Competencies for Project Management: a Knowledge Engineering Approach, Applicable to Service Science

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AGENDA

A. Introduction
B. Project Management (PM) competences
C. PM competence modeling. An ontological approach
D. Protégé – an Ontology editor (**Dinu Mihai-Vaduva, Academy of Economic Studies, Bucharest**)
E. Competence Management Systems (CMS). Applications in Service Science
F. Conclusions

A. Introduction

- Human Resource (HR), a key factor for competitiveness
- Competence management, instead HR management
- The complex structure of the competence profile
- Competence dynamics (Competence lifecycle)
- Education and Training , as processes for competence development; competence-based Education and Training
- Knowledge Engineering for competence management. Ontology-based Competence Management Systems
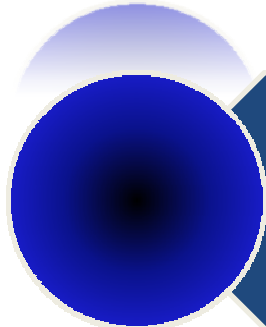
Competence definition

- Competence is a collection of knowledge, skills, personal attitudes and relevant experience needed to be successful in a certain function/role.

- Perspectives of competence:
    - Theoretical (as a structure that facilities a certain behavior) vs. operative perspective (as the ability to manage complex unpredictable situations)
    - Attribute-based vs. performance based

Competence dynamics

Initial Education
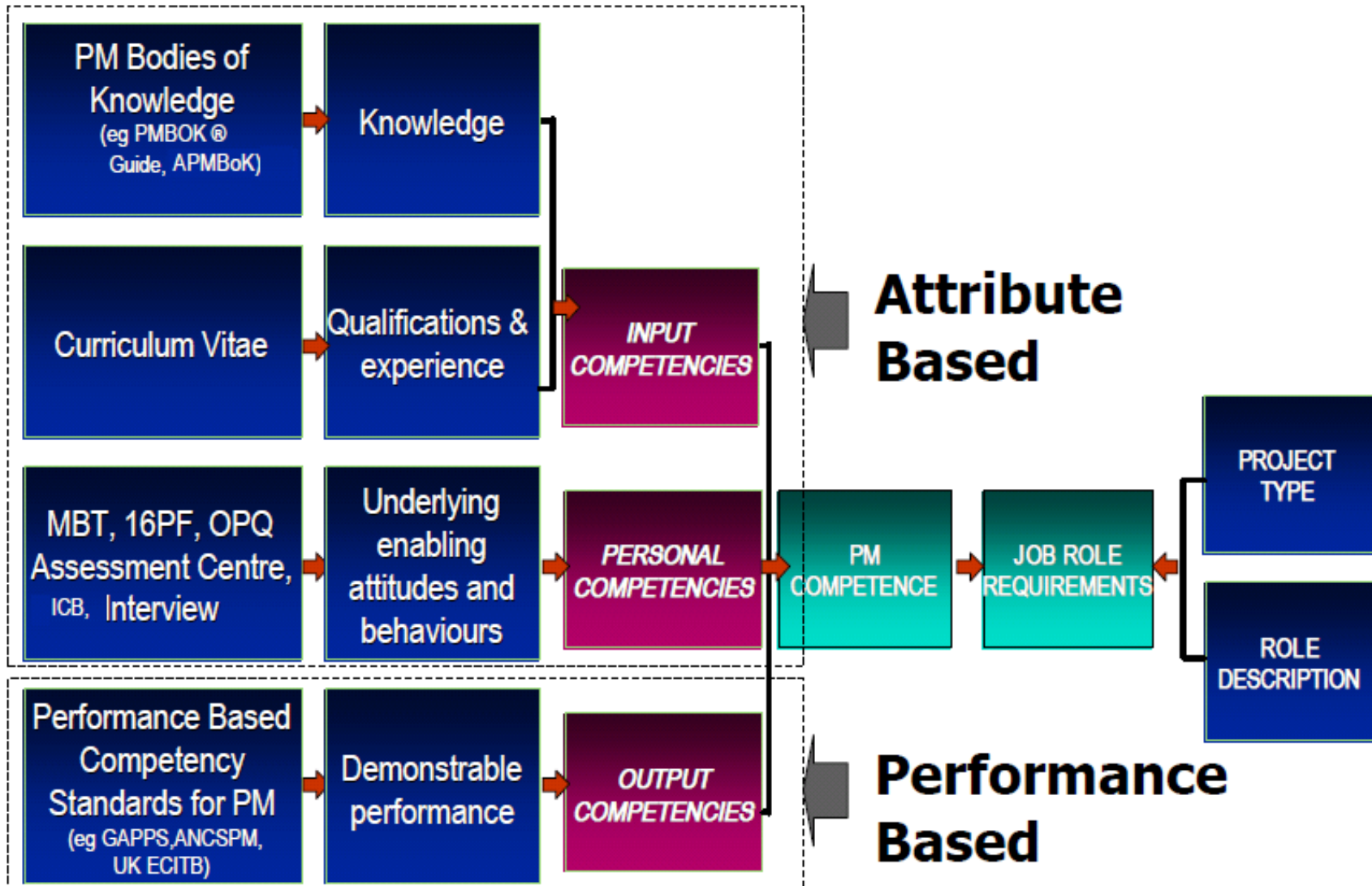
Lifelong learning (formal si informal learning)

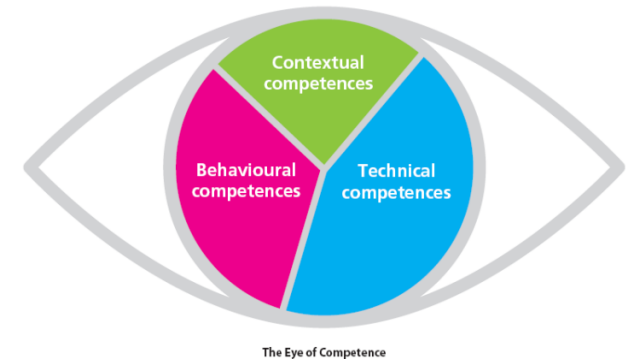Competence assessments , such as certification

Competence-based Curricula (*MIP Program Example*)

- *Applying* project management techniques related to project objectives, risks and opportunities, quality, organization, time, resources, costs, procurement, stakeholders, project success, results-orientation, motivation, communication, leadership, negotiation, and consultation
- *Applying* management techniques and tools in project-oriented organizations
- *Developing* project proposals
- *Developing* project information and communication infrastructure
- *Innovating* project management domain

