

News

30-05-2014 New expression of interest to join one of ESCO's Reference Groups Currently, ESCO is being developed together with stakeholders and experts grouped according to their professional expertise around 11 Sectoral Reference Groups and the Cross-sector Reference Group. Another 16 Sectoral Reference Groups will be established...	07-05-2014 Welcome to the new ESCO portal The Commission has made an overhaul of the ESCO portal since it was launched in October 2013 with the release of the ESCO classification v0. Maintaining a similar style and colour scheme, the revamp makes it easier for users to...	11-12-2013 ESCO Goes live Conference – success shared with 350 participants On 23-24 October, the European Commission launched the classification of European Skills, Competences, Qualifications and Occupations (ESCO) during the conference...	14-11-2013 ESCO v0 new features The now public ESCO v0 is a classification of skills and competences, occupations and qualifications. In total the classification contains more than 200 000 terms...	14-11-2013 New Sectoral Reference Groups from 2014 ESCO is being developed by the European Commission together with the support of the European Centre for the Development of Vocational Training (Cedefop) and with stakeholders...
--	--	---	---	--

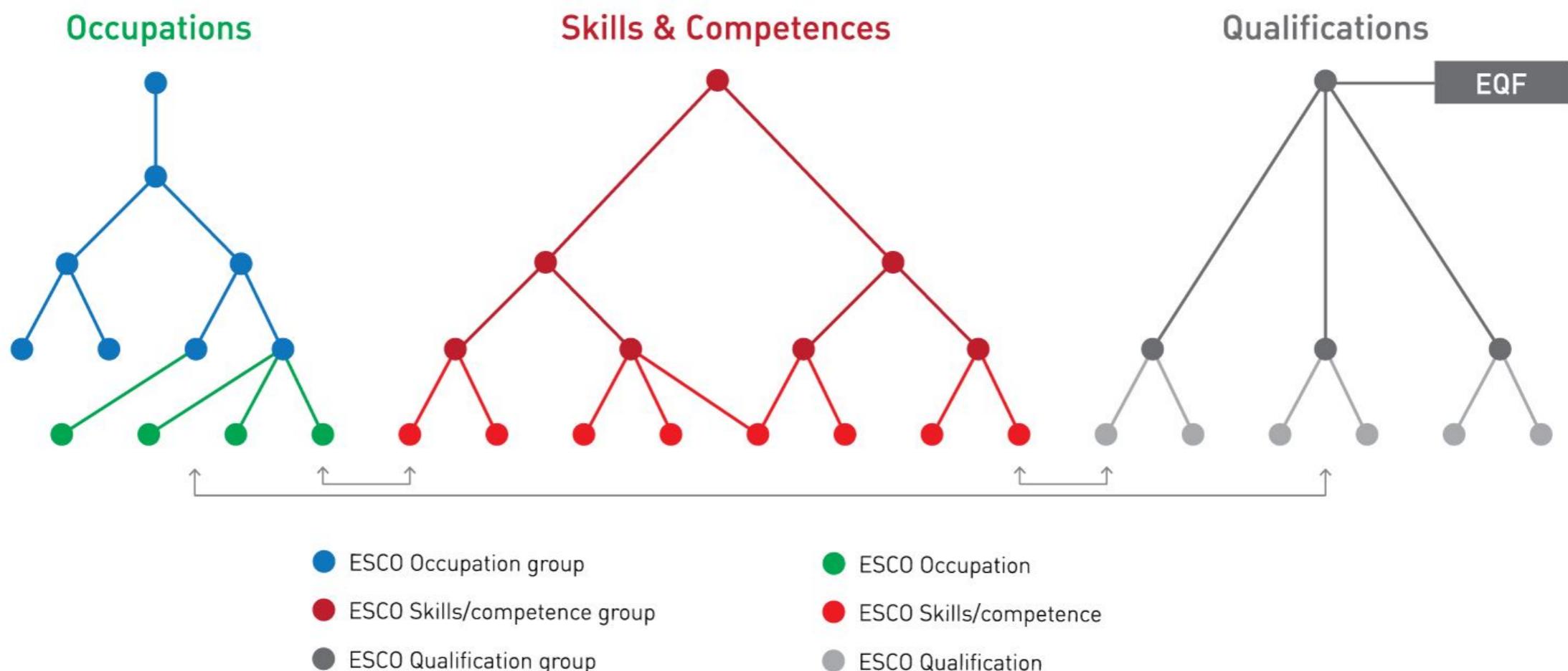
What is ESCO

- A classification of European Skills, Competences, Occupations and Qualifications
- An H2020 initiative
- Developed by [DG Employment, Social Affairs and Inclusion](#) and [DG Education and Culture](#) of the European Commission in collaboration with stakeholders and with the [European Centre for the Development of Vocational Training \(Cedefop\)](#).
- <https://ec.europa.eu/esco/home>

Main Objectives

- EU-wide set of multi-lingual vocabularies
 - An upcoming standard in the EU job labor market?
- Facilitate EU job market transparency and mobility
 - ESCO is developed in 25 languages
- Facilitate supply (CVs) and demand (Job Vacancies) matching
 - Applications can be built on top of the classification
- ESCO classification as a hub taxonomy for the job labor market
 - Will be mapped to National Job Labor Market classifications
 - Public/Private Employment Services

A Taxonomy with 3 main pillars



ESCO Sample Concepts

Occupations	Skills and competences	Qualifications
<ul style="list-style-type: none">• Mail courier• Safety technician• Valet• Automotive designer• Neurologist• Parquet floor layer• Hairdresser• Civil engineer• Bandsaw operator• Flight attendant	<p><i>Occupation-specific</i></p> <ul style="list-style-type: none">• Handling complaints• CAD drawing• Car painting• Bacteriology <p><i>Transversal (cross-occupational)</i></p> <ul style="list-style-type: none">• Editing electronic content• Gathering data• Collaborating on tasks	<ul style="list-style-type: none">• European Certificate of Floral Design• Project Management Professional (PMP)• European/International Welding Specialist• Cisco Data Centre Application Services Design Specialist• European Hairdressing Certificate

ESCO Concept (detailed view)

Legal notice | Cookies | Contact | Search on Europa | English (en) ▾

 ESCO
European Skills, Competences, Qualifications and Occupations

European Commission > ESCO > Concept

Home ESCOpedia Browse ESCO Download ESCO Get involved

Search

Flight attendant
Occupation

Hierarchy

English (en)	Français (fr)
5 Service and sales workers	5 Personnel des services directs aux particuliers, commerçants et vendeurs
51 Personal service workers	51 Personnel des services directs aux particuliers
511 Travel attendants, conductors and guides	511 Agents d'accompagnement et assimilés (transports et tourisme)
5111 Travel attendants and travel stewards	5111 Agents d'accueil et stewards

Term details

English (en)	Français (fr)
Preferred term Flight attendant	Preferred term Hôtesse, hôtesse de l'air
URI http://ec.europa.eu/esco/occupation/19320	URI http://ec.europa.eu/esco/occupation/19320
NPT Air cabin crew member Air host Air host/hostess Air hostess Airline host/hostess Airline steward/stewardess Air steward Air steward/stewardess Steward Stewardess	NPT Hôte de l'air Hôtesse de l'air Steward, hôtesse de l'air à bord d'avions Steward à bord d'avions

Related facet groups | 0

Related skills/competences | 2

Related qualifications | 0

ESCO is a Europe 2020 initiative.

Current version: [ESCO v0](#) (Last update: [07/05/2014](#))

DG Employment, Social Affairs and Inclusion and DG Education and Culture of the European Commission develop ESCO in collaboration with stakeholders and with the European Centre for the Development of Vocational Training (Cedefop).

Top

ESCO as Linked Open Data

ESCO Data Model
relies on SKOS
(Simple Knowledge Organization System)

ESCO is published as
Open Data



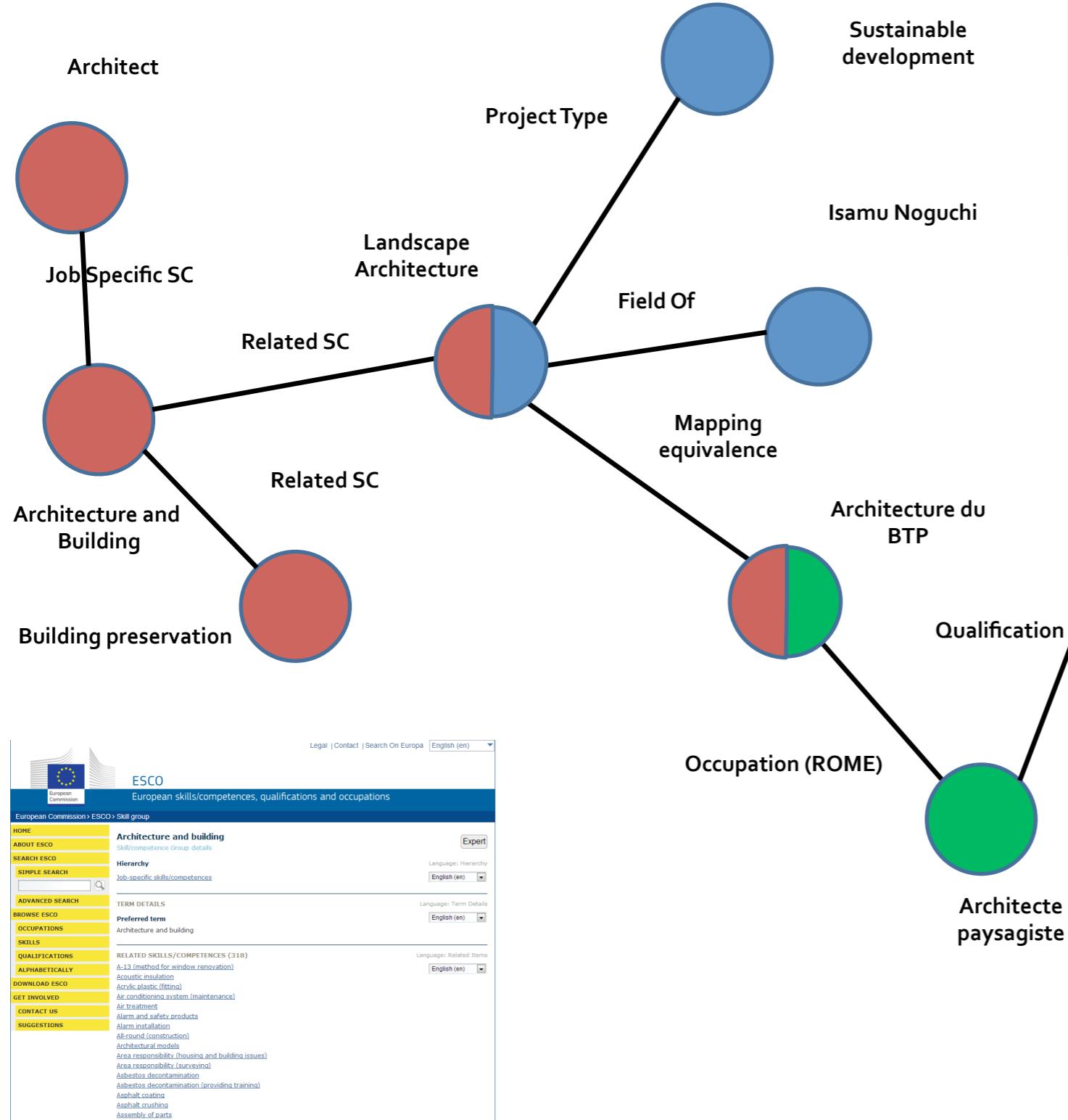
The screenshot shows the ESCO website interface. The top navigation bar includes links for Legal, Contact, Search On Europa, and English (en). The main content area displays the 'Architecture and building' skill group details. It features a sidebar with links for Home, About ESCO, Search ESCO, Simple Search, Advanced Search, Browse ESCO, Occupations, Skills, Qualifications, Alphabetically, Download ESCO, Get Involved, Contact Us, and Suggestions. The main content area shows the preferred term 'Architecture and building' and a list of related skills/competences such as 'Acoustic insulation', 'Acrylic plastic (fibres)', 'Air conditioning system (maintenance)', etc.

This screenshot is identical to the one above, displaying the 'Architecture and building' skill group details on the ESCO website.

This screenshot is identical to the ones above, displaying the 'Architecture and building' skill group details on the ESCO website.



Eco-System of Labor Market Linked Open Data



[WIKIPEDIA](#)
The free encyclopedia

Article | Talk | Read | Edit | View

Landscape architecture

From Wikipedia, the free encyclopedia

Landscape architecture is the design of outdoor public areas, landmarks, and structures to achieve environmental, social-behavioral, or aesthetic outcomes.^[1] It involves the systematic investigation of existing social, ecological, and geological conditions and processes in the landscape, and the design of interventions that will produce the desired outcome. The scope of the profession includes: urban design; site planning; stormwater management; town or urban planning; environmental restoration; parks and recreation planning; visual resource management; green infrastructure planning and provision; and private estate and residence landscape master planning and design, all at varying scales of design, planning and management. A practitioner in the profession of landscape architecture is called a *landscape architect*.

