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Automated Competency Management System: An Advanced Approach to Competence Management Efficiency

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Abstract
In this study, a structure for an automated competency management system model is presented. The system involves an advanced approach to competency identification and evaluation that takes into account the prediction of future activities in competency development. Once competencies are identified and graded for all resources, they are then matched to running projects via a domain of action related to each project. The acknowledged competencies are then linked to a time management factor, or the occupational rate, in a manner that the percentage of time dispensed by each resource on a project in a domain of action including a defined competency is shown. An enrollment criterion for the automated competency management system is proposed. The presented model may be applied for both products and services.
Keywords: automation, competency, job models, organizational processes

1. Introduction

Competency based management has become a very crucial element in the effective operation of an enterprise or an organization, due to the increased need of the latter to be agile enough to adapt to quick market changes and re-orientation of business plans. In such situations, competency management systems (CMS) become the core human resource tool which enables the enterprise to manage and develop the skills of their employees, recruit the most appropriate candidates, and make effective succession planning and employee development plans. (Kochanski 1996)

Stakes associated with market challenges confirm that the competency-based approach is an appropriate way to overcome the lack of flexibility of job-based approaches to organizational design (Sector 2011). Even though this approach is somehow weighted with the competency evaluation and identification processes – of which it shows high dependence – it is still possible to consider these processes as independent model components in a competency based management system. There is a common thinking in managerial practice that considers competencies as "universal" concepts independently directed out of the specific organizational context in which they are activated and developed (Beheshtifar, 2011). This approach can be traced back to the well-known McClelland studies (1978), an approach in which competencies are mapped by using statistics to identify those behaviors distinguishing average from the best performers, and to Spencer and Spencer's (1993) surveys aimed at identifying general competency profiles for standard professional figures.

2. How competency is defined, characterized and identified?

As presented by McClelland in 1970, competencies, or individual's characteristics, were presented as significant predictors of employee performance and success, equally as important as an individual's academic aptitude and knowledge content as indicated by tests scores or results. A competency is the capability of applying or using knowledge, skills, abilities, behaviors, and personal characteristics to successfully perform critical work tasks, specific functions, or operate in a given role or position.

This definition is outlined through a combination of the following components:

- Intelligence.
- Education.
- Experience.
- Ethics.
- Interest.

However, these components are retroactive, and some of them could enhance and promote other components such as education and intelligence, intelligence and experience, experience and interest, education and ethics, etc…

Rankin presented a more recent definition of competency in 2004; he expressed that competencies represent the language of performance. They can articulate both the expected outcomes from an individual's efforts and the manner in which these activities are carried out (Calhoun, 2002).

Because everyone in the organization can learn to speak this language, competencies provide a common, universally understood means of describing expected performance in many different contexts. (Figure 1)
Competences, as presented in literature, fall into three categories (Capaldo, 2006).

- Behavioural competencies: They reflect behavioral expectations. This category reveals important indications about the type of behavior required for attaining capabilities as teamwork, communication skills, leadership and decision-making. They are often referred to as 'soft skills'. Those skills are usually set out in a competency framework.
- Technical competencies: They define what people have to know and should be able to do (knowledge and skills) in order to carry out their roles effectively. They are related to either generic roles (groups of similar roles) or to individual roles ('role-specific competencies'). They are not usually part of a behaviour-based competency framework, although – of course – the two are closely linked when considering and assessing role demands and requirements.
- Vocational competencies: These specify minimum standards for the achievement of set tasks and activities expressed in ways that can be observed and assessed with a view to certification. An element of competence in NVQ (National Vocational Qualifications) language is a description of something that people in given work areas should be able to do. They are assessed as being competent or yet to be. No attempt is (has been) made to assess the degree of competence.