B. Project Management (PM) competences

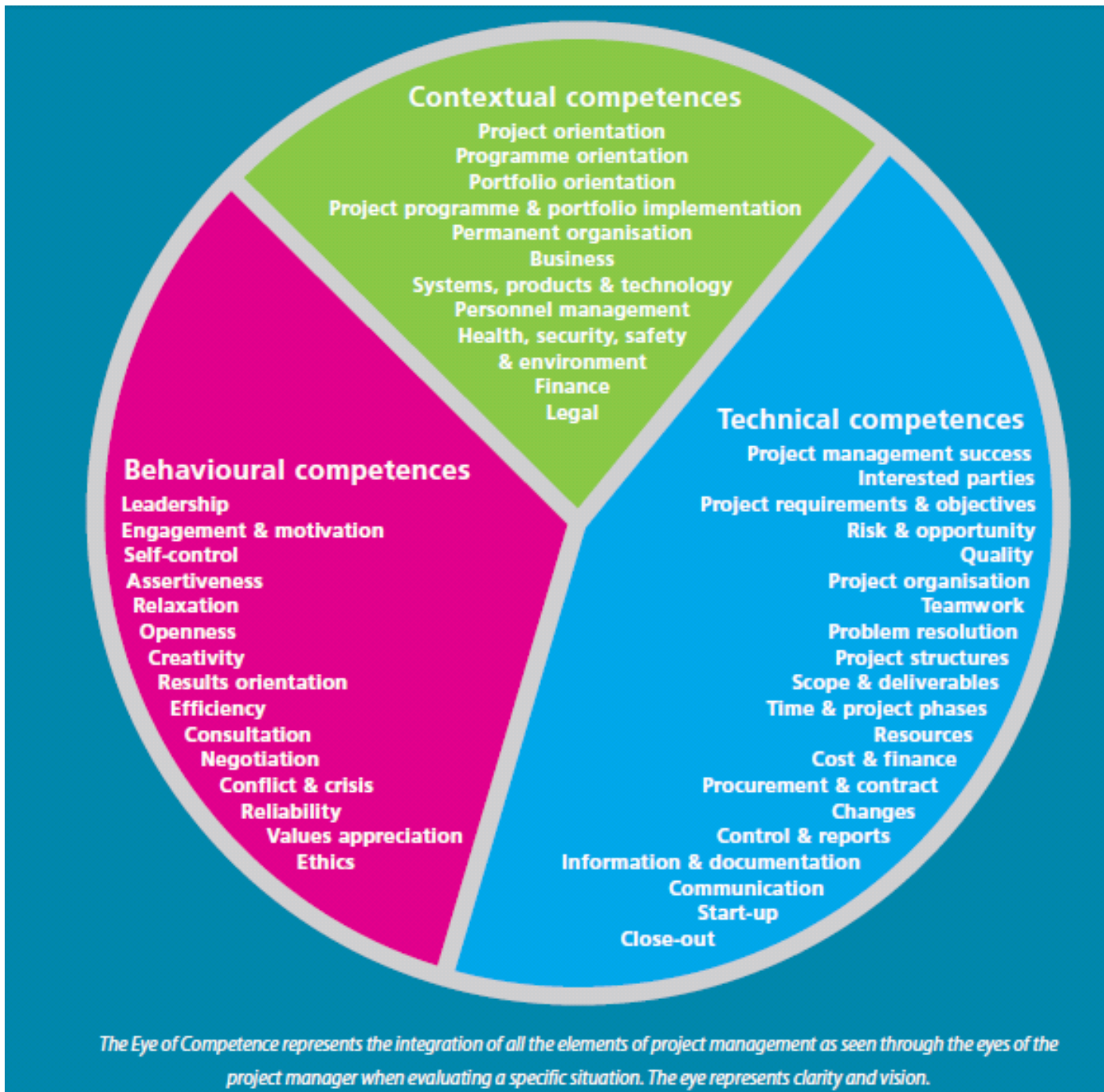# International Competence Baseline – ICB (IPMA Standard)

Technical	Behavioral	Contextual
Personal Attitudes		
Skills		
Experience		
Knowledge		

The Eye of Competence

http://pm.org.ro/ICB-V-3-0/ICB-V-3-0.pdf

PM competences *components:*
• *Knowledge* (generally accepted practices of project management).
•*Skills* (the capability to apply knowledge in an efficient, effective, professional, and successful manner)
•*Personal Attitude (t*he commitment to perform in an appropriate and acceptable manner)
•*Experience* (knowledge or skill that is gain from doing an activity)

PM competence *categories*
•*Technical competencies,* in executing project management process
•*Contextual competencies* in managing relations with projects within organisations
•*Behavioural competencies*

Contextual competences
Project orientation
Programme orientation
Portfolio orientation
Project programme & portfolio implementation
Permanent organisation
Business
Systems, products & technology
Personnel management
Health, security, safety & environment
Finance
Legal

Behavioural competences
Leadership
Engagement & motivation
Self-control
Assertiveness
Relaxation
Openness
Creativity
Results orientation
Efficiency
Consultation
Negotiation
Conflict & crisis
Reliability
Values appreciation
Ethics

Technical competences
Project management success
Interested parties
Project requirements & objectives
Risk & opportunity
Quality
Project organisation
Teamwork
Problem resolution
Project structures
Scope & deliverables
Time & project phases
Resources
Cost & finance
Procurement & contract
Changes
Control & reports
Information & documentation
Communication
Start-up
Close-out

The Eye of Competence represents the integration of all the elements of project management as seen through the eyes of the project manager when evaluating a specific situation. The eye represents clarity and vision.

Categories:
- 20 technical
- 15 behavioural
- 11 Contextual

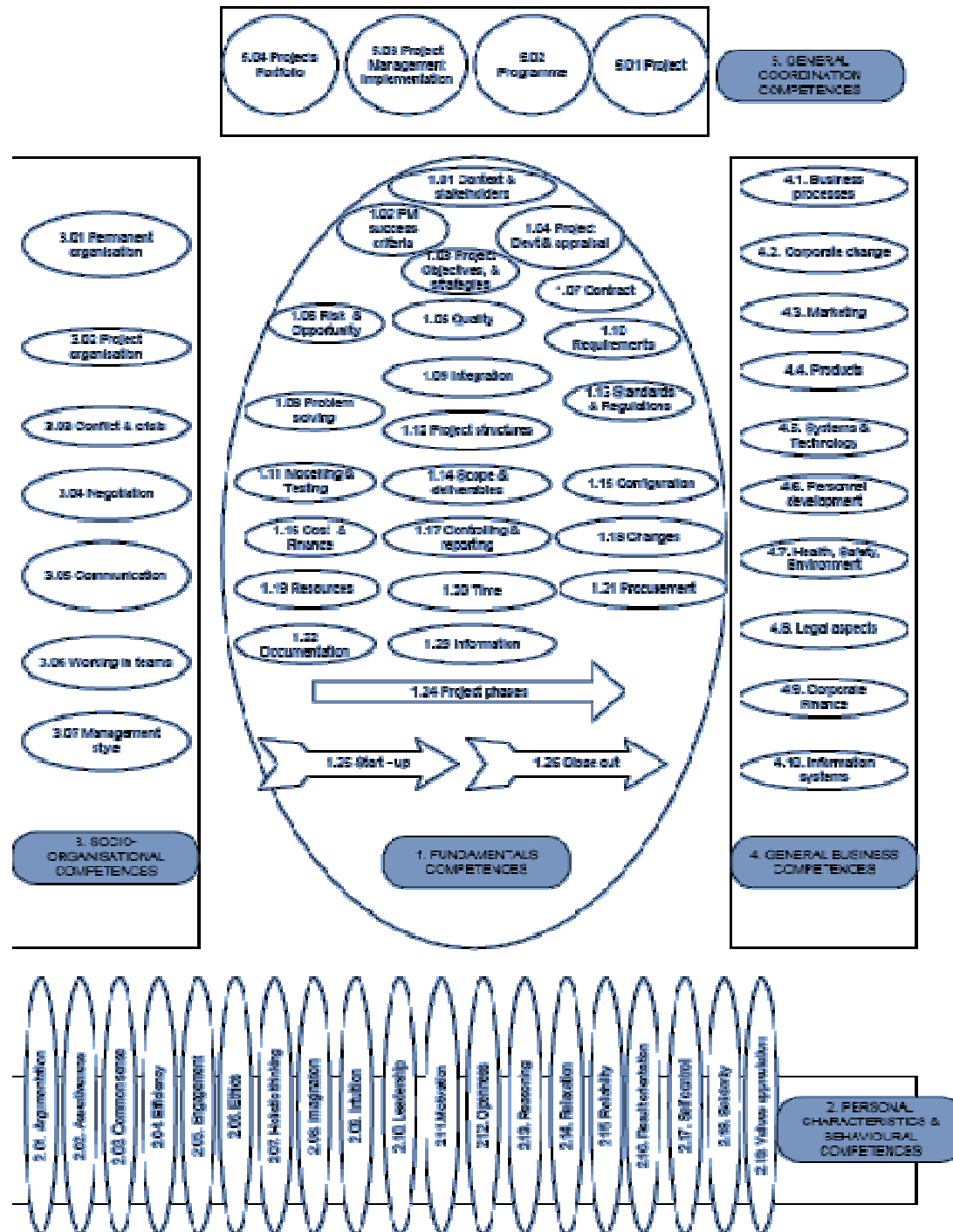**Levels**:
- Level A
- Level B
- Level C
- Level D

