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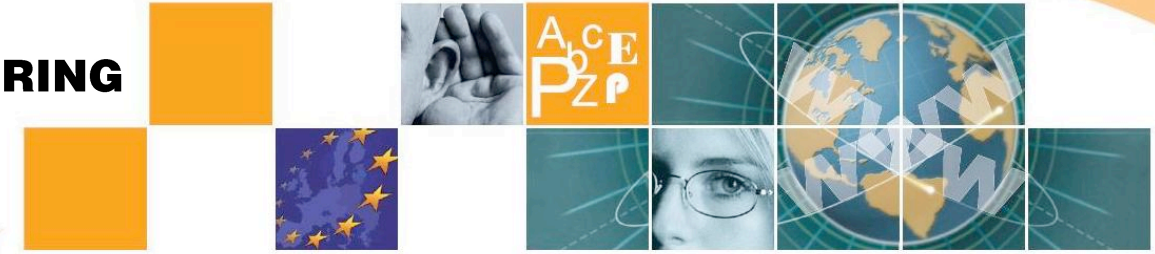

Search as architectural component:

Searching for a new paradigm

Ghent, 17 December 2010

Francesco S Nucci – Engineering R&D Lab

Director European Projects

Reference context: DAM search

"**Search**" is not limited to everyday experience of *searching* the web but it is a must feature of business intelligence applications for the enterprise and archive

- According to analysis 50% of applications will include a search facility as a primary interface for end users.
- Content is increasingly going to be Multimedia: combination of text, audio, still images, animation, video, and interactivity content into a single form.
- The size of digital archives has grown enormously in many application domains(e.g. enterprise, news agencies, TV broadcasters, advertising agencies,..)

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PHAROS: a SOA Multimedia search platform

- Built around a collection of reusable components with well-defined interfaces.
- Offering a tool kit to build search-driven applications and services
  - easy to build, customizable, adaptable to your specific needs;
  - extensible with plug-in (e.g. third-party) capabilities;
  - flexible and open to evolve and to be extended as application requirements change over time;
  - replicable to new application scenarios without having to rebuild a solution from scratch
- It is unique!

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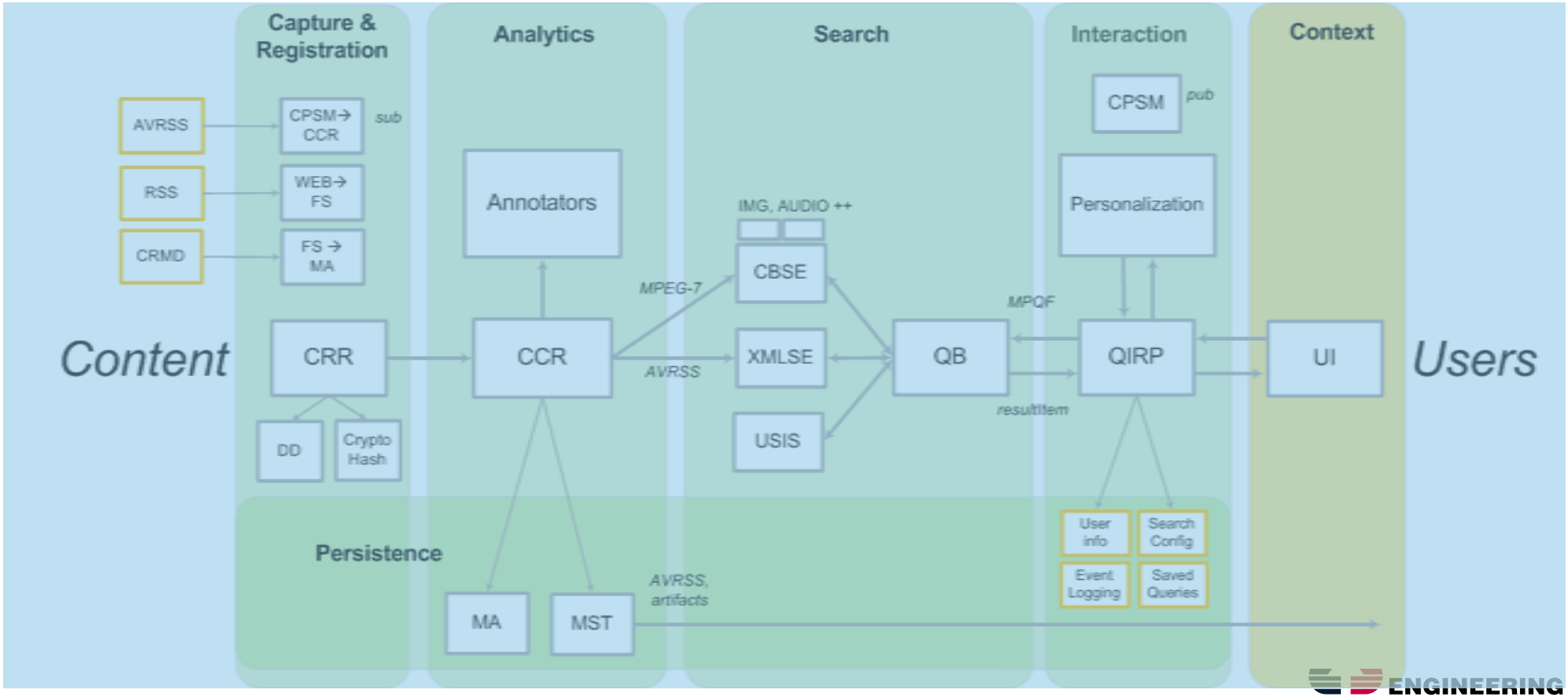
PHAROS: a SOA Multimedia search platform (simplified)

