

INTEGRATING LABOR SKILLS CERTIFICATION WITH TRADITIONAL TRAINING FOR ELECTRIC POWER OPERATORS

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Abstract: In this paper the integration of a traditional training system with a competence management model is conceptually described. The resulting e-system is accessed through powerful Web interfaces and contains a comprehensive database that maintains information of the two models. The traditional model emphasizes the contractual worker training rights and the skills model the alignment of the human talent with the mission and objectives of the company. The paper describes the specific traditional training model of CFE (Federal Electricity Commission), its competences model and the integration of the two models following a thematic contents approach.

1 INTRODUCTION

Derived from governmental policies related to training management and considering its strategic planning objectives, CFE (Comisión Federal de Electricidad – the National Electric Utility in Mexico, a 70,000 employee power company) has established a strategic program to improve its human capital offering 10 training days per year for each employee. This program is related to labor skills for CFE that is responsible for generating, transmitting and distributing electricity through out the Mexican nation.

In the literature there are papers that describe labor skills systems (Hatfield, 2007) (Glen, 2006) (Riley, 1994) but none includes the integration with training. In this paper first, a traditional training model of CFE is presented, second, the model of labor skills management and certification is described, and third, the integration of the two models is discussed.

2 THE TRADITIONAL TRAINING MODEL

For more than 20 years, CFE has executed a training program that includes a coherent and comprehensive group of standards developed. The norms are classified in four groups:

Planning: Position Profiles, Training Batteries, Training profile per worker, Individual Knowledge Matrix, Individualized Training Program, Specific problem solution oriented program

Organization and Integration: Revision, consolidation and authorization of the annual training program, Instructors' development.

Execution: Execution, Budget, Reports, Statistical
Control: Diagnostic evaluations, Partial evaluations, Course reports and credits, Worker's evaluation in his position, aptitude record,

The objective of the traditional program is to obtain an annual training program of individualized courses with impact in the productivity indexes.

CFE classifies the hundreds of employee positions of its organizational chart into organic groups or levels (from I to XII) depending on the

position responsibility (director, manager, department boss, operator, clerk, etc.), the position participation in business processes (generation, transmission, distribution) or support processes, if the position is unionized, and the remuneration level.

For each employee a career plan defines the positions that are allowed for the worker to pass from his current position level to a position in an organic level immediately superior and to other positions up in the organizational hierarchy.

Each position in the organization has an assigned profile that it includes one or more specialties, for example:

- Maintenance (mechanic, instrumentation, electric);
- Operation (analysis and results, engineering, chemical);
- Planning (supply, analysis, studies);
- Services (billing);
- etc.

The specialties are classified in levels that match with the academic levels: secondary, high school, primary technician, secondary technician, bachelor, graduate, master, and doctorate. In this fashion, the annual training needs are detected.

3 LABOR SKILLS CERTIFICATION MODEL

A competency, job or labor skill is a specific capacity to perform a productive function in different labor contexts on the basis of obtaining quality results in the corresponding productive sector. A job skill standard indicates which knowledge, abilities and attitudes define the competence. A productive sector is a part of the society that specializes in some type of activity, for example, agriculture, health, or energy (Molina and Rodriguez, 2005).

In contrast with a traditional training system, the main objective of a job skills management system or program is to certify individuals in knowledge, skills, expertise, abilities, and attitudes appropriate for specific enterprise productive functions independent of how they acquired them.

3.1 Job Skills Technical Standards Management

In this section, the JSTS management module of the e-system is described. It includes the productive functions map for the electric sector, the

collaboration mechanisms for the JSTS development, printing and publishing, and the content structures to manage their storage.

A Job Skill Technical Standard (JSTS) is defined and developed by a Job Skill Standard Committee (compose of methodologists, technicians and specialists, among other) authorized by CFE, and approved by the National Council for Job Skills Standardization and Certification (CONOCER, Spanish initials) and sanctioned by the Public Education and the Work and Social Affairs Secretaries of State. A JSTS establishes, for repeated and common use in the whole Mexican States territory, the characteristics and the guidelines for the evaluation of capacity or labor competence.