Nevertheless, a more detailed sub-identification would divide competencies into the following seven types:

- Generic competencies: General competencies that are considered as common sense knowledge and essential for all staff regardless of their function or level or responsibilities.
- Specific competencies: These are the competencies needed for a specific job or task.
- Threshold or performance competencies: These fall into the following two categories
  - Basic competencies; required to achieve a job or task regardless of the quality level of the task.
  - Performance competencies; distinguish between high-level and low-level performers as per defined quality levels.
- Differentiating competencies: These are considered as behavioral characteristics that usually appear on high performers.
- Managerial competencies: Those are essential for staff with managerial or supervisory responsibilities regardless of services or areas, including directors and senior positions (decision making, team leadership…).
- Technical competencies: presented earlier.
- Behavioral competencies: presented earlier as well.

2.1 Competency Mapping

Competency mapping is a process of identifying key competencies for an organization, the jobs and functions within it. Competency mapping is important and is an essential activity. Every well-managed firm should have well defined roles and list of competencies required to perform each role effectively (Langdon 2002). Competency mapping identifies individuals' strengths and weaknesses in order to help them better understand themselves and to show them where career development efforts need to be directed. Competency mapping does not only apply for full-time permanent employees of an organization, but also for contract workers as well as for those seeking employment to emphasize the specific skills that would make them valuable for potential employment (Langdon, 2002).

2.2 Competency Identification

Typically, four sources contribute to the development of performance-based competencies (Figure 2):

1. Behaviour plus attributes
2. Standards
3. Support
4. Human relations

According to the Language of Work Model presented by Langdon in 2000, these four layers constitute performance. Competency identification must be based on performance to be accurate and complete (Sanghi 2007).

3. Job Models

Job model is a performance-based reflection of how an exemplary job performer does his or her work. It should be based on and aligned to the core processes of the business, which in turn should be aligned to the business unit's goals and strategies.

After considerable research and testing, Langdon (1995) determined that the behavioral component of performance could be described in six words (Figure 2). These elements of behavior are always present when there is performance, whether the performance is visible or not. Thus, describing individual work using these six related words creates a performance-based definition of the intended behavior needed from individuals as prescribed (or not) by the organization. These six integrated words are:

1. Inputs
2. Conditions
3. Process steps
4. Outputs
5. Consequences
6. Feedback

A diagram or narrative of these six words for a job makes up the foundation of a job model. Thus, each job produces certain outputs (deliverables) intended for clients or customers. These outputs will result in related consequences (desired results for the customer, organization, and individual).

3.1 Competency Models Drawbacks

An analytical overview of what was presented concerning competency and evaluation models makes it clear that these models are more focused on the behavior rather than on results. Admitting the importance of the behavior in performing a certain activity, more advanced models are needed to inject a feedback from the output (result) to modify the performance behavior as illustrated in Figure 3.

Another important issue linked to the identification of competencies is that they are generic. This is a double-sided stake, i.e. going on competencies of lower level definitions increases the number of specificities and hence renders better evaluation. A more suitable model would be one that could comprise multi-level evaluations on different stages. Each stage includes a number of same level competencies to be evaluated. However, the absence of a general quantitative empirical model for the evaluation of competencies makes the evaluation dependent only on past activities and not on future or expected behaviors or results.

The Human Resources department usually owns competency models in a given organization, while the line management is less implicated in evaluation-associated processes. In addition, applied models have the tendency to focus competency evaluation processes on middle and lower levels paying less attention to top-level management.

In this study, we are proposing an automated competency system model that relies on dynamic management strategies with evolving perspectives. The proposed model takes into account a new approach in the competency evaluation and scoring. Well-structured competencies will be associated with a time factor that indicates percentage of occupation of a staff on working activities that intend to develop a certain competency. In the system, all staff members have their competency list along with their time factors. Those parameters will be used in order to move staff from one project to another and help plan their career development towards competencies that support the strategy of the company.

4. Organizational Processes

The proposed system is based on a developed structure that permits the management, control and efficient utilization of competencies. Here we define resources by their competencies and their score in the respective competency.

The organizational structure presented in Figure 4 represents an organization offering services in technical research and development. The organization is composed of many departments following a standard organization structure. A department contains many technical units including resources of different technical competences. This is presented in Figure 5.

As previously mentioned, units contain different resources with multiple competences. In order to facilitate the conception, we will assume that each resource has 2 or 3 different competencies. Resource competencies may have been acquired from experience acquired before being involved in the unit (recruited) or through present involvement within the unit. In both cases, an evaluation of the score in a given competence is necessary.