Grades:
0 - no
1-3 low
4-6 medium
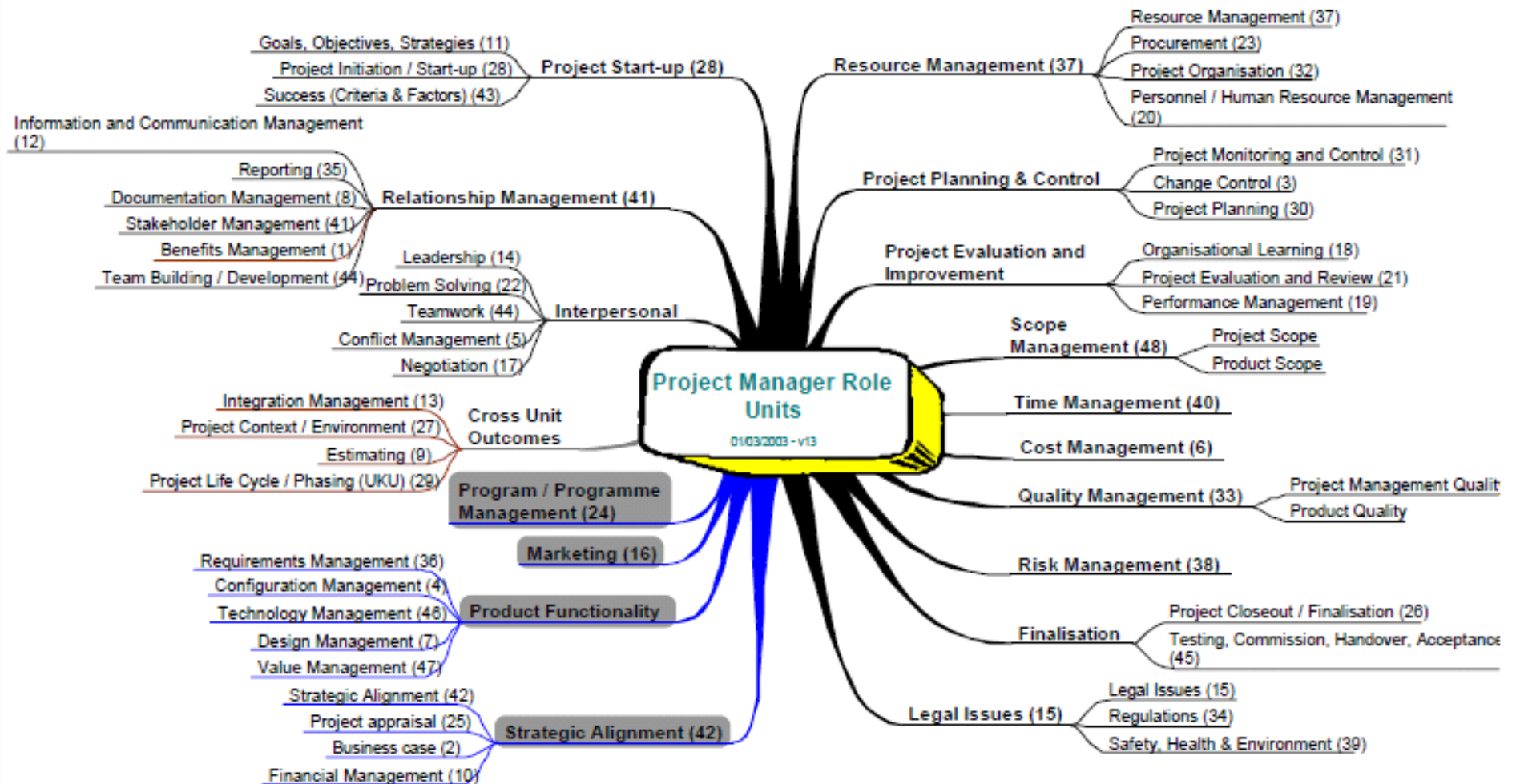7-9 high
10 exceptional

Competence Element Description

- General description
- Topics addressed
- Possible process steps
- Key competence at level
- Main relations
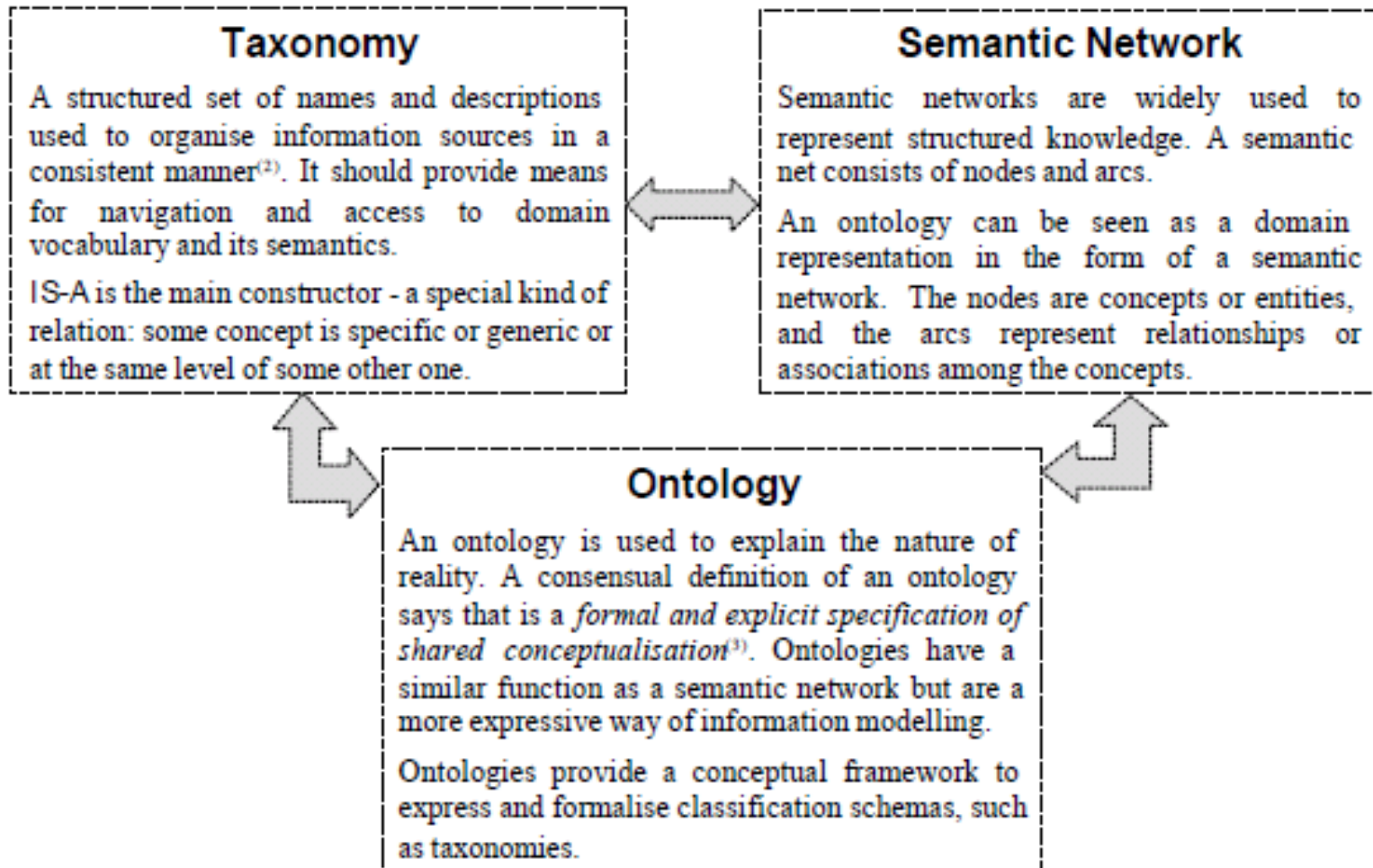
Example (pag.40)

