



**“Exploring the future of Enterprise search.  
Workshop and Think-Tank Roundtable discussion  
of the future trends and directions of Enterprise  
Search”**

***4<sup>th</sup> CHORUS+ Think-Tank***

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***Authors: Joost Geurts, Henri Gouraud, Stavri Nikolov, Pieter van  
der Linden***

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## Abstract

### **Think-Tank Roundtable discussion of the future trends and directions of Enterprise Search.**

This Think-Tank discussion was part of the Workshop on technological and techno-economic aspects of Enterprise search applications organized by IPTS in Sevilla on October 13 and 14 2011.

The Think-Tank gathered 15 Enterprise Search experts - vendors, integrators and analysts - mainly from Europe. In a first stage, the discussions aimed at establishing an assessment of the techno-economic aspects of the Enterprise Search market. The second part of the discussion concentrated more precisely on EU. Several options for improving the situation of European vendors were examined and a series of recommendations and suggestions were issued to the European Commission.

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## Table of Contents

1. OBJECTIVES OF THE THINK-TANK .....	4
2. THINK-TANK PARTICIPANTS.....	4
3. INTRODUCTION .....	5
4. THE SLOW ADOPTION OF ENTERPRISE SEARCH SOLUTIONS.....	5
4.1 WHAT HAMPERSTHE TAKE OFF OF ENTERPRISE SEARCH?.....	7
4.2 ARE THERE ADDITIONAL HURDLES FOR EU BASED VENDORS.....	8
5. ARE ANY TECHNOLOGIES MISSING? AND WHY ARE THEY MISSING?.....	9
5.1 WHAT IS MISSING? .....	9
5.2 FACTORS HAMPERING RESEARCH AND TRANSFER FROM RESEARCH TO INDUSTRY ..	9
5.3 THE QUEST FOR MEANINGFUL DATASETS FOR STRUCTURING RESEARCH .....	10
6. WHICH ROLE COULD BE ASSUMED BY THE EU TO HELP ENTERPRISE SEARCH VENDORS AND ACTORS?.....	10
6.1 WHAT ARE THE STRENGTHS, WEAKNESSES, OPPORTUNITIES AND THREATS (SWOT) OF ES IN EUROPE? .....	11
6.2 WHAT RESEARCH POLICIES SHOULD THE EU PUT INTO PLACE TO STIMULATE ADOPTION OF ENTERPRISE SEARCH BY THE INDUSTRY? .....	12

## 1. Objectives of the Think-Tank

Globally the workshop aimed at gaining insight in the techno-economical trends in enterprise search. Main themes addressed during the Think-Tank "Exploring the Future of Enterprise Search" included:

- Enterprise Search in the cloud
- The link between enterprise search and mobile search, i.e. mobile access to enterprise resources
- Convergence between enterprise search and database technology
- Enterprise Search in unstructured data
- The link between enterprise search and semantic search
- The social elements of enterprise search

Enterprise search and web search The Think-Tank roundtable more precisely addressed the technological and techno-economic aspects. Main questions set forward were:

- What are the **main technologies** shaping enterprise search?
- What is the state of the **enterprise search market** and how is it likely to evolve?
- Which are the major **bottlenecks** and the main **challenges** to be overcome?
- What are the main **business models** today and in the future?
- How is **Europe placed** with regards to the rest of the world?
- Is there a consensus on **future trends** and directions?
- What are the main **technological and economic challenges** ahead?

## 2. Think-Tank Participants

This Think-Tank gathered a number of highly knowledgeable experts and actors from the Enterprise Search business area. In addition to participating to the roundtable, each of the experts also presented on aspects of their business during the workshop sessions.

The selection of participants was based with the aim of having representatives from very diverse and broad areas from the Enterprise Search industry, covering a variety of aspects, while keeping the discussion group small enough in order to enable contributions by each person.