42 components / 110 web services implemented, tested, integrated, deployed



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Using PHAROS as a LEGO architecture

- A System Integrator can select from PHAROS the search related functionality needed for a business intelligence applications
- This concept is intrinsic in PHAROS service architecture with web service and defined API interfaces . Adding a functionality that it is not yet present is easy (for example new annotators can be easily developed for specific needs)
- We did this exercise successfully by embedding a Face recognition service from 3rd party. The 3rd party actually did in a couple of weeks with the support of our PHAROS technical team

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PHAROS, what' s else

- New projects, new research challenges
  - I-Search
  - Chorus plus
  - Assets
- Search in Future Internet Initiative –
  - http://www.future-internet.eu/
  - http://ec.europa.eu/information_society/activities/foi/index_en.htm

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Research challenges

- **Challenge 1: Lack of a unified framework for multimodal content search and retrieval**
  - Currently, information is perceived, stored and processed in various forms leading to vast amounts of heterogeneous multimodal data.
  - I-search will develop novel methods for supporting multimodal queries and also integrate multimodal, descriptive, static and dynamic descriptor information of all forms of content.
- **Challenge 2: Lack of Dynamic and Scalable Indexing techniques for searching over the network**
  - Firstly, search and indexing of multimedia data should be performed in a dynamic and scalable way. Today content is dynamically created, deleted, changed and retransformed in distributed and pervasive environments. Therefore, content indexing methods should be dynamic and autonomous in the sense that they can change their structures as content is evolved.

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Research challenges

- **Challenge 3: Lack of user-centric and context-aware S&R framework**
  - Thirdly, we need to pay a great research attention on increasing the content utilization efficiency, measured as the fraction of the relevant delivered content (i.e., content which satisfies their information needs and preferences) over the total amount of delivered content.
  - This goal can be achieved by the development of interoperable interfaces able to describe multimedia content under a context aware and user-centric framework.
- **Challenge 4: Lack of efficient tools for searching Intelligent Content**
  - Further intelligence can be added by providing real objects (and their reproduction in virtual worlds) with an own intelligence, connected with identification codes (IDs, for instance obtained from barcodes or RFIDs), annotation (tags or meta-tags associated with the description of the object and describing it), learning (from past history/use of the object itself or similarity with other objects).