Contents [edit]

- 1 Definition
- 2 Fields of activity
- 3 History of landscape architecture
- 4 Profession
 - 4.1 Australia
 - 4.2 Canada
 - 4.3 Italy
 - 4.4 New Zealand
 - 4.5 Republic of Ireland
 - 4.6 United Kingdom
 - 4.7 United States
- 5 See also
- 6 References

[Ministère du Travail, de l'Emploi, de la Formation Professionnelle et du Dialogue Social](#)

Ministère du Travail, de l'Emploi, de la Formation Professionnelle et du Dialogue Social

TRAVAIL EMPLOI FORMATION PROFESSIONNELLE DIALOGUE SOCIAL APPRENTISSAGE

Le ministre Le Ministère Actualité - Presse Europe / International DOCUMENTATION - PUBLICATIONS

Accueil > Études, recherches, statistiques de la Dares > Sources et définitions > **Nomenclatures**

8 avril 2010

ROME V3 - Répertoire Opérationnel des Métiers et des Emplois

European Commission ESCO European skills/competences, qualifications and occupations

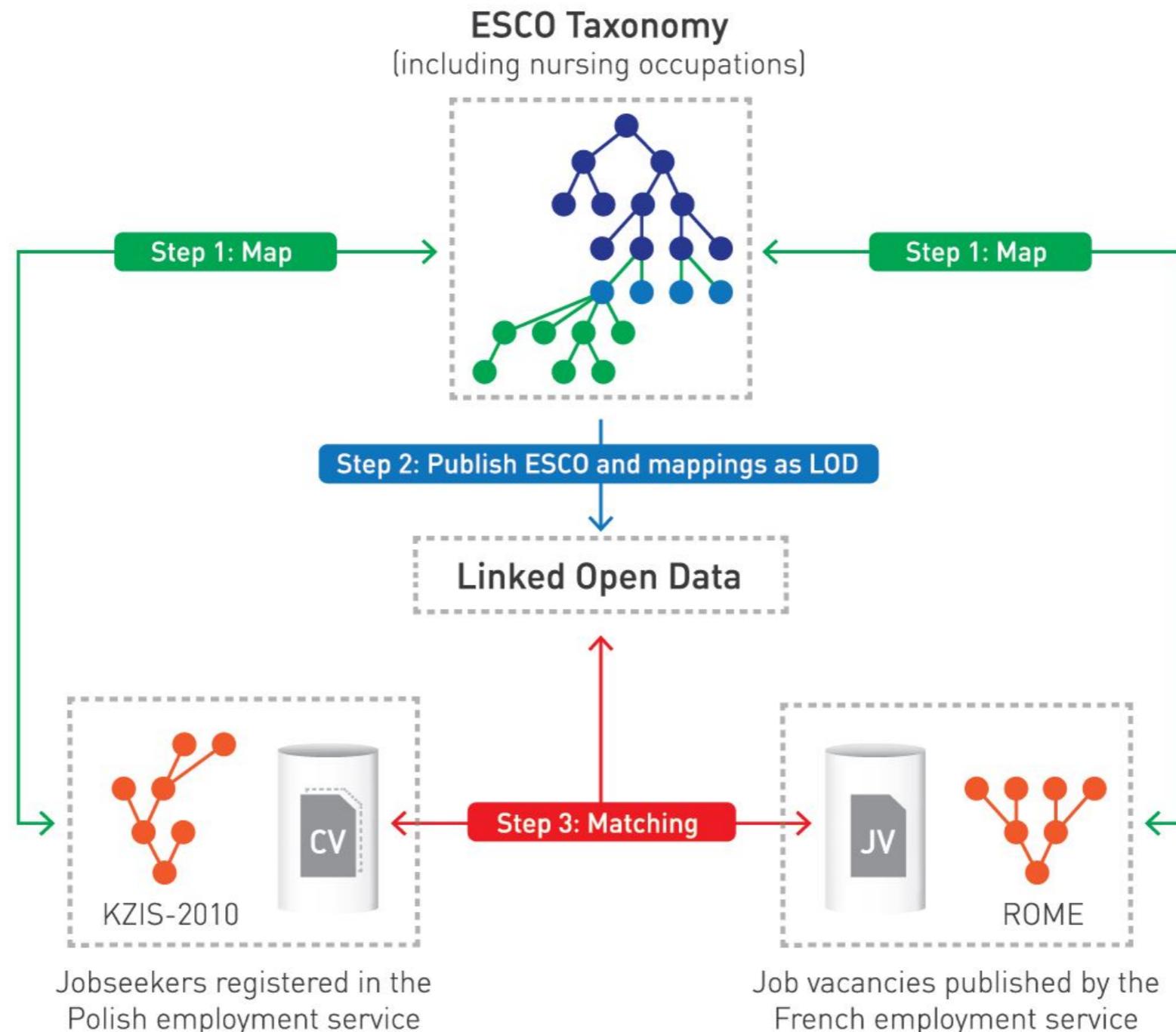
European Commission > ESCO > Skill group

HOME ABOUT ESCO SEARCH ESCO SIMPLE SEARCH ADVANCED SEARCH BROWSE ESCO OCCUPATIONS SKILLS QUALIFICATIONS ALPHABETICALLY DOWNLOAD ESCO GET INVOLVED CONTACT US SUGGESTIONS

Architecture and building Skill/competence Group details Expert Hierarchy Job-specific skills/competences TERM DETAILS Preferred term Language: Term Details English (en) RELATED SKILLS/COMPETENCES (318) A-13 (method for window renovation) Acoustic insulation Acrylic plastic (fitting) Air conditioning system (maintenance) Air treatment Alarm and safety products Alarm installation All-round construction Architectural models Area responsibility (housing and building issues) Area responsibility (surveying) Asbestos decontamination Asbestos decontamination (providing training) Asphalt coating Asphalt crushing Assembly of parts

ESCO as a hub

Case: A surgical nurse in Poland is seeking employment in France



ESCO Current Status

- ESCO v0 published in 2013 – a trial version
- Final ESCO Version (v1) is ongoing
 - Developed in partial upgrades (v0.1, v0.2 ...) until the final version (early 2017).
 - Version 0.1 foreseen for publication in 2015.
 - 3 sectors (out of 27 in total):
 - Agriculture, Forestry and Fishery;
 - Hospitality and tourism;
 - Veterinary
 - Version 0.2 ongoing – 8 more sectors
 - 16 remaining sectors
 - Online Consultation a.k.a."Crowd sourcing"
 - Citizen engagement
 - Sector Experts (contributors) selection process starts in February 2015
 - “Stay tuned”

For more details

- Articles in ESCOpedia
 - <https://ec.europa.eu/esco/escopedia>
- Main publications and lectures
 - Le Vrang, M.; Papantoniou, A.; Pauwels, E.; Fannes, P.; Vandensteen, D.; De Smedt, J., "ESCO: Boosting Job Matching in Europe with Semantic Interoperability," Computer , vol.47, no.10, pp.57,64, Oct. 2014, doi: 10.1109/MC.2014.283
 - De Smedt J, Papantoniou A.– “The ESCO platform for a collaborative NKOS development” –13th Networked Knowledge Organization Systems (NKOS) – Digital Libraries 2014 Conference London, September 2014 ([link](#))

Case study II: publicspending.gr

FINANCIAL TIMES

EUROPE Friday November 2 2012

Revenge of Les Pigeons
The French tax revolt. Analysis, Page 7

Hurricane Gary's birthday blues
Notebook, Page 8

TOMORROW IN FT WEEKEND
How To Spend It
Jasper Conran on taking over The Conran Shop: Zimbabwe's authentic wilderness safaris. Plus feel good fashion's refreshing new palette

News Briefing

European buybacks fall to 2009 levels
Share buybacks by European firms have fallen to the lowest levels since 2009 as pessimism over business conditions spur management to hold on to cash. Page 13

Ford refutes talk
Ford Motor has refuted speculation of an imminent change to its leadership, saying chief executive Alan Mulally, 67, planned to stay until at least 2014, although Mark Fields would take over as temporary chief executive if operational management Page 13; Chrysler buys stake, Page 16; www.ft.com/bs

Ebay in China push
Ebay is making a renewed push into China through a joint venture with Alibaba, a local online retailer of luxury goods. Page 17

NY power outages
Treaty complications, power outages and a shortage of fuel forced New York even-

Georges Papandreou and his former Economic Vice Minister, who held the finance portfolio from September 2009 until June this year, could face charges of criminal negligence if parliament refers them for trial, according to legal experts.

Yesterday's request to Greek police to detain Christos Vassilakis, a Greek journalist who published the list was acquired of charges of violating data protection laws. Costas Vassilakis has said he acted in the public interest by publishing the names of the 1,000 Greeks with Swiss bank accounts.

Opponents and supporters of Mr Vassilakis, including leftwing politicians, gathered outside the court as the hearing got under way. The case has triggered criticism of Greece's judicial system.

"Instead of arresting the tax evaders, the journalist who publicized their names has been arrested," said Eleftherios Avgoustis, an international banking law and finance professor at Edinburgh university. "It's a reminder that in contrast to most countries around the globe, freedom of speech is repressed in order to serve vested interests."

Mr Papandreou responded to a question with the list of Greek depositors in 2010 from Christine Lagarde, then French finance minister and now managing director of the International Monetary Fund, Greek financial police to carry out a full investigation. He said the list was later "misfiled". Mr Vassilakis also left the issue alone after its rock over as finance minister in 2011.

Papandreou opened proceedings against Vassilakis yesterday night. Yiannis Mouzalas, the current finance minister, told the issue that he had found no trace of the list when he took over in June. "It is another list that went to the ministerial level that went to me," he said.

Christos Vassilakis, the veteran investigative reporter, talked to the media before his appearance in court in Athens yesterday.

EU set to proceed with budget talks

However, Vice President in charge of regional policy, Olli Rehn, told the monthly gathering on the EU budget despite Mr Papandreou's demands for early talks on an agreement.

Indeed, in a European Council statement, it was agreed to seek a compromise with David Cameron, the British prime minister, or include the UK by striking a deal with the other 26 EU members. Report, Page 6

... I was told by my officials that it wouldn't be issued, he said. ...

Mr Vassilakis said he had asked the French authorities to provide an official copy of the list. The Greek names include two former government ministers who are already under investigation for suspected tax evasion, according to officials in the financial police, as well as members of the country's business elite and several senior ministry officials.

Under Mr Mouzalas, the finance ministry has initiated separate investigations into possible tax evasion in the case of high-end London properties by 800 Greeks, and also overseas transfers involving Greek citizens.

The finance ministry has issued at least 10,000 transfers worth yesterday as a more astute ground to sunset. Mr Vassilakis, as Justice Minister Anastasiakopoulou, a former minister, said she was leaving the party because the government is continuing to pursue policies that were not in the public interest.

Mr Vassilakis made clear he would continue to support conservative premier Antonis Samaras, who is committed to implementing fiscal and structural reforms despite mounting criticism of the socialist leader.

Sharp
admits its
survival is
in doubt

By Jonathan Soble in Tokyo
Sharp has admitted "material losses" since its ability to stay in business as it entered a second year of record losses, accepting the gloom surrounding Japan's once-dominant consumer electronics industry.

The century-old company will it expects to end the financial year to March with a net loss of ¥40 billion (US\$480 million), worse than the ¥32 billion loss it had predicted in August. Last year it lost ¥360 billion, mainly attributed to Japan's weak yen, which is starting to move in the right direction for the losses.

The warning came a day after Panasonic stunned investors by proposing a second consecutive share issue. Panasonic's share price dropped further on Wednesday.

While Panasonic, along with Sony, are the most market-focused of Japan's large technology companies, all three firms suffered as global sales



January 2015



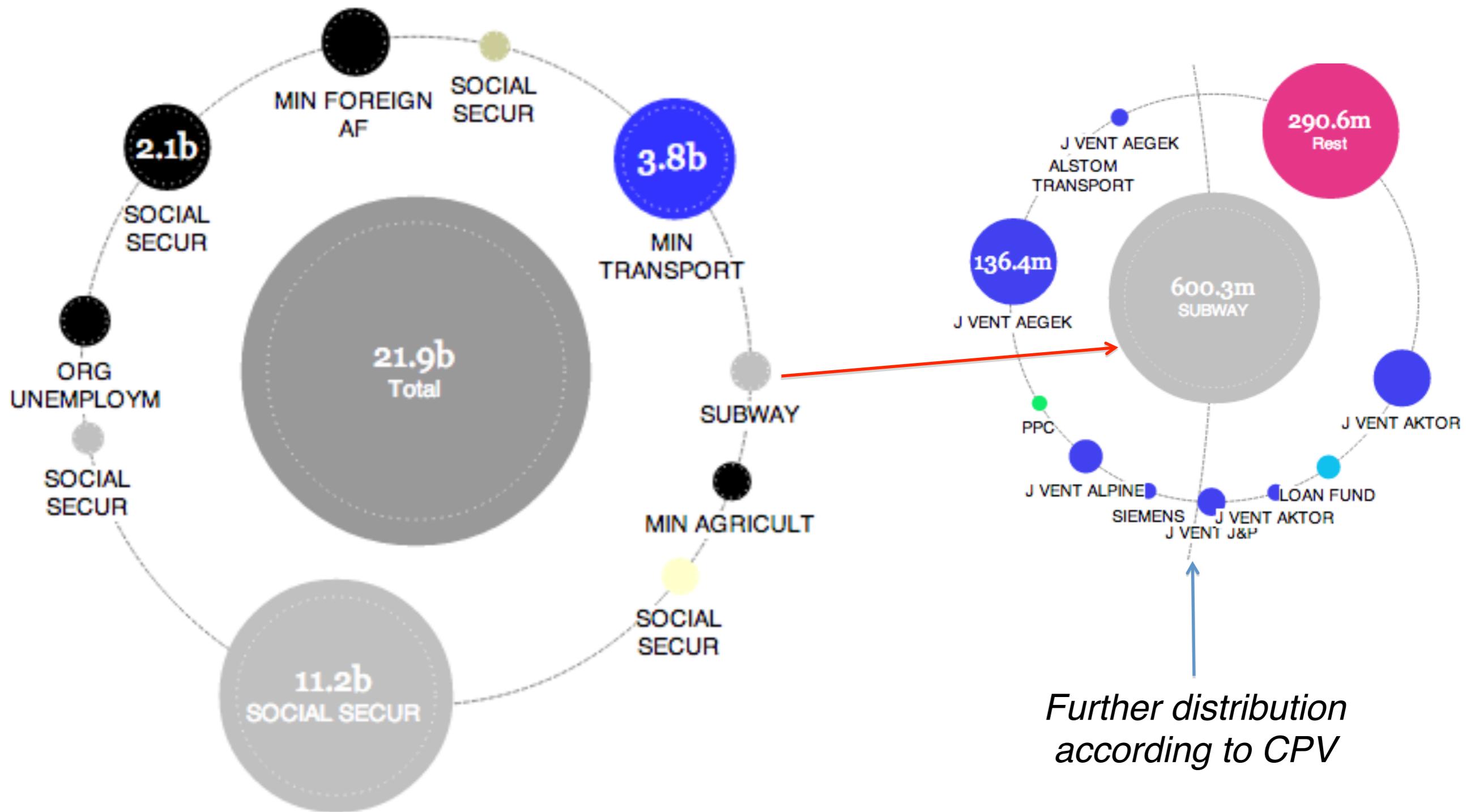
Motivation

- A team of 4 NTUA affiliates and 5 master students
- In December 2011, decided to exploit the “ΔΙΑΥΓΕΙΑ”¹ (Hellenic Government’s Transparency program) and “TAXIS”² (Taxation Information System) APIs
- To provide a publicly available Internet service that employs Semantic Web technologies - based on “Open Data”
- Result: **real-time information** and (easy to read) **data visualizations** of public expenditure in Greece
- An open free and objective Web point that targets to enhance citizen awareness
- Improving decision-making regarding public spending
- Build a robust semantic dataset for research activities