5. Project Planning Process

Once a project is proposed, an assessment and evaluation process is launched. This process determines the efforts needed for the achievement of the project objectives. The delineated efforts take into consideration the resources allocated and associated with certain competencies (Figure 6). The priority level of the project *(PPL)* is determined in the initial phase. This parameter will serve in resources engagement planning.

The list of competencies of a project *(CnncPmmc)* is identified according to the efforts estimation. We denote

(nnc) as the competency code, and (mmc) as the project serial number in the workflow. Assuming 2 projects requiring three types of different competencies per each, this will be represented as follows:

$$C_{IT005}P_{Ap0010} \quad C_{IT005}P_{Ap0011}$$
$$C_{IT002}P_{Ap0010} \quad C_{IT015}P_{Ap0011}$$
$$C_{IT050}P_{Ap0010} \quad C_{IT215}P_{Ap0011}$$

After being identified, the project-associated competences *(CnncPmmc)* are compiled by the competency management system module.

5.1 Domain of Action (DoA)

Each project will be associated with a Domain of Action (DoA) which contains a set of competencies of different types and levels. Management models, as previously presented, usually consider this as a Job model. We define the DoA as a set of competencies that are needed to perform a project including diverse tasks. The reason behind taking the DoA as a key point and not the job model is that this allows more flexibility in resources assignment. Thus, the DoA is the list of competencies *(CnncPmmc)* required to run a project according to the efforts estimation. These competencies will include management competencies and other specific ones such as technical or behavioral competencies.

5.2 Competency Identification and Scoring (Leveling)

As presented earlier, competencies are identified as per their basic definitions. Reconsidering the identification of the competency based on its definition reveals a low capacity, less competent model. This illustrates the importance and the need for a multilevel approach that decomposes the competency components to small sub-competencies and tries to trace early the relationship between the set of the new components as depicted in Figure 7. The sub-components shown in Figure 7 and others (not shown) constitute the baseline for the development of any of the mentioned pillars of the competency. For example, to maintain a sustainable developed knowledge level, one should be able to auto diagnose their knowledge level, i.e. have a management plan for their continuous improvement, ensure good communication with contacts in the domain, learn on their own, etc.

If knowledge has to be evaluated without taking the future into consideration, then the evaluation will be misleading since knowledge is something that should be updated and reinitialized all the time especially nowadays with the emerging needs in markets. Now, to have a future-based evaluation of knowledge, it is necessary to evaluate all the factors that help in assuring a sustainable or continuously improving knowledge level. The same applies to other pillars, like skill and aptitude.

Based on the structure shown in Figure 4, it will be possible to have a list of different competencies with a score for each determined through a particular evaluation relative to the structure's policies.

We denote by Ri the resource, and by *Ri(Ccfrm, Scfrm)* the set of competencies for Ri, where *Ccfrm* is the competency of index (cfrm), which is a code, attributed to this competency in the competencies framework of the company, and *Scfrm* is the score associated with the competency *(cfrm)* for the resource (i) (Figure 8).

In Figure 8, and on the list of competencies of Ri, a column revealing the status of the competency is added. A competency can either have an Active or Non-Active status. Active-status competencies are contained in an actual Domain of Action that the resource is involved in. However, Non-Active status competencies are the ones that have been acquired by the resource in the past, either through working on previous projects, or through certain educational activities, and haven't constituted any part of an actual DoA in which the resource is currently involved.

6. Implementation and Discussion

6.1 Linking Competencies to the resource time factor or resource occupation rate

In a well-structured organization with a competency management system, the staff will be working on, or as a part of, multiple projects, where the resource is performing some tasks related directly to the domain of his/her competency. However, this should not lead to the involvement of the resource only in activities in his/her specific domain, i.e. limiting his/her chance to develop competencies in other domains.

The resource time factor or the resource occupation rate is a list showing the percentage of the resource time spent on each project. And since a project is associated with a domain of action (DoA), listing the competencies required in a certain project, will then certainly identify the resource contributing to the project based on one or more of the listed competencies (Figure 9).

