A Competence Management Supported by Recommendation Mechanism

W. N. Silva, S. N. Brandao, M. A. Vaz, J. M. Souza

1COPPE/UFRJ - Computer Science Department, Graduate School of Engineering, Federal University of Rio de Janeiro, Brazil
2DCC-IM/UFRJ - Computer Science Department, Mathematics Institute, Federal University of Rio de Janeiro, Brazil

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Abstract - The constant changes in social, economic and political scenario have required tightly response time from organizations and ability to reconfigure its resources to remain competitive. In this context, this article aims at presenting a recommendation mechanism for a competence model to improve the competence gaps analysis and identify the better Development Plan for Employees (DPE), which consist of training and development for knowledge development through the use of a corporate competence management system. Besides, this article presents a case study that shows the gain of use the recommendation mechanism in a corporate environment which has a competence management system.

Keywords: Competence Management System, Competence Management, Competence Model.

1 Introduction

Currently, institutions face difficulties when it comes to competence management. A weakness is related to how address a specific gap on employee competence. Often Human Resource (HR) analyst provides courses to the employees that do not fully solve gap or could be replaced by a cheaper course, which would solve the gaps in the same way. Another relevant factor is the time taken for the HR analyst to perform this task.

This paper proposes a recommendation mechanism for a competence model that aims to improve the gaps analysis and identify the better Development Plan for Employees (DPE), which consist of training and development for knowledge development, such as courses, training etc, as well as institutions, load-time and costs. The DPE is the educational solution that will solve the individual gap in each competence.

The recommendation mechanism was based on actual parameters used by the human resource department from one of the largest oil and gas companies in Brazil. During the last year, the HR analysts feel the needs for a tool that assist in the task of analyzing the gaps and creating an individual development plan (DPE) to meet the need.

The role of competence management model is to achieve the goals of the institutions through the alignment of Human Capital. For this model bring the expected results, it is necessary that the organizations know their needs. The clarity and focus in the future is a very important issue that can even ensure the survival of the organization in such scenarios. The competence management can be seen as an integration of ideas, concepts and practices of Personal Management in an intense competition in a dynamic environment have required companies from the time of increasingly tight capacity and reconfiguration of its resources to obtain the sustainability of its competitive advantage.

The implementation of a competence management model suffers various influences of factors that allow the specification of this process. For example:

- Strategic Plan of the Organization;
- Maturity level of the management and HR departments;
- Computerized and Integrated Resources Management;
- Readiness and willingness to change.

The organizations need to make the task of identifying human expertise very important in this scenario. Also, some questions are raised, such as: Who are the professionals in our company? What are your competences? Who needs training? We are investing the right people? We have a strategy to harness the potential of people? [3]

The implementation of innovative practices in personnel management based on performance and driven by their knowledge, skills and attitudes, requires the establishment of a methodology that incorporates a set of procedures and tools that lead to the creation of a management model for competences that enable companies conduct their business strategies [7].
Within this scenario, the study presents the recommendation mechanism inside the competence management model of a Brazilian Energy Company for semi-automatically construction of their Development Plan of Employees (DPE) to ensure the effective adequacy and development of technical knowledge and guarantee the development of Company’s strategies / goals. We seek to guarantee the completion of the competence management cycle with concrete and tangible results.

Our mechanism was implemented by a computational tool [7] that assist the HR analyst with a dynamic and effective system for continuous professional development based on the best choice that have already been applied on the company.

2 CONTEXT

In a corporate language, competence is often applied to various organizational levels, from individual competence (also called "skill") to organizational capacity to achieve some sort of result (which could be called "strategic skills"), through the collective skills that broadly corresponds to what might be called "capabilities".

The environment studied in this work is the Brazilian Company with a competence management system with a consolidate management practices and instruments to attract, develop, train and retain people, investing in their talent and improving their technical and managerial competencies. The human resources department mission focus on providing an HR management system that enhances the human potential and manages organizational environment conducive to the motivation of people, leading them to contribute and to commit to excellence in performance and results organizational.

In our context, the Required Proficiency (RP) levels are defined to guide and align the expectation of the company to each employee inside the process. The analysis of competences involves self-assessment of all employees [4], which is used to collect information about the Observed Proficiency (OP) levels by own employee. With this, the gap can be calculated as the difference between the required proficiency (RP) level and observed proficiency (OP) level in each employee competency (Gap = RP-OP).

After, the Development Plan of Employees (DPE) is created based on the identification and planning of actions to strengthen the competence required. It involves the establishment of strategies to close the gaps found in each employee assessment [11].