¹ <http://opendata.diavgeia.gov.gr/>

² <http://www.gsis.gr/>

Visualizations - Diagrams



Top-10 distribution of public expenditure and a of Payer-Payee relation

Case study: Attica Subway SA

Visualizations - Aggregate cards

EGNATIA STREET SA



public payments from 10/2010 onwards

€1,244,318,021

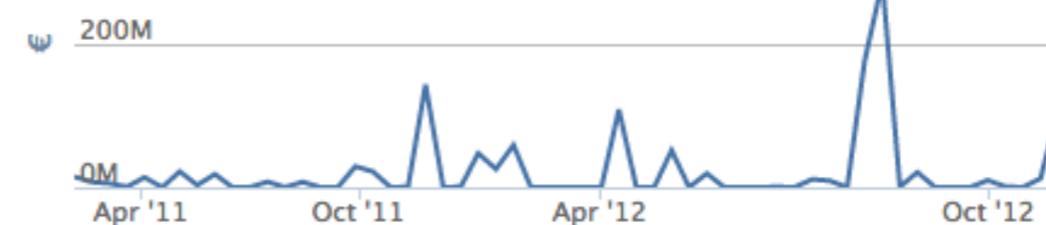
Ranking

2

Number of payments

246

Time plot of contracts
01/10/2010 – 16/11/2012



Category of payments

Motorway construction works	€682,654,771	54%
Construction work	€307,362,994	24%
Administration services	€140,931,715	11%
Construction work for highways, roads	€22,826,935	1%

<< < 1 2 3 4 > >>

Top payers

MINISTRY OF TRANSPORT GENERAL SECRETARIAT OF PUBLIC PROJECTS	€1,244,312,832	99%
EMPLOYMENT AGENCY FORCE	€4,681	0%
MUNICIPAL THEATRE OF KOZANI	€218	0%
MUNICIPALITY OF KAVALA PUBLIC BENEFIT ORGANIZATION	€55	0%

<< < 1 2 3 4 5 > >>

Top 100 payments

Date	Paying authority	Amount	Category of payment	Original expenditure decision
2012-08-13	MINISTRY OF TRANSPORT GENERAL SECRETARIAT OF PUBLIC PROJECTS	€194,585,881	Construction work	http://et.diavgeia.gov.gr/f/all/ada/B4ΓΛ1-Φ10
2012-08-01	MINISTRY OF TRANSPORT GENERAL SECRETARIAT OF PUBLIC PROJECTS	€130,401,159	Motorway construction works	http://et.diavgeia.gov.gr/f/all/ada/B40Ζ1-ΦΥ5

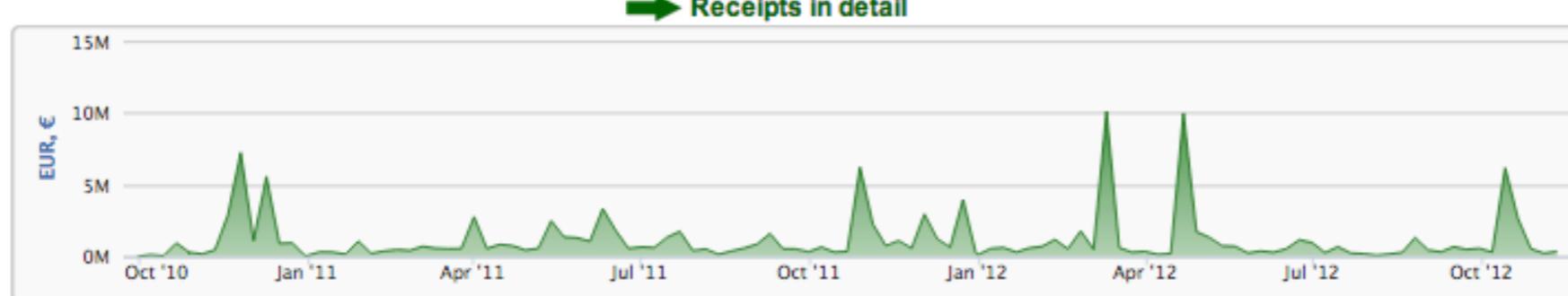
Visualizations- Profiling (Name / VAT reg. number)

ORGANISMOS TÍLEPIKOINÓNIÓN TÍS ELLADOS ANÔNYMÎ ETAIREIA

receipts → Has received from the public: **€128,005,660** (25,771 decisions)

Main Activity	Other telecommunications services
Address	LEÔFOROS KÍFISIAS 99 - show on map
City	MAROUSI
Zipcode	15124
Phone Number	6118112
Status	✓
Active Since	1949-11-26
Inactive Since	-
V.A.T. Registration Number	094019245
Fiscal Authority	MEGALÓN EPICHEIRÍSEON
Legal Status	Public Limited Company

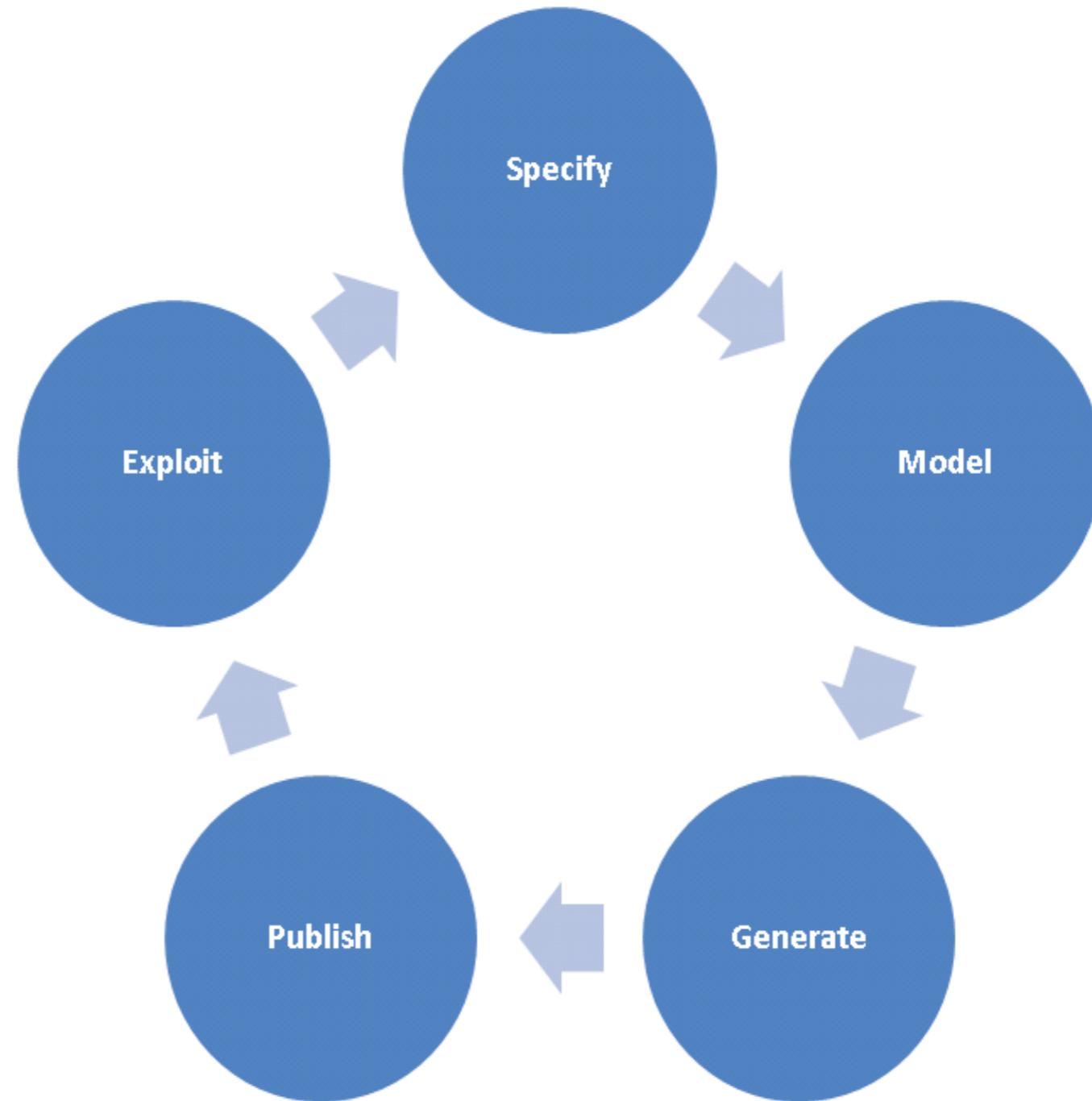
[Like 0](#) [Share 0](#) [Tweet 0](#)



Date Issued	Payer	Amount	Payment Category (CPV)	Link to Decision	Link to PDF
2012-03-19	YPOURGEIO ESÓTERIKÓN DÍMOSIAS DIOIKÍSIS KAI APOKENTRÓSIS GENIKÍ GRAMMATEIA DÍMOSIAS DIOIKÍSIS	€9,485,812	Telephone connections	http://et.diavgeia.gov.gr/f/all/ada/B44AX-K4O	
2012-05-02	YPOURGEIO ESÓTERIKÓN DÍMOSIAS DIOIKÍSIS KAI APOKENTRÓSIS GENIKÍ GRAMMATEIA DÍMOSIAS DIOIKÍSIS	€9,485,812	Telephone connections	http://et.diavgeia.gov.gr/f/all/ada/B496X-6AN	
2012-10-16	YPOURGEIO ETHNÍKÍS PAIDEIAS KAI THRÍSKEUMATÓN	€6,022,382	Telephone and data transmission services	http://et.diavgeia.gov.gr/f/all/ada/B43E9-7ΓΑ	

Case study: Hellenic Telecommunications Organization SA

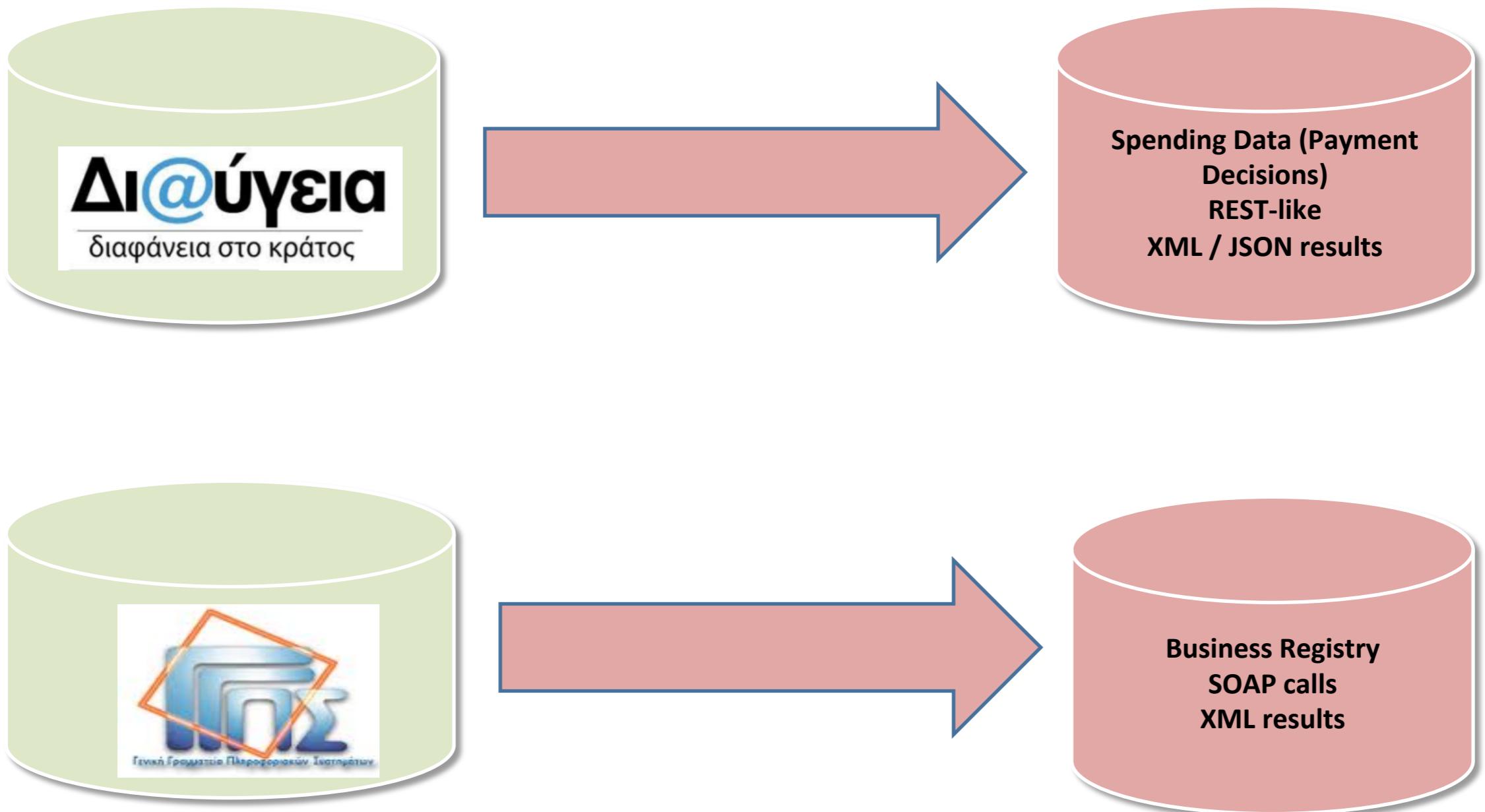
How we did it



Linked Data Production Life Cycle

Source: Villazon-Terrazas et al [link](#)