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Research challenges: a paradigm shift

- ***A paradigm shift in search based applications*** *is needed*
- *Better in line with open innovation approach*
- *And business ecosystem creation*

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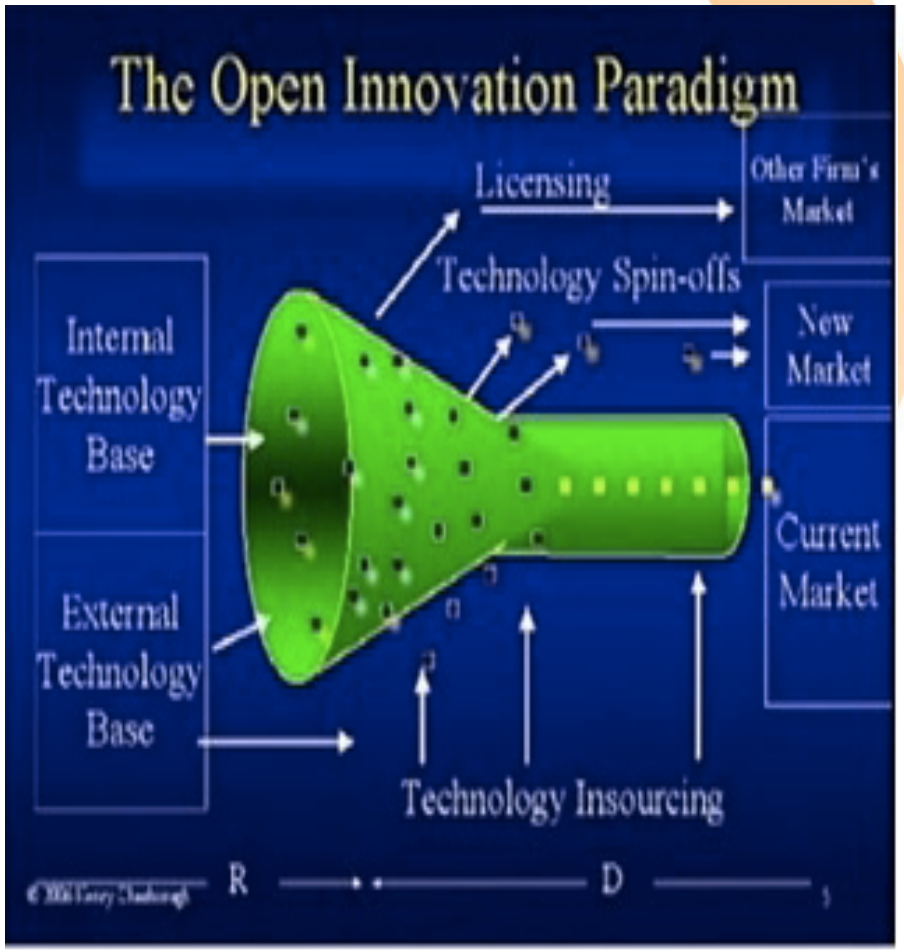
Open Innovation paradigm

- *"Open innovation is the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively.*
  [This paradigm] assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as they look to advance their technology."

Open Innovation

- Open innovation is what happens when big companies collaborate on a large scale with outsiders – university researchers, suppliers, small tech, start-ups – to get new, products or services to market.



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Business Ecosystem

- We propose an new approach to innovation, based on the concept of developing a **business ecosystem** around the Future Internet Core Platform
- In this ecosystem, the different actors – large companies, university researchers, suppliers, small tech start-ups – will **collaborate, compete and share the innovation**, exploiting both existing internal and external sources of innovation.
- (see "*Open innovation: researching a new paradigm*" di Henry William Chesbrough, Wim Vanhaverbeke e Joel West. Oxford University Press – 2005).

