

Advances in Technology and CRIS

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Agenda

- Introduction
- Indicative overview of a selection of technologies in CRIS systems
- Impact of technology evolution on CRIS

Technologies

- Semantic web technologies/ Linked Data
- Cloud computing / Software as a Service
- Tools to present content
- Mobile devices – context awareness
- Software engineering / application frameworks
– interfaces with databases
- Data processing technologies

Semantic web technologies

- Vision: machine processable content and links, “intelligent agents”
- RDF / OWL
- Identifying resources with URIs and linking between them
- Inference capabilities
 - Not widely used
- Extremely high degree of expresiveness
 - But cannot easily express everything, e.g. temporal information in relationships

Semantic web in practice

- Significant advances have been achieved
- Many challenges still to tackle
- Performance / scalability issues
- A range of tools is available
 - Tools to generate / process / edit RDF, OWL
 - Triplestores, unified servers
- Considerably lower degree of tools and platforms maturity compared with their counterparts for relational database back-ends

Linked Open Data

- A method of publishing structured data in a way that facilitates linking / interconnection of information.
- Identify entities / resources with URIs that can be dereferenced and resolve to useful information in RDF.
- In the description of resources include links to other resources.
- Identifying resources with URIs and linking between them.
- Very useful to support information interconnection, navigation and other services.
- Specialised euroCRIS Task Group formed in 2011 to standardise how LOD can be produced from CERIF databases.
- Relevant projects: VOA3R, ENGAGE

Cloud Computing

- Computing as a utility
- Infrastructure as a Service (IaaS)
 - Provision of virtual machines, storage, network
- Platform as a Service (PaaS)
 - Provision of a computing platform and a full stack to develop and run applications.
- Software as a Service
 - Turn-key operation of application software in the cloud, minimal or no need for IT expertise by the client

Software as a Service and CRIS

- Minimal or no need for IT expertise by organisations to run the system, very good fit for small-to-medium size institutions (and not only)
- Multi-tenant architecture
 - A single instance serves many clients
 - Substantial gains in efficiency, utilisation
 - Facilitates updates / upgrades
- Considerable effort to develop applications that support multi-tenancy
 - Associate records in the database with tenant identifiers
 - High degree of parameterisation capabilities required by application to allow transparent customisation on a per tenant basis.
 - Need to address security, access control, monitoring/billing
- Need to interoperate with systems that might run locally at the institution.
- Can be used as a model for running institutional CRIS in a single infrastructure at the regional or national level.

Tools and technologies to present content

- Visualisation
- Online readers / browsers for digital material
- Specialised tools for datasets

Visualisation

- Many open source tools and free online systems available
- Based on standard, open, widely supported technologies (e.g. non-Flash)
- Dynamic generation of practically all types of common graphs
- More sophisticated visualisations (e.g. network diagrams, tree maps, timelines)
- Maps / geospatial information visualisation
- High degree of interactivity

