

Methods and Techniques for Corporate Memories

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*«If you are not acquiring Knowledge,
you are losing it » Yuval Shahar*



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Outline

- Definitions
- Some Models for Knowledge Management (KM)
- Corporate Memory
- Corporate Memory Lifecycle
- Examples of Methods
- Corporate Semantic Web (CSW) Approach
- Conclusions



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Some Concrete Examples

- INRETS : memory of experiences of multiple experts in detailed analysis of road accidents
- RENAULT : memory of a vehicle project in order to reuse solutions for later projects
- Deutsche Telekom : support to insertion of a new employee
- CSTB : support to technological monitoring
- IPMC : memory of experiences of biologists.



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Knowledge Management

- Organisation = people interacting for common objectives, in a given structure, in an internal environment and with an external environment.
- KM = Management of knowledge resources of an organisation in order to ease:
 - access, sharing out, reuse of this (explicit or tacit, individual or collective) knowledge
 - creation of new knowledge



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Strategic Objectives of KM (Grundstein)

- Patrimonial objective: for Knowledge preservation, reuse and actualisation
- Innovation objective: organisational learning and active creation of individual knowledge and integration at a collective level in the organisation
 - KM = locate crucial knowledge, preserve it and perpetuate it, so that it can be shared and used by as many people as possible in the organisation for increasing the organisation wealth.



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Possible objectives of KM

- Improve *knowledge sharing* and *co-operative work* between members of an organisation
- Disseminate *best practices in the enterprise*
- Improve *learning* and *integration* of newcomers
- Avoid loss of know-how and *Preserve past knowledge in order to reuse it*
- Improve *quality of projects* and *innovation*
- Improve *relationships with external environment* (e.g. customers, competitors, etc.) and *anticipate their evolution*
- Be ready to *react* to unexpected events and to *manage urgency or crisis situations*.



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Typology of Knowledge (Polyani)

- **Explicit Knowledge :**
can be transmitted in a language ;
can be stated, communicated, and captured in a
writing / talks, in doc, in DB ...
- **Tacit Knowledge :**
known without awareness, difficult to state,
formalise and communicate through language

Typology of Knowledge (Le Bortef)

- **Competence** = validated « know-how-to-act »
- **Theoretical Knowledge :** concepts, schemas, disciplinary knowledge, knowledge on processes, on materials/products, organisational knowledge, social knowl.
- **Procedural Knowledge :** « How-to-do » for an action
- **Procedural Know-How :** enables, after training, to apply, for action, methods / procedures known thanks to procedural knowledge
- **Empirical Know-How :** knowledge coming from action and including lessons from practical experience.
- **Social Know-How**

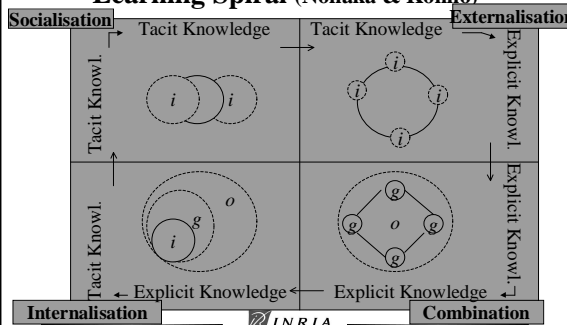
Organisational Knowledge

- It is composed of 4 types of knowledge:
 - * tacit and individual,
 - * tacit and collective,
 - * explicit and individual,
 - * explicit and collective.
- It is dynamic.
- The object of the org. is to create knowledge.
- Knowl. is in centre of organisational dynamics.

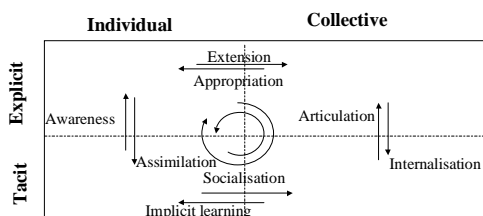
Knowledge Transformation. (Nonaka)

- **Externalisation** : transformation of tacit knowledge into explicit knowledge
- **Internalisation** : transf. of explicit knowl. into tacit (e.g. : learning by action)
- **Socialisation** : creation of tacit knowledge from other tacit knowledge, via observ., imitation, prat.
- **Combination** : creation of explicit knowledge from explicit (e.g. sorting, recategorisation, recontextualisation...)