In Figure 1, a semantic model is shown for the normalization management that has been implemented with a relational database management system.

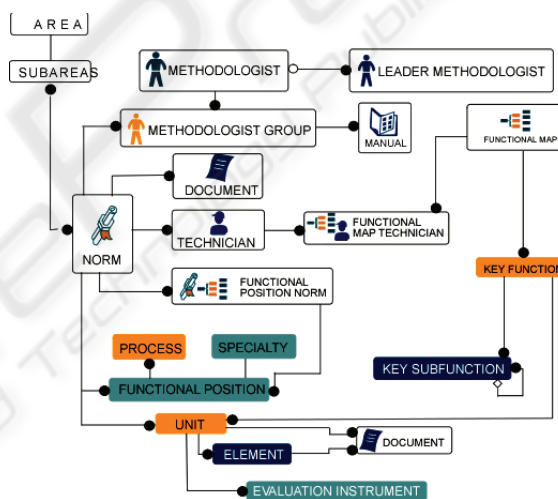


Figure 1: Semantic Model for job skills normalization.

The methodologists (leader, group, and observer) support the generation of the knowledge included in a JSTS, and the experts (technicians) in a productive function contained in the company's functional map provide the knowledge. Roughly, the functional map of the CFE is a functions hierarchy or tree where the functions corresponding to the highest level are four:

1. To operate the equipment for electric power generation, transmission, transformation and distribution.
2. To maintain the equipment for electric power generation, transmission, transformation and distribution under operating conditions.
3. To manage the operation and energy transactions of the Power Electrical System.
4. To provide the electric power utility service.

It is no the intention of this paper to show the complete functional map for each one of the four mentioned highest level functions, it would be very extensive. All functions are composed of sub-functions.

For example, for the function 2.2.1.4.2 several standards are at hand, one of those is the norm: CCFE0628.01 Mechanical maintenance of steam turbines with high and low pressure cylinder.

In this way, CFE had to elaborate a JSTS for each one of the lowest level productive functions of the company (approximately two hundred norms).

A JSTS or norm contains units and a unit contains elements. In turn, the elements include evaluation instruments that are the performance criteria related with categories, in such a way that for an element different skills evidences can be assessed, either for abilities, for knowledge or for attitudes.

The functional map structure defines the enterprise purpose; it defines the strategic key functions, and recursively the more basic key sub-functions. To the lowest level key functions of in this hierarchy corresponds a certain number of standard elements. Both the norms and the functional map are documents that can be stored in electronic format files.

Note that a JSTS applies to one or more company processes (Generation, Transmission, Transformation, Control or Distribution), and a process is ruled by one or more norms.

In a similar way, a JSTS can be assigned to one or more functional positions in the organization and a position is ruled by one or more norms. One can observe that to work in a company position, a person will have to be certified in several labor competences.

Each standardized competence or labor skill has assigned a performance level according to the English NVQ system (National Vocational Qualification). This classification of the competences is in five performance levels, based on different variables: complexity of the behavior, variety of acting in different contexts, autonomy and responsibility, requirement level, and of the collaboration management of other people and resources.

3.2 Model for JSTS Certification

A Web system was developed for the planning, evaluation and certification of CFE's personnel in labor competences. The model includes structures to record and monitor the personnel's certification

process: from the candidate's interview, his evaluation, until his final registration at CONOCER.

4 INTEGRATING THE LABOR SKILLS MODEL AND THE TRADITIONAL TRAINING MODEL

The integration of the traditional model and the labor skills model includes several aspects like the personnel recruitment; the diverse levels the specialties, and the course batteries of the employees' career plans. The objective is that the traditional training model supports to the employees' labor competences certification without affecting the training contractual rights.