The Think-Tank started with a brief introduction by Henri Gouraud and Stavri Nikolov. The final list of participants was the following one:

Participant	Organization
Ramon Compano ( <b>RC</b> )	IPTS
Christoph Goller ( <b>CG</b> )	IntraFind Software
Henri Gouraud ( <b>HG</b> )*	INRIA
Gregory Grefenstette ( <b>GG</b> )	EXALEAD
Kathrine Hammervold ( <b>KH</b> )	Microsoft
David Hawking ( <b>DH</b> )	Funnelback
Matthieu Jonglez ( <b>MJ</b> )	Smartlogic
Harald Kirsch ( <b>HK</b> )	Rayton
Mika Konnola ( <b>MK</b> )	Documill
Man-Sze Li ( <b>MS</b> )	IC Focus
Stavri Nikolov ( <b>SN</b> )	IPTS
Ray Owens ( <b>RO</b> )	LTU Technologies
Nicu Sebe ( <b>NS</b> )*	University of Trento

Hendrik Speck ( <b>HSP</b> )	University of Applied Sciences Kaiserslautern
Hendrik Strindberg ( <b>HS</b> )	Findwise
Andrew Terry ( <b>AT</b> )	Toumetis
Martin White ( <b>MW</b> )	Intranet Focus
Yiannis Kompatsiaris ( <b>YK</b> )*	CERTH-ITI
Thomas Lidy ( <b>TL</b> )*	TU Vienna
Henning Muller ( <b>HM</b> )*	HES-SO
Pieter van der Linden ( <b>PL</b> )*	Technicolor
Michele Wilmet ( <b>MWI</b> )*	JCP-Consult
Joost Geurts ( <b>JG</b> )*	JCP-Consult

\* organizers, on behalf of the European Coordination Action project CHORUS+, [www.avmediasearch.eu](http://www.avmediasearch.eu)

### 3. Introduction

A slide show by IPTS, using material from the forthcoming report on Enterprise Search and input of the Think-Tank participants established via a Delphi study conducted prior to the Think-Tank, was used for guiding the Think-Tank discussion.

Henri Gouraud introduced the Think-Tank by highlighting some selected remarks from the workshop presentations which took place prior to the Think-Tank roundtable. In particular he mentioned the search based application<sup>1</sup>, described by Gregory Greffenstette, as one of the most promising venues for future use of search technologies by Enterprises. He also commented on mobile enterprise search, which he believes, with the exception of the user interface, does not fundamentally differ from non mobile Enterprise Search. He also quoted the study presented by Martin White which demonstrated the teaching gap, no academic course is in place on the Enterprise Search related topics. Finally he questioned the need for new technologies, as none of the presentations of the workshop strongly put forward specific problems related to missing technology.

The first part of the Think-Tank discussion focused on the Enterprise Search market and technologies of Enterprise Search systems. The second part of the discussion deepened on the specific situation of EU based vendors and the on the role the EU commission could play to help the market to take of.

### 4. The slow adoption of enterprise search solutions

SN introduced the discussion on Enterprise Search technological aspects with the slides below extracted from the Delphi study:

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<sup>1</sup> **Search-based applications (SBA)** are [software applications](#) in which a [search engine platform](#) is used as the core infrastructure for information access and reporting. SBAs use [semantic technologies](#) to aggregate, normalize and classify [unstructured](#), [semi-structured](#) and/or [structured content](#) across multiple repositories, and employ [natural language technologies](#) for accessing the aggregated information. (Source : Wikipedia)

Which technologies you regard as important to the demand and adoption of enterprise search	Total	Vendor	Analyst	Integrator
Search as an integration platform (unified access platforms)	3.7	3.1	3.0	3.8
Search-based applications	3.6	4.0	3.0	3.8
Text mining	3.5	3.7	4.2	2.4
Cloud-based search	3.4	3.1	3.0	3.0
Enterprise mobile search applications	3.4	2.8	3.8	2.8
Search incorporated into business intelligence applications	3.3	3.4	3.4	3.4
Multimedia search	3.3	3.1	3.4	2.4
Semantic search	3.2	3.0	3.4	2.8
Expert search	2.9	3.3	2.6	2.4
Tagging of search results	2.8	3.4	2.4	1.8
Enhanced federated search	2.8	2.4	3.4	3.2
Being able to search multiple languages with a single query	2.4	1.9	2.8	2.0

\*) Participants to the survey were asked to allocate 10 points to the most important technologies.

