COMPETENCE MODELING AND MANAGEMENT: A CASE STUDY

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Abstract: This paper presents a novel approach to the enterprise competence management and a case study. This approach is based on a model called CRAI (Competency-Resource-Aspect-Individual) which allows representing enterprise personnel's competencies. On the other hand, the paper provides a generic competency management process in which the CRAI model plays the central role. The proposed case study is part of a real project developed with the partnership of a French enterprise in the manufacturing domain.

1 INTRODUCTION

Competency management is becoming a critical necessity in enterprises to make a better appraisal of human capital, to envisage and plan execution of new missions, to tack highly innovative projects, or to decide about a new organization structure (Hamel and Heene, 1994), (Prahalad and Hamel, 1990), (Dubois, 1993).

To support competence management, we have developed a generic and operational model, named CRAI (Competency – Resource – Aspect – Individual). It is applicable to a wide range of organizations, to various application domains and for different needs. Fundamental concepts underlying the notion of competence are formalized and structured in the CRAI model. The notion of competence seems to get stabilized in the literature and to converge towards the following definition: a *competence is the effect of combining and enabling operational use of its resources (i.e., knowledge, know-how, and behaviors) in a given context to achieve an objective or fulfill a specified mission* (Lucia and Lepsinger, 1999), (Marreli, 1998), (Le Boterf, 1997). Four fundamental features has been identified: (1) competence is distinguished in competence required by an enterprise and competence acquired by individual people (working in or for the enterprise), (2) resources falling into categories and sub-categories and used for describing a competency, (3) a description of the context to which the competency refers, (4) mission or task requiring the competency (Harzallah and Vernadat, 2002).

The objective of this paper is to show through a case study based on a real project, how the proposed CRAI model can be used for providing an effective support to competency management. Section 1 just provide an overview of the technical framework used to realize the CRAI model. Section 2 describes the main components and organization of our competence modeling and exploiting approach. Section 2.1 presents a generic competence management process and its links with the CRAI model. The section 3, 3.1 and 3.2 shows, using a case study, the application of the approach proposed in Section 2.1.

2 MODELING FRAMEWORK

The main concepts underlying the notion of competency have been represented, first, by using the simple Extended Entity-Relationship model expressed in the notation suggested by Nanci et al. (Nanci et al., 1992). Second, these concepts have been formalized by means of the set theory i.e. using

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sets, mappings, relationships, and axioms to define relevant semantic rules.

To support and enhance competence management, typical needs raising in the competence management have been identified. For instance, the usual ones is to find a group of personnel to accomplish a given mission, to identify training and recruitment needs, to transform/adapt job positions, to identify common competencies between projects and trades, to identify acquired enterprise competencies, to orient decision changes to be made.

On this base, we have defined eight general-purpose inquiries. In general, inquiries are formulated in terms of activities, tasks, missions, objectives that an enterprise wants to successfully accomplish and for which the enterprise needs to know required and also acquired personnel's competencies.

For each inquiry (Q), we have defined a generic answering method (M). An inquiry is basically a function defined through inputs, outputs, and an algorithm.

Figure 1 below just provides an example of how the concept of competency has been formalized in term of set theory, with some axioms.

Competency Mappings

C-Reference: Competency → Label
C-Description: Competency → Label
Concern: Competency → P (Aspect) - {ϕ}
Is-Associated-to: Competency → P (C-Resource)
Use-enabling-Res: Competency → P (C-Resource)
Resource-Set: Competency → P (C-Resource) - {ϕ}
Nb/Level/C: (Competency x Aspect)→ (Integer → Integer) ∪ {⊥}
+Competent: Competency ∏ P (Individual x Individual)

Axiom 3 definition

∀ r ∈ C-Resource, ∃ a ∈ Aspect/ (A-Knowledge (r) = (a, *) ∧ A-Know-how (r) = ⊥ ∧ A-Behavior (r) = ⊥) ∨ (A-Knowledge (r) = ⊥∧ A-Know-how (r) = (a, *, *) ∧ A-Behavior (r) = ⊥) ∨ (A-Knowledge (r) = ⊥∧ A-Know-how (r) = ⊥ ∧ A-Behavior (r) = (a, *, *)))