Learning Spiral (Nonaka & Konno)



Knowledge Transformation (Baumard)



Typology of Knowledge (Baumard)

	Episteme	Techné	Phronesis	Metis
Definition	Abstract generalisation	Capability to achieve a task	Practical and social wisdom	Conjectural and oblique
Nature	Abstract & objective	Abstract & practical	Abstract & practical	Practical, oblique
But	Verity-science	Structure	Wisdom	Result
Method	Abstraction, Deduction, Idealisation	Observation, Study, Recipes	Implicit learning, Socialis.	Combination, Cunning, Intuition, Short cuts



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Action Perimeters

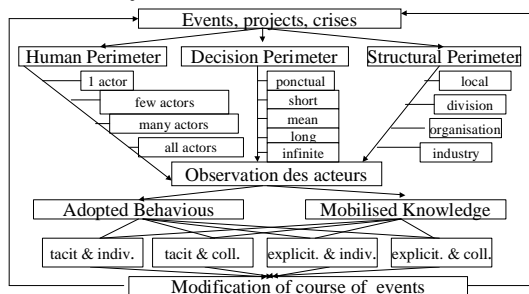
- **Human Perimeter :**
 - individual vs higher nb of individuals vs collective
 - vs more restricted nb of individuals
- **Decision Horizon :**
 - ponctual action (very short and determined term)
 - vs short term vs mean term vs long term
 - vs action questioning the « sole aim » of the org.
- **Structural Perimeter :**
 - immediate environment vs organisational unit
 - vs whole organisation
 - vs action spread to the inter-organisational context



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Analysis Schema (Baumard)




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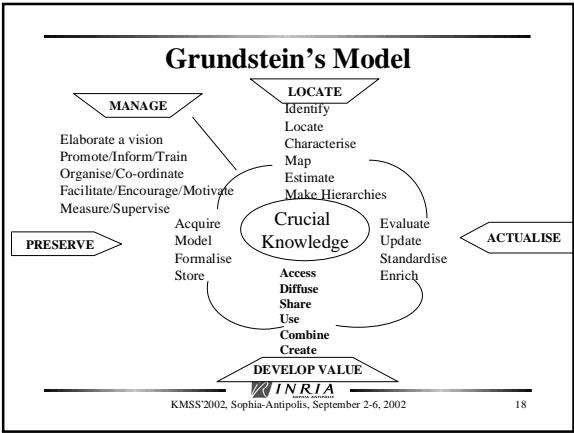
Corporate Knowledge (Grundstein)	
KNOWLEDGE	KNOW-HOW
Explicit, formalised & specialised Knowl.	Tacit, can be made explicit or not, adaptative
<i>Tangible Elts</i> : data, procedures, plans, models, algos, analysis & synthesis doc.	<i>Intangible Elts</i> : talents, abilities, knacks, « job secrets », « routines »...
Heterogeneous , incomplete or redundant Marked by the context of their creation Don't express the « non said »	Acquired by practice , Often transmitted by implicit collective learning or according to a logic « master-apprentice »
Distributed	Localised
Representations of the experience and of the culture de l'entreprise Stored in archives, shelves, computers and head of persons Encapsulated in processes, products and services Characterise capabilities of study, realisation, selling, support of products and services Constitute and produce the added value of organisational and production processes	
	
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Corporate Crucial Knowledge

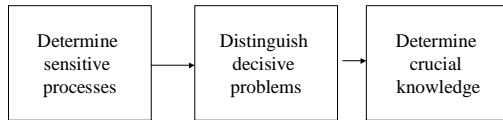
- Knowledge and know-how strictly necessary to development of essential processes that constitute the heart of activities of the company. (Grundstein)



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GAMETH Method (Grundstein)