Some technologies, such as integrated search of structured and unstructured content, search based applications, text mining, business intelligence, mobile and also the integrated search platform are generally considered more important than the other technology categories.

In private discussion with the respondents this trend was confirmed (as the numbers in the table are largely spread, it is difficult to reach a conclusion on this data only).

In addition to the above technology overview, the respondents were asked to give their insight specifically on the mobile case. The results of that study, summarized below, demonstrate that mobile is indeed a key technology as the overwhelming majority of respondents believe that in the near future enterprise search will be extended to mobile devices.

Impact and direction of mobile search technology	Total	Vendor	Analyst	Integrator
Companies will prefer to extend the capabilities of their current search application to mobile devices	7.6	8.8	7.4	6.7
Mobile search applications for enterprise use will stimulate new vendors to enter the market	3.4	3.0	3.0	4.3
Innovation in mobile search will result in innovation in workplace enterprise search	3.1	2.2	3.8	3.7
Companies will place mobile search requirements as a justification for replacing their current search application	2.5	2.5	3.6	3.0
The requirement for mobile enterprise search is overstated	2.5	3.7	2.2	2.3

After having displayed and commented these slides, some discussion took place on technologies and research, for the sake of readability of this report we have merged those discussions with the research discussion described later.

## 4.1 What hampers the take off of Enterprise Search?

The first important topic debated was the huge gap between Enterprise Search solutions really deployed and the actual addressable market. Several participants did propose explanations and comments pointing schematically towards lack of maturity of the product offering and a insufficient evidence of the economical or other benefits to the companies.

HK suggested that the market is maybe just not mature enough. He believes that, for the time being, enterprises are mostly worried about secure means of storing information. They do not (yet?) necessarily think about localizing and extracting the information out of the system. Moreover, they often confuse between the search button in the content management system of their company, and full Enterprise Search solutions.

KH is of the opinion that technological innovation is not the limiting factor in ES. The reason for the slow adoption should be sought in the complexity of the product, the pricing model, usability, interoperability and maintainability. She added that throwing money in Enterprise systems technology is unlikely to change the problems hampering adoption of Enterprise Search. Research surely will improve technology and functionalities, but to understand why ES is not being adopted we have to look harder to find the actual problem.

MS stressed operational aspects. In her view, Enterprise Search is typically a component in a larger enterprise system. It should therefore be considered in a wider context, paying in particular attention to the interaction and integration with the enterprise system.

DH added that because of organizational and social reasons, rather than technological shortcomings, the level of failure of Enterprise Search projects is particularly high. This high failure level has cause a bad image. As an example, he pointed to the lack of incentive for corporate users to

make documents available. On the web, there is an incentive to make your documents discoverable: this incentive is often missing in ES2.

As a result of these failures, MJ stated that nine out of ten people are unsatisfied with their ES system. He then pointed to the fact that unrealistic expectation could hamper the user adoption: “Perhaps we are setting expectations too high and make it look far too simple”.

MW voiced an additional argument on adaptability to change. In his view, the search systems actually work quite well from a technological point of view. However, the enterprise is changing over time. Adapting the search system to a changing environment requires constant investment of the enterprise. This is costly and therefore often does not happen. The result is the perception of progressively degrading performance.

MJ pointed to a lack of information at the level of the system integrators. Enterprises often realize they have a search need. However, if they turn to system integrators they are typically not advised on Enterprise Search, simply because the system integrators don’t exactly know what this is. We should educate integrators about what ES is, so they can advise it to their customers.