Definition of the method $M1c_{Q1}$ for Q1 (finding the required resources for a given mission)
$M1c_{Q1}$: P (Aspect) → P (Competency)
The algorithm of method $M1c_{Q1}$ is the following:
let D = DeCompose (Mission), Mission ∈ P (Aspect)
$M1c_{Q1}$(Mission) = {c ∈ Competency| S ∈ D ∧ c = Comp (S) ∧ Decomposed-In (c)= ϕ}

Figure 1: Example of concept mapping, axiom and method definition

3 CRAI Model AND COMPETENCY MANAGEMENT

The Entity-relationship representation of the CRAI (Competency, Resource, Aspect, Individual) model is depicted by Figure 2. Two entities are specific to the competence domain: *Competency* (for instance, "to be competent for machine X") and *C-Resource* for competence resources (for instance, "to know how to remove components on machine X"). C-resource can be understood as basic knowledge, or know-how or behavior concerning a specific enterprise aspect and that can be used for precisely identifying and understanding what a competency is. Another entity, *Individual*, represents the personnel set of the enterprise. The entity *Aspect* represents the contextual information, i.e., the enterprise components and feature comprising several additional concepts, especially business processes, organizational aspects, economic aspects, information aspects, etc., as developed in the enterprise modeling field (Williams, 1994), (Vernadat, 1996), (IFIP-IFAC, 1997). In the CRAI model, it is possible to link a resource to an occurrence of the Competency entity by means of one of the specific relationships named *To-Know*, *To-Know-how*, and *To-Behave*. It has been decided to consider the entity Competency as one of the sub-entities of the entity Aspect: this allows to take into account, among other things, *use-enabling resources of* a competency, which are formulated as, for instance, "to know how to manage resources of a competency C1". The use of a specific relationship, named Decomposed-In, allowing to represent a whole-part relationship between aspects, is useful to compose and decompose any aspect and also competency.

Four mappings are defined for quantitative competency management: Nb/Level/C and Nb/Level/R, Acquire-C and Acquire-R. Nb/Level/C (Nb/Level/R) allows specifying for a given domain and for each required level of a given competency (resource), the number of people required. Acquire-C (Acquire-R) allows specifying the level of mastery of a given competency (resource) by a given individual.

The other important relationship is Dm. This relationship is needed to represent a kind of "implication" between distinct competencies. In other words, Dm represents the natural fact that "a specific enterprise aspect X" needs some competencies on "a specific enterprise aspect Y". This fact has therefore been represented as a special relationship between X and Y.

According to the entity-relationship representation of CRAI, the competency management process follows iteratively the steps depicted in Figure 3. In the first (initial) run, the two steps suggests to specialize with enterprise specific concepts (entities) the root entity Aspect and then to instantiate (i.e. creating for all the entities in the model, their occurrences) the resulting model. Instantiation also needs to set up some quantitative parameters. In fact, in the CRAI model it possible to specify a degree associated to required and acquired competencies. More precisely, it is possible to define for the personnel, a degree of mastering a given resource. Through a formula, per each employee, is therefore possible to calculate the degree of mastering of a competency.