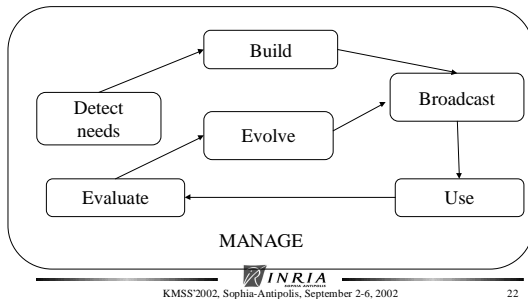
Corporate memory

- Explicit and persistent materialisation of crucial knowledge and information of an organisation in order to **ease their access, sharing and reuse** by the members of the organisation in their individual and collective tasks.
- Individuals + Organisation + Technology
→ Need of a **pluridisciplinary approach**

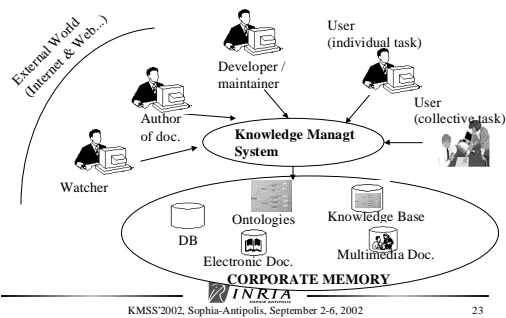
Typology of corporate memories

- Pomian's Typology :
 - Technical Memory
 - Project Memory
 - Managerial Memory
- Tourtier's Typology :
 - Profession Memory
 - Society Memory
 - Individual Memory
 - Project Memory

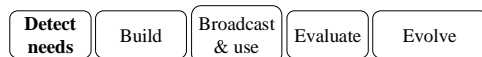
Corporate Memory Lifecycle



Our vision



Detection of Needs



Scenario-guided and users / stakeholders-centred Approach

Organisational Models (intra & inter-organisations)

Models of Enterprise, Task, Activity, Interaction

Detection of Needs

- Inventory of fixtures: Sources of knowl. & info available in the organisation? Quality, volume, availability?
- Objectives of the memory: why and for whom?
- Knowl. to take into account : Tacit vs explicit knowl. ?
- Human, financial and techn. means available for building and maintaining the memory?
- Potential users : profiles, work environment, needs in info retrieval / knowledge sharing in their daily taask and in which context?
- Organisation for diffusion and evolution of the memory?
- Evaluation criteria according to the stakeholders?



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Enterprise Model

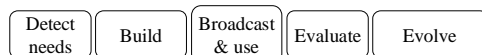
- Organizational structure
- Work processes & production processes
- Strategies
- Resources
- Goals
- Constraints
- Environment
- History
- Intra-enterprise vs inter-enterprises



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Building: some IT Solutions



Competence Map, Lessons-learnt Base

Document-based Memory, Hypermedia System

Knowledge portals

Ontologies, Knowledge Base, Knowledge Book

Knowledge-Based System, Decision-making support system

Workflow Systems

Case-Based system

CSCW tool, Supporting-tool for Communities of Practice

Multi-Agent System



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Methods

- Knowledge engineering Methods : CommonKADS, KOD...
- Dedicated Methods : CYGMA, MEREX, MKSM, MASK, REX...
- Methods from CSCW : QOC, IBIS, DIPA (useful for project memories)



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CommonKADS Method Principles

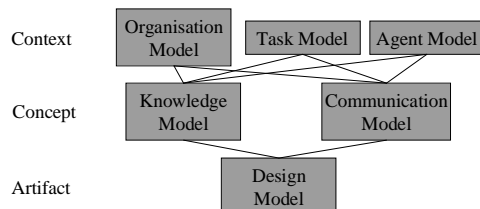
- Knowl. Engineering (KE) is not a kind of mining of expert 's head but consists of constructing diff. aspects models of human knowl.
A model is a purposeful abstraction of some part of reality.
- Knowledge-level principle: in modelling, first concentrate on the conceptual structure of knowl., and leave progr.details later.
- Knowl. has a stable internal structure that can be analysed by distinguishing specific knowl. types & roles.
- A knowl. project must be managed by learning from your experiences in a controlled « spiral way ».