Development of the number of Greek scientific publications, 1996-2010

Jon M. Kleinberg

Change in the number of citations for Greece, EU and OECD, 1996-2010

Source: Thomson Reuters, Incites 1996-2010

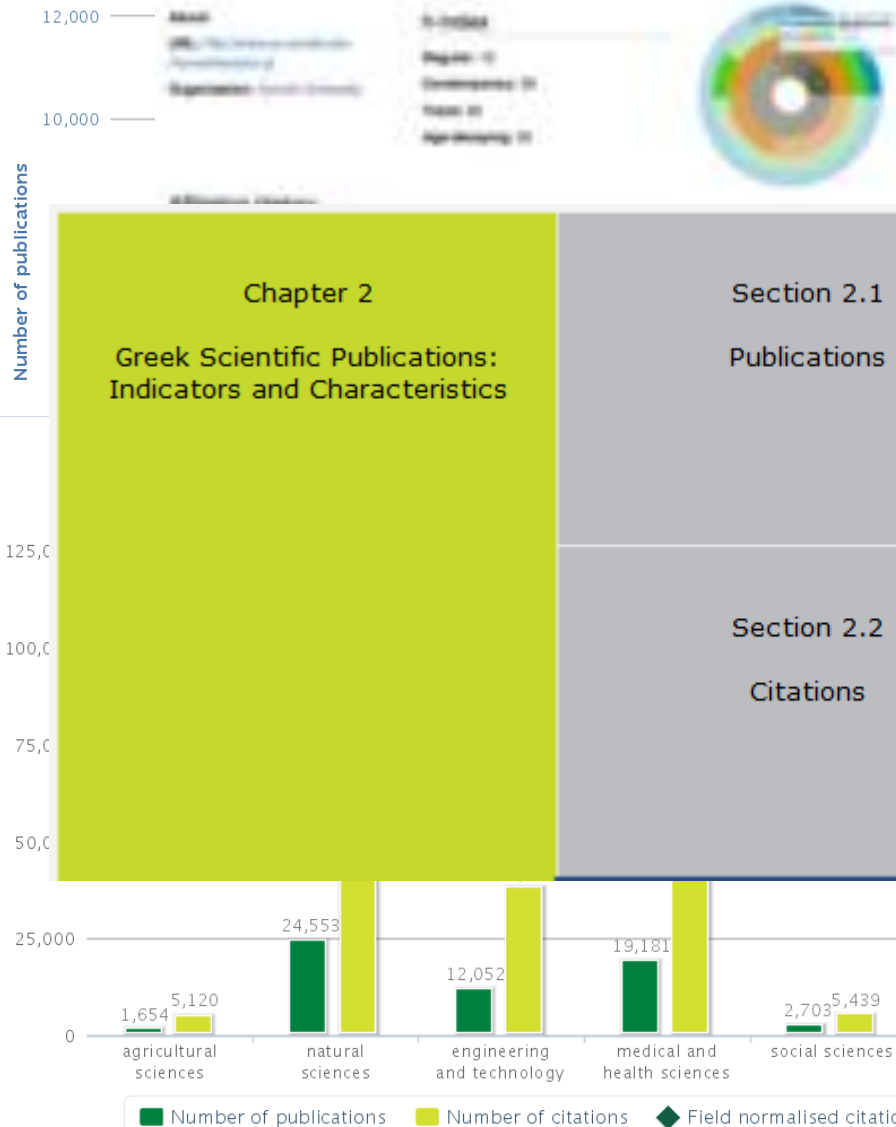
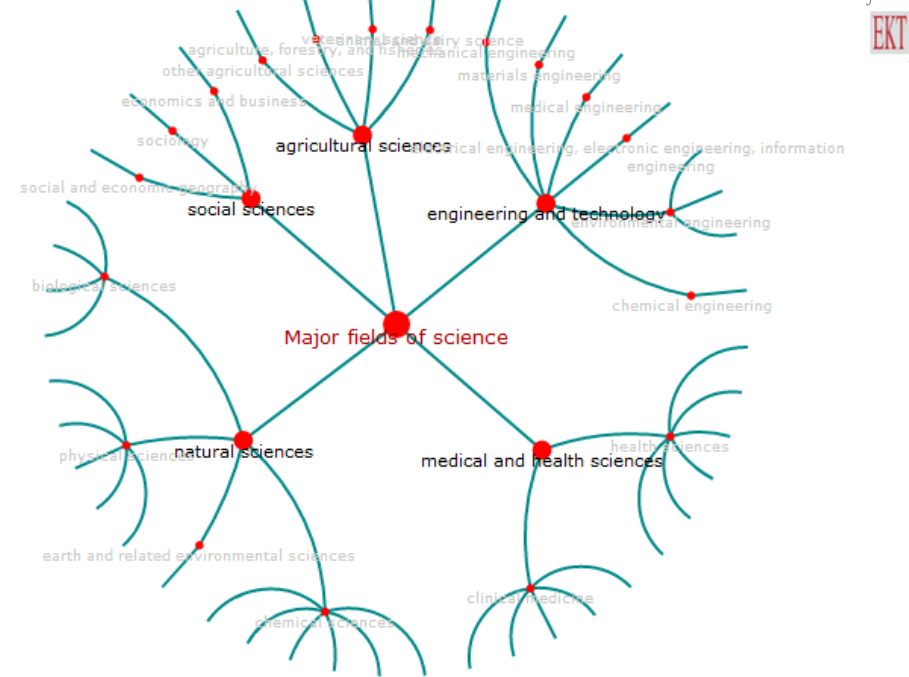
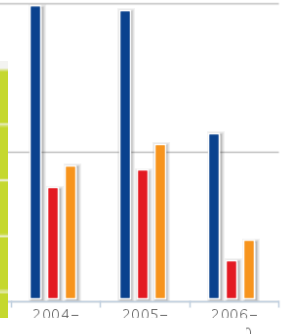


Figure 2.1.1
Figure 2.1.2
Figure 2.1.3
Figure 2.1.4
Figure 2.1.5



Online readers / browsers for digital material

- Significant capabilities not available with off-line reading / browsing:
 - Bookmarking and sharing at the page level
 - Annotations at the page level – available anywhere
 - Detailed access statistics – navigation / bookmarking information
 - Better promotion of the overall system - back links to CRIS
 - Progressive, incremental streaming of content – very useful for files of large sizes.
- Many tools available based on standard, open, widely supported technologies (e.g. non-Flash)
- Many specialised tools for domain-specific material and datasets

Καρτία.