This may lead to deduce the rate at which a resource is working on a certain competency. In the example shown in Figure 9, a project DoA is identified, where the competency TEC01 appears in the list. In the same figure, the Occupation Rate Sheet of a resource Ri shows that this resource is spending 50% of his/her time on the project AP0012. In the DoA of the project AP0012, only the competency TEC01 appears, i.e. the resource Ri is working

50% of his/her time in the domain of the competency TEC01. We call this factor as competency time factor of Ri, (αtf).
This time factor is considered important in this study due to the fact that it may lead to many conclusions about the experience developed in the structure of a given resource in a given domain.

6.2 The ACMS Task Assignment Chart

One of the important applications of the competency resources management strategy detailed above is the assignment of new projects or tasks to available resources, or even the recruitment of needed resources as per desired competencies. A proposed chart is presented in Figure 10.
In the presented model in Figure 10, once a new project opportunity is acquired, a project assessment phase is needed to determine the efforts and the resources to be allocated. Once competencies for the project are identified, a DoA for the project is defined. If the DoA already exists and all the required competencies are available, then the project is assigned to the group of resources in this DoA depending on their occupational rates. Now, if the DoA does not exist or some competencies are missing, then necessary recruitment must be performed. Another possibility is checking if any of the resources may have the needed competencies as Non-Active. Then a decision should be made as to whether to assign this resource or not according to his/her occupation rate and willingness to develop in the new domain of activity.

7. Conclusion

In this study, a basis for an automated competency management system is presented. Such systems are in high demand in companies where resources are numerous, especially with the growing challenges in different markets. An important aspect is taken into account in this study. It relies on the strict inter-relation between the competency identification and evaluation process and the whole human resources management and professional development processes.
The proposed model may also be implemented in small size companies willing to develop their profile in new markets. The overall model can be applied on both products and services. A product is considered as a virtual project that can be assessed in terms of efforts, resources, etc.
A further prospect future work that may be considered is to define clear automated paths that help in planning the development in the company. The main challenge with such an idea is to show the competencies that might be needed in the company as per the strategic plan, and to make those expectations available through a clear process for the staff, so that they may identify their development tracks.

References

Asqar Fani, A., Shiri, A., Azar, A., & Javadin, S. (2012). “A Prioritization of Competency Components of Operational Managers from Management Experts’ View”, A Case Study, Tehran, Iran. International Business Research , 5 (9), 203-209.
Marrelli, A.F., Tondora, J., & Hoge, M. (2005). “Strategies for developing competency models”, Administration and Policy in Mental Health, 32 (5/6), 533-561.
Armstrong, M. “ARMSTRONG’S Handbook of human resource management practice” (11), London and Philadelphia: Kogan Page.
Langdon, D., Marelli, A.F. (2002). “A New Model for Systematic Competency Identification”, International Society for Performance Improvement, 41 (4), pp. 16-23.
Ennis, M. R. (2008). “Competency Models: A Review of the Literature and the Role of the Employment and Training Administration” (ETA). U. S. Department of Labor , Division of Research and Evaluation. US NY: U. S. Department of Labor .
Guido Capaldo, L. I. (2006). “A situationalist perspective to Competency Management”, Human Resource Management, 45 (3), 429-448.
Kochanski, J.T., Ruse, D.H. (1996). “Designing a competency-based human resources organization”, Human Resource Management, 35 (1), 19-33.
Sandberg, J. (2000). “Understanding human competence at work: an interpretative approach”, Academy of Management Journal, 43 (1), 9-25.
Calhoun, J, Davidson, P., Sinioris, M., Vincent, E., & Griffith, J. (2002). “Toward an Understanding of Competency Identification and Assessment in Health Care Management”, Quality Management in Health Care, 11 (1), 14-38.
Beheshtifar, M., Moghadam, N.M. (2011). “Studying the Competency-Related Models in Succession Planning”, European Journal of Economics, Finance and Administrative Sciences (34), 114-119.
Sefiani, N., Boumane, A., Campagne, P., & Bouami, D. (2012). “Process of identifying Competencies based on a functional approach”, International Journal of Engineering Science and Technology, 4 (1), 265-275.
Gholipur, R.A., Mahmoodi, S.N. (2012). “Presentation Model of Managerial Competency Approach in