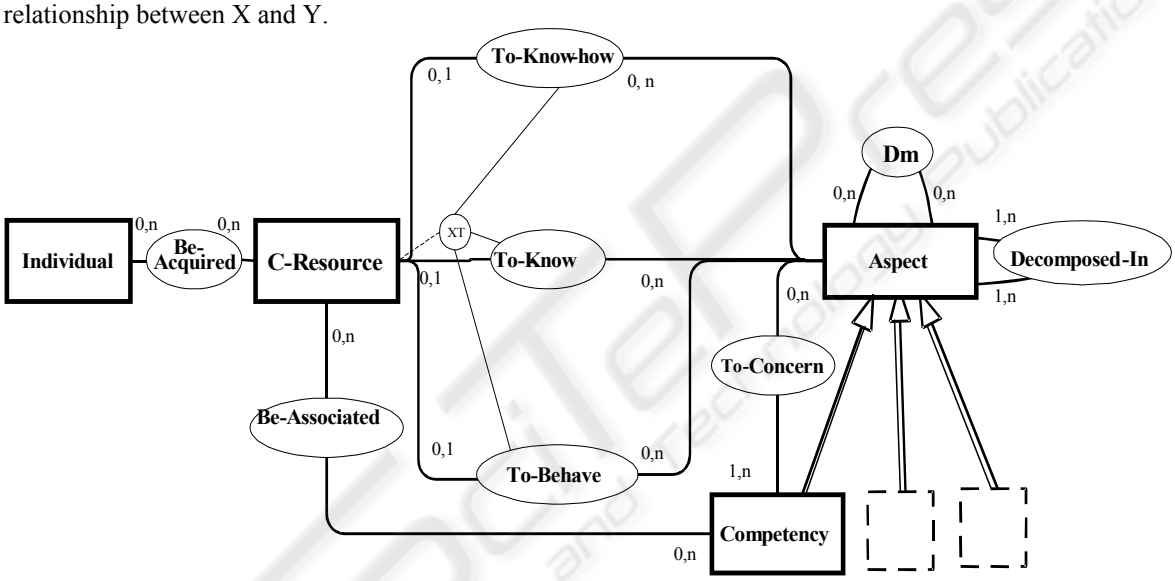

Figure 2: The CRAI (Competency, Resource, Aspect, Individual) model of competence

We have developed some simple guidelines for specializing Aspect. In fact, usually a competency refers to a type of object: for instance, be competent on a "Machine of type X" in spite of be competent on a "Machine n.123 of type X". While being not a general rule, it is useful in many cases. A second guideline concerns situations that may occur during enterprise operations. For instance, if a "Machine of type X" stops because of any problem, it is important to represent the kind of problem as a sub-entity of the entity Aspect. In fact, we are interested in personnel able to deal with kinds of machine stops.

The analysis step focuses on using the generic inquiries. In fact, the generic inquiries have been designed for evaluating if

- in the current enterprise situation, there are lack of competencies regarding any of the enterprise aspects
- in a planned situation, (for instance a new mission) the required competencies have already been acquired

As a consequence, inquiries are also useful for

- knowing who have to be trained,
- knowing which competencies have to be acquired,
- regarding to a competency, who is more (the most) competent.

Therefore, it is also possible, for instance to redistribute the work according to the more competent personnel.

4 CASE STUDY

This example is mainly inspired from the real application carried out at SMAE in Tremery, France, a subsidiary plant of PSA Peugeot Citroën group. The mission of the maintenance department (MD) is servicing and mending machines of the whole plant. The MD is made of two workshops. Workshops have been defined according to a geographic criterion. Each workshop includes a set of machine (M) (Figure 4). Each type of machine includes a component (E) and uses a Technology (T).

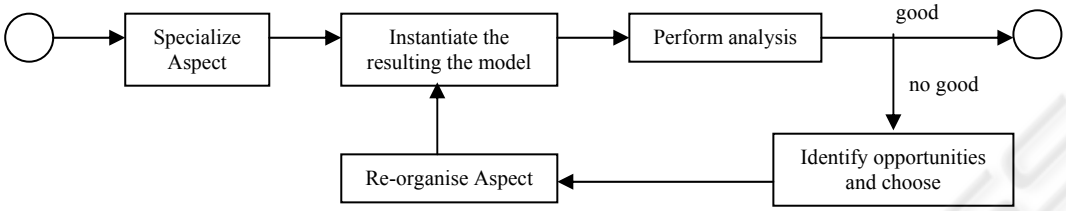

Figure 3: The generic competence management process

For each workshop, both a technician It and a supervisor Is are assigned. The MD has three core business processes:

- Technical Processes : Curative and preventive maintenance processes
- Improvement Projects: They concern investments in machines and maintenance methods. One process is considered (ImpPrjt1).
- Staff management processes: Processes involving the personnel affected to the MD (StaffMgt1).

