

Semantic Web Technology RoadMap: the case of KWTR in the KW NoE



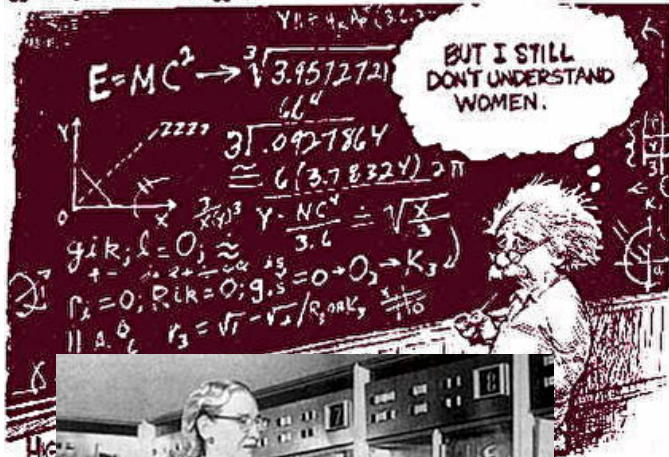
Roberta Cuel
Department of Computer and Management Studies
University of Trento
roberta.cuel@economia.unitn.it

Budva, June 11, 2006



The O2I purposes of the KW NoE

Aggies' Opinion / Jack Higgins



Which gaps
and
technology locks ???



... awareness on how, semantic
web technologies could help
organizations:
deliver new products and
services
create new business value



Aims of semantic web technology roadmap (KWTR):

Analysis of some **current and future trends** on semantic web theories and methods, tools and applications,

Analysis of general **organizational needs** (common markets and social drivers, user requirements, etc.),

Identification of **some technology locks** between organizational/user needs and research activities.



A multi-organizational technology roadmap

Roadmaps are traditionally used from a company perspective in order to understand how to:

- Develop new technologies,
- Integrate technologies with the business model and the organizational strategy,
- Analyze impacts of new technologies in the market.

KW technology roadmaps (multi-organizational roadmap):

- should capture the environmental landscape, threats and opportunities for a particular group of stakeholders in a technology or application area.
- should support strategies and medium or long time planning for both research and industries activities/initiative



KWTRM structure

- ❑ Unveil gaps between KW research activities and organizational needs:
 - Semantic Web Research
 - Industry Applications

- ❑ Identify some challenges

- ❑ Present a research roadmap
 - Short term
 - Medium term
 - Long term

- ❑ Present an action plan and a series of recommendations

KWTR activities promote a discussion on:

- These **results are to be disseminated** through the Knowledge Web portal in order to allow researchers and entrepreneurs to address their activities, in a mutually beneficial way.

Technology and the business model

- Technology is an important type of resource within organization at:
 - **Technology level:** engineering and science platforms, technology management processes required for maintaining the technology base.
 - **Product level:** product and service portfolio and platforms, manufacturing and operations functions, together with innovation in new product development and processes;
 - **Business level:** organization and associated networks, business portfolio, marketing and financial functions, together with strategy development and implementation processes.

- Effective alignment of technology with business objectives requires effective mechanisms for knowledge flow between the levels;



Technology and business model within the KWTR

- **Technology level (Maintain the technology base)**
 - algorithms and methods used within products,
 - trend of the research in Semantic Web and all the related research areas (managerial and computer science).

- **Product level (Develop product /services and processes innovation)**
 - Which kind of products?
 - Which kind of service?
 - Which kind of use consumer can we have with these products? Etc.

- **Business level (Deliver value to the business):**
 - Trend of the markets and new market niches,
 - Business needs for new services and products,

Some methodologies

- Two methodologies used in the KWTR:
 - **Delphi methodology**
 - **Focus Group methodology**

- Several important factors should be considered prior the Technology Road Map start-up process workshops, including:
 - Identification of experts (**researcher and industries**).
 - **Face to face meeting and workshops.**
 - **Definition of the first agreement on a common vision.**
 - Identification of concrete challenges to overcome.



Two calls for contributions

- ❑ **1st questionnaire** focused on:
 - Research/industry fields;
 - Research/business trends (in KW and other SW projects);
 - Researchers and Organizational needs and problems;
 - Solutions, methodologies, tools that solve these problems;
 - Impacts that these solutions will have within (and among) organizations.