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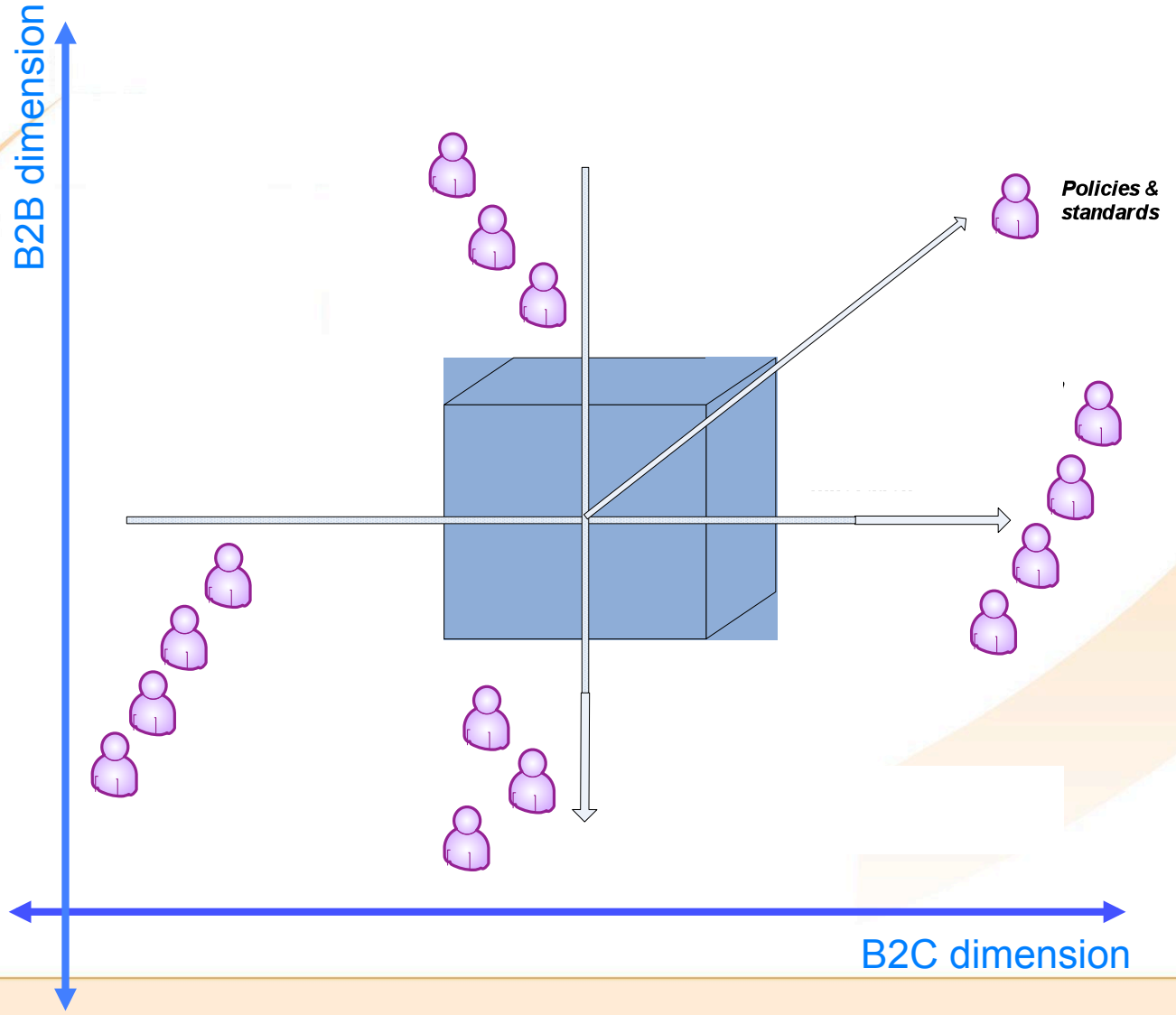
Business Ecosystem

- The idea of Business Ecosystem in the search context means to move forward from the simple value chain model to a more innovative Business Ecosystem approach for the multimedia search domain.
- Business Ecosystem is a sustainable community of enterprises and institutions, sometimes collaborating and sometimes competing, but in both cases creating value for end-users, their customers, themselves and each other.