To go into the direction of more effective information, HS reported on an experience Findwise conducted. To prove or at least illustrate the effectiveness of ES, the company carried out a user test demonstrating that open tasks in a company were executed faster by user using Enterprise Search. These concrete figures were much appreciated by customers as opposed to abstract qualifications (such as a feature list) used very often by the vendors and integrators.

GG concluded: “For an enterprise to adopt technology the return of the investment should be clear. Currently the effective value of ES for a company is hard to formalize and demonstrate.”

## 4.2 Are there additional hurdles for EU based vendors

Then, the discussion moved on to questions specifically related to the EU. On this domain the discussion turned around rather generic remarks: fragmentation of the European market and also the lack of confidence in EU developed software products. None of the points brought up were very specific to the Enterprise Search domain.

MJ pointed to the fact that the market of ES vendors is very fragmented with little activity across EU borders. There is no common effort on marketing ES. This results in a lack of awareness of what ES is and what it can do for a company. He added that it was actually harder and much less rewarding, to go from one EU country to another rather than going for EU to US.

HG confirmed this point: to his experience, EU companies prefer partnering with US rather than with EU suppliers. He then added that most of EU search companies were not pure solution vendors. Most EU vendors mix consultancy and product design.

MJ also pointed to high level of effort required to win public deals in EU. In his experience winning a public sector deal in Europe can be very difficult, in one instance requiring the submission of 3 near identical proposals.

RC took a more strategic view on the market. Based on the experience acquired on similar markets, he foresees that less than 60 companies will survive out of the 200 currently active in the area. He questions what should be the reaction of the policy maker; let consolidation happen, or take specific actions to secure the knowledge.

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<sup>2</sup> DH concurred on this statement; he stated that “dictatorship” was the most beforehand tactic to tackle this document dissemination question.



## 5. Are any technologies missing? And why are they missing?

Several participants reacted to HG opening statement about technology not being the limiting factor (see above). They indeed believe there is a need for improvements on technologies, and therefore for a structured research effort on these topics.

### 5.1 What is missing?

The need to aggregate structured and unstructured data and content “staling” were identified as specific features of Enterprise Search. Further the experts agreed that Enterprise Search would benefit from advances in Feature extraction (image text, etc...).

Several concrete example of missing pieces were mentioned:

DH explained that there was a need for improvement for most of the technologies used. For instance of Text retrieval, best systems and technologies have currently only an accuracy of 50%. He also believes the dynamic aspect of a company is not sufficiently well captured by existing technology. He stressed the fact that to do research in this area, meaningful data sets (see below) were needed.

GG said that ES is about simultaneously searching structured and unstructured data. Mixing these two types of data is not a solved problem. Especially the semantic modeling of heterogeneous data sources that are needed to present a user a unified interface still needs a lot of work. In his opinion the Enterprise Search term is not really adequate for designating these technologies. He proposes to use “Unified Information Access” instead.

RO expressed the fact that a great deal of information is in images (he mentioned for instance a talking head carrying the semantics of a description). Technology for extracting that information is still in infancy. He is convinced that an important research effort is required to make multimedia content available to Enterprise Search application. Based on the examples of non anticipated introduction of disruptive technologies or devices (iPhones/iPads, etc...), he also added that the fact that people do not request for a technology at some point in time, does not mean that it is not needed.

MS made the point that current Enterprise Search systems have been mainly technology driven. However, enterprises are mostly about people and networks of people interacting. User-driven applications and information management should be the focus of future research actions.

Finally KH proposed a new research topic. She told that people are not happy with their Enterprise Search solution, because the performance of a search system degrades over time. Companies and people are not willing to constantly invest to keep search accurate and they shouldn't have to. An interesting research topic could be to prevent search going stale.