The competency management process started after the following report: machines aren't quickly and well repaired whereas, it seems the existence of qualified technicians. The competency management objective is to better use competencies in order to enhance the department performance. Indeed, by assigning the right person(s) to the right task(s), on the one hand the lead-times of servicing and the number of breakdowns can be reduced significantly and on the other hand, misuse of critical competencies is avoided.

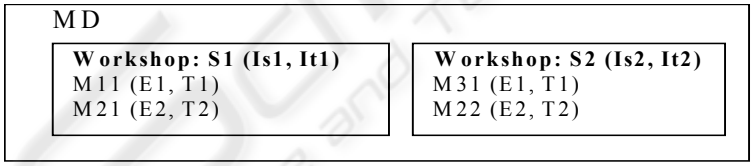

Figure 4: Organization of the maintenance department

4.1 Specialization of Aspect and instantiation of the resulting model

According to the generic management process, the entity Aspect has been specialized (Figure 5). Then, the CRAI model has been instantiated resulting in the competencies and resources (Table 1). The important remark is that the entity Machine does not represent the existing physical machines in the workshops but just the types of machines that should be distinguished from the point of view of the required competencies.

Table 2 completes the instantiation of the model: it provides the evaluation of the two functions Acquire-R and Acquire-C according to the CRAI model. In this case, It is possible to derive the evaluation of Acquire-C is derived from Acquire-R in the following manner: Acquire-C(i)= (c,E(Average$_{Rj \in Resource_set(c), j=1..n}$(Acquire-R(i),Rj)* 4)), i = It1,It2,Is1,Is2, normalized according to a four levels scale, E is an integral part function.

Therefore, to provide an evaluation of Acquire-C, resources of C(M1), C(M2), C(M3), C(StaffMgt1), C(ImprPrjt1) are also needed. The query Select-CR has been specifically introduced for finding all resources of the given competency. Basically, Select-CR performs a transitive closure of the relationship DM.

Select-CR(C(ImpPrjt1)) = {K9, K10, KH12, KH40, KH41, B1}

Select-CR(C(StaffMgt1)) = {K37, K39, KH36, KH37, B1, B4}

Select-CR(C(M1)) = {K1, K27, KH1, KH2, KH14, KH15, B1}

Select-CR(C(M2)) = {K2, K29, KH3, KH4, KH18, KH19, B1}

Select-CR(C(M3)) = {K3, K27, KH1, KH2, KH21, KH22, B1}

Table 3 and table 4 provide the degrees of mastering of identified required resources and competencies in the context of workshops S1, S2 and department MD. These two tables instantiate the mappings Nb/Level/C and Nb/Level/R as needed for comparing required and acquired competencies.