Management Development", Interdisciplinary journal of contemporary research approach in management, 3 (9), 506-520.
Rankin, N. (1999). "Benchmarking survey, Competency and Emotional Intelligence", 12 (1), 4-6.
Sanghi, S. (2007). "The Handbook of Competency Mapping". (S. P. Inc, Ed.) California, California: Sage Publications Inc.
Bonder, A., Bouchard, C-D., & Bellemare, G. (2011). "Public Personnel Management, Competency-Based Management, an Integrated Approach to Human Resource Management in the Canadian Public Sector", 40 (1), 1-10.
Yuvaraj, R. (2011). "Competency Mapping". International Journal of Scientific & Engineering Research, 2 (8), 1-7

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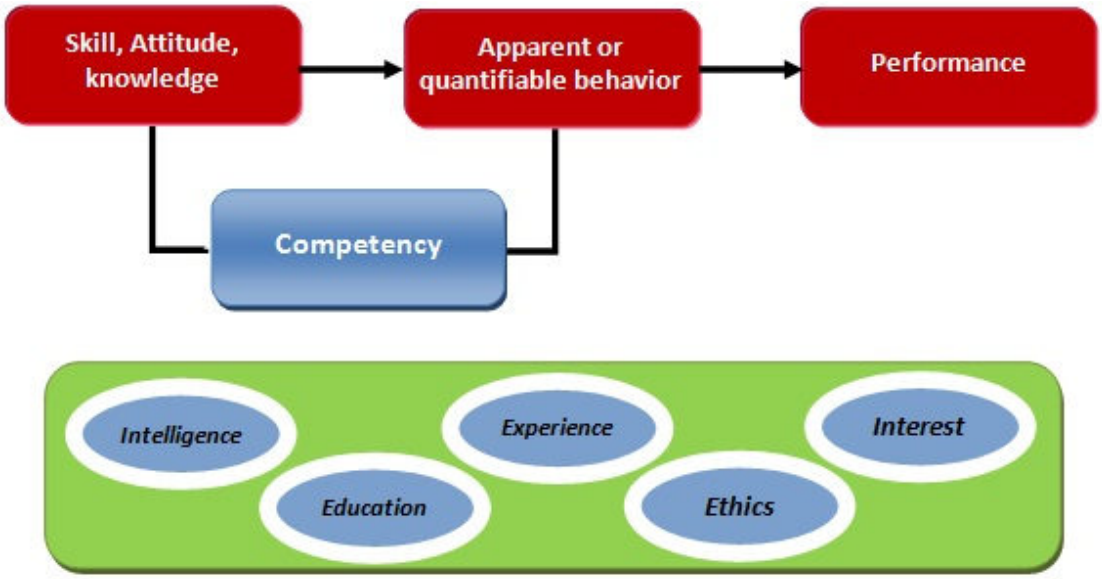

Figure 1: The competency components and retroactivity.