Business ecosystem



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Social Innovation

- Social innovation refers to new strategies, concepts, ideas, and organizations that meet social needs of all kinds
- From working conditions and education to community development that will extend and

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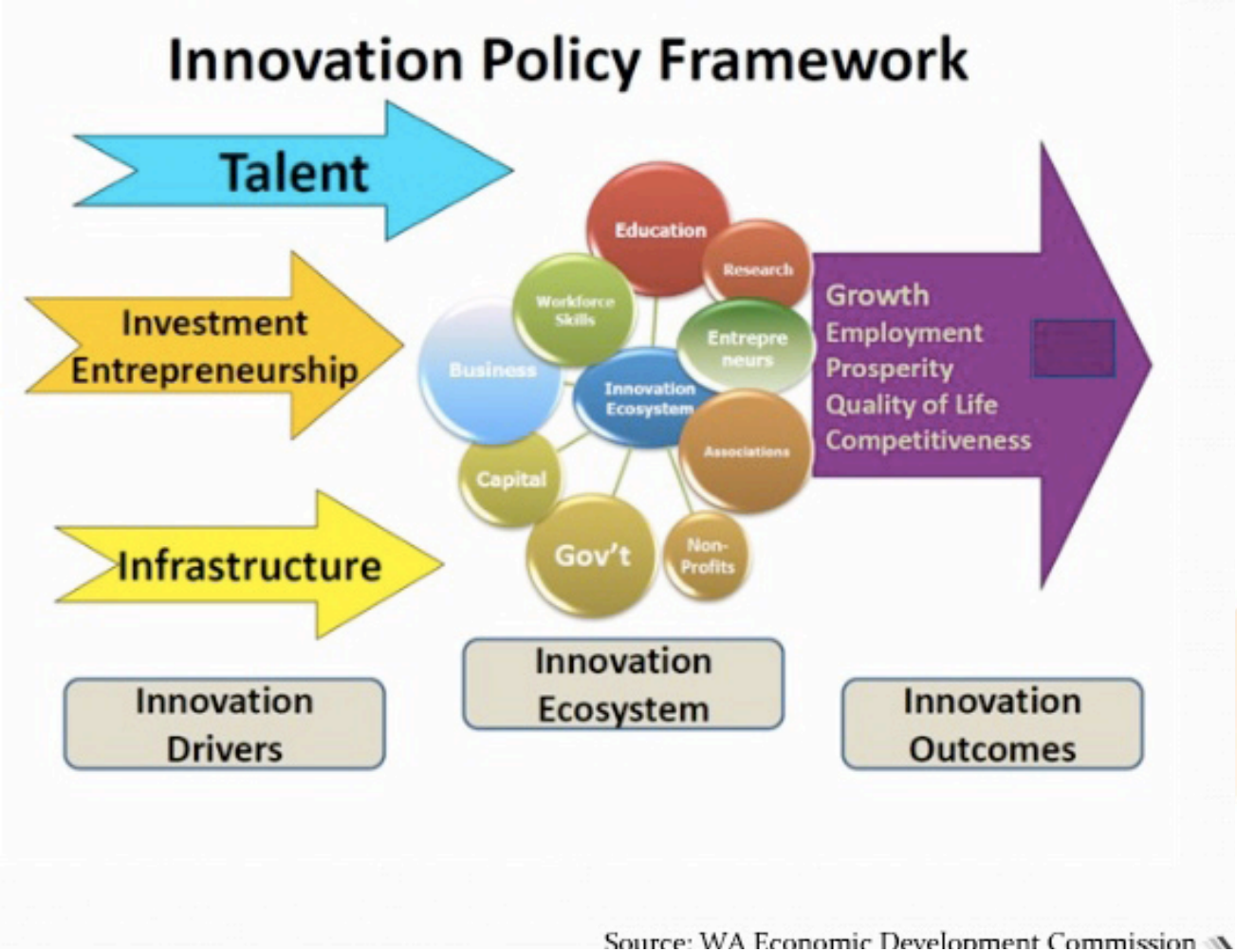
Innovation Policy Framework



Source: WA Economic Development Commission

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Search in Future Internet

- *Already in the current Internet we are using some core services – such as search engines. Others, e.g., to provide geo-information, people search or social networking, have seen tremendous growth in recent years. Mostly we are using these services in isolation from each other, e.g., via independent websites and user interfaces. Some services – like search – are starting to become integrated but here a significant increase can be expected.*
- **Future Internet Cross-ETP Vision Document**

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Conclusion

- A new paradigm for the future: **open search**
- Search in the Future Internet of Services

- Some keywords for the future: lessons learnt:
  - Open source Search is possible
  - Open Innovation vs. close one
  - Business Ecosystems vs Value Chain

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The end

- Thank you !!!

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