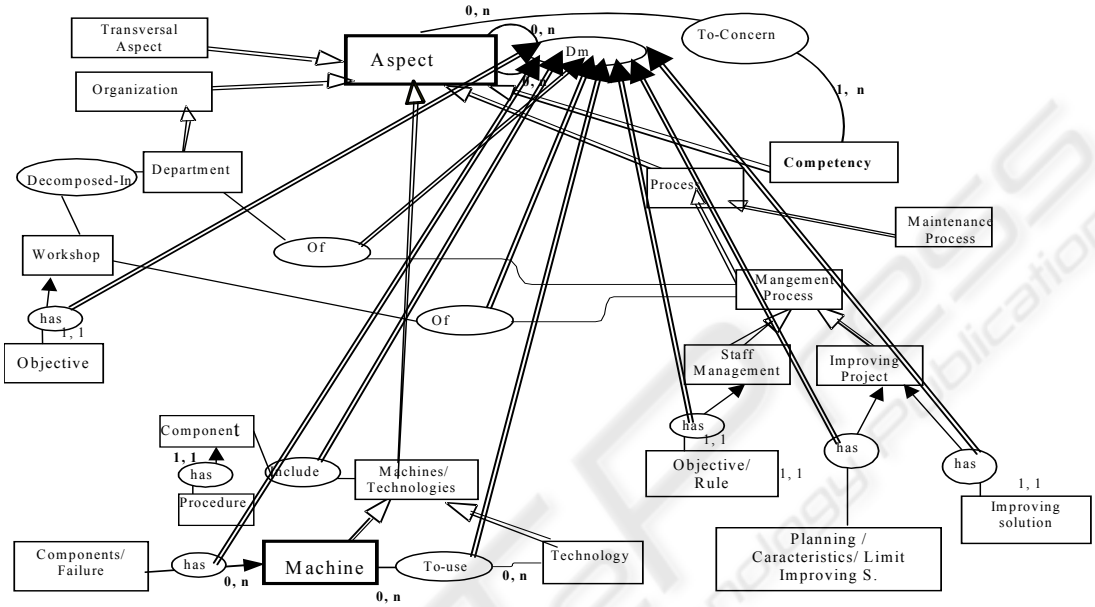

Figure 5: Entity Aspect that has been specialized

4.2 Methods for determining acquired and required competencies

According the discussion in section 2, we defined eight generic inquiries and corresponding evaluation algorithms (called methods). Here, we just provide an informal description of four inquiries allowing the determination of acquired and required competencies.

- Q1 with the method $M1r_{Q1}$: finding the required resources for a given mission
- Q2 with the method $M2_{Q2}$: finding the resources or elementary competencies of a given person and for a given mission
- Q3 with the method $M3_{Q3}$: finding acquired resources or competencies for a given mission and given personnel
- Q7 with the method $M7_{Q7}$: finding the required and acquired competencies for a given mission and given personnel

Required competencies per workshop are found by using Q1.

$M1r_{Q1}(S1)$ = {K18, KH30, B1, B4} ∪ Select-CR(C(M1)) ∪ Select-CR(C(M2)) ∪ Select-CR(C(ImpPrjt1)) ∪ Select-CR(C(StaffMgt1)) where

Select-CR(C(ImpPrjt1)) = {K9, K10, KH12, KH40, KH41, B1}

Select-CR(C(StaffMgt1)) = {K37, K39, KH36, KH37, B1, B4}

Select-CR(C(M1)) = {K1, K27, KH1, KH2, KH14, KH15, B1}

Select-CR(C(M2)) = {K2, K29, KH3, KH4, KH18, KH19, B1}

$M1r_{Q1}(S2)$ = {K19, KH32, B1, B4} ∪ Select-CR(C(M2)) ∪ Select-CR(C(M3)) ∪ Select-CR(C(ImpPrjt1)) ∪ Select-CR(C(StaffMgt1)) where Select-CR(C(M3)) = {K3, K27, KH1, KH2, KH21, KH22, B1}.

According to tables 1 and 2, it is possible to determine the acquired competencies per each workshop S1 and S2 and individuals, by using Q3:

$M2_{Q2}$(It1, S1) ={(C(M1), 4), (C(M2), 1), (B1,1)}

$M2_{Q2}$(Is1, S1) = {C(StaffMgt1), 4), C(ImprPrjt1, 4), (K18, 1), (KH30, 1), (B1, 1), (B4, 1)}

$M3_{Q3}(S1)$ {It1, Is1}= *{(C(M1), 3, 1), (C(M2), 3, 0),* (C(StaffMgt1), 4, 1), (C(ImprPrjt1), 4, 1), (K18, 1, 1), (KH30, 1, 1), (B1, 1, 2), (B4, 1, 2)}
$M3_{Q3}(S2)$ {It2, Is2} = *{(C(M2), 3, 1), (C(M3), 3, 0),* (C(StaffMgt1), 4, 1), (C(ImprPrjt1), 4, 1), (K19, 1, 1), (B1, 1, 2), (B4, 1, 1)}.

Now, it is possible to analyze the adequacy between acquired and required competencies, by using *Q7*.

$M7_{Q7}(S1)$ {It1, Is1}= *{(C(M1), 3, 1, 1), (C(M2), 3,1, 0),* (C(MangStaff1), 4, 1,1), (C(ProjtImpr1), 4, 1,1), (K18, 1,1, 1), (KH30, 1, 1,1), (B1, 1, 1,2), (B4, 1, 1,2)}.