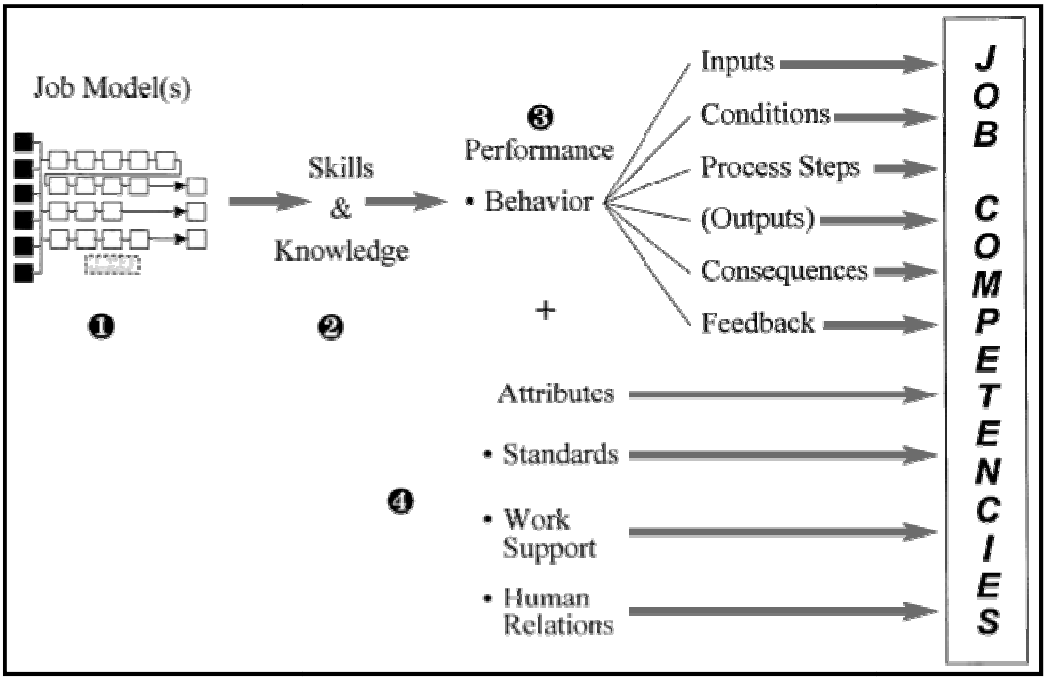

Figure 2: Systematic Competency Identification and Development: The Language of Work Model (Sanghi 2007)

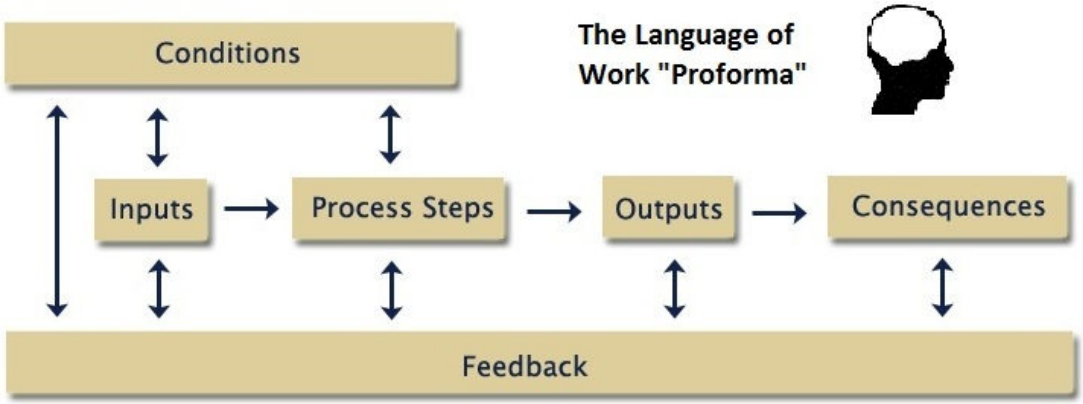

Figure 3: Model for Defining, Aligning, Talking, Facilitating, Improving, Thinking, Measuring, and Changing Performance (Sanghi 2007)