Phase 1: Identify and analyze data sources



Phase 2: Model the data

- Usage of existing standard vocabularies
- Benefit: Re-usability + Cross domain interoperability
- Vocabularies used in publicspending.gr
 - UK Gov Payments Ontology adjusted for Greek Data
 - W3c Organizations Ontology
 - EU ISA Core Vocabularies

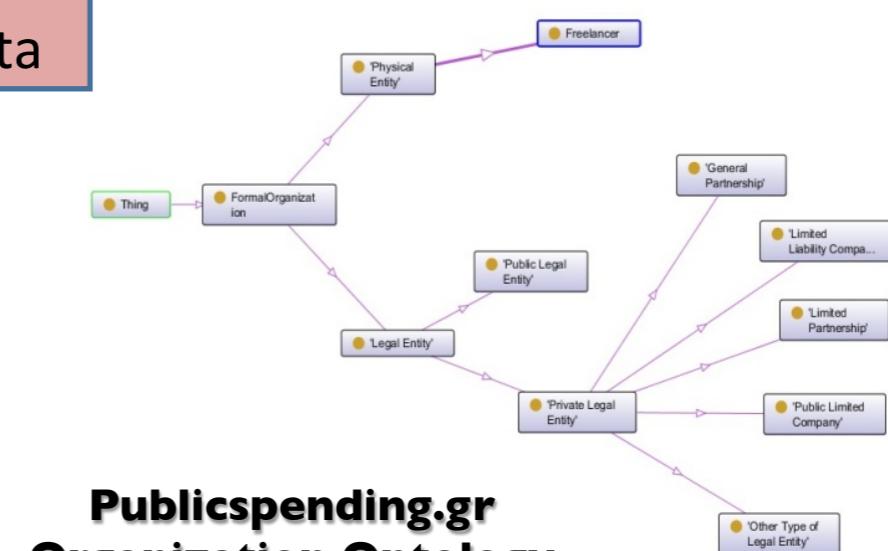
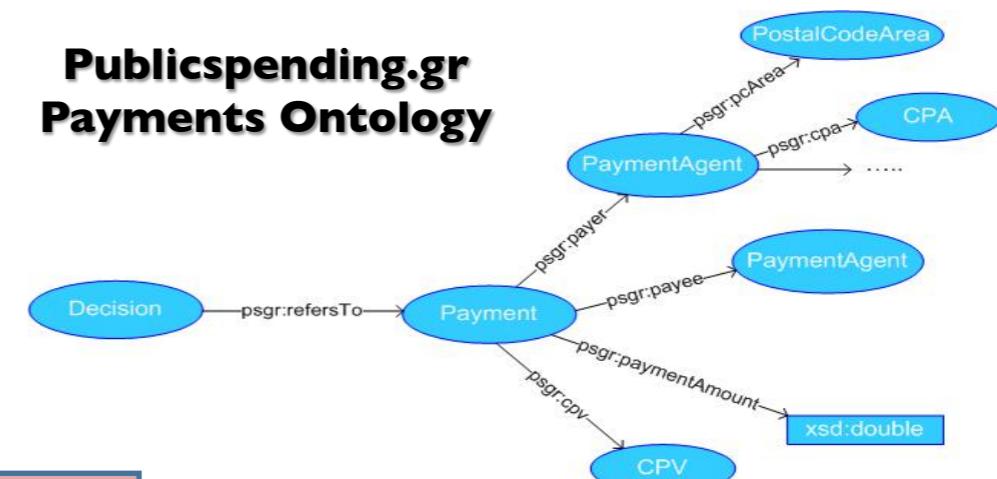
```

<ns3:decisionTypes>
  <ns3:decisionType uid="1">
    <ns3:label>ΝΟΜΟΣ</ns3:label>
    <ns3:extraFields/>
  </ns3:decisionType>
  <ns3:decisionType uid="2">
    <ns3:label>ΠΟΛΙΤΙΚΗ</ns3:label>
    <ns3:extraFields/>
  </ns3:decisionType>
  <ns3:decisionType uid="3">
    <ns3:label>ΠΡΟΓΡΑΜΜΑ</ns3:label>
    <ns3:extraFields/>
  </ns3:decisionType>
  <ns3:decisionType uid="4">
    <ns3:label>ΕΓΚΥΚΛΙΟΣ</ns3:label>
    <ns3:extraFields/>
  </ns3:decisionType>
  <ns3:decisionType uid="5">
    <ns3:label>ΔΙΑΧΕΙΡΙΣΗ</ns3:label>
    <ns3:extraFields/>
  </ns3:decisionType>
  <ns3:decisionType uid="6">
    <ns3:label>ΜΙΩΣΕΩΝ</ns3:label>
    <ns3:extraFields/>
  </ns3:decisionType>
  <ns3:decisionType uid="7">
    <ns3:label>ΠΡΟΚΗΡΥΞΗ ΠΛΗΡΩΣΗΣ ΘΕΣΕΩΝ</ns3:label>
    <ns3:extraFields/>
  </ns3:decisionType>

```

Clarity and GSIS data
enriched with
semantic metadata

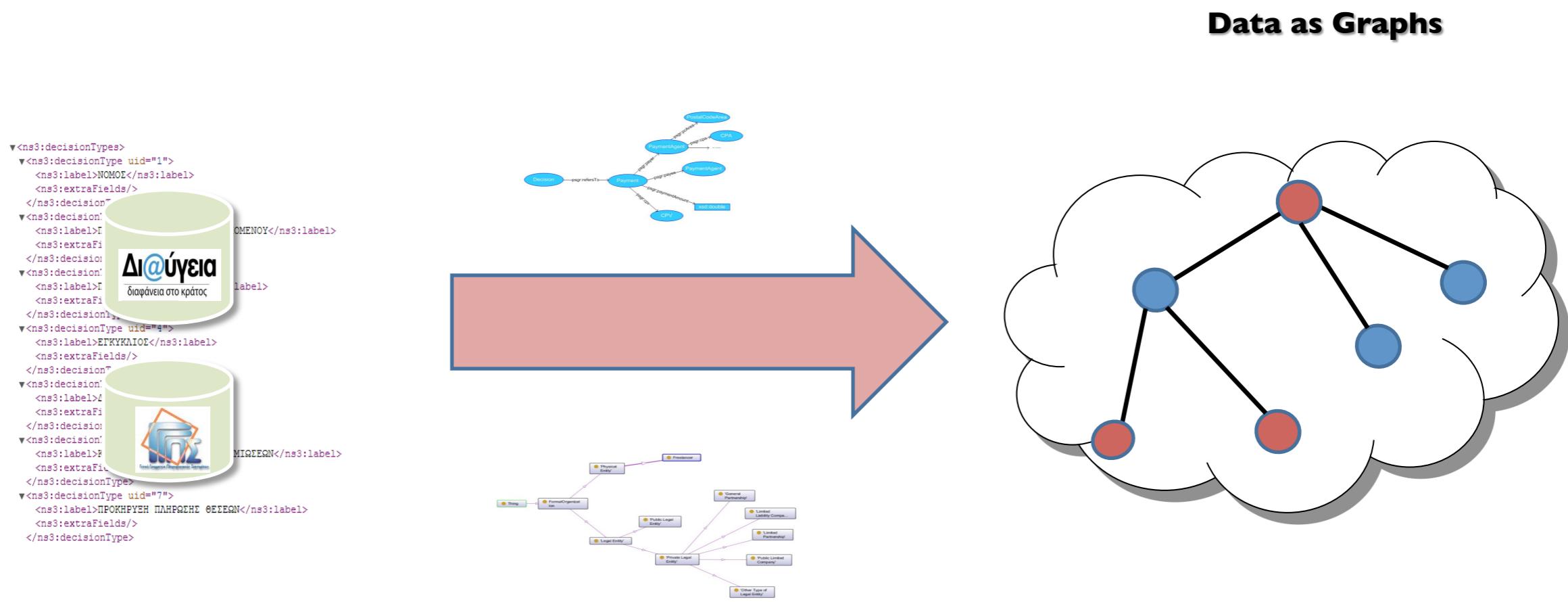
Publicspending.gr Payments Ontology



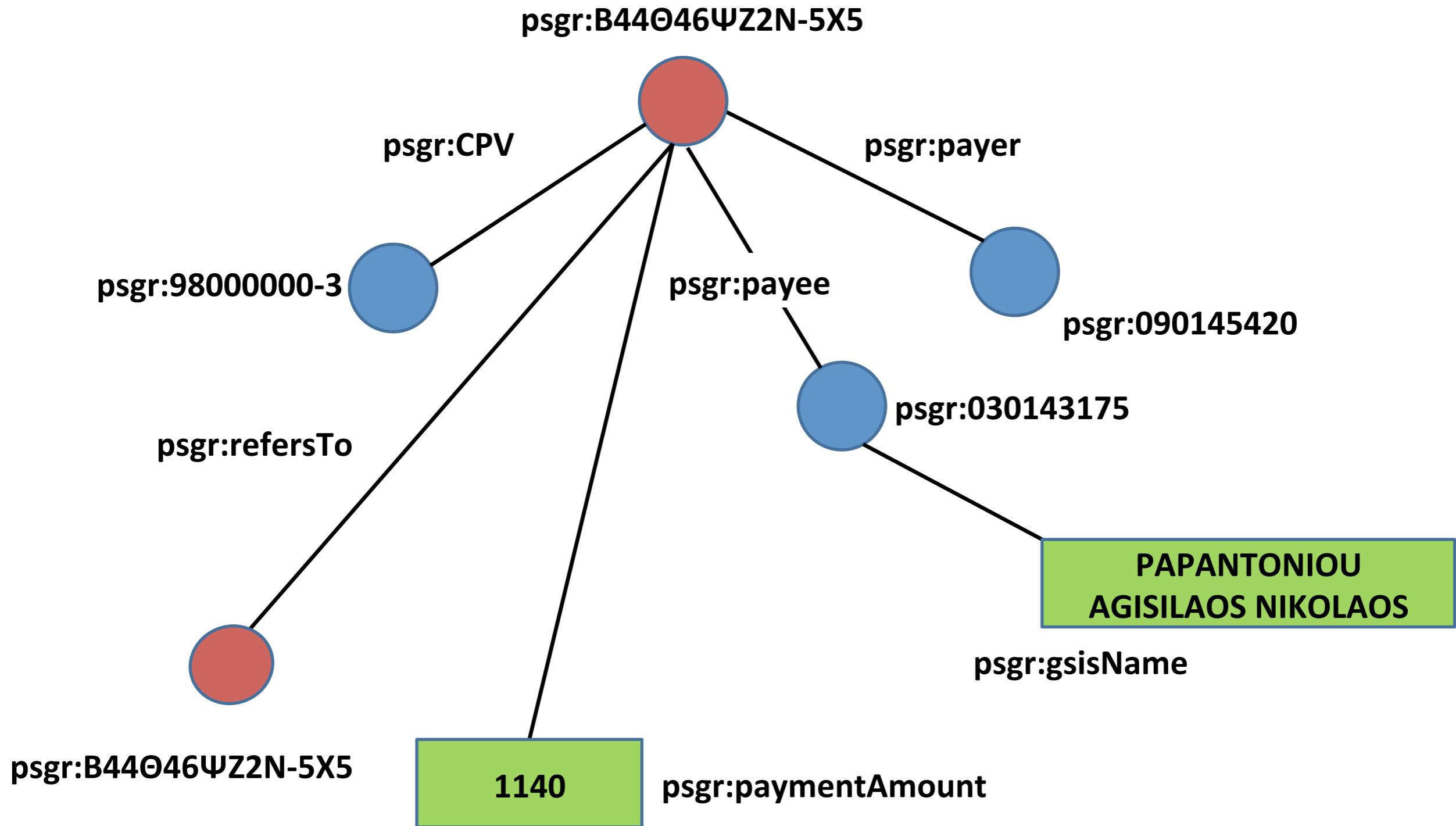
Publicspending.gr Organization Ontology

Step 3: Generate the processed data

- Common representation → RDF
- Graph database - Triples
- In standardized coding format (RDF/XML)

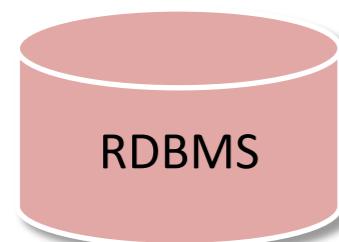


What's in a Graph?