- ❑ Discussion of previous results in a **Focus Group** in Crete during the plenary session June 2005

- ❑ **2nd call for contributions** focused on:
 - trends on specific methods/theories, tools and applications;
 - for short (0-3), medium (3-6), and long (6-12) term.



Market and social trends

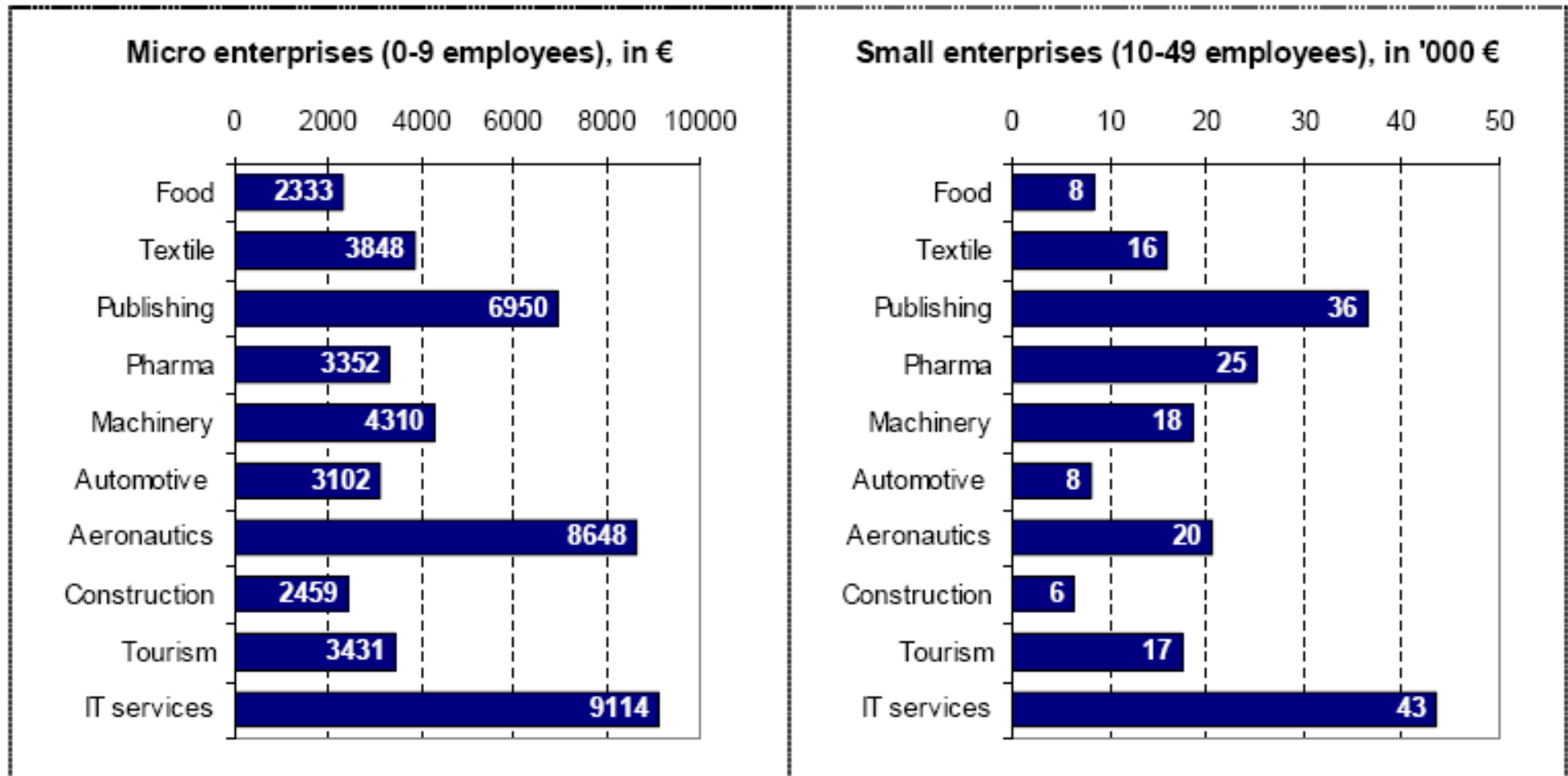
- ❑ Sectors analysis (primary, secondary, services sectors).
- ❑ Market and society;
 - Socio economical trends:
 - Net economy and new business needs;
 - Ethical problem in the net economy;
 - Users and networks;
 - Networked users (Virtual communities, CoP, networks of practices);
 - Organizations and networks;
 - Networked organizations;
 - Organizational outsourcing;
 - Supply chain management and virtual supply chains;
 - E-business;
 - Distributed cost and risk management;
 - Knowledge trends and KM overview.