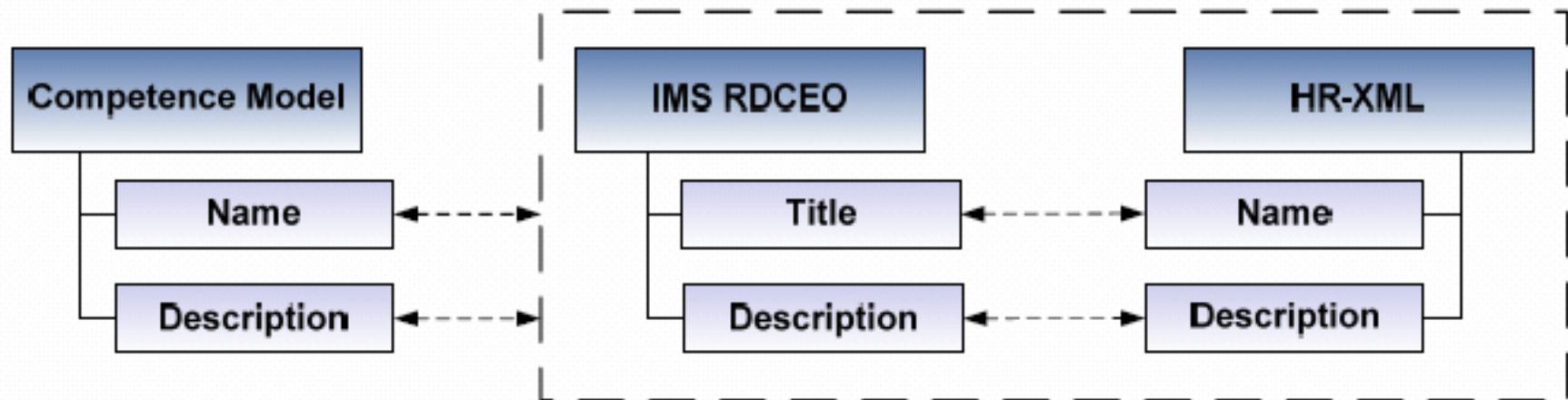# Project Manager (PMI Standard)

Project Manager (GAPPS Standards)

Manager de proiect (COR 241919)

Categorii de competențe	Nr. crt.	Titlul unității
SPECIFICE OCUPAȚIEI	1	Stabilirea scopului proiectului
	2	Stabilirea cerințelor de management integrat al proiectului
	3	Planificarea activităților și jaloanelor proiectului
	4	Gestiunea utilizării costurilor și a resurselor operaționale pentru proiect
	5	Realizarea procedurilor de achiziții pentru proiect
	6	Managementul riscurilor
	7	Managementul echipei de proiect
	8	Managementul comunicării în cadrul proiectului
	9	Managementul calității proiectului

C. PM competence modeling. An ontological approach

Taxonomy

A structured set of names and descriptions used to organise information sources in a consistent manner[2]. It should provide means for navigation and access to domain vocabulary and its semantics.

IS-A is the main constructor - a special kind of relation: some concept is specific or generic or at the same level of some other one.

Semantic Network

Semantic networks are widely used to represent structured knowledge. A semantic net consists of nodes and arcs.

An ontology can be seen as a domain representation in the form of a semantic network. The nodes are concepts or entities, and the arcs represent relationships or associations among the concepts.

Ontology

An ontology is used to explain the nature of reality. A consensual definition of an ontology says that is a *formal and explicit specification of shared conceptualisation*[3]. Ontologies have a similar function as a semantic network but are a more expressive way of information modelling.

Ontologies provide a conceptual framework to express and formalise classification schemas, such as taxonomies.

Mapping between Competence Model and Competence Specifications

Ontological approach

Ontology is a high level formal and explicit specification of a shared domain conceptualisation (Gruber 1993).

A domain conceptualisation is a particular and abstract view about real entities and events and their relationships.

- **Formal** - an ontology is a form of knowledge representation and has a formal software specification to represent such domain conceptualisations, i.e. an ontology has to be machine readable.
- **Explicit** - all types of primitives, concepts, and constraints used in the ontology specification are explicitly defined.
- **Shared** - the knowledge embedded in ontologies is a form of consensual knowledge, that is, it is not related with the individual, but accepted by a group.