### 5.2 Factors hampering research and transfer from research to industry

On the missing technology topic the experts did discuss the more general technology transfer problem. Moderators have considered that discussion of this general topic was beyond the objectives of this Think-Tank and therefore have closed rapidly.

MJ expressed concerns about inadequate intellectual property rules of academic institutions, hampering actual transfers of technology to occur. He estimates that many of the missing technology in ES, actually do exist in IR research community, but is poorly accessible to industrials. He hopes this “transfer gap” between research and industry is being addressed by EU programs, such as FP7.

After the meeting CG reflected on this intellectual property issue topic. He advocated the idea to making academic results available through open-source development. In his opinion this would

allow making these results available to more companies than just the one who participated in a research project.

MS also challenged non realistic exploitation plans in research projects (including but not limited to EU). He believes the actors would benefit from the availability of better plans.

### **5.3 The quest for meaningful datasets for structuring research**

The mention of datasets for research (see above) triggered a discussion on dataset generation among several participants, including DH, KH and GG<sup>3</sup>.

According to DH, the availability of benchmark dataset is essential to unlock the current lack of research interest in Enterprise Search. He said that TREC allowed to double performance of text retrieval technologies within 5 years. He recognizes though that the creation of Enterprise Search oriented datasets is complicated for various reasons. He proposed the EU commission to consider initiating an initiative for fostering progress on this point.

GG commented on successful dataset driven evaluation campaigns: the results booked in TREC are in the first place beneficial for the American intelligence community, which funds and organizes the initiative. Similarly, the involvement of industrials is necessary to improve ES. He concurred with DH on the need for external help, and also suggested the EU to helping organizing and setup a coalition of companies to drive such an initiative.

HG elaborated on the data set question also: he advocated establishing guinea pig organizations for testing Enterprise Search applications. One would imagine that the EU commission could be one of these organizations.

## **6. Which role could be assumed by the EU to help Enterprise Search vendors and actors?**

Based on the interviews with the respondents and analysis work, IPTS prepared the SWOT analysis pictured below. This slide triggered quite some discussion among the participants.

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<sup>3</sup> This comment did trigger a short discussion on datasets and technology evaluation. As this subject will be treated in detail in next think-tank on technology evaluation, it was decided not to deepen this subject here.

## SWOT Analysis for EU Enterprise Search Version 3.0

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>World-class search vendors based in the EU</li> <li>High academic standards in the teaching of mathematics and informatics</li> <li>Significant IR research capability</li> <li>Understanding of multiple language issues</li> <li>Acceptance of open-source solutions</li> <li>Active IR community</li> </ul>	<ul style="list-style-type: none"> <li>Generally poor marketing of search benefits by vendors</li> <li>Difficulty in identifying search vendors and integrators</li> <li>Limited interaction between IR and ES communities</li> <li>No enterprise search community and until Oct 2011 no specialised ES conference</li> <li>EU vendors finding expansion into USA a challenge</li> </ul>
<ul style="list-style-type: none"> <li>No dominant suppliers to inhibit smaller vendors</li> <li>Significant market potential</li> </ul>	<ul style="list-style-type: none"> <li>Search is low down the organisational priority</li> <li>Mobile search will be developed in US where broadband mobile is more widely available</li> <li>EU vendors not able to capitalise on US market</li> <li>Microsoft SharePoint 2010 seen as ‘good enough’</li> </ul>
Opportunities	Threats

### 6.1 What are the Strengths, Weaknesses, Opportunities and Threats (SWOT) of ES in Europe?

MS, who was involved in preparing the SWOT, explained that in practice doing this SWOT turned out to be rather hard. He wonders whether preparing one SWOT per category of stakeholders would be a more suitable approach. A global SWOT analysis is not really possible, because it takes a specific point-of-view. To represent a global perspective you may need multiple SWOT diagrams relative to a users perspective and even multiple perspectives for different types of users.