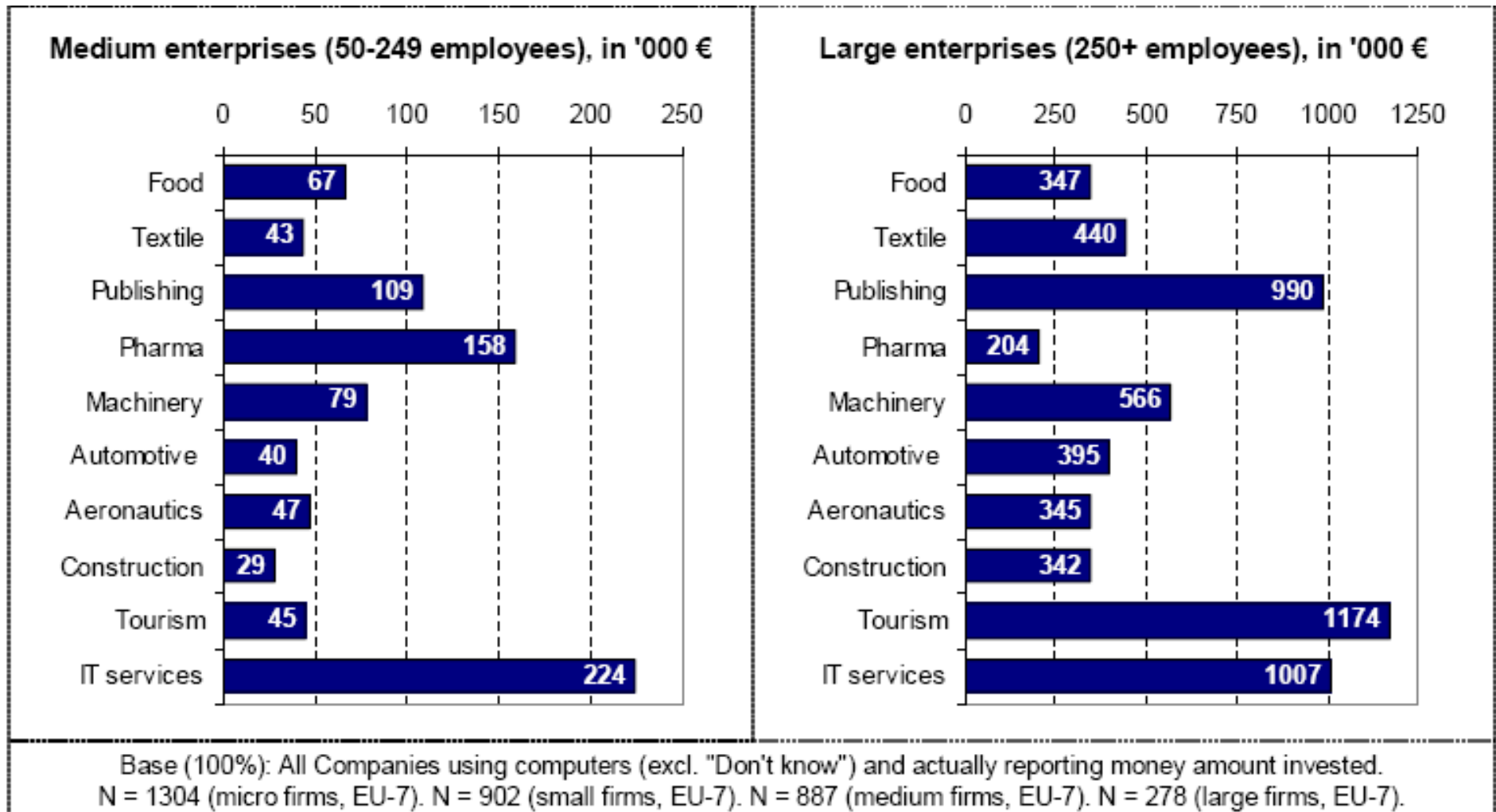
Market and social trends

- ❑ Macro Dynamics
 - the socio-economical trends (networked organizations, open value chains, distributed design and production, clients involvements, etc.)
 - The knowledge trends (how knowledge is managed, distributed knowledge management, distributed strategies, etc..)
- ❑ Industrial application needs
 - Evaluation for technology selection
 - Technology recommendations
 - Promotion of ontology technologies
- ❑ Problems generated by these changes:
 - Within organizations (costs and revenues; organizational (on HR) impacts of technologies, new processes routines)
 - Across organizations (trust on distributed e-commerce, low, fiscal issues, etc.)
- ❑ Possible Semantic Web based solutions

Market and social trends: Average investment in ICT infrastructure and software by firm size in 2004 (in €)

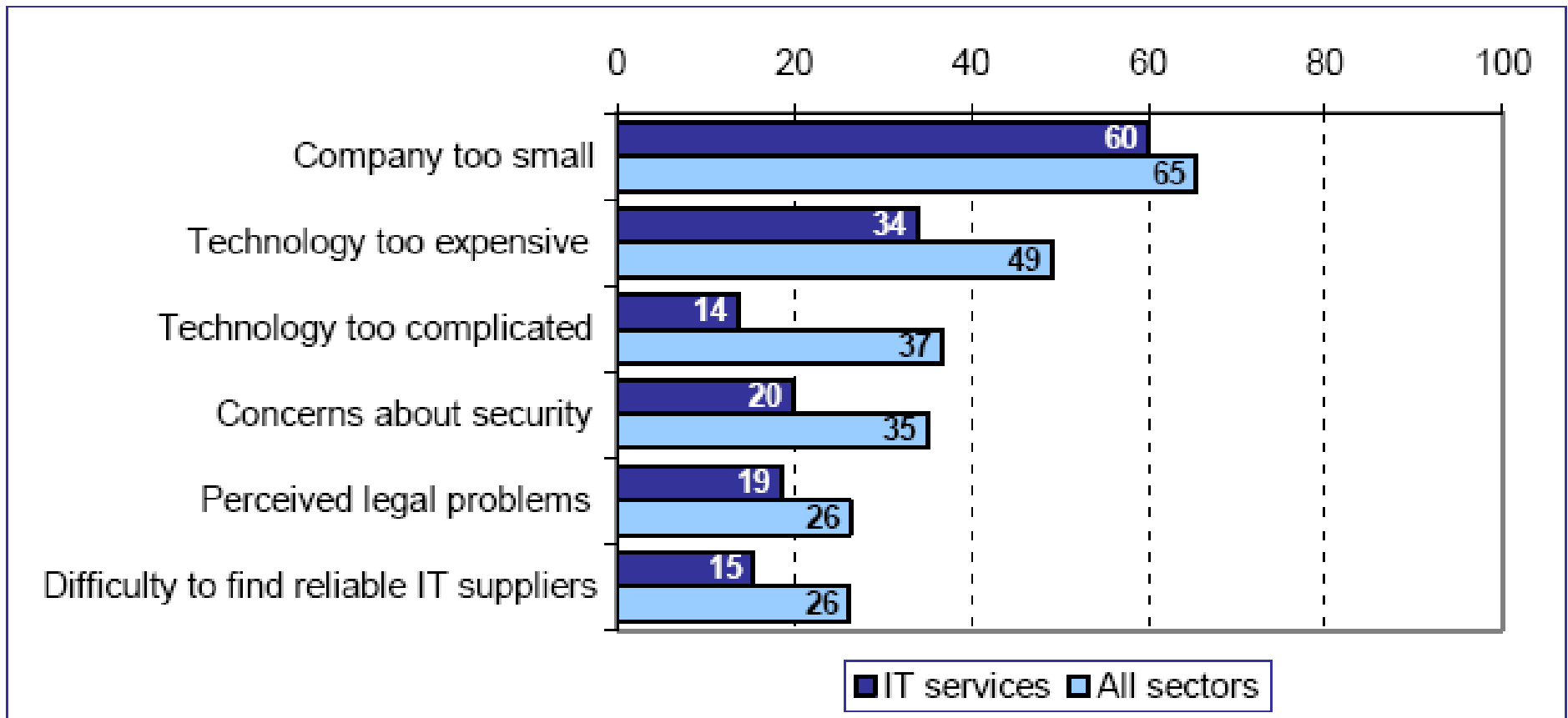


Market and social trends: Average investment in ICT infrastructure and software by firm size in 2004 (in €)