Competence Ontology

- Well defined competences (types, levels)
- Well defined competence relationships (composition, generalization, subsuming)
- Context-specific refinement of ontology frameworks
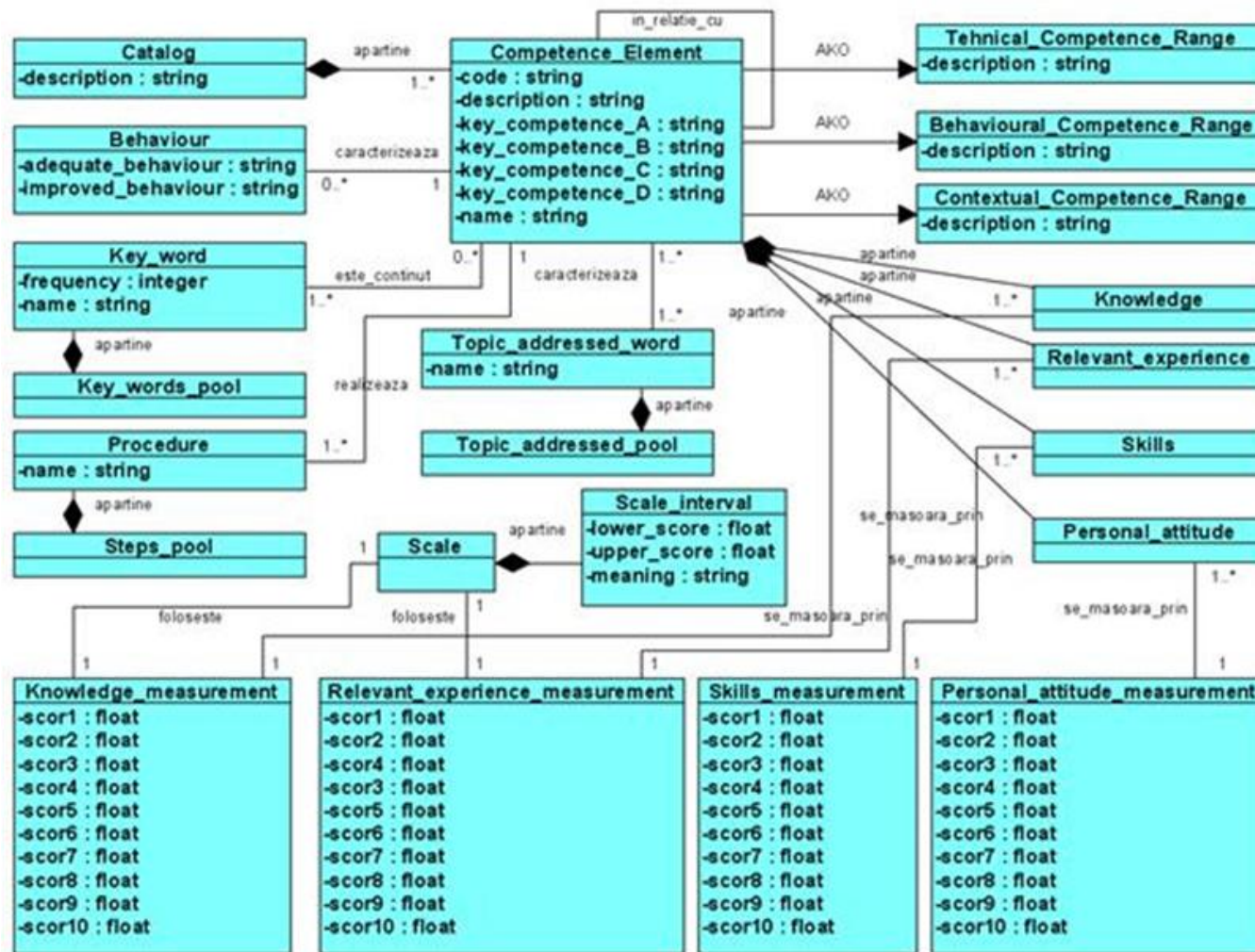
Competence Model/Catalog – an example
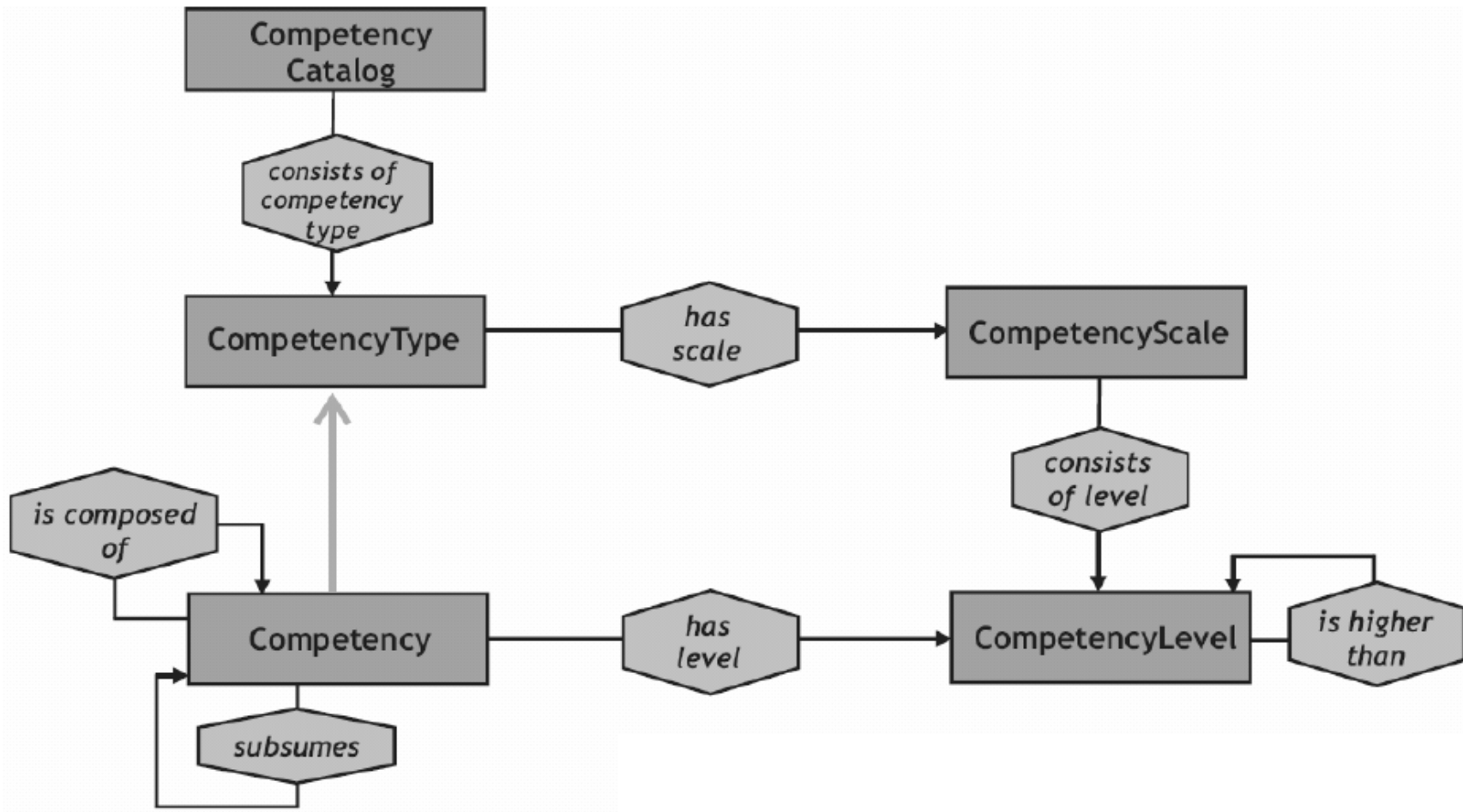
(Source: Andreas Schmidt, 2006)