More data sources?

- A. Papantoniou in Diavgeia – he exists!
- in Public Debtors? - (fortunately not!)
- Everything to RDF – common data model

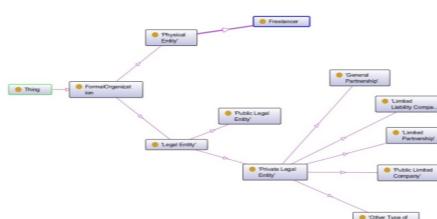
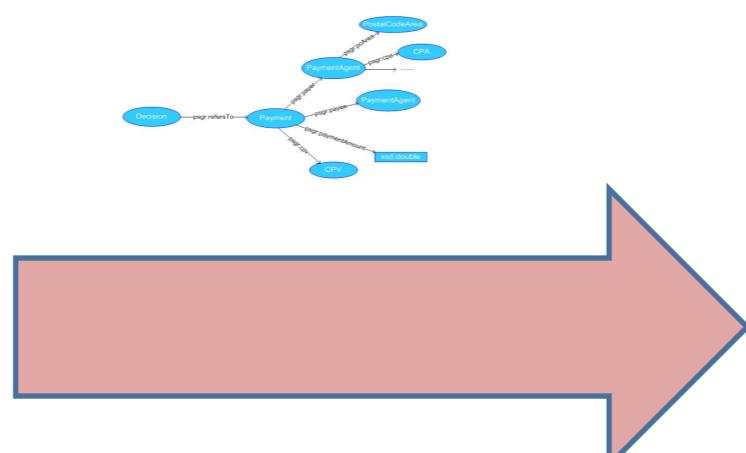


```
<ns3:decisionTypes>
  <ns3:decisionType uid="1">
    <ns3:label>ΝΟΜΟΣ</ns3:label>
    <ns3:extraFields/>
  </ns3:decisionType>
  <ns3:decisionType uid="2">
    <ns3:label>ΟΜΕΝΟΥ</ns3:label>
    <ns3:extraFields/>
  </ns3:decisionType>
  <ns3:decisionType uid="3">
    <ns3:label>ΕΤΚΥΚΑΙΟΣ</ns3:label>
    <ns3:extraFields/>
  </ns3:decisionType>
  <ns3:decisionType uid="4">
    <ns3:label>ΜΙΩΣΕΩΝ</ns3:label>
    <ns3:extraFields/>
  </ns3:decisionType>
  <ns3:decisionType uid="5">
    <ns3:label>ΠΡΟΧΩΤΥΣΗ ΠΛΗΡΩΣΗ ΘΕΤΕΩΝ</ns3:label>
    <ns3:extraFields/>
  </ns3:decisionType>
</ns3:decisionTypes>
```

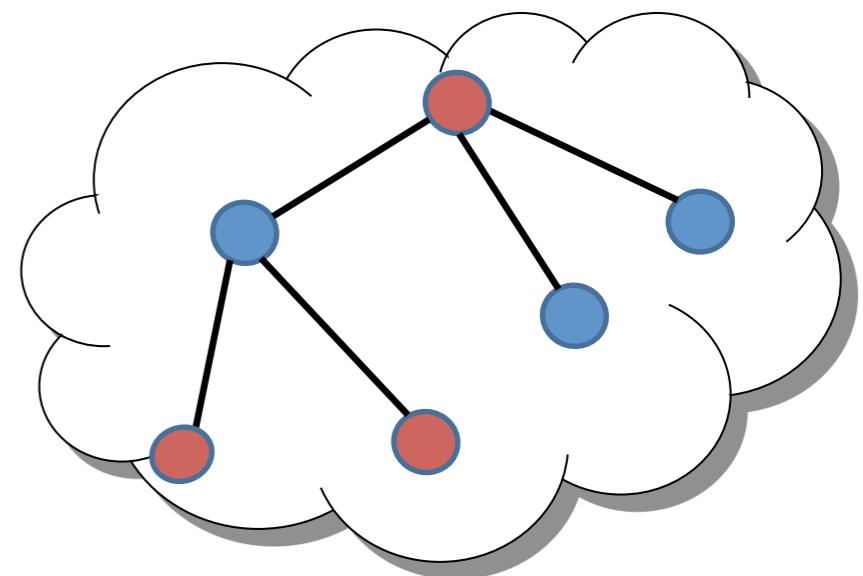
Ληξιπρόθεσμες οφειλές φυσικών προσώπων (άντληση στοιχείων 16/11/2012)

A.Φ.Μ.	Στοιχεία Οφειλής	Βασική οφειλή Δ.Ο.Υ.	Βασική οφειλή Τελωνείων	Συνειδρατόμενα	Σύνολο	Περιστρέψεις
016314081	ΚΑΔΙΜΑΤΗΣ ΝΙΚΟΛΑΙΤΗ	561.572.215,80	0,00	457.909.352,19	1.019.481.567,99	.
028584729	ΣΙΕΝΤΟΣ ΕΥΑΓΓ ΓΕΩ	191.793.657,31	0,00	151.921.075,32	343.714.732,63	.
049652209	ΚΑΡΥΖΟΠΟΥΛΟΥ ΕΛΕΝΗ ΝΙΚ	141.762.777,54	0,00	115.160.617,71	256.923.395,25	.
067690627	ΟΙΚΟΝΟΜΟΥ ΕΛΕΝΗ ΣΩΤ	160.867.598,81	0,00	75.162.327,71	236.029.926,52	.
020864597	ΓΕΩΡΓΙΤΣΟΓΙΑΝΝΑΚΟΣ ΣΤΑΥΡ ΙΩΑ	83.225.242,80	11.311,11	88.666.829,11	173.870.241,12	.
031765411	ΖΟΥΡΗΑΤΣΙΔΗΣ ΔΑΝΗ ΝΙΚ	137.014.490,69	0,00	33.591.224,91	170.605.715,60	.
045291341	ΜΕΣΩΝΟΓΓΙΤΗΣ ΔΙΟΝΥ ΚΩΝ	83.200.086,85	0,00	85.116.482,78	168.316.569,63	.
014923770	ΛΙΑΣΚΑΣ ΜΑΤΘΑ ΒΑΣ	75.122.234,83	0,00	87.063.993,28	162.186.228,11	.
043492167	ΚΟΥΡΜΠΕΤΣΟΥ ΑΝΑΣΤ ΒΑΣ	96.151.526,10	0,00	58.349.515,73	154.501.041,83	.
067749979	ΚΑΤΕΒΑΣ ΣΤΑΥΡ ΓΕΡ	92.488.621,48	0,00	61.388.104,92	153.876.726,40	.

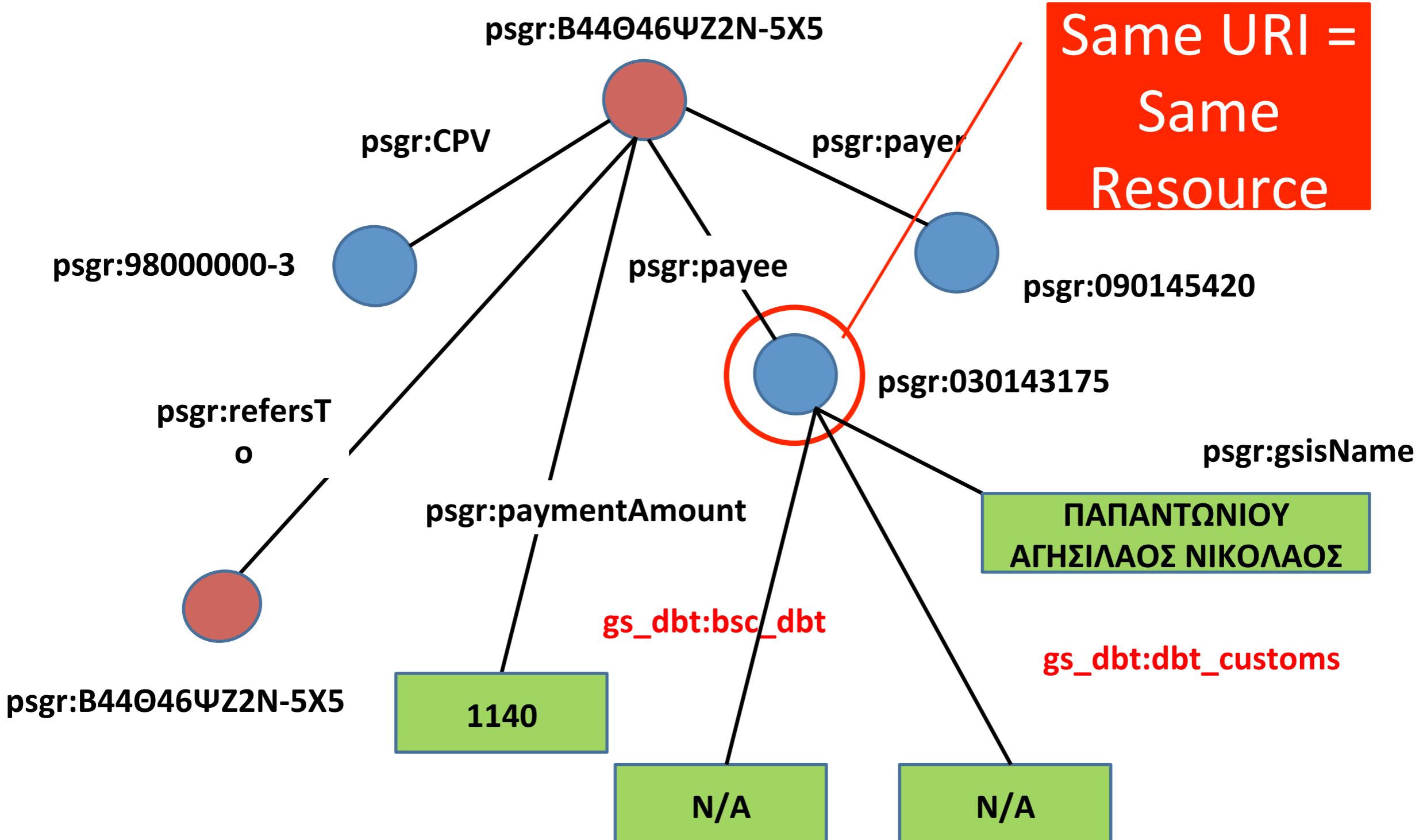
HTML



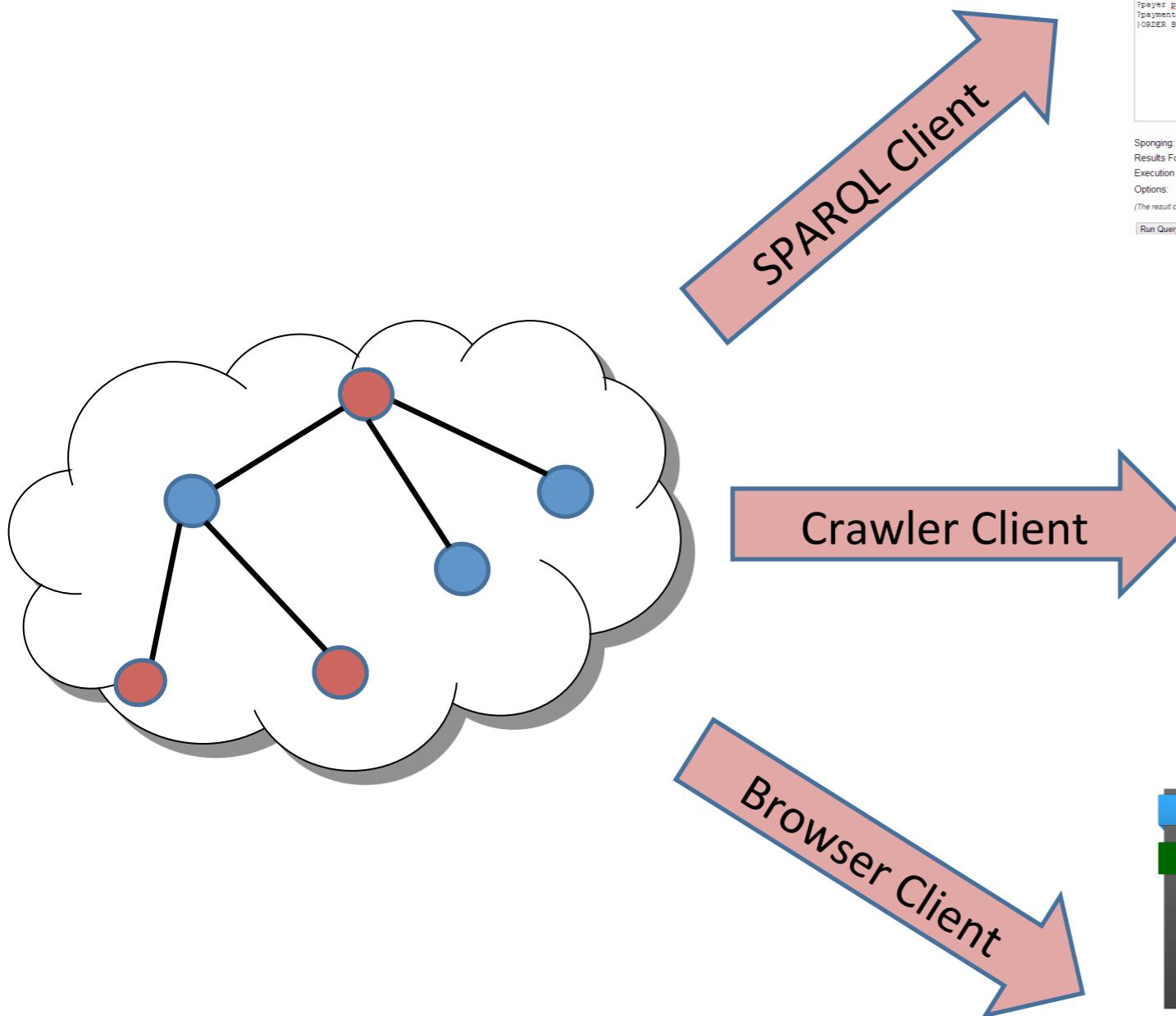
Data as Graphs



What if I existed in the debtors dataset ?