Table 1: Instantiation of entities in the model

Technology Instantiation: T1, T2	Component Instantiation: E1, E2
Department Instantiation MD	Workshop Instantiation S1, S2
Individual Instantiation Is1, Is2, It1, It2	Machine Instantiation M1, M2, M3
Transversal aspect Instantiation Meeting, Problem	Decomposition-In instantiation Decomposed-In(MD)= {S1, S2}
Competency Instantiation C(StaffMgt1): To be competent in StaffMgt1 C(ImpPrjt1): To be competent in ImpPrjt1 C(M1): To be competent for M1 C(M2): To be competent for M2 C(M3): To be competent for M3	Dm Instantiation S1 Dm StaffMgt1, S1 Dm ImpPrjt1, S1 Dm M1, S1Dm M2 S2 Dm StaffMgt1, S2Dm ImpPrjt1, S2 Dm M2, S2Dm M3. StaffMgt1 Dm TechnicianT1, M1 Dm T1, M1 Dm E1, M2 Dm T2, M2 Dm E2, M3 Dm T1, M3 Dm E1
C-resource Instantiation	
Knowledge on existing things: K1: To know the components of M1 K2: To know the components of M2 K3: To know the components of M3 K9: To know the characteristics of ImpPrjt1 K10: To know the context of ImpPrjt1 K18: To know the objectives of S1 K19: To know the objectives of S2 *Procedural Knowledge* K27: To know the mounting procedure of E1 K29: To know the mounting procedure of E2 K37: To know the objectives of MangStaf1 K39: To know the rule of StaffMgt1 *Formalized Know-how :* KH1: To know how to remove E1 KH2: To know how to mount E1 KH3: To know how to remove E2 KH4: To know how to mount E2	KH12: To know how to define a planning of ImpPrjt1 *Empirical Know-how* KH14: To Know how to identify a failure of M1 KH15: To Know how to repair a failure of M1 KH18: To Know how identify a failure of M2 KH19: To Know how to repair a failure of M2 KH21: To Know how identify a failure of M3 KH22: To Know how to repair a failure of M3 KH30 : To Know how to define objectives of S1 KH32 : To Know how to define objectives of S2 KH36: To know how to apply the rules of StaffMgt1 KH37: To know how to achieve objectives of StaffMgt1 KH40: To know how to define Improving S. of PrjtImp1 KH41: To know how to execute a planning of PrjtImp1 *Cognitive skills* B1: To know how to state a problem *Relational Skill (Know-how)* B4: To know how to lead a meeting

We note a lack of competencies for M2 in S1: in fact, (C(M2), 3,1, 0)) means that in S1, 1 person having acquired the competence C(M2) with mastery degree 3 is needed while in the current situation there is 0 person at mastery degree 3.

$M7_{Q7}(S2)$ {It2, Is2}=*{(C(M2), 3, 1, 1), (C(M3), 3, 1, 0),* (C(StaffMgt1), 4, 1, 1), (C(ImprPrjt1), 4, 1, 1), (K19, 1, 1, 1), (KH32, 1, 1, 1), (B1, 1, 1, 2), (B4, 1, 1, 1)}

As before, we note a lack of competencies for M3 in S2.

Now, we evaluate the required and acquired competencies for MD. This allows understanding if the required competencies have already been acquired by the department (i.e. acquired by the individuals affected to the department).

$M1c_{Q1}(MD)$= {C(S1), C(S2)}

$M1_{Q1}(MD)$={K18, K19, KH30, KH32, B1, B4} ∪ Select-CR(M1) ∪ Select-CR(M2) ∪ Select-

CR(M3) ∪ Select-CR(ImpPrjt1) ∪ Select-CR(StaffMgt1)

The acquired competencies in the department are:

$M3_{Q3}$(MD) {It1, It2, Is1, Is2} = *{(C(M1), 3, 1) (C(M2), 3, 1), (C(M3), 3, 1))*, (C(StaffMgt1), 4, 2), (C(ImprPrjt1), 4, 2), (K18, 1, 2), (K19, 1, 0), (KH30, 1, 2), (KH32, 1, 2), (B1, 1, 4), (B4, 1, 3)}

Now, it is possible to analyze the adequacy between acquired and required competencies in the department, by using *Q7*.