4. CERNANICO — ET DRVSO των κάτω άκρων των γραμμάτων προς τὰ ἔξω ἐστραμμένων. Κεραλή γυναικὲς πυργόρους πρ. δ.
 *Οπ. CAESARIBVS — IIIIVIR Q[ART] των κάτω άκρων των γραμμάτων προς τὰ ἔξω ἐστραμμένων. Πηδάλιον ἐρθὼν ἐστραμμένον πρ. δ. Νόμισμα κατωμαίνον. $\mathbb{X}$. 4. — Γραμμ. 3,55
5. CARTEIA κυλιστέρως ἐμπροσθεν ἑμοίας κεραλῆς πρ. δ.
 *Οπ. $\frac{1}{2}$ ἐμπροσθεν Ποσειδῶνος ἐστραμμένον πρ. δ., ἐρριζόντιος τὸν δ. αὐτοῦ πόδα ἐπὶ βράχου, κρατούντος τῇ μὲν δ. ἀλφίνα πρ. δ., τῇ δ' α. πρίανον. Νόμισμα κατωμαίνον. $\mathbb{X}$. 5 $\frac{1}{2}$ — Γραμμ. 6,12
6. Ως ἐν τῷ προηγουμένῳ νομίσματι.
 *Οπ. Ἐπιγραφή ἐρθεραμένη. 'Αλφειὸς καθήμενος ἐπὶ βράχου πρ. δ., ἀλειών διὰ τῆς ἑμῆς μικρὸν ἔχθρὸν πρὸ τῶν ποδῶν διὰ τοῦ ἀλφειῶς τὸ κέντρον τὸ περιέχον τὸ δάλαρ. Νόμισμα μετ' ἡμετέρων τύπων. $\mathbb{X}$. 5. — Γραμμ. 4,66

Κορδύβη ἢ καὶ Πατρία.

Αὔγουστος

7. PERM CAES — AVG των κάτω άκρων των γραμμάτων προς τὰ ἔξω ἐστραμμένων. Κεραλή τοῦ αὐτοκράτορος ἀστέρης πρ. δ.
 *Οπ. COLONIA PATRICIA ἐντὶς σιγάρου δρύας. Νόμισμα κατωμαίνον. $\mathbb{X}$. 7. — Γραμμ. 9,825

Γαδίρα.

8. Κεραλή Ἡρακλίου ἀγνέως μετὰ λεοντῆς πρ. δ. ὅπως ἐν βίβλῳ πλάγιον.
 *Οπ. Ἐπιγραφή Φοινικικὴ ἡμίθετος (ἔρα πίν. Β'. ἀρ. 1). Δύο θύνην παράλληλοι πρ. δ., μεταξύ αὐτῶν σφαιρίδιον καὶ ἡμιθέτων Φοινικικῶν στοιχείων ἄλλω (ἔρα αὐτῆς ἀρ. 2) ἐν δὲ τῷ πάλῳ, ἐμπροσθεν τῶν θύνην, μηνίσκος ἐστραμμένος πρ. δ. ἐν ὧ σφαιρίδιον. $\mathbb{X}$. 7. — Γραμμ. 12,05
9. Ως ἐν τῷ προηγουμένῳ νομίσματι.
 *Οπ. Ἐπιγραφή ἑμοία τῇ ἐν τῷ προηγουμένῳ νομίσματι. Θύνης πρ. δ. Νόμισμα κατωμαίνον. $\mathbb{X}$. 4 $\frac{1}{2}$ — Γραμμ. 2,72
10. Ὁμοία κεραλή πρ. δ.
 *Οπ. Δύο θύνην παράλληλοι πρ. δ., μεταξύ αὐτῶν τὸ Φοινικικὸν στοιχεῖον ἄλλω (ἔρα αὐτῆς ἀρ. 2) ἐν δὲ τῷ πάλῳ, ἐμπροσθεν τῶν θύνην, μηνίσκος.

Ταπα ἢ Τάπια.

11. Στάχυς.
 *Οπ. Τηθὺς πρ. δ. ἀνωθεν αὐτοῦ μηνίσκος κάτωθεν δὲ τρία σφαιρίδια ἐρριζόντιος διατεταμένα. Νόμισμα καλῶς κατωμαίνον. $\mathbb{X}$. 4. — Γραμμ. 3,865

Ταδία ἢ Ἰταλική.