Phase 4: Data Publication & Visualization



ΠΟΥ ΠΑΝΕ ΟΙ ΦΟΡΟΙ ΜΟΥ

Virtuoso SPARQL Query Editor

Default Data Set Name (Graph IR)

Query Text

```
select ?payerName ?am ?url ?ppr where
{ ?payment psgr:payerName <http://publicspending.medialab.ntua.gr/resource/paymentAgents/030143175> .
?payment psgr:paymentAmount ?am .
?payment psgr:payer ?payer .
?decision psgr:refersTo ?payment ;
psgr:uri ?url .
?payer psgr:aliasName ?payerName .
?payment psgr:ppr ?ppr
}ORDER BY DESC(xsd:decimal(?am))
```

Sponsoring: Use only local data (including data retrieved before), but do not retrieve more

Results Format: HTML

Execution timeout: 0 milliseconds (values less than 1000 are ignored)

Options: Strict checking of void variables

(The result can only be sent back to browser, not saved on the server, see [details](#))

Run Query Reset

About: PAPANTÔNIΟU AGÍSILAOΣ NIKOLAOS

An Entity of Type : `psgrOrg:Freelancer`, within Data Space : `publicspending.medialab.ntua.gr` associated with source dataset(s)

Type: Freelancer New Facets Session with This Class

Attributes	Values
<code>type</code>	Payment Agent Freelancer
<code>label</code>	PAPANTÔNIΟU AGÍSILAOΣ NIKOLAOS
<code>psgr:afm</code>	030143175
<code>psgr:paymentAgentName</code>	ΠΑΠΑΝΤΩΝΙΟΥ ΑΓΗΣΙΛΑΟΣ ΝΙΚΟΛΑΟΣ
<code>psgr:isValidAfM</code>	true
<code>psgr:corporateCode</code>	71121202
<code>psgr:cpaGreekSubject</code>	ΥΠΗΡΕΣΙΕΣ ΕΚΠΟΝΗΣΗΣ ΣΤΑΤΙΚΩΝ ΜΕΛΕΤΩΝ ΦΕΡΟΥΣΩΝ ΚΑΤΑΣΚΕΥΩΝ ΚΤΙΡΙΩΝ
<code>psgr:stopDate</code>	Null
<code>psgr:phoneNumber</code>	2109824376
<code>psgr:idno</code>	1133
<code>psgr:postalStreetName</code>	ΑΙΟΛΟΥ
<code>psgr:firmDescription</code>	ΕΠΙΤΗΔΕΥΜΑΤΙΑΣ
<code>psgr:postalStreetNumber</code>	13
<code>psgr:afisName</code>	ΠΑΠΑΝΤΩΝΙΟΥ ΑΓΗΣΙΛΑΟΣ ΝΙΚΟΛΑΟΣ
<code>psgr:govName</code>	ΠΑΛΑΙΟΥ ΦΑΛΗΡΟΥ
<code>psgr:faxNumber</code>	Null
<code>psgr:postalZipCode</code>	17561

ΠΑΠΑΝΤΩΝΙΟΥ ΑΓΗΣΙΛΑΟΣ ΝΙΚΟΛΑΟΣ

Έχει εισπράτει από το δημόσιο: **€4,280** (4 αποφάσεις)

Κύρια Δραστηριότητα: Διδάσκων
Πόλη Τ.Κ.
Τηλέφωνο
Κατάστημα
Έναρξη
Διάρκεια
Α.Φ.Μ.
ΔΟΥ
Νομική Μορφή

Υπηρεσίες εκπόνησης στατικών μελετών
εφεύρεσης και αποδοτικών κτηρίων
ΑΙΘΟΥΣΑ 13
ΠΑΛΑΙΟ ΦΑΛΗΡΟ
17561
2109824376
✓ 1992-10-21
030143175
ΠΑΛΑΙΟ ΦΑΛΗΡΟ
ΕΠΙΤΗΔΕΥΜΑΤΙΑΣ

εισπράτει

Από ποιους έχει εισπράτει

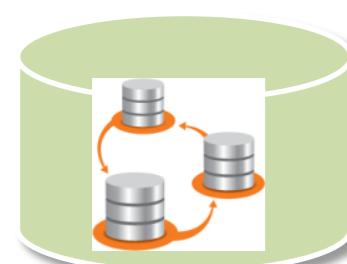
Στατιστικά



publicspending.gr

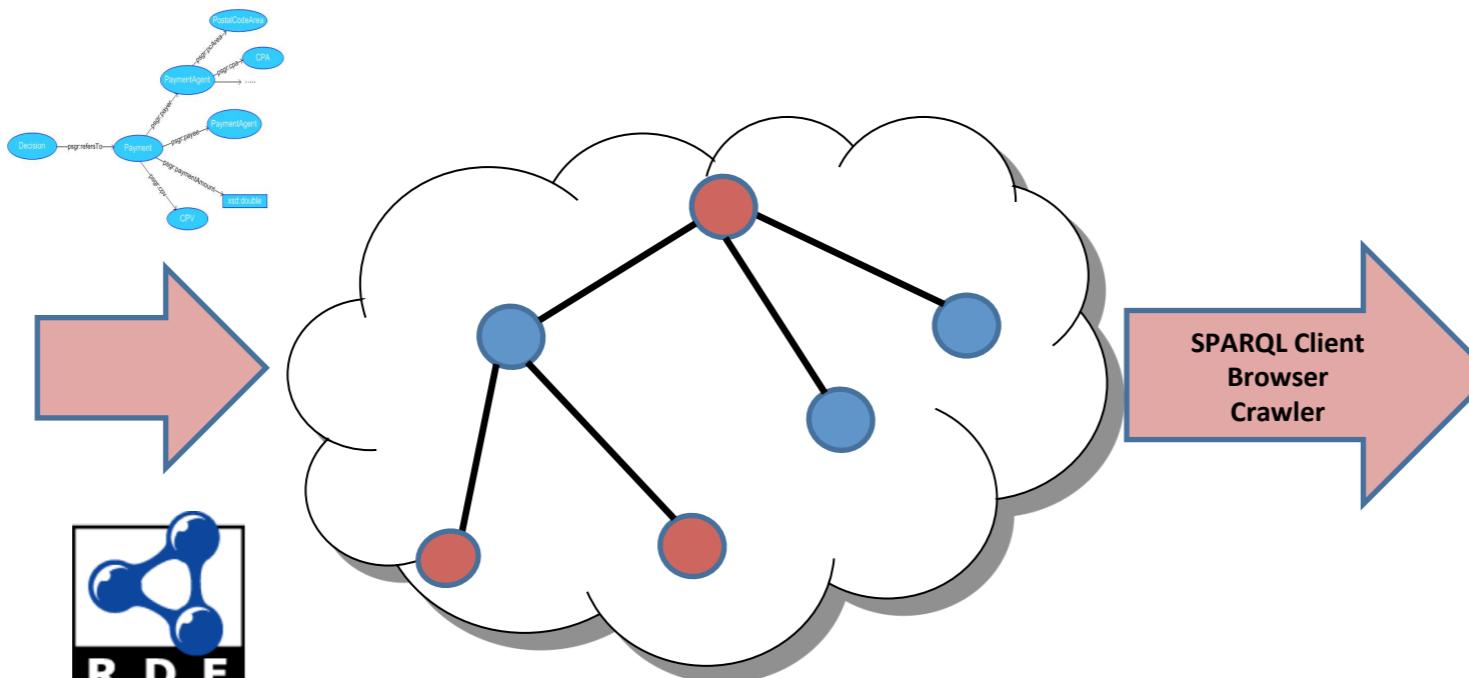
Data Silos

opened and transformed to

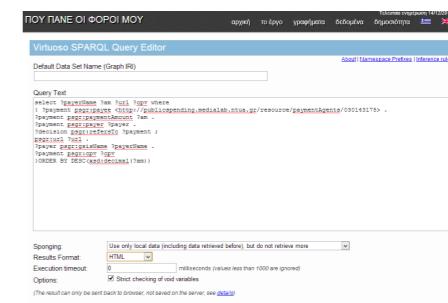


Graph DB

**published and
available to**



Consumers



Status	Ημερομηνία	Πληρωτής	Τιμού	Κατηγορία θέματος (OP)	Συγκεκριμένη στοιχεία	ΠΟΠ
	2011-03-21	ΕΛΛΗΣΣ ΛΟΓΑΡΙΑΣΜΟΣ ΕΡΓΕΙΩΝ ΤΑΧΥΔΡΟΜΟΥ ΑΘΗΝΩΝ	€1.140	Από τις κοινωνίες που διατηρούν και ασύρματη υπηρεσία	http://ellogegea.gr/gntzta/ia/KA1249/C219-3W	

About: ΠΑΠΑΝΤΩΝΙΟΥ ΑΓΙΣΛΑΟΣ ΝΙΚΟΛΑΟΣ	
An Entity of Type person , place with Data Space public / dcid:medialab-mua or associated with source data.	
Type:	Freelancer
	New Facts Session with This Class.
<hr/>	
Attributes	Values
title	Εκπαιδ. Λαζαρίδης
label	ΠΑΠΑΝΤΩΝΙΟΥ ΑΓΙΣΛΑΟΣ ΝΙΚΟΛΑΟΣ
scap:affiliation	001041375
scap:parentOrganizationName	ΕΠΑΓΓΕΛΜΑΤΙΚΗ ΑΓΓΕΛΙΑΣ ΝΙΚΟΛΑΟΣ
scap:role	νεανικός
scap:roleCode	71121202
scap:roleDetailsText	ΥΠΗΡΕΣΙΑ ΕΚΠΑΙΔΕΥΣΗΣ ΙΤΑΛΙΚΩΝ ΜΕΛΕΤΩΝ ΦΕΡΟΥΣΩΝ ΚΑΤΑΣΚΕΥΩΝ ΚΤΠΙΩΝ
scap:status	Νυν
scap:statusNumber	2109824376
scap:sex	1133
scap:sexDetailsText	ΑΙΓΑΙΟΝ
scap:sexDescription	ΒΙΤΤΗΝΗΣ ΧΑΝΙΑΣ
scap:streetNumber	13
scap:cityName	ΠΑΠΑΝΤΩΝΙΟΥ ΑΓΙΣΛΑΟΣ ΝΙΚΟΛΑΟΣ
scap:countryName	ΠΑΠΑΙΟΝ ΦΑΝΗΡΟΥ
scap:faxNumber	Νυν

Why we did it?

- Technologically inaccessible and difficult-to-handle data warehouse of highly sensitive information, into an easy to use web application, accessible by the citizen/researcher
- Provide consultant services to the “ΔΙΑΥΓΕΙΑ” program support team (technical reports, error handling, data cleansing etc.)
- **Exploit** (data journalism, hackathons) Greek Open Data Expenditure and **Link** it with Open Data of other countries

More information

- [Publicspending.gr](http://publicspending.gr) and publicspending.net not updated anymore (.net still accessible...)
- Transparency seems still to be a “hot topic”
- Publications (significant)
 - Vafopoulos M., Meimaris M., Anagnostopoulos I., [Papantoniou A.](#), Xidias I., Alexiou G., Vafeiadis G., Klonaras M. and Loumos V., “Public spending as LOD: the case of Greece”, accepted for publication, Semantic Web Journal, IOS Press, 2013.
 - Vafopoulos M., Meimaris M., [Papantoniou A.](#), Anagnostopoulos I., Xidias I., Alexiou G., Vafeiadis G., and Loumos V., “Intelligent and Semantic Real-Time Process of the Greek LOD for Enhancing Citizen Awareness in Public Expenditures”, X.S. Wang et al. (Eds.): WISE 2012, LNCS 7651, pp. 808–811, 2012, © Springer-Verlag Berlin Heidelberg 2012
 - M. Vafopoulos, M. Meimaris, [A. Papantoniou](#), I. Anagnostopoulos, G. Alexiou, I. Avraam, I. Xidias, G. Vafeiadis and V. Loumos, “publicspending.gr: An initiative for Greek Public Expenditure following Linked Open Data directives”, PMOD 2012 Workshop – Using Open Data: policy modeling, citizen empowerment, data journalism – 19-20 June 2012, European Commission Headquarters, Brussels
 - M. Vafopoulos, M. Meimaris, [A. Papantoniou](#), I. Anagnostopoulos, G. Alexiou, I. Avraam, I. Xidias, G. Vafeiadis and V. Loumos, “publicspending.gr: Greek Public Spending in a nutshell”, to be presented in the Samos Summit on Open Data and Interoperability for Governance, Industry and Society, 2 - 4 July 2012, Samos, Greece