In this moment, we analyzed the need for automation on assisting the HR analyst in the decision-making to solve the employee's gap. With this the analyst will aid of a system through automation, which indicate the best path to follow, which provide training to the individual to its gap and a specific role has been supplied. The monitoring and management analysis of the results, both for knowledge and organizational effective, are performed through management tools (analytical queries) to enable support to development decisions, empowerment of employees and future hires.

According to Vygotsky (apud [6]), the management process by competencies should be implemented, as any process of human intervention, with specific languages, models and analysis method, to help the actors to translate their collective activities (current and future processes) in requirements for collective skills and to translate these shared competences requirements into viable action.

3 Recommendation Mechanism for Competence Gap

The idea of this paper is to implement a recommendation mechanism for competence management to avoid problems found by Human Resources (HR) analysts that often provide an educational solution that do not solve completely a gap or an educational solution that could be replaced by a cheaper solution eliminating the gap in the same way. Also, another difficulty for the HR analyst is the great time spent to manually identify the best educational solution.

Therefore, this paper proposes a model to assist the HR analyst in the analysis of competence gaps of an individual and recommend the best educational solution based on history training of the company.

At the end of this paper we present an experiment conducted under a corporate system that is currently being used by one of the largest oil and gas companies in Brazil. All parameters used for the creation of this model have been based on interviews of people who work on competence management in this company. Currently our model is not in the corporate environment, but we present indications that will bring gains for the company.

The model presented is divided into three sequential steps. Regardless the quantity of competences to be assessed, the three steps are triggered and are complementary to one another, where the result obtained in the first step is passed to the second step and the result of this is sent to the third step as input parameters. The first step is related to time series analysis based on historical data related to the educational solutions already adopted to meet the previous gaps for a considered competence. The selected solutions are sent to the second step to rank them taking into account three features to compare with the considered competence they need to have solved the gaps:

- The years of educational solution was applied;
• The bibliography involved in a educational solution;
• The competences involved in a educational solution;

Finally, the third step will examine the financial cost to determine the optimal educational solution, which can be only one education solution or a subset of which were defined in step two. This third step uses both time series analysis and text mining. All data from each step are stored in a database.

![Figure 1 – An example of individual evaluation](image1)

### 3.1 Step one: Temporal Data Analysis

Before use the recommendation mechanism, the managers must use the competence management system of the company [7] to associate the competence for the employee defining the Required Proficiency (RP) level for each employee’s skills (Figure 2).

![Figure 2 - Interface where the manager defining the RP level for each employee’s skills](image2)

The competences have been previously loaded from the Specific Individuals Competences Map that was the result of previously Mapping Step out of the system through workshops between managers and Human Resources Department. After, the self-assessment of the employee need to be done to define the observed proficiency (OP) level in each competency by own employee (Figure 3).

![Figure 3 - Self-evaluation of the employee](image3)

With this information, the competence gap of the employee is the difference between the required proficiency (RP) level and observed proficiency (OP) level in each employee competency (Gap = RP-OP). In this moment, the model proposed in this paper can be executed to recommend a driven individual development plan to solve the gap in competence of the employee. The first step of the model, as stated earlier is the analysis of historical data related to the educational solutions already adopted to meet the previous gaps for a considered competence. For each competency in this assessment, the gap of employee is calculated and verified on corporate database the historical of educational solutions adopted for the same competence, with same (or nearest) gaps from other employees. All solutions retrieved from these restrictions are processed and send to the second step. Figure 4 illustrates this first step, where an employee has a Gap = 2 to the competence ‘Cost control’.

The proposed model will be responsible for searching in the corporate database, all occurrences of gaps in the competence 'Cost control' from others employees. Competence gaps with a value lower than the considered employee are not considered.

The goal of this step is to extract the solutions adopted to meet the gaps in self-assessments in previous years. In the example illustrated in Figure 3, we identified the following educational solutions for the competence ‘Cost Control’:

- 1990 - Risk management in projects (FGV - $3,000.00)
- 2007 - Analysis of risks in projects (IBGP - $1,500.00)

The result obtained in this first step will be used as input parameters of the second step, which has a very important role in this task to rank education solutions already adopted in previous years in the corporate environment. The best solution will be chosen based on (1) the years of educational solution was applied, (2) the bibliography of the educational solution and (3) the competences involved in an educational solution, when we compare this information with the current gap of the considered employee.
3.2 Step two: Proximity Analysis with Current Resources

The second step of this model is responsible for ordering the solutions identified in the previous step analyzing the cost-effectiveness. If there is no exit from the first step, the entry is a description of the competence with the gap, but the end result may not be optimal.