Protégé - an Ontology editor
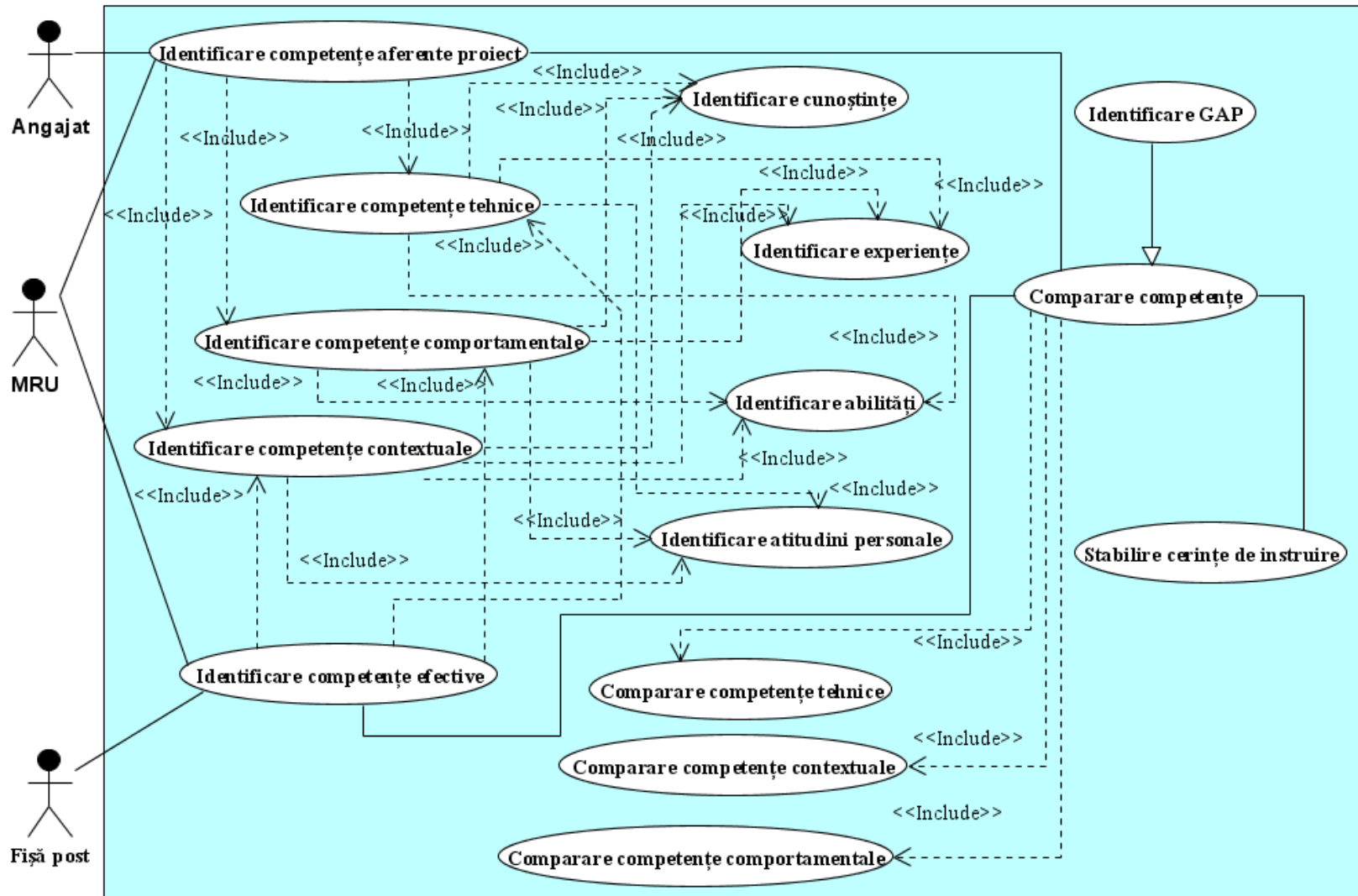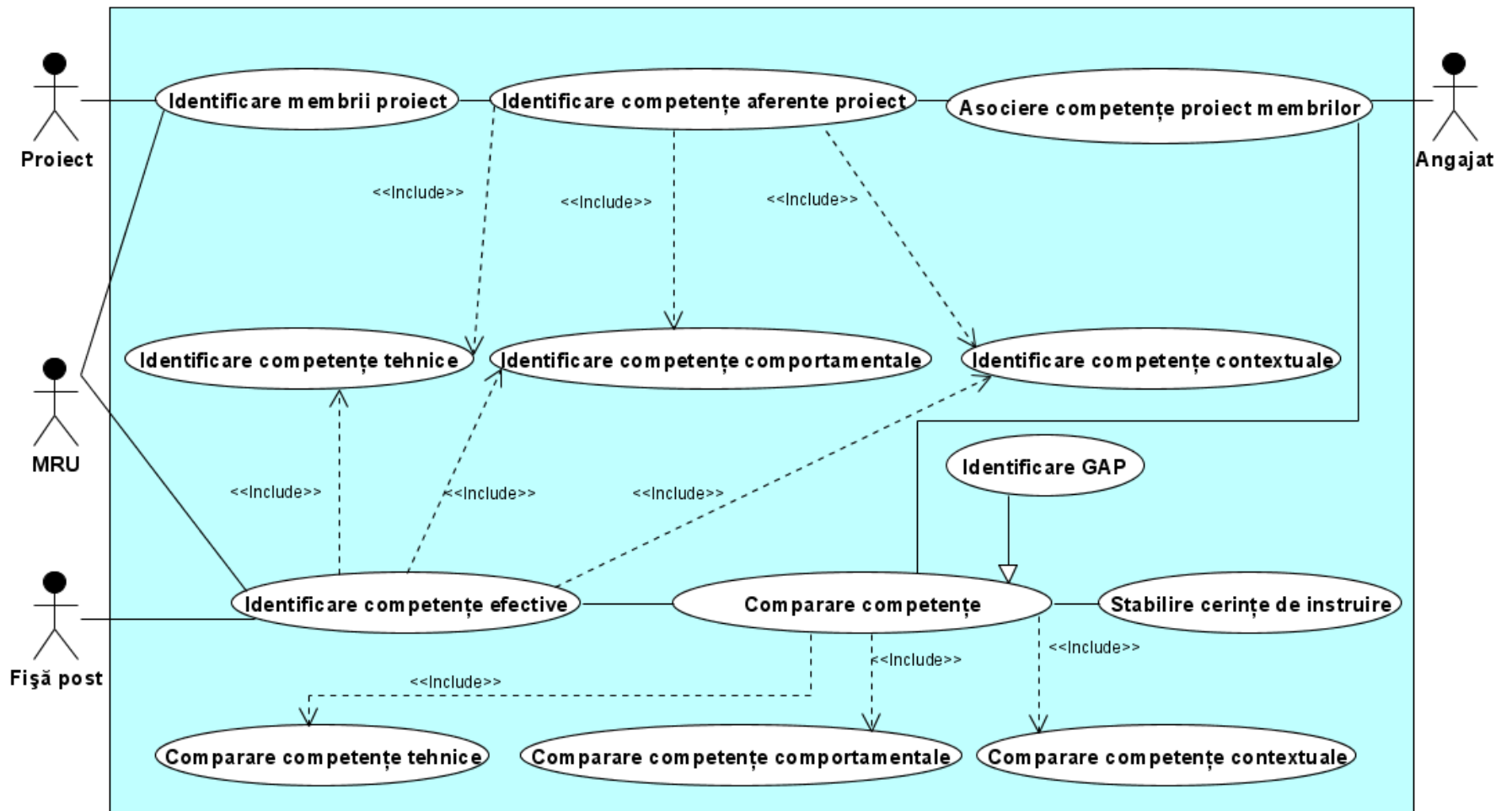## (Dinu Mihai-Vaduva)