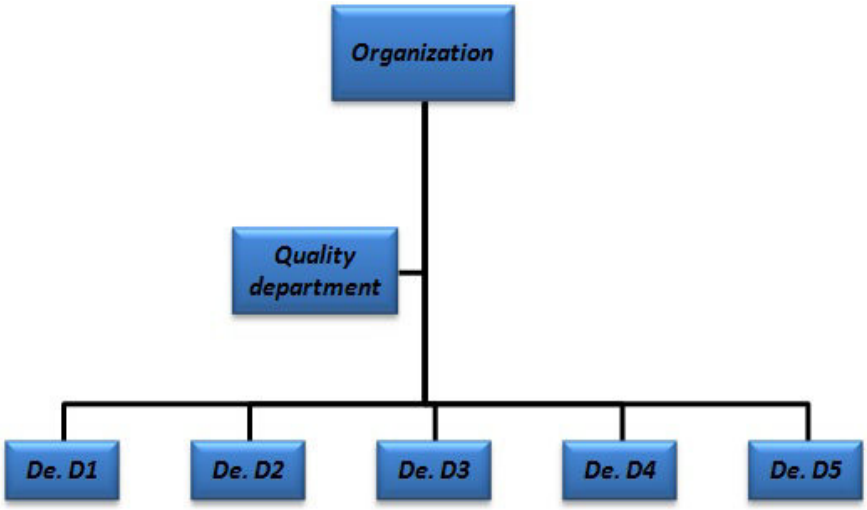

Figure 4: Organizational Structure

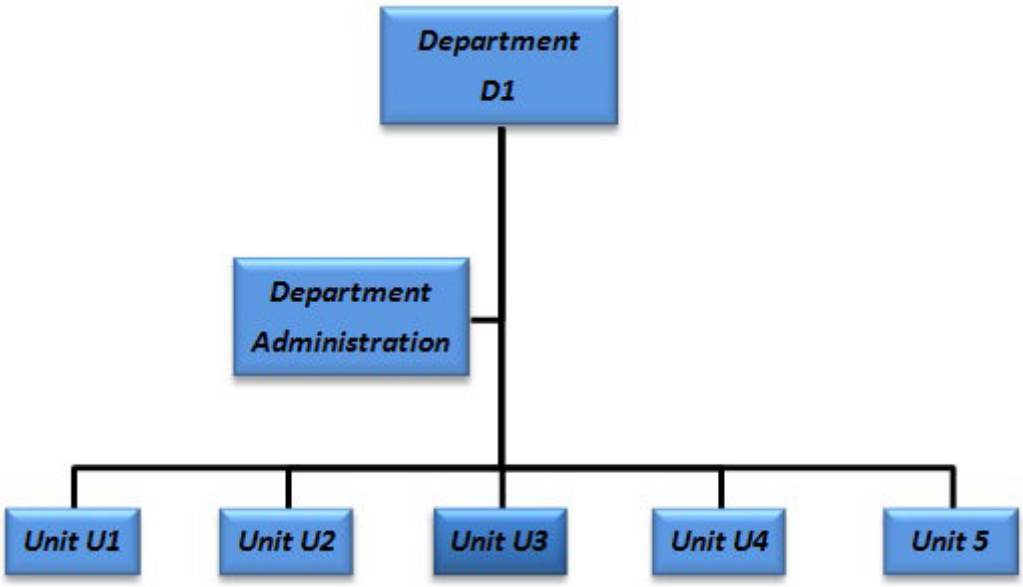

Figure 5: Departmental Structure

Figure 6: The Project Planning Process

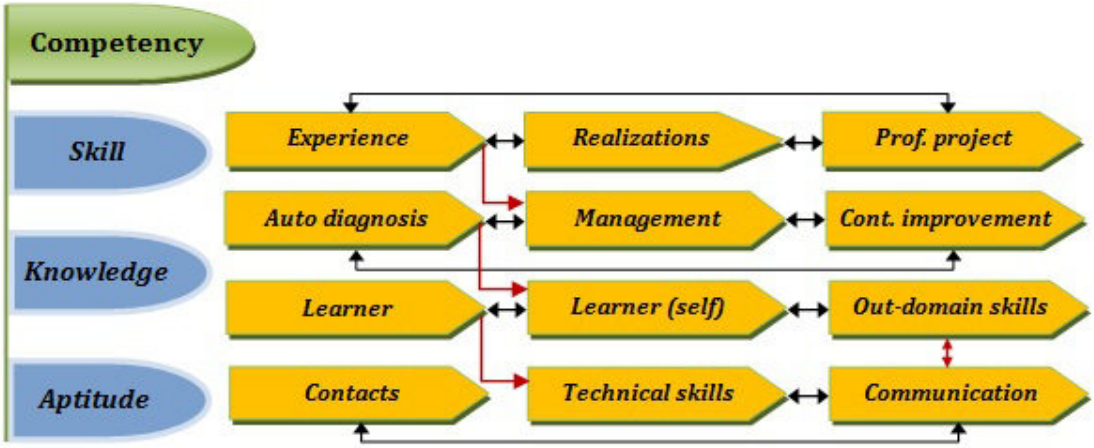

Figure 7: Decomposition of competencies to sub- or new competencies