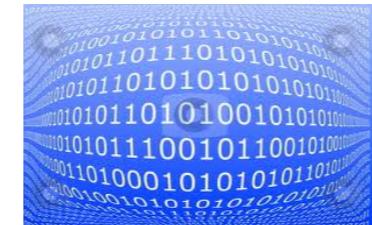
Linked



Open

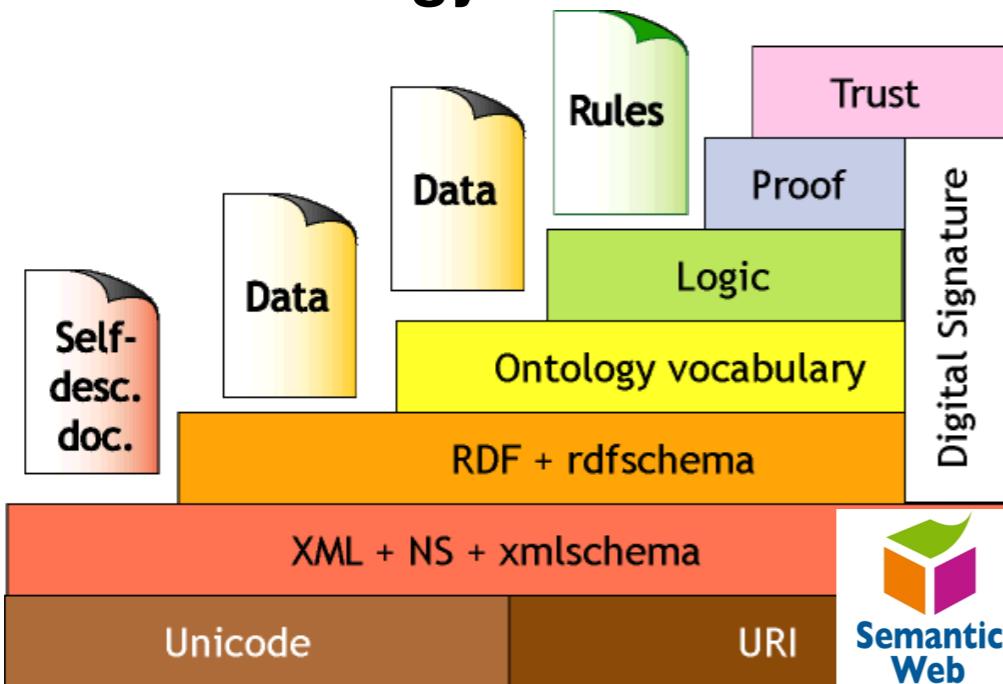


Data



What do these 2 projects have in common?

Technology



Need for Data Quality



Why do we need Quality in (Linked) Open Data?

- Data Quality is needed in every project
- But in the open (and linked) data world the need is multiplied
- Open Data quite a few times comes from crowd-sourced activities
 - Poor quality
 - If we want Open Data to succeed then assessment needs to take place
 - One of the failures of publicspending.gr
- Linked Data is linked (also to) external datasets
 - Quality does not rely only on 1 provider
 - The major case for ESCO

Quality in Linked Open Data

- In the Web of Data there are novel approaches
 - Coherence via links to external datasets
 - Data representation quality or consistency wrt to implicit information
 - Open world assumption (LOD) vs Closed World Assumption (DB)
 - *Source: Quality Assessment Methodologies for LOD: A. Zaveri et al., Semantic Web Journal, IOS Press, 2012*
- Zaveri's framework for assessing Quality in LOD
 - The most complete at the moment

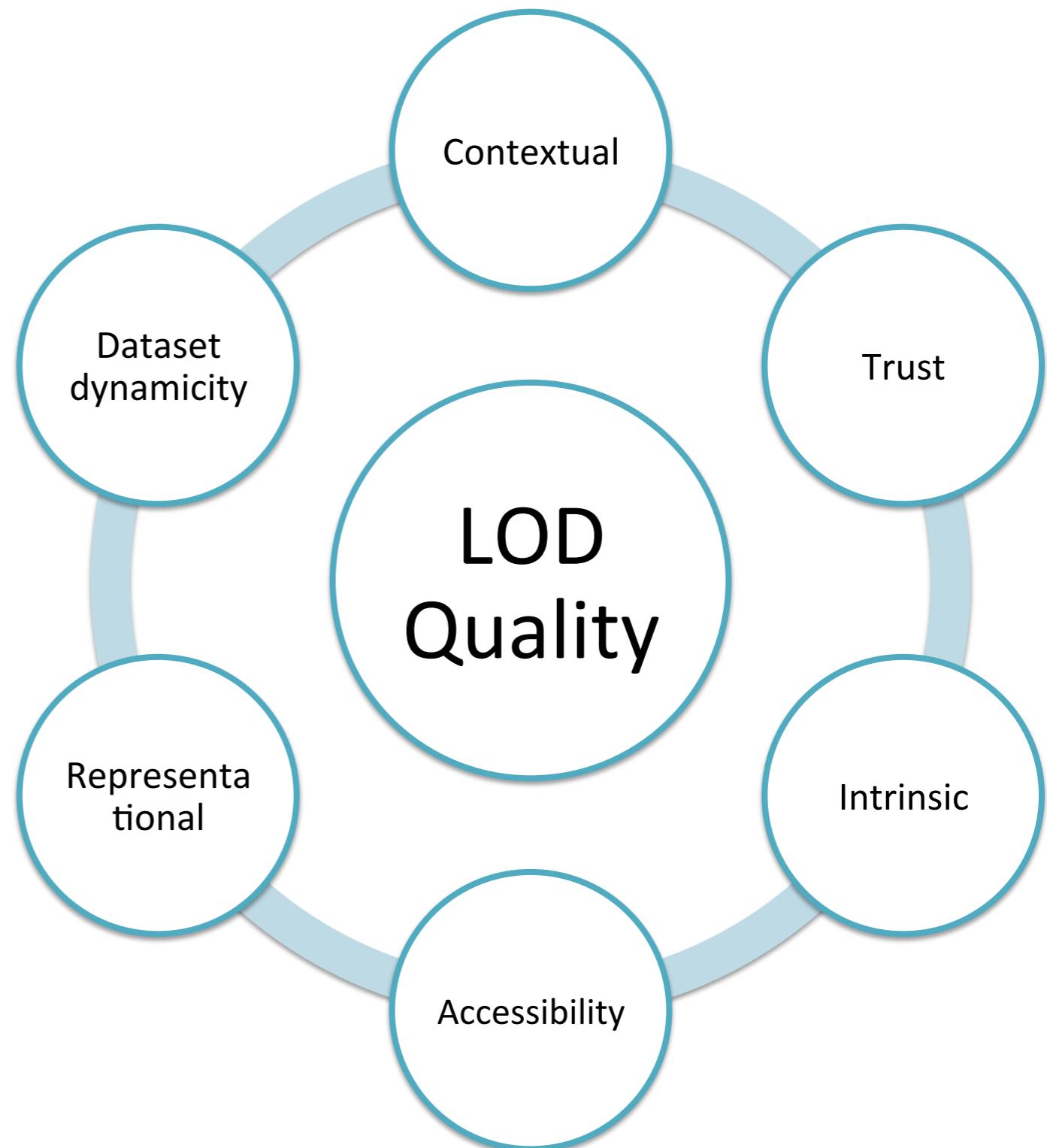
Quality dimensions in LOD

A.Zaveri et al. define 6 major dimensions (criteria)

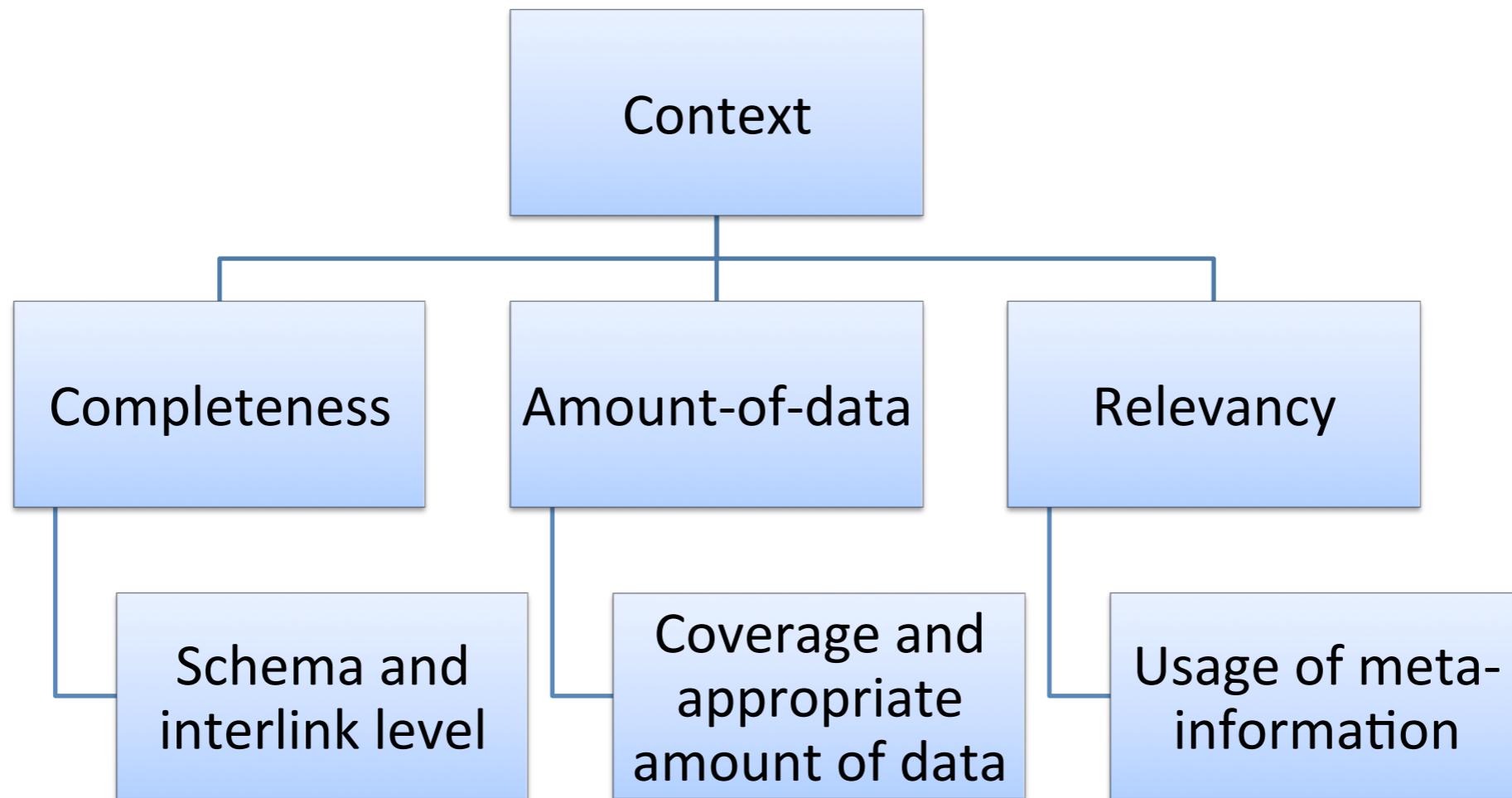
Source: *Amrapali Zaveri, Anisa Rula, Andrea Maurino, Ricardo Pietrobon, Jens Lehmann and Sören Auer: Quality Assessment Methodologies for Linked Open Data, A Systematic Literature Review and Conceptual Framework, Semantic Web Journal, IOS Press, 2012*

In ESCO we have started to apply the dimensions

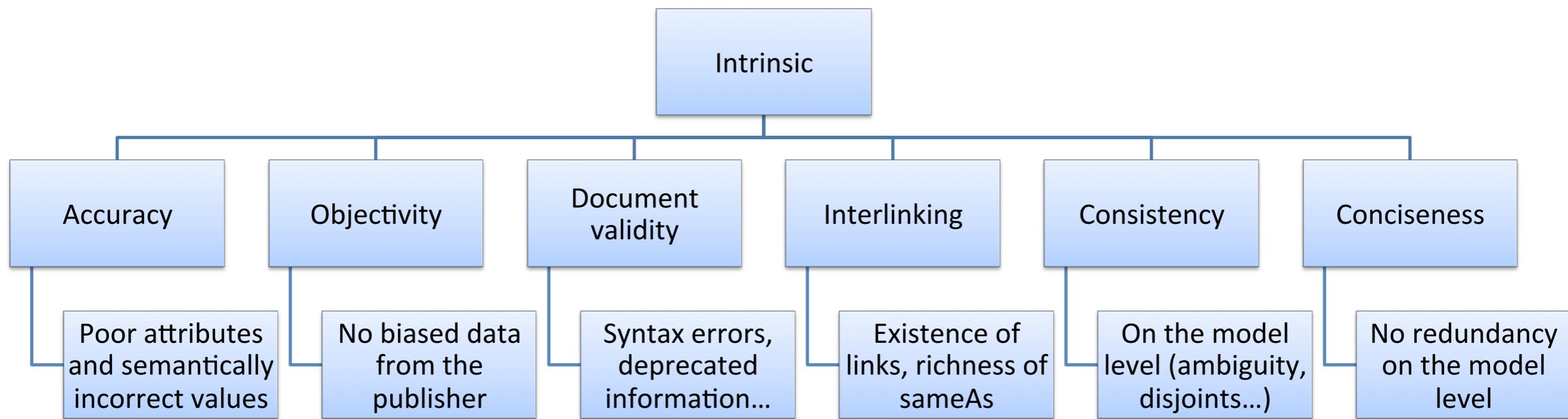
Focus (at this moment) on contextual, representational, accessibility and intrinsic