The approach followed to integrate the labor skills concept with traditional training is centered in the concept of thematic content that the training course programs will have to include to support the employee in the labor skills certification. The idea is to establish and achieve thematic consistency between the elements of the labor skills norms of the functional map key functions and the specialty courses of the employee position profiles.

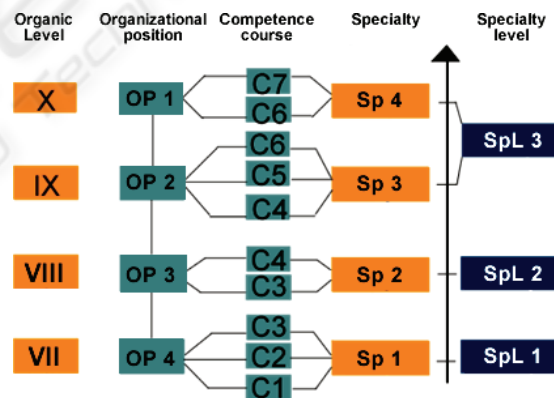


Figure 2: Competence oriented specialty courses.

The convergence process includes the following steps:

1. Find the business and productive functions from the organizational positions.
2. Correlate the elements of the functional map key functions with the productive functions of the organizational positions.
3. The set of specialties (SP1, SP2,... SPn) is obtained from the position profiles of the productive organizational functions.
4. The configuration of specialties based on skills or competences (c1, c2, ... cn) is achieved by

correlating the thematic content of the skills norm with the content of the specialties courses and adapting them or creating new contents to impact the competence certification.

In this fashion, a specialty is a group of competences, $Sp1 = C1 + C2 + \dots + Cn$, (see Figure 2).

As an example of a competence oriented analysis for the courses thematic contents of master level specialty, the design of a master degree curriculum in power plant operation is briefly described.

The analysis was carried out in a joint project with the National Polytechnic Institute, one of the most prestigious academic institutions in Mexico, and the result is a 5 semester master in engineering curriculum shown in the Table 1 where the courses in shady background represent competence oriented courses with thematic contents matched to the thematic contents of labor skills. The first generation of 15 employees will graduate by the end of the spring of 2008.

Table 1: Competence oriented master in power plant operation specialty courses.

1	2	3	4	5
		Thesis Seminar	Thesis Seminar	Thesis Seminar Project
	Thesis Seminar	Diagnosis Evaluation	Goal Negotiation	Controllers Simulation
Agent Operation	Recovery Strategies	Energy Balance	Tactic Projects	Performance Measurement
Thermo Economic	Performance Tests	Fuel Consumption	Problem Identification	Plant Modification
Thermo Fluids	Combustion Start Up	Maintenance Planning	Performance Evaluation	Corrective Actions
Communication Techniques	Tests Coordination	Maintenance Execution	Information Management	Preventive Actions

The dimensions used in CFE to classify the training levels are the organic position levels of the employees, the competence or skill levels and the specialty levels.

With these levels CFE knows if its personnel have the appropriate qualification to his position profile, competences and specialties, and to make decisions with regard to the alignment of the labor activities of his workers with the processes and functions of the company.

5 THE e-SYSTEM

An e-system was developed that implements the Web interfaces and the semantic nets that contain the information of the training traditional system, the competence management model and the

integration of the two models with competence oriented courses.

The system has software for the production of more than 130 interactive reports including the following executive ones: Functional maps displays; Listings of norms, granted certificates and evaluation centers; The worker's record in terms of positions, taken courses, competences and specialties; Number of employees by organic level that comply or not with the position profile of the level of specialty and skills; Etc.

6 CONCLUSIONS

An e-system that integrates the competence certification management and the traditional training in a company that generates, transmits and distributes electric power was conceptually described. In the system CFE registers, among other information, functional maps, competence and training standards, planned and taken courses, and the training record of each one of the 70,000 employees, and obtains executive reports that allow to know if the employees comply or not with the their organization position profile in terms of specialty and competence levels.

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