Figure 8: Competencies identification and scoring

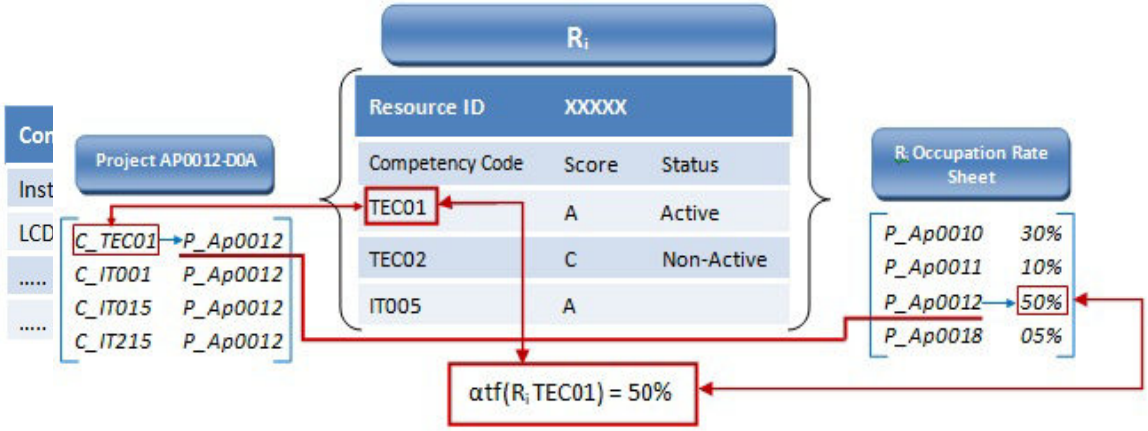

Figure 9: Relating resource competencies to their occupation rate

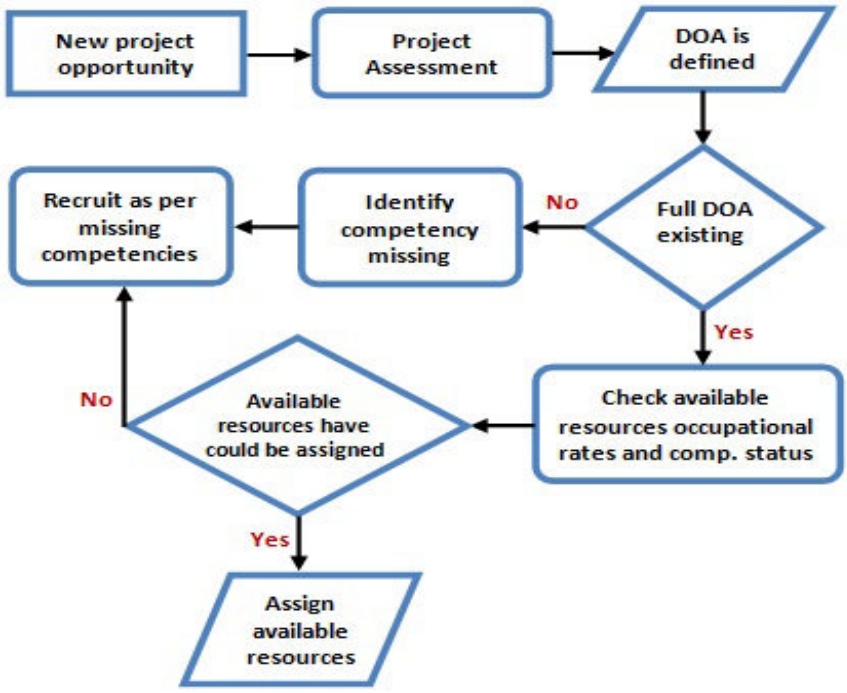

Figure 10. A proposed chart for task assignment