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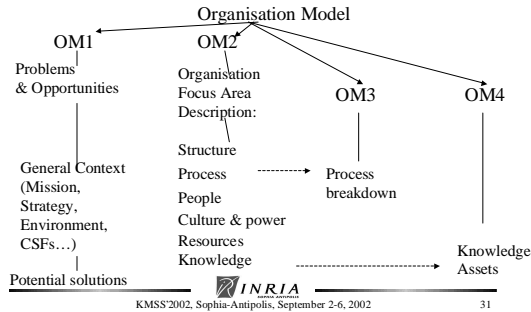
CommonKADS Model Suite



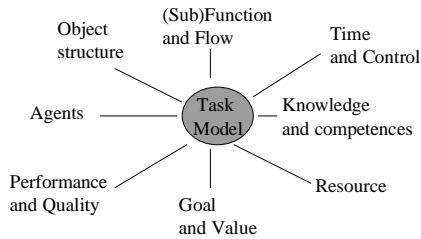
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CommonKADS Organisation Model

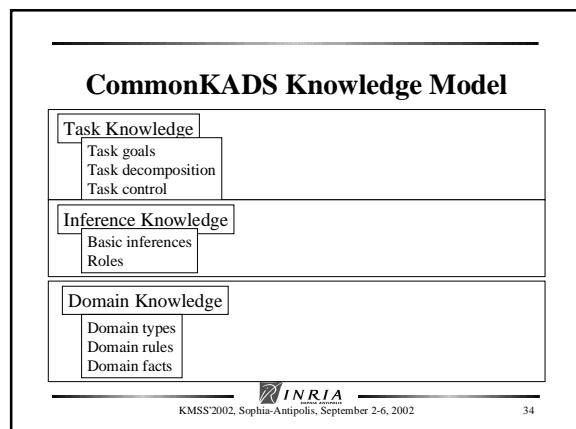


CommonKADS Task Model



CommonKADS Agent Model

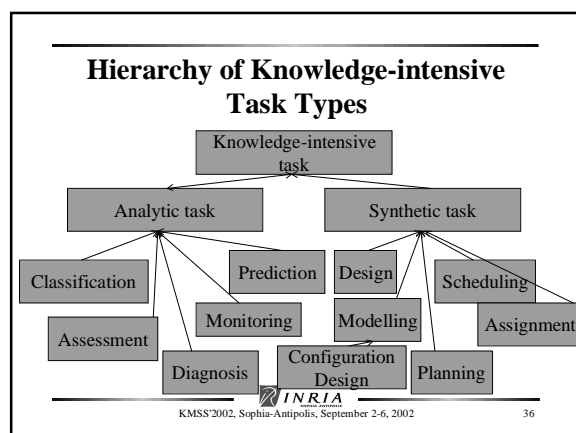
- Organisation
- Involved in
- Communicates with
- Knowledge
- Other competences
- Responsibilities and constraints



Template Knowledge Models

- Need for reuse of knowledge-model elements
- Task templates
- Task types

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MKSM (Ermine)

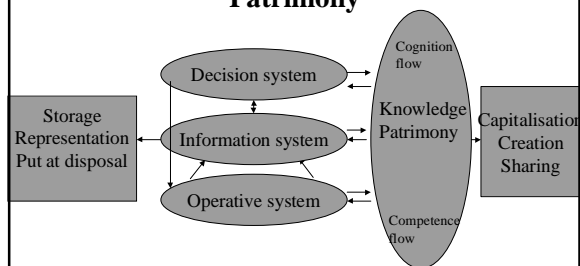
- Systemic approach:
 - Corporate Knowledge is organised as a system (Knowledge patrimony).
 - This system is in constant interaction with the other sub-systems of the organisation.
 - This system is in constant interaction with its environment.



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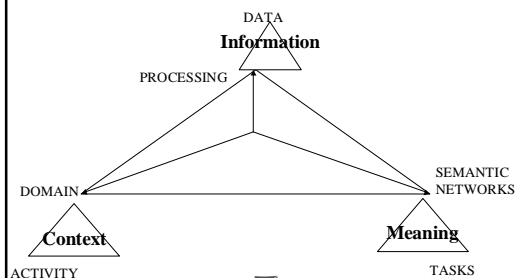
Internal Interactions with the Knowl. Patrimony



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MKSM Macroscopic



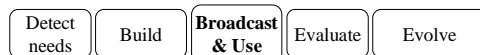
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Knowledge Book

- Hypermedia document containing the MKSM knowledge models obtained after knowledge modelling, and linked to:
 - References
 - (Descriptive, scientific) Forms
 - Plans, documents
 - Images...