Online tutorial:

http://www.gridnet.ro/csie/Index.html

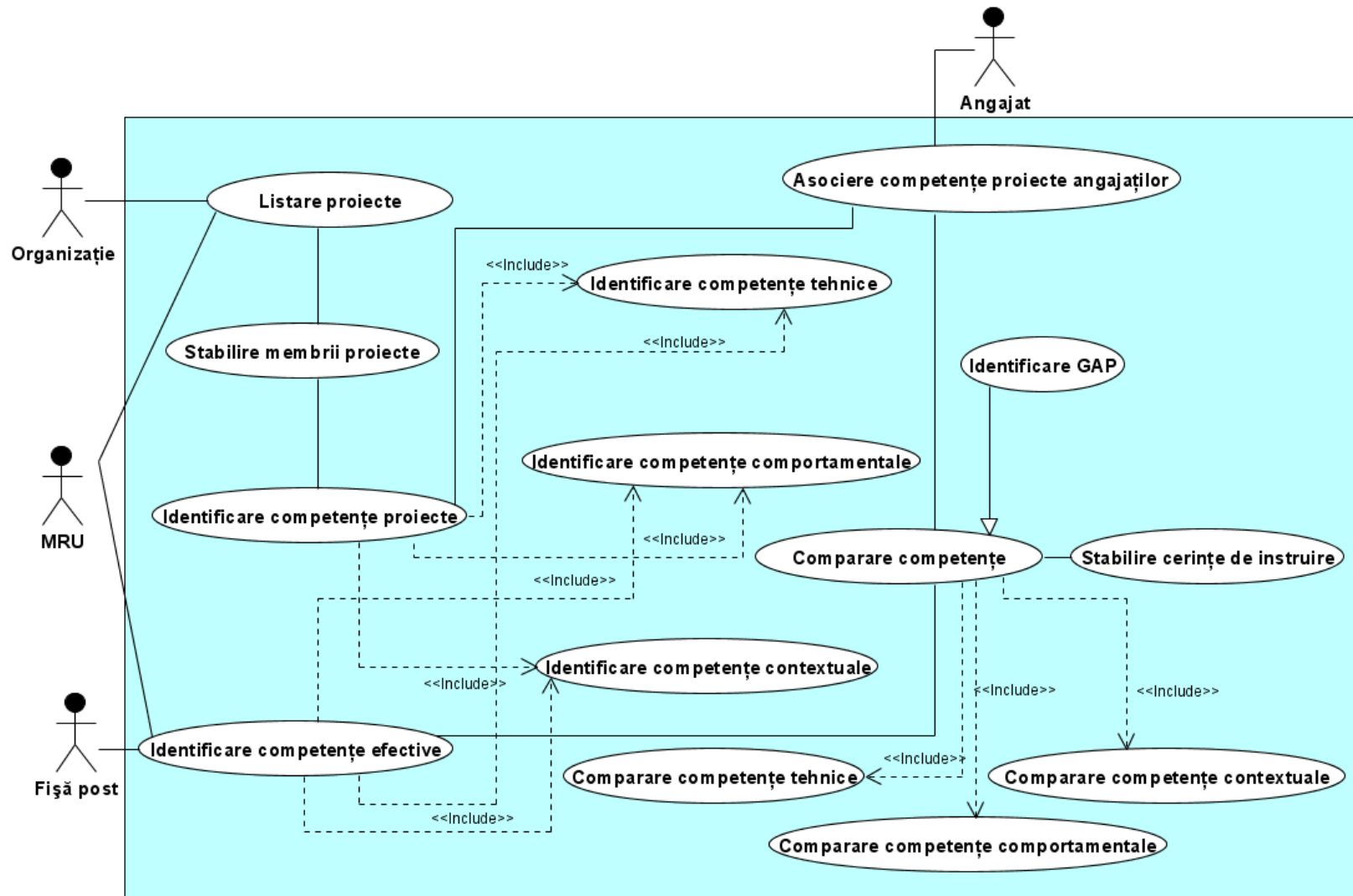# PM Competence Catalog : the Class Model

(in line with IPMA ICB, 2006)

PM Catalog – the Use Cases

Ontology Query

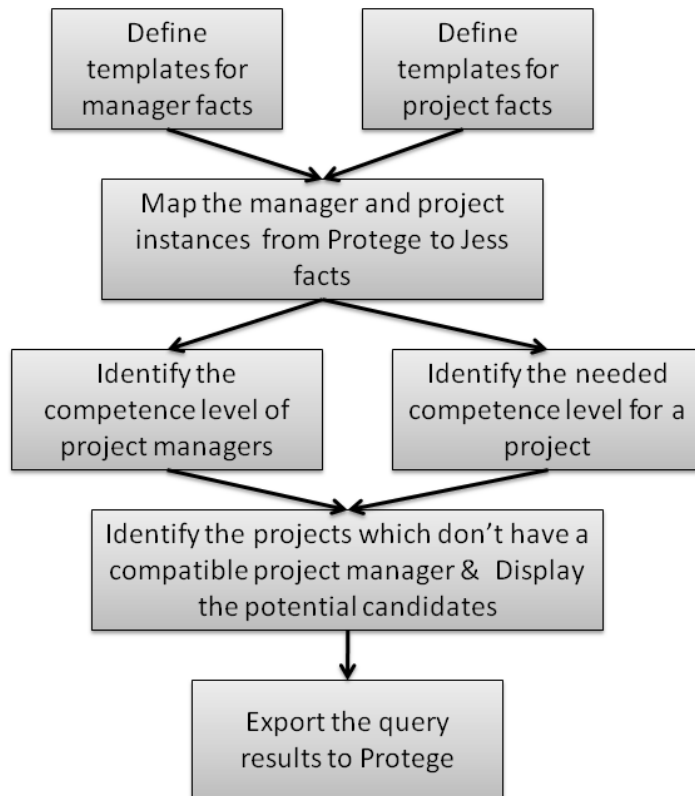**1 Ionescu Ion   (instance of Manager , internal name is PM-Catalog_Instance_100055)**

Nume: Ionescu
Prenume: Ion
Id manager proiect: 1

Punctaj cunostinte tehnice: 7.0
Punctaj cunostinte comportament: 6.0
Punctaj cunostinte contextuale: 6.0

Luni proiecte complexe: 100
Luni proiecte necomplexe: 60

Punctaj Experienta: 6
Punctaj Total:
Nivel:

Instance of a Project Manager

4 A   (instance of Proiect , internal name is PM-Catalog_Instance_100063)

Id proiect: 4
Denumire Proiect: A
Id manager proiect:

Scor obiective, evaluare rezultate: 4.0
Scor parti interesate: 2.0
Scor context cultural social: 2.0

Scor grad inovare: 4.0
Scor structura proiect: 4.0
Scor organizatia proiect: 4.0

Scor leadership: 3.0
Scor resurse: 3.0
Scor riscuri: 2.0

Scor metode: 4.0
Scor Total: 0.0
Nivel Solicitat:

Instance of a Project

Flowchart:

- Define templates for manager facts
- Define templates for project facts
- Map the manager and project instances from Protege to Jess facts
- Identify the competence level of project managers
- Identify the needed competence level for a project
- Identify the projects which don't have a compatible project manager & Display the potential candidates
- Export the query results to Protege

|	**Use Case 1**	**Use Case 2**
Query	Identify the needed competence level of a project manager to successfully conduct project A.	Identify all the projects which don't have a compatible project manager and display the managers who have the needed competence level.
Results	Being a complex project, project A (id 4) needs a B-level project manager.	The project C (id 6) needs a B-level manager and has no such compatible manager. The associated manager is Popescu Valise, who is a D-level certified manager. The compatible managers for this project are: Lupu Andreea (B level) Ionescu Ion (B level) The project CONTO (id 3) needs a B-level manager and has no such compatible manager. The associated manager is Popescu Ion, who is a C-level certified manager. The compatible managers for this project are: Lupu Andreea (B level) Ionescu Ion (B level)