Source: *e-Business W@tch* (e-Business Survey 2005)

Market and social trends: Barriers for adopting e-business in the IT services sector



Base = Enterprises saying that e-business does not play a role in their operations:

N = 118 (IT services, EU-7), N = 2103 (Total, EU-7). In % of firms.

Source: *e-Business W@tch* (e-Business Survey 2005)

We have adopted
the “Semantic
Web Topic
Hierarchy”
(WP3.1)

[https://wiki-
sop.inria.fr/wiki/bin/view/Aca-
cia/KnowledgeWeb](https://wiki-sop.inria.fr/wiki/bin/view/Academia/KnowledgeWeb)

Research trends

1.2.1 Data Modeling (Conceptual models; ontologies, UML, Relational data model, Semistructured data, Object-oriented model)

1.2.2 Database systems

1.3 Basic Web information technologies

1.3.1 XML (Namespaces, Schema languages, XML query and, transformation languages, XML programming techniques)

1.3.2 Web data integration

1.3.3 Security

1.3.4 Web services

1.3.5 Personalization techniques

1.3.6 Web data extraction / information extraction

1.3.7 Architecture of Web Information Systems

2 Semantic Web Special Topics

2.1 Natural language processing / human language technologies

2.4 Peer-to-peer and Semantic Web

2.5 Agents and Semantic Web

2.6 Semantic Grid

2.8 Benchmarking and scalability

2.9 Semantic community portal and social networking

2.10 Semantic browsing and learning



Few of the finest expertise analyzed

□ Trends in theories/methods, tools and applications:

- Heterogeneity: ontology matching;
- Ontology Engineering;
- Agents and Semantic Web;
- Semantic Web services;
- Semantic browsing and learning;
- Semantic community portal and social networking.



Research trends: Ontology Matching Roadmap

□ Theories and methods

- Background knowledge in ontology matching;
- Performance of matching techniques;
- Interactive ontology matching;
- Transparency of ontology matching;
- Social aspects of ontology matching;
- Ontology matching evaluation.

□ Applications

- Traditional: data integration, catalog integration;
- Emerging: agents, p2p, web-services.

□ Tools

- Scalability of visualization techniques;



Some critical aspects (research vs. industry)

- **Researchers have vague knowledge about:**
 - Organizational needs,
 - Technology impacts (implementation, interpretation, adoption)
 - Use cases are better than business cases

- **Companies have vague knowledge about:**
 - Advantages deriving from the implementation of semantic web in a variety of industry sectors and company sizes;
 - Impact of semantic web technology within and among organization;

- **Mapping between research and industry results is hard work (because of their perspectives, aims, ...).**

Research vs. industry fields

- ❑ Computer science, artificial intelligence, knowledge representation, semantic web, and databases, distributed knowledge management
 - ❑ **Ontologies and Conceptual Modelling**, ontology alignment, multimedia document adaptation, semantic interoperability
 - ❑ **Intelligent multimedia**, knowledge-based matching, context, security, tuplespace computing
 - ❑ Temporal Logics and Temporal Databases, **Computational Logics**
 - ❑ **Information Access and Integration, Peer-to-Peer Database Systems,**
 - ❑ **Human Language Technology** and the Semantic Web
 - ❑ **User and groups modelling behaviour** (socio-cognitive, statistical....); Analyse of traces of activity, Reciprocal impact of the human factor in data networks (collective intelligence...)
 - ❑ **web mining**, multimedia content analysis....etc.....
 - ❑ **XML family**, XML applications, Metadata, Metamodels, Taxonomies, Ontologies
- ❑ IT consulting, Software development, IT research
 - ❑ Design and independent web applications with integration aspects (other applications without web integration)
 - ❑ IT, KM, Business Process Integration, information integration
 - ❑ New possibilities for website promotion and PR methods in the web: conventional and unconventional ones (marketing)
 - ❑ e-Government projects: KM approach, providing information to citizens, and enterprises