Broadcast & Use



Forums, Knowledge Portals

Information retrieval guided by ontologies

Pro-active Dissemination by « push » agents

Query languages

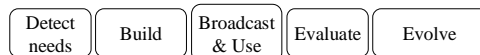
Personalisation, user profiling, collaborative filtering

Machine Learning Techniques, Case-based reasoning

User Interfaces for querying, navigation, user-tailored presentation

Support to cooperative work & communities of practice

Evaluation



Metrics & Evaluation of corporate intellectual capital

Usefulness & utilisability criteria vs ROI vs technical criteria

Scenario-guided and users / stakeholders centred Approach

Evolution

Detect needs

Build

Broadcast & Use

Evaluate

Evolve

Centralised vs distributed evolution (cf. validation, coherence pb)

Coherent, dynamic modification of the memory

Adaptation to **new corporate strategies/contexts/viewpoints**

Cooperative vs automatic evolution

Selective disposal of **obsolete or useless knowledge**

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IntraWeb for Corporate Memory

- **Web technologies** enable wide diffusion of information.
- **Intranets or IntraWebs**, based on Web techno, improve sharing out in companies.
- Need to **access** to competent people, to **retrieve** relevant info in documents, to **discover** useful services, to communicate or **publish so as to share** a specific knowledge....
- Analogy between **Web resources** and the **corporate memory resources**.

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Corporate Semantic Web

- Corporate Memory materialised in:
 - **resources (persons, documents (XML, HTML...), or services, software, materials),**
 - **ontologies** (describing the conceptual vocabulary shared by the organisation communities),
 - **semantic annotations** on these resources (i.e. on **persons' skills, document contents, characteristics of services/software/material),** relying on these **ontologies,**
 - with diffusion on the **intranet or corporate web.**

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Ontologies and Annotations

- Ontologies **capture relevant aspects of meaning of the concepts** used in the appl. scenarios.
- **Ontologies & annotations** can be represented:
 - **AI Knowledge Representation formalisms:**
Frame-based languages (e.g. DAML), Description logics (e.g. OIL), Sowa 's Conceptual Graphs
 - **W3C languages for Semantic Web:**
RDF(S), future **OWL**
→ **Need of standards & interoperability between these languages**



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The Semantic Web

- "The Semantic Web is an **extension of the current web in which information is given well-defined meaning**, better enabling **computers and people to work in cooperation**."
Tim Berners-Lee, James Hendler, Ora Lassila
- **Vision:** Data on the Web must be **defined and linked** in a way that it can be used by **machines** not just for display purposes, **but for automation, integration and reuse of data across various applications**.



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Specificities of CSW w.r.t. SW

- Bounded organisation
 - **Easier agreement** on a corporate policy
 - Easier to build ontologies & annotations
 - Easier to check validity & trust of info sources
 - More precise **User profiles**
 - **Lower scale needed** (document corpora, ontologies...)
- But: **Security & confidentiality constraints**
 - Need of **stability, compatibility & easy integration** with workers' internal environment



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XML (eXtensible Markup Language)

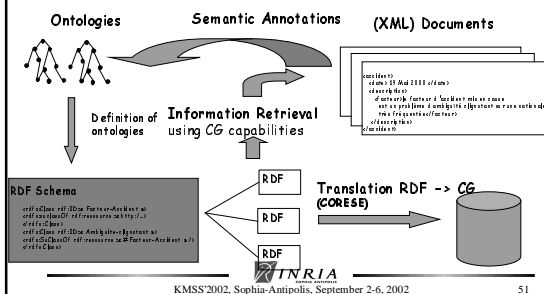
- Description language recommended by W3C for exchanging structured data and documents on the Web
- Separation of the structure of data/documents (XML) and their presentation (stylesheets):
 - “Write once, publish everywhere”
 - Poss. several presentations of the same doc.
- An organisation can agree on a Schema and use XML as *standard for exchange of structured documents and data*.
- Poss. info retrieval guided by *tags* or by *ontologies* and *semantic metadata* (cf. RDF)
- Sophisticated *Hypertext* Links