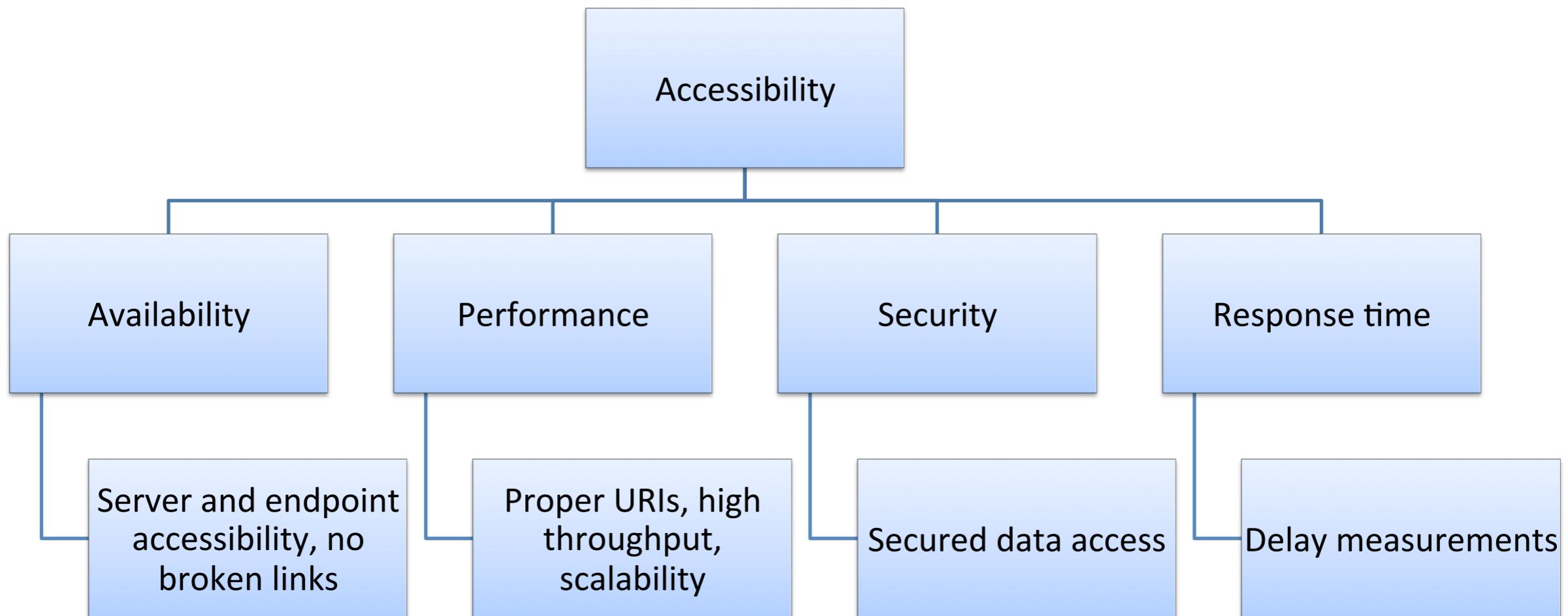
Contextual dimensions



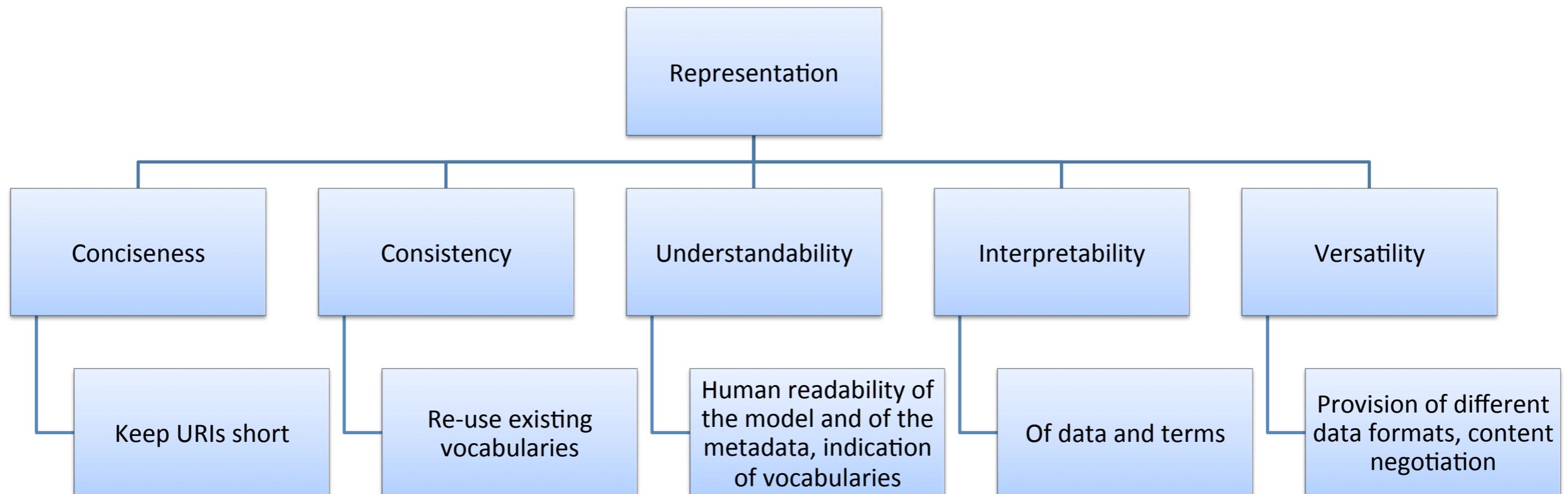
Intrinsic dimensions



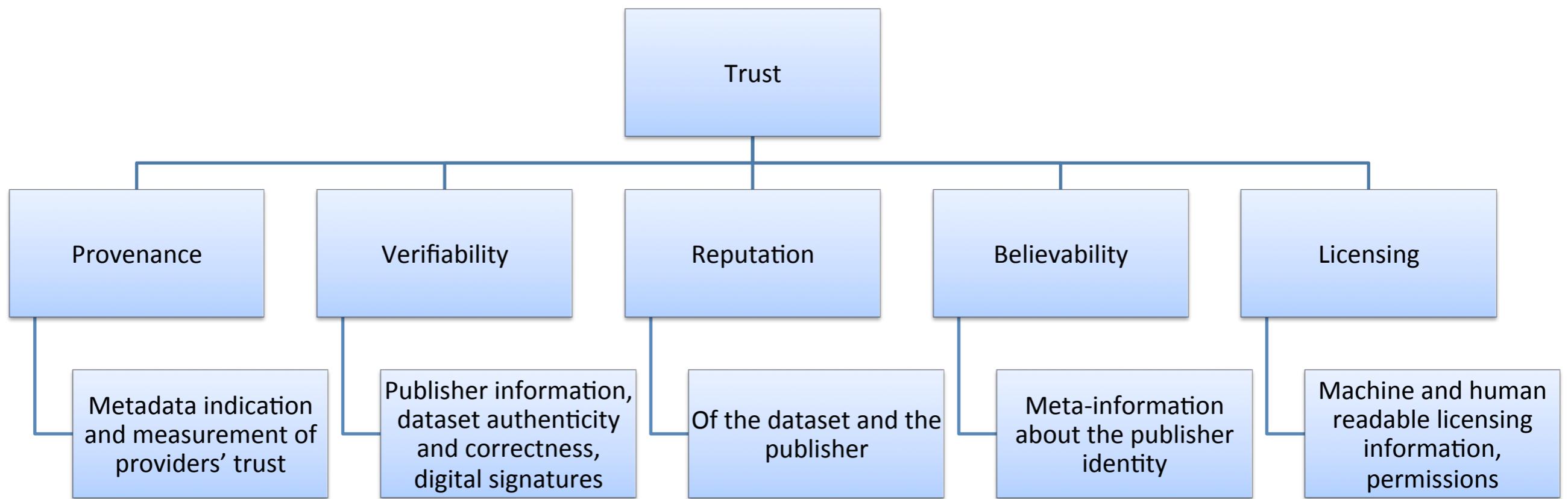
Accessibility dimensions



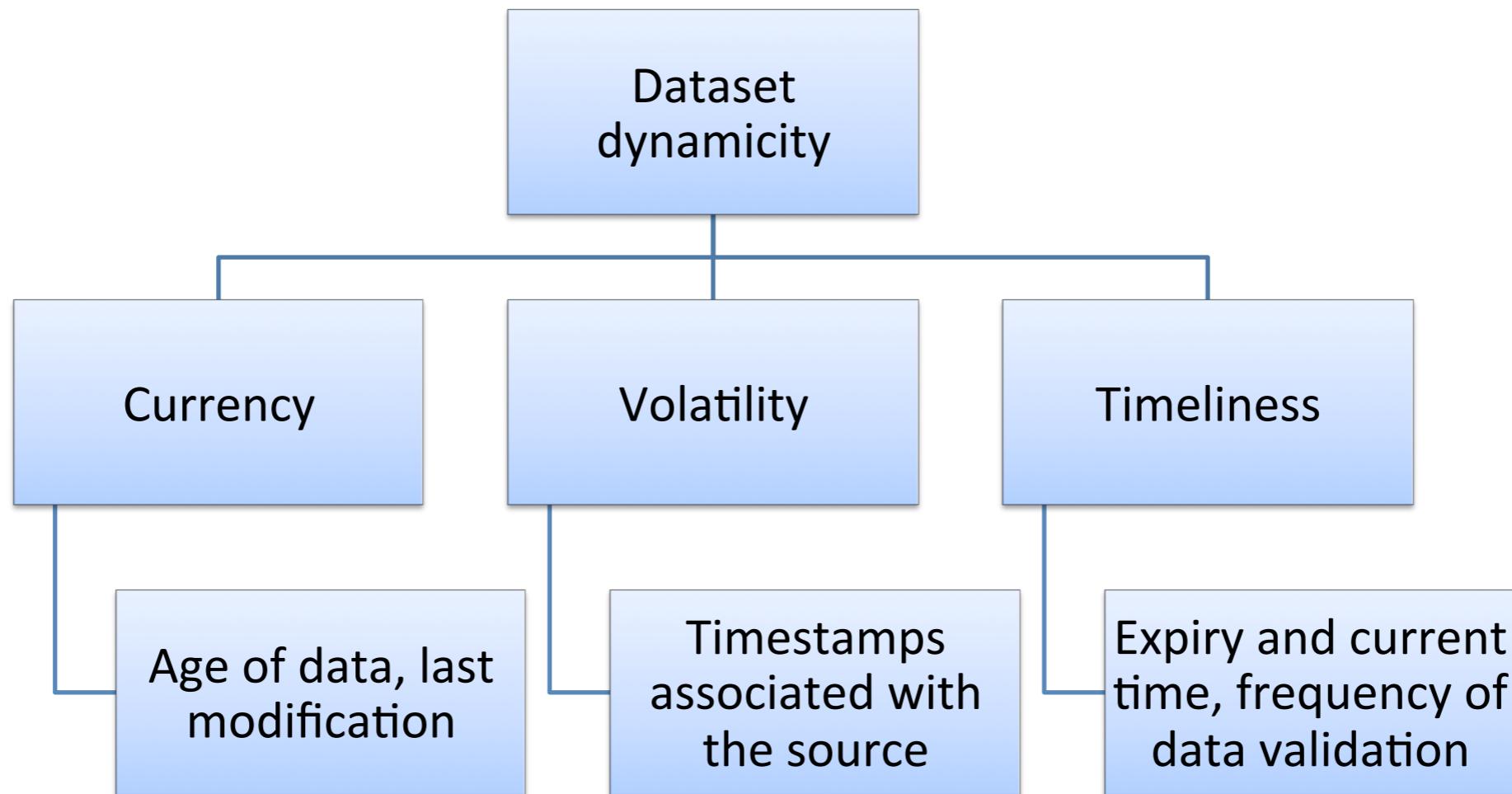
Representational dimensions



Trust dimensions



Dataset dynamicity



Further reading

- For more information
 - **Amrapali Zaveri, Anisa Rula, Andrea Maurino, Ricardo Pietrobon, Jens Lehmann and Sören Auer:** *Quality Assessment Methodologies for Linked Open Data, A Systematic Literature Review and Conceptual Framework*, Semantic Web Journal, IOS Press, 2012
 - **Bizer, C., and Cyganiak, R.:** *Quality-driven information filtering using the wiqa policy framework*. Web Semantics 7, 1, (Jan 2009), 1 – 10
 - **Bonatti, P. A., Hogan, A., Polleres, A., and Sauro, L.:** *Robust and scalable linked data reasoning incorporating provenance and trust annotations*. Journal of Web Semantics 9, 2 (2011), 165 – 201
 - **Flemming, A.:** *Quality characteristics of linked data publishing datasources*. Master's thesis, Humboldt-Universität zu Berlin, 2010

Conclusions

- Open Data
 - Transparency and citizen engagement
 - Benefits of opening up data
- Technology is mature (even though we didn't discuss about it)
 - Happy to give another lecture when/if possible
- Linked Open Data are here to stay!
 - Many EC projects
 - Organizations are embracing Semantic Technology
- Quality assessment of LOD
 - Very interesting new topic
 - Key factor for LOD adoption

Thank You!

For your patience and attention



Agis Papantoniou

TenForce

agis.papantoniou@tenforce.com

+32 479 76 09 62

@agis_papant



be.linkedin.com/pub/agis-papantoniou/4/209/758/