New social development

- ❑ Increased transparency in e.g. job market,
 - ❑ Moving personalised services online, speeding up service and availability (marketing services)
 - ❑ Information sharing and acquisition will be performed by software agents rather than humans.
 - ❑ More efficient human decision processes and interactions
 - ❑ Use solutions that empower the user to target disclosed information
 - ❑ Community oriented learning with mixed virtual and face-to-face interactions
 - ❑ Knowledge will define people and their possibility to keep a job
 - ❑ This will change the communication patterns
 - ❑ eCommerce becomes easily.
 - ❑ Business becomes more open and flexible and less human involved.
 - ❑ Much more integration, faster reaction time, life and organization more open and complex
- ❑ Interoperability (integration of information systems)

Changes in networked organizations

- ❑ Middle-men (who provide the knowledge service) will become unnecessary
 - ❑ Only specialisation will remain necessary (e.g. a job provider for computer scientists) where particular expertise can be additionally provided
 - ❑ All the obvious information will be available easily to those who are entitled to get it.
 - ❑ This means less time lost waiting for some info (think about the time google help you spare in having an answer).
 - ❑ Knowledge become more distributed, owned and controlled by many individuals and groups.
 - ❑ Most of the content archives, from museums and libraries to TV channels and digital cinemas, hold multimedia content.
 - ❑ Information management of the multimedia content production chain (from pre-production to post-production)
 - ❑ Competition, client- friendliness, targeting customers, indirect marketing, imaging will become more sophisticated.
 - ❑ More and more distributed knowledge management as an organizational principle
- ❑ Concentration on their core business
 - ❑ New types of collaboration (B2B platform)
 - ❑ Lower transaction costs



**Please, make “KWTR” works
and make we rich ;)**



Thanks for your attention, any question?

KWTRs and call for questionnaires:

<http://fandango.cs.unitn.it/net-economy/roadmap>



Delphi methodology

- ❑ Delphi may be characterized as a method for structuring an off-line group communication process

- ❑ To accomplish this "structured communication" there is provided:
 - proposal on a specific topic of common interest;
 - feedback of individual contributions of information and knowledge;
 - assessment of the group judgment or view;
 - opportunity for individuals to revise views;
 - degree of anonymity for the individual responses.