D. Competence Management Systems (CMS). Applications in Service Science

A CMS Architecture
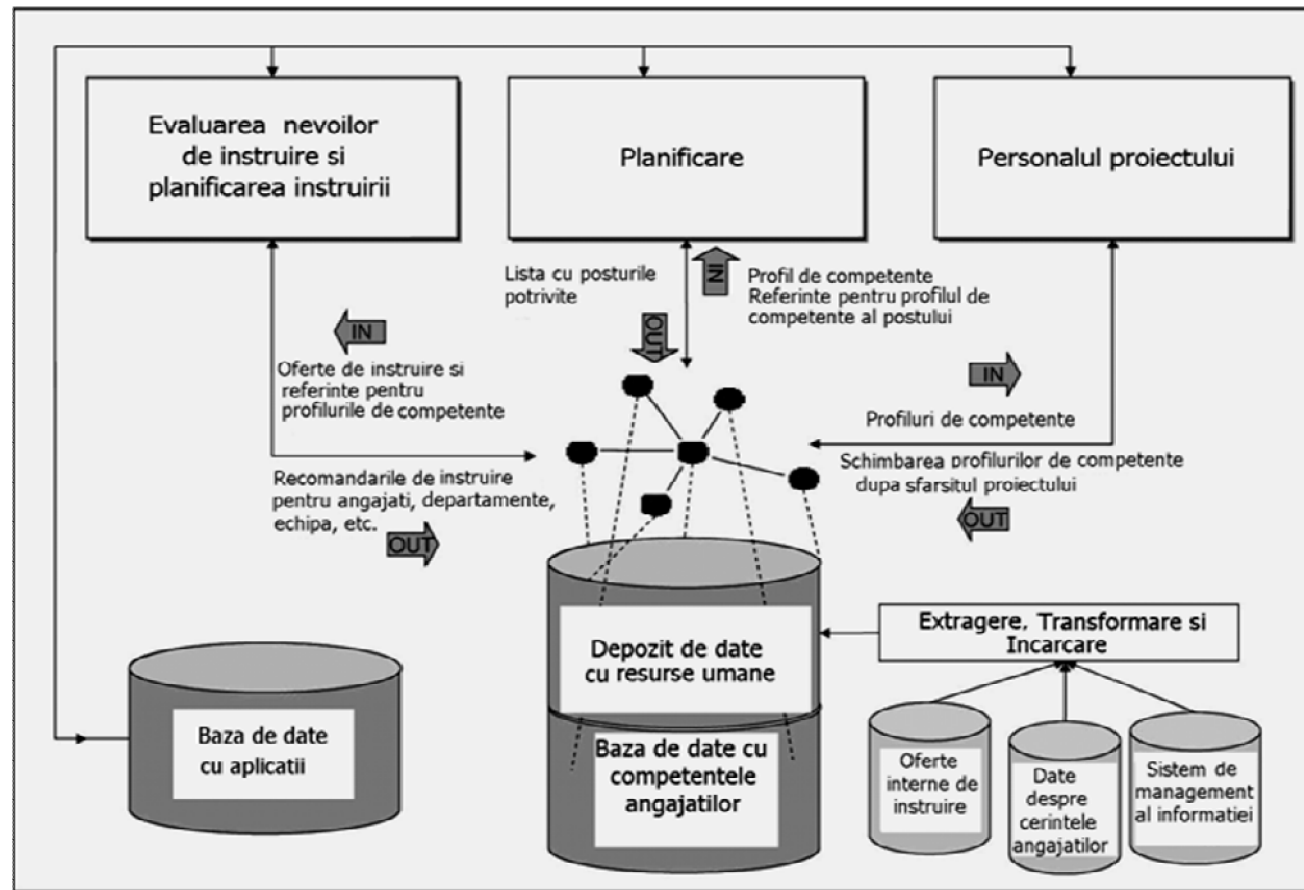
The CMS for IT Services
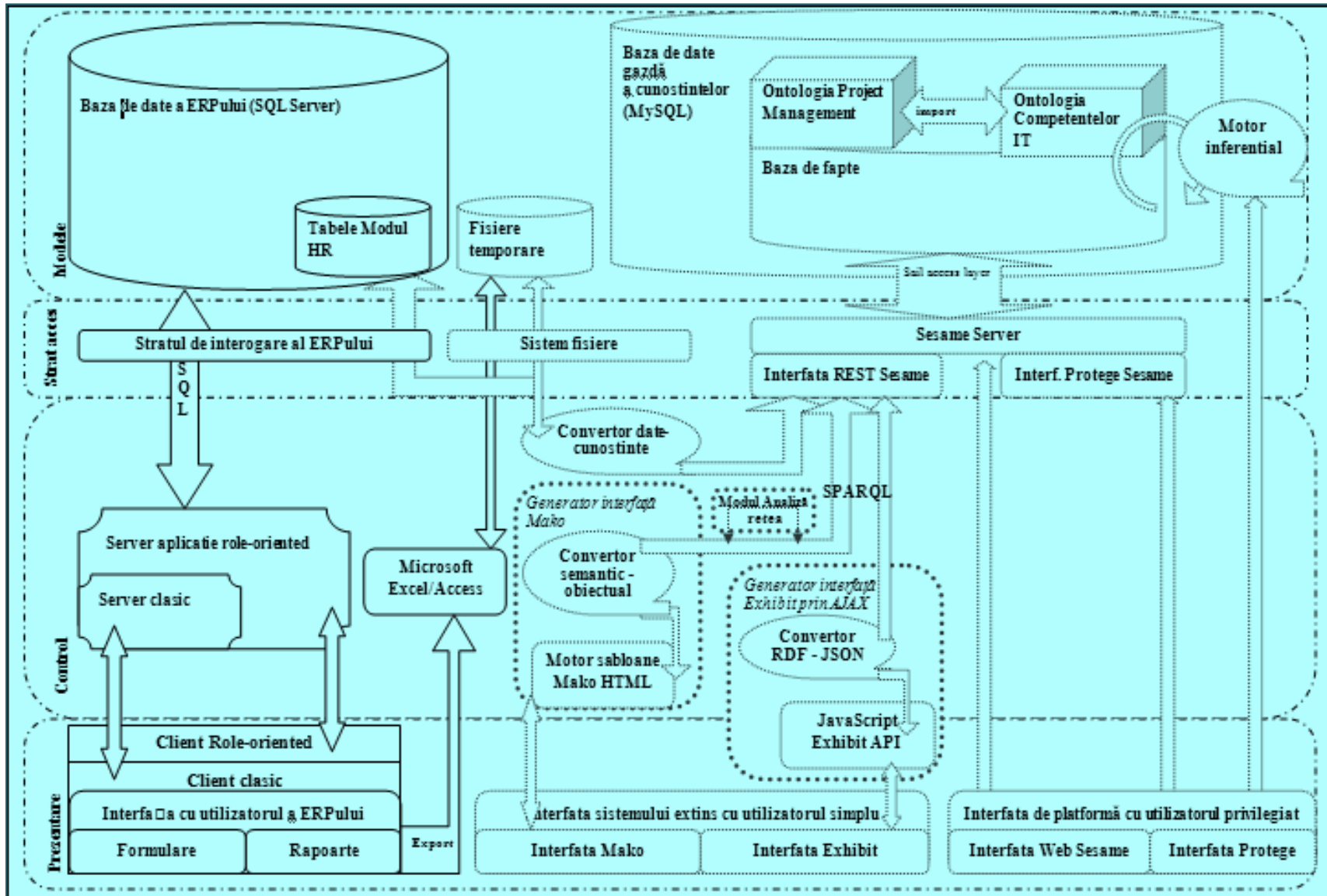
(developed for SC NET BRINEL SA, in the framework of CONTO project)

F. Conclusions

- In competence management system development, the knowledge engineering approach is relevant due to the competence concept complexity and the multiple competence management processes involved.
- PM competences are relevant for service sector, considering the project-oriented organization of the processes.
- PM competence modeling should be consistent with standards defined and applied in the PM profession.
- PM catalog should be integrated in a CMS, part of the enterprise information system.

Thank you!