Table 2: Evaluation of Acquire-R and Acquire-C

Individual	It1	It2	Is1	Is2
K1	1	1		
K2	0	1		
K3	1	1		
K9			1	1
K10			1	1
K18			1	1
K19			0	0
K27	1	0		
K29	0	1		
K37			1	1
K39			1	1
KH1	1	0		
KH2	1	0		
KH3	1	1		
KH4	0	1		
KH12			1	1
KH14	1	0		
KH15	1	0		
KH18	0	1		
KH19	0	1		
KH21	1	1		
KH22	1	0		
KH30			1	1
KH32			1	1
KH36			1	1
KH37			1	1
KH40			1	1
KH41			1	1
B1	1	1	1	1
B4	1	0	1	1
C(M1)	4	1		
C(M2)	1	4		
C(M3)	4	1		
C(StaffMgt1)			4	4
C(PritImp1)			4	4

Proposed solution. Following the previous analysis, we can try to affect again individuals according to workshop required competencies. However, without any specific individual training, the workshops have to be redefined from the maintenance department viewpoint. Two steps to approach the problem: (1) Existing workshops are analyzed to draw required common competencies, and (2) Starting from the required common competencies, try to define new workshops based on similar competencies and verify the competency adequacy of each one.

$M7_{Q7}$(MD) {It1, It2, Is1, Is2} = *{(C(M1), 3, 1, 1), (C(M2), 3, 1, 1), (C(M3), 3, 1, 1))*, (C(StaffMgt1), 4,1, 2), (C(ImprPrjt1), 4, 1,2), (K18, 1, 1,2), (K19, 1, 1,0), (KH30, 1, 1, 2), (KH32, 1, 1, 2), (B1, 1, 1, 4), (B4, 1, 1, 3)}

As a conclusion, there is a competency adequacy for MD (except for K19), the department has got the required competencies.

Table 3: Nb/level per each workshop

Nb/Level(C(M1), S1)= (3, 1)	Nb/Level(K19, S2) = (1, 1)
Nb/Level(C(M2), S1)= (3, 1)	Nb/Level(K18, S1) = (1, 1)
Nb/Level(C(MangStaff1), S1)=(4, 1)	Nb/Level(KH30, S1) = (1, 1)
Nb/Level(C(ImprPrjt1), S1) = (4, 1)	Nb/Level(B1, S1) = (1, 1)
Nb/Level(C(M3), S2)= (3, 1)	Nb/Level(C(M2), S2)= (3, 1)
Nb/Level(C(StaffMgt1), S2)=(4, 1)	Nb/Level(B1, S2) = (1, 1)
Nb/Level(C(ImprPrjt1), S2) = (4, 1)	Nb/Level(KH32, S2) = (1, 1)

Table 4: Nb/level per MD

Nb/Level(C(M1), MD)= (3, 1)	Nb/Level(C(StaffMgt1), MD)=(4, 1)
Nb/Level(C(M2), MD)= (3, 1)	Nb/Level(C(ImprPrjt1), MD) = (4, 1)
Nb/Level(C(M3), MD)= (3, 1)	Nb/Level(KH32, MD) = (1,1)
Nb/Level(K18, MD) = (1, 1)	Nb/Level(B1, MD) = (1, 1)
Nb/Level(K19, MD) = (1, 1)	Nb/Level(B4, MD) = (1, 1)
Nb/Level(KH30, MD) = (1, 1)	

4.3 Method for determining common competencies

One inquiry Q8 with the method *$M8_{Q8}$* is defined to allow the *determination of common elementary competencies between two or more missions.*

For the first step, we use Q8 to analysis of common competencies between existing workshops: *$M8_{Q8.1}$ (*S1, S2*)={C*(StaffMgt1), C(ImpPrjt1), C(M2)*)}*

Therefore, it seems that common competencies are required on machines of type M1 and M2. This means that M3 has to be associated to M1 or M2. In this case, we note that required competencies between M1 and M3 are more important than between M2 and M3.