GG suggested an additional strength: the experience with Semantic Web technology and Linked Open Data.

MJ reminded on a weakness: Crossing borders within the EU is extremely difficult. Going to the US then coming back appears to be a more chartered route. It is not so much a question of language support but a question of culture and – unfortunately – seemingly a lack of trust between SMEs of the different European countries.

CG did point on opportunities in open source. Enterprise Search as a business is still very much in development. We don’t know what it is going to be in future and if it is going to be a big market at all. Nevertheless, there are many opportunities. Small companies can exploit these at a relatively low cost, because many of the required technologies are available as open-source software. He also suggested the companies to look at the opportunity to start new open source projects in the area.

DH said that the combination of consultancy and technological development is a success factor. It assures revenues and makes the business interesting. However, besides revenue as a success indicator, we should also look at the rate of growth of ES company and the risk factors ES company are exposed to.

MK and HG did challenge this view. According to MK small companies should focus on what they do best. Consultancy in addition to product development may work for some companies, but it is not necessarily the only recipe to survive. HG also challenged the soundness of mixing business and consultancy. He believes that on the long run, mixed consultancy and product firms will most likely end up as pure consultancy firms.

MJ did also point on an additional weakness of the EU market. He said that public deals were very long and time consuming (an average of 3 times submission of similar offerings for one deal).

## 6.2 What research policies should the EU put into place to stimulate adoption of Enterprise Search by the industry?

DB, RC and SN then asked the participants about suggestions policy options for endorsing and supporting the development of the Enterprise Search market.

- 1) (GG and HS) Participate to creating an industrial and user community of actors of the Enterprise Search market.  
He mentioned the DAM community as a possible source of inspiration.  
HS agreed on this position and went one step further. He suggested creating an academic conference to find out about the suppliers and the topics addressed. This conference would concentrate Enterprise Search success stories.
- 2) (DH+GG+KH) Support benchmarking and data set creation:  
Benchmark dataset are essential to unlock the current lack of research interest in ES. The creation of ES datasets is complicated for various reasons. An EU initiative could help to progress on this point.  
GG added on this subject with insight from other benchmarking efforts: The results booked in TREC are in the first place beneficial for the American intelligence community, which funded and organized the initiative. Similarly, the involvement of industrials is necessary to improve ES. The EU can help to organize and setup a coalition of companies that would drive such an initiative
- 3) (HK + HS) put more emphasis on user testing and user interface:  
There is significant room for improvement in the usability and user interface for ES systems. Especially for emerging innovations, such as Social search and mobile search, which offer interesting opportunities for Enterprise Search.  
(HS) concurs to this point. The focus of research in ES is often on technological improvements. However, there is little research done on the social part ES. This includes improved Human Computer Interface but also studies that show the effectiveness of Enterprise Search for a company.
- 4) (MS) Create a marketplace by promoting interoperability standards.
- 5) (MJ) Sort out intellectual property rights:  
The collaboration between industry and academia is hampered by the unclear situation regarding intellectual property rights. Most universities do not have a clear policy about this, which makes that academic research stays academic.
- 6) (KH) Make sure that research is better aligned with objectives of EU industrials.  
The exploitation plans in EU projects are intended to facilitate the adoption of EU research by EU industry. However, in its current form it seems to miss the point. The plan is typically not very substantial as the incentive to commercialize research results is missing. Moreover, the evaluation of the plan by the EU commission reviewer is relatively weak too.
- 7) (CG) Organize special requests for open-source software and invite companies to submit for projects depending heavily on existing open-source solutions (such as Lucene/Solr, Hadoop, ...).

This approach would support the emergence of a community of academics, SMEs, integrators and large groups working together to create a market and standards for Enterprise Search

As several participants have pointed to the lack of Enterprise Search oriented education, there has also been a discussion on training and education. This discussion has not led to a consensus; several participants were of the opinion that creation of an academic study curriculum was not needed at this point.