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CSW-Based Memory



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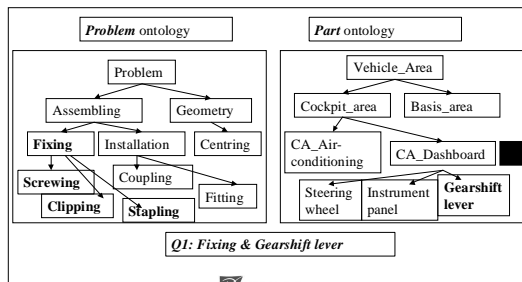
Examples of CSW projects

- CORESE (Conceptual Resource Search Engine)
- CoMMA (Corporate Memory Management through Agents)
- FRODO
- Ontobroker
- Ontoknowledge
- SAMOVAR...

Vehicle Project Memory (RENAULT)

- Objectives : Capitalise knowledge on problems encountered during a vehicle project.
- SAMOVAR Approach :
 - Use a Natural Language Processing Tool on the **textual** fields of the Pb Management System
 - Build an **ontology** (*Problem, Part...*)
 - **Annotate** the problem descriptions with this ontology
 - Use the search engine **CORESE** for info retrieval

Ontology-guided Information Retrieval



Conclusions

- Human + organisational + technical + econ.
+ financial + law aspects →
Pluridisciplinary research:
management science, knowledge
engineering, cognitive psychology /
ergonomics, sociology, linguistics, doc.
engineering, CSCW, data & text mining,
Multi-Agent System...



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Bibliography on KM

- J.F. Ballay. Capitaliser et transmettre les savoir-faire de l'entreprise. Eyrolles, 1997.
- P. Baumard. Organ. déconcertés: La gestion stratégique de la conn. Masson, 1996
- R. Dieng, O. Corby, F. Gandon, A. Giboin, J. Golebiowska, N. Matta, M. Ribière. Méthodes et outils pour la gestion des connaissances, 2ème éd., Dunod, 2000
- R. Dieng-Kuntz & N. Matta eds, Knowledge Management & Organizational Memories, Kluwer Academic Publishers, 2002
- J.L. Ermine. Les systèmes des connaissances. Hermès, 1996
- D. Fensel, Ontologies, the silver bullet of Knowledge Management, 2001
- F. Gandon. DAI & KM: Ontologies & MAS for CSW, PhD Thesis, 2002
- J.M. Fouet. Conn. et savoir-faire en entreprise, intégration et capital., Hermès, 1997.
- J. Lebowitz ed, Knowledge Management Handbook, CRC Press, 1999.
- J. Pomian. Mémoire d'entr., techn. et outils de la gestion du savoir, Sapienta, 1996.
- G. Schreiber et al. Knowledge Engineering and Management: The CommonKADS methodology, MIT Press, 1999.
- M. Zacklad, M. Grundstein eds. Management des connaissances, Hermès, 2001.
- M. Zacklad, M. Grundstein eds. Ingénierie des conn. et capitalisation des conn., Hermès, 2001
- <http://www.inria.fr/acacia>



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Bibliography on Semantic Web

- Proc. of WWW Conferences
- T. Berners-Lee, J. Hendler, O. Lassila, « The Semantic Web », Scientific American, May 2001
- D. Fensel ed, IEEE Int. Syst. Special Issue on Semantic Web, 2001
- F. Gandon. DAI & KM: Ontologies & MAS for CSW, PhD Thesis, 2002
- I. Horrocks, J. Hendler eds, Proc. of ISWC 2002
- Workshops on Ontol., on KM & OM, on Semantic Annotations & Knowledge Markup, or on Semantic Web at ECDL, WWW, IJCAI, ECAI, KCAP...
- <http://www.sop.inria.fr/acacia/Publications/acacia-pub-year.html>



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