*$M8_{Q8}$ (*M1, M3*)={*K27, KH1, KH2, B1*}*

*$M8_{Q8}$ (*M1, M2*)={*B1*}*

Therefore, we propose tow new workshops: NS1 (M11, M31) and NS2 (M21, M22) where the following additional resources need to be defined as new instances in the aspect model:

K18': To know the objectives of NS1

K19': To know the objectives of NS2

KH30': To Know how to define objectives of NS1

KH32': To Know how to define objectives of NS2

We assume that the function Acquire-R for all these additional resources and for all individuals of DM is equal to zero.

Therefore, $M1r_{Q1}$(NS1) = {K18', KH30', B1, B4} ∪ Select-CR(M1) ∪ Select-CR(M3) ∪ Select-CR(ImpPrjt1) ∪ Select-CR(StaffMgt1).

$M1r_{Q1}$(NS2) = {K19', KH32', B1, B4} ∪ Select-CR(M2) ∪ Select-CR(ImpPrjt1) ∪ Select-CR(StaffMgt1)}

4.4 Method for determining an individual group for a mission

One inquiry Q4 with the method $M4_{Q4}$ is defined to allow the determination of common elementary competencies between two or more missions).

Now, we are able to retrieve relevant persons needed to manage the new workshops NS1 and NS2: $M4_{Q4}$(NS1) = {It1, Is1, Is2}, $M4_{Q4}$(NS2) = {It2, Is1}

However, {It1, Is1} are sufficient to satisfy the needs on competencies of NS1. Indeed,

$M7_{Q7}$*(NS1)* {It1,Is1} = *{(C(M1), 3, 1, 1), (C(M3), 3,1, 1)),* (C(StaffMgt1), 4, 1,1), (C(ImprPrjt1), 4, 1,1), (K18', 1,1, 0), (KH30', 1, 1,0), (B1, 1, 1,2), (B4, 1, 1,2)}

Likewise, {It2, Is1} are sufficient to satisfy the needs on competencies of NS2. Indeed,

$M7_{Q7}$*(NS2)* {It2, Is1} =*{(C(M2), 3, 1, 1),* (C(StaffMgt1), 4, 1,1), (C(ImprPrjt1), 4, 1,1), (K19', 1,1, 0), (KH32', 1, 1,0), (B1, 1, 1,2), (B4,1, 1,1)}

In conclusion, new workshops are retained. NS1: (M11, M31) to which (Is1, It1) are assigned and NS2: (M21, M22) to which (Is1, It2) are assigned. Finally, Is2 can be transferred to carry out others tasks.

4.5 Methods for determining needs for training on competencies

Tow inquiries are defined for determining needs for training on competencies

Q5 with the method $M5_{Q5}$: Finding the training needs for a given mission)

Q6 with the method $M6_{Q6}$: Finding the training needs for a given individual involved in a given mission.

For resources that concern organizational aspect of new workshops, the training needs are finding by Q5: $M5_{Q5}$*(NS1)= { (K18', 1, 1), (KH30', 1, 1)}, $M5_{Q5}$(S2)= {(K19', 1, 1), (KH32', 1, 1)}*

With the proposed solution, the competency adequacy per workshop is ensured under the hypothesis mentioned above (in any situation, only one person who has a needed competency is required to guarantee the correct behavior of the department.). Anyway, this hypothesis must be checked if it remains true after this workshop reorganization.

5 CONCLUSION

The important points discussed in this paper are:
-the CRAI model, which allows to represent most individual competencies features and to provide an effective support (through the eight inquiries) for competence management processes

- a generic competence management process which can be customized by fully specifying its steps, integrated with the support offered by the CRAI model.

- the case study, which provides the reader with a simple application of the CRAI model with the generic competence management process.

The CRAI model will be translated into a computer langage to validate it and to implement it on a computer tool.

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