Τιτέριος

12. IMP TI CAESAR AVGVSTVS PONT MAX των κάτω άκρων των γραμμάτων προς τὰ ἔξω ἐστραμμένων. Κεραλή τοῦ αὐτοκράτορος ἀστέρης πρ. δ.
 *Οπ. PERM DIVI AVG MV[NIC] ITALIC των κάτω άκρων των γραμμάτων προς τὰ ἔξω ἐστραμμένων. Βομὸς φέρον τὴν τριστείον ἐπιγραφήν PROVIDE — NTIAE — AVGVSTI Νόμισμα κατωμαίνον. $\mathbb{X}$. 8. — Γραμμ. 13,79

Μάλακα.

13. Ἐπιγραφή Φοινικικὴ ἡμίθετος (ἔρα πίν. Β'. ἀρ. 3) ἐκατέρωθεν κεραλῆς Ἡρακλίου μετὰ πύλου κωνοειδὸς πρ. δ. ὅπως ἐν αὐτῇς παλάτραι.
 *Οπ. Κεραλή Ἰδίου κατὰ μέτωπον ἔχουσα ἀκτίνας. Νόμισμα μετ' ἡμετέρων τύπων. $\mathbb{X}$. 6. — Γραμμ. 10,47

Ὁβούλων ἢ Ὁβουλίων, Ὁρίππον καὶ Ἀττούζι.

14. OBVLCO κυλιστέρως ἐμπροσθεν κεραλῆς γυναικὲς μετὰ διπλοῦ περιδεραιοῦ πρ. δ.
 *Οπ. Ἐπιγραφή γραμματικὴ Τουρδτανικὴ ἡμιθέτος (ἔρα αὐτῆς ἀρ. 4) ἀνωθεν αὐτῆς ἀστέρην πρ. δ., κάτωθεν δὲ στάχυς ἐρριζόντιος πρ. δ. Νόμισμα κατωμαίνον. $\mathbb{X}$. 8 $\frac{1}{2}$ — Γραμμ. 19,95

Ὁσστ.

15. OSSET των κάτω άκρων των γραμμάτων προς τὰ ἔξω ἐστραμμένων ἐμπροσθεν ἀστέρης κεραλῆς ἀνδρὸς πρ. δ.
 *Οπ. Ἀνὴρ γυνὴς ἐστάντος κατὰ μέτωπον σιγάρου τὴν κεραλήν πρ. δ., κρατῶν μὲν τῇ δ. ἐκτεταμένην βέτρου ὑπερμεγέθη κριμαίνον, ἐρριζόντιον δὲ τὴν α. ἐπὶ τοῦ μετροῦ. $\mathbb{X}$. 6 $\frac{1}{2}$ — Γραμμ. 6,93

Ρωμύλα ἢ πρότερον Ἰσπαλία.

Αὔγουστος καὶ Λιβία.

16. COL — ROM — PERM — DIVI — AVG των κάτω άκρων των γραμμάτων προς τὰ ἔξω ἐστραμμένων. Κεραλή τοῦ αὐτοκράτορος μετὰ σιγάρου ἔξ ἀκτίνων πρ. δ.

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Mobile devices / context-awareness



Mobile devices / context-awareness

- Does it make sense for CRIS?
- The answer is definitely Yes!
- Anywhere access to research information
- Particularly useful when combined with visualisation / online reading-browsing capabilities
- Personalisation and context awareness can be really important
- Considerable cost for application developers
 - Portability to different device characteristics (e.g. size, screen resolution, execution environment)
 - Native application execution environments may (still) offer better experience, but the implementation cost is high
 - Making applications context-aware might be quite complex

Application frameworks - interfaces to databases

- Application frameworks and interfaces to databases
- Object-to-relational mapping tools
- Automatic generation of source code to interface with the database
- Dynamic generation / execution of code on-the-fly
- Ready components for common tasks (e.g. user management, authentication, web services, etc.)
- Easy to build simple applications from the database specification
- In practice, significant additional effort is required to achieve high performance, scalability, appropriate user interfaces, customisability
- Dependency on a stack of complex tools that can be buggy

Data processing

- Automating tasks for data quality and interoperability
 - Automatic data cleaning, entity identification, schema mapping
 - Many techniques (e.g. machine learning, statistical)
 - Great advances in research in the last decade, further automation is very challenging
- Automatic metadata extraction / citation parsing
 - Machine learning techniques (e.g. based on Conditional Random Fields)
 - Open source tools available
 - ParsCit, FreeCite, etc.

Thank you for your attention!