In this step runs a classification and mining tasks that takes as parameter the output of the previous step and run the database mining on educational solutions applied in previous years in the corporate environment, taking into account (1) the years of educational solution was applied, (2) the bibliography of the educational solution and (3) the competences involved in a educational solution to compare this information with the current gap of the considered employee.

The mining task is performed by a feature of Oracle [10] called Oracle Text, which is a feature built into the database using SQL to index, search and analyze text and documents stored in binary tables. Our model is not tied only to this feature, others can be used and this technology was chosen because the competence management system runs under this Database Management System on the environment corporate.

3.3 Step three: Cost Analysis

The third and final step of the proposed model defines the best solution to be used to meet the needs of the employee in his/her competences gaps. The goal of this step is to find, based on the output generated by the second step, the most complete solution and with the least cost.

First, we verify what solution solves more gaps in all competence of a considered employee. The purpose is to identify possible solutions that can meet various competences with gap. After, we verify what educational solution has the best cost-effective, i.e., it takes into account the financial cost and the amount of competences that will be covered with educational solution.
 Firstly, we verify if the resource meets another competence and, in parallel, if the solution has the least cost. In our example was chosen a course of $1900.00 which is one of the most expensive, but it satisfies other requirements, i.e., instead of adopting a course of $1,000.00 and another $1,100.00 to attend two gaps, it is preferable to take only one course from $1900.00 to satisfy the two gaps. So we have an economy of $300.00.

In the figure 7, we illustrate our recommendation mechanism for a competence model to observe the interaction between the three steps, which are sequential and dependent on one another. We also can observe the generated an output after the third step, which is a reusable solution as an indication of the best and the least cost.

4 Case Study

4.1 The Competence Management System

The case study carried out in this work run on the Competence Management System of Downstream Sector (SGCA) [7] to support the competence management process focusing on the Analysis and Adequacy of Competences activities one of the largest companies in the oil and gas in Brazil. The Competence Management System is aligned to the Competence Model adopted by the company to continually manage the professional development of its employees, incorporated the policy of human resource development. Figure 8 illustrates the architecture of this system.

Figures 7 and 8 show the workflow allows to choose the best solution in order to meet the gaps in the competences. Figure 7 indicates the sequence of the recommendation mechanism for a competence model.

4.2 Results

The evaluation process recovered and mentioned in section 4.1 was used to simulate the behavior of our recommendation mechanism to automatically construct DPE for the 30 employees cited. The objective of this case study is to compare the DPE construct by the HR analyst and the result automatically constructed. Thus, we analyzed the degree of reliability of the model by comparing the original results with those generated independently.

The table below shows the result of the comparison between the two processes of DPE construction. In the second column we see the percentage of competences that have the same educational solution to meet the gap in the two cases. Note that about 59% of the gaps did not have the same solution. And only 41% of results were identical.
We analyze why a different solution was recommended by our mechanism and we observed that in most cases (74%) our mechanism recommended solutions to somehow reduce the cost, the training time or the quantity of courses for the employee. The table below showcases the final results of the case study.

<table>
<thead>
<tr>
<th>Results</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Identical results</td>
<td>41 %</td>
</tr>
<tr>
<td>Different Results</td>
<td>59 %</td>
</tr>
<tr>
<td>Different results that reduce the cost</td>
<td>47 %</td>
</tr>
<tr>
<td>Different results that reduce the time</td>
<td>27 %</td>
</tr>
<tr>
<td>Gain</td>
<td>44 %</td>
</tr>
</tbody>
</table>

Table 3 – Final Results

5 Conclusions

The competence management gain importance for organizations to align employees and activities in light of organizational strategy. A competence management system is essential in this task, and a functionality to reduce cost and facilitate the intervention of the administrator can gain equal importance in this field, where the manager and HR analyst’s time is usually expensive to the organization.

This study focuses on implementing a recommendation mechanism to construct the Development Plan for Employees (DPE), who needs of individual training and development through the resources for knowledge development, such as courses, training etc, as well as institutions, load-time and costs. Our focus on the competence management was on avoiding problems found by Human Resources (HR) analysts that often provide an educational solution that do not solve completely a gap or an educational solution that could be replaced by a cheaper solution eliminating the gap in the same way. The development of the recommendation mechanism brings solutions to somehow reduce the cost, the training time or the quantity of courses for the employee.

There are points to be studied in order to improve the model, but the initial results were very positive with regard to aspects relating to the diagnosis and identification of educational solutions for employee training and reduce costs for an organization.

6 References