Delphi Phases

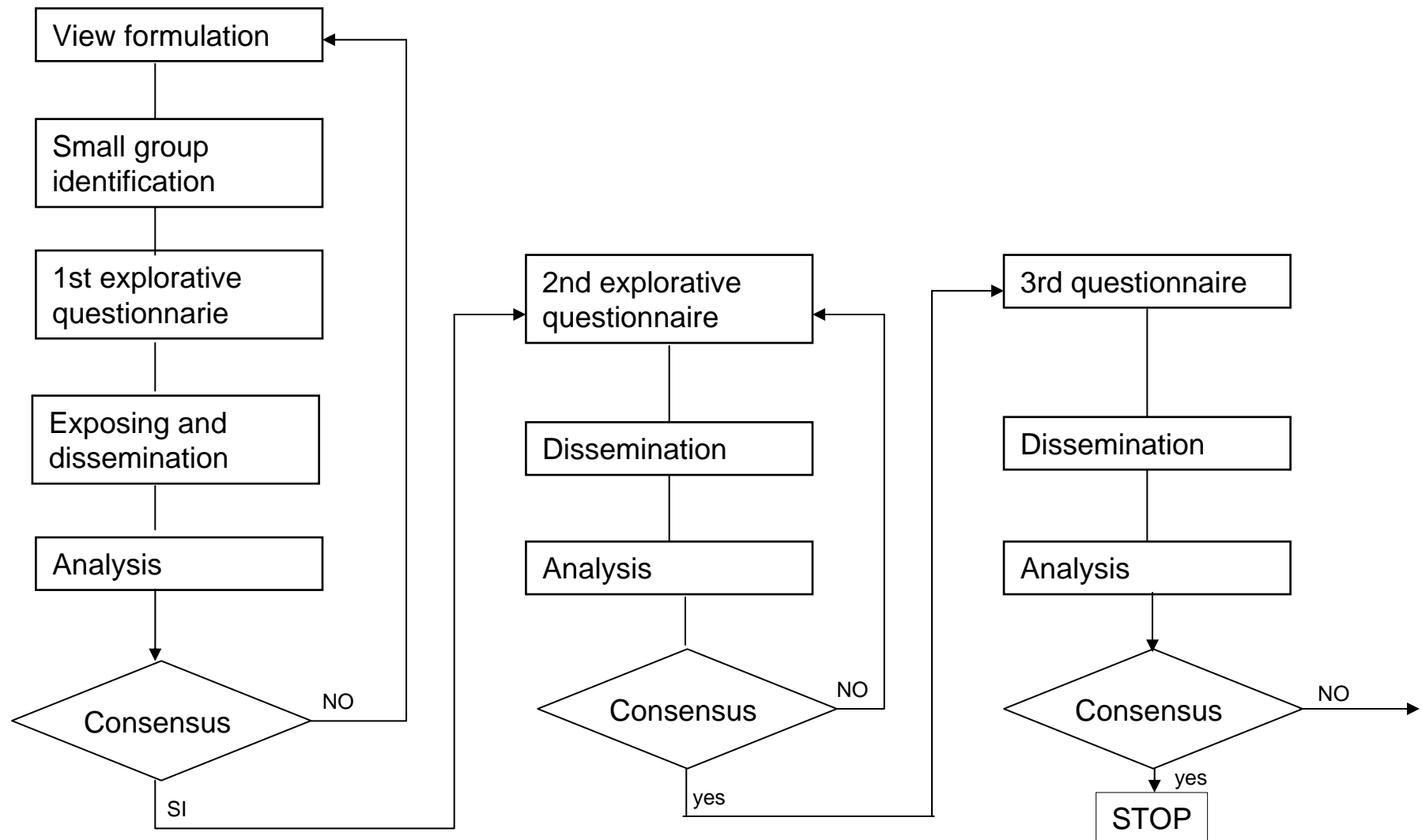
1. **object exploration:** each participant submit all the relevant information (s)he considers relevant (forecast)
2. **analysis:** each participant gives detailed information on forecasted objects (communication)
3. **evaluation:** each participant judges the analysis, gives motivations about his/her consensus or disagreement and provide quantitative data which estimate the phenomena (action)

The Delphi process can be managed through:

- *Paper and pencil (conventional Delphi):* a small monitor team designs a questionnaire which is sent to a larger respondent group. The respondent group is usually given at least one opportunity to reevaluate its original answers based upon examination of the group response.
- *Conference Delphi* replaces the monitor team to a large degree by a computer which has been programmed to carry out the compilation of the group results.



A typical Delphi process



The second methodology: Focus Group

- ❑ Interviewing is "...limited to those situations where the assembled group is small enough to permit genuine discussion among all its members" (Smith, 1954, p.59 cited in Stewart & Shamdasani, 1990, p.10).
- ❑ Focus group as a "carefully planned discussion designed to obtain perceptions in a defined area of interest in a permissive, non-threatening environment" [Kreuger, 1988, p.18]
- ❑ The term "focus group" was coined in 1956: a situation in which the interviewer asks group members very specific questions about a topic after considerable research has already been completed [Denzin and Lincoln, 1994, p.365]

References

- ❑ Cunningham, J.B. (1993). Action research and organisational development. London: Praeger.
- ❑ Denzin, N.K., & Lincoln, Y.S. (1994). Handbook of qualitative research. London: Sage.
- ❑ Glesne, C., & Peshkin, A. (1992). Becoming qualitative researchers: An introduction. New York: Longman.
- ❑ Howe, R., & Lewis, R. (1993). A student guide to research in social science. Cambridge: Cambridge University Press.
- ❑ Kreuger, R.A. (1988). Focus groups: A practical guide for applied research. London: Sage.
- ❑ Merton, R.K., Fiske, M., & Kendall, P.L. (1990). The focused interview: A manual of problems and procedures. (2nd ed.). London: Collier MacMillan.
- ❑ Morgan, D.L. (1988). Focus groups as qualitative research. London: Sage.
- ❑ Patton, M.Q. (1990). Qualitative evaluation and research methods. (2nd ed.). London: Sage.
- ❑ Stewart, D.W., & Shamdasani, P.N. (1990). Focus groups: Theory and practice. London: Sage.