Competence Tracking and Automatic Training Design Simulation

Lucia Pannese[1], Susanna Lenardon[1], Vito Nitti[1], Mauro Santalmasi[1] and Valentina Festorazzi[1]

[1] imaginary s.rl. c/o Acceleratore d'Impresa del Politecnico di Milano, via Garofalo, 39, 20133 Milano, Italy
info@i-maginary.it
http://www.i-maginary.it

Abstract. Skills taught through computer-based simulation are the training solution of the 21st century for the Knowledge Worker. This same approach is being applied by the authors to the design process of the training itself.
An innovative approach to the definition of a Training Schedule is presented starting from a software based Competence Tracking. The idea is to map different training methodologies together with psychological and pedagogical aspects in a software system and to choose the correct mixture and weight of these according to the training objectives of a group of people. The competences of these people are traced and stored in the same system and the gap of competences is computed starting from "ideal profiles" and from the training objectives. A user modelling system is used to highlight potential differences in the training goals among the group and to obtain a learner oriented knowledge structure.

1 Introduction: the Approach

In the last years the explosion of knowledge and the thunderstorm of technological innovation made it extremely difficult for education to respond effectively to the ever changing challenges and requirements of society. In order to guarantee competitiveness knowledge-intensive enterprises require increased productivity and specialization; this means a quick and sharp competence development of knowledge workers. A new discipline considering the dynamics of the complete working system (competence, staff, work, technology, organization) is becoming strategic: Knowledge Work Management will therefore focus on and improve the currently insufficient integration of work and (e-)learning processes in companies.

This project is carried out with respect to this new societal framework.

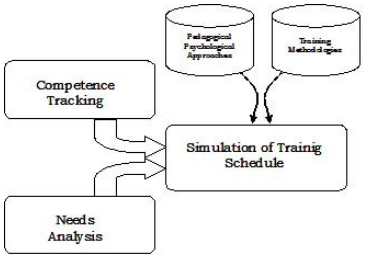
It is always difficult to match the tracking of different competences of a group of people (especially if heterogeneous or belonging to different working environments) with a homogeneous objective for a training course and with the preparation of a course schedule. A good job would be done considering different pedagogical approaches and several possible training methodologies, with respect to each indi-

vidual as a single and to the group as a whole, making the preparation of a training course a very long and expensive work. The ideal solution for a new approach was found in the area between Knowledge Management and e-Learning, especially in the Knowledge Work Management: knowledge management tools have to be designed, implemented (or selected) to support knowledge work and knowledge transfer (training) has to be organized efficiently, identifying the best tools/methods available with respect to each training item.

Another aspect which characterizes strongly the work which is being carried out is the dual approach: a formal theoretical approach is coupled with empirical and practical experiences. Sometimes they are in strong divergence and the system is able to suggest a solution which is the best theoretical approach given the constraints of the "real" situation. It is always possible to make adjustments and corrections to the system manually, in order to give even the most experienced users the possibility of concretely using the system.

2 Modules of the Project

The whole project represents the logical standardization and formalization of a collection of empirical results coming from the realization of several technological tools for competence tracking and resource profile generation in different contexts, together with another research project about a "Training Design Simulator" carried out in collaboration with a Professor for Training Sciences of the Università Cattolica di Milano, which first results were presented at the "ICL 2004" [2].



The basic idea is to obtain a homogeneous tool combining all the above mentioned activities which should support the head of the HR and Training Department ("user") in all the different phases of his job, creating a working curriculum with the profile evolution of every knowledge worker in his company: competence tracking, profile tracing, definition of training needs, setup of training programs. During this continuous process the user will be supported in the choice of the correct mixture of approaches and methodologies ideally for each single employee. The modules represented in the picture will be described more in detail.

2.1 Competence Tracking: the "BEE" project ("create your company competence hive")

The competence tracking module will be characterized by:

1. Areas of Intervention: an area identifies a "macro-problem" which has to be analyzed and evaluated, like e.g. "Problem Solving", "Relational Ability" or "Management Ability"; each area collects a set of Capacities.

2. Capacity: they describe attitudes and competences; e.g. “Leadership”, “Coaching” belong to “Management Ability”; it is a set of Items.
3. Item: it describes a behaviour through statements in order to be able to attribute a scoring to each one. “Leadership” contains statements like “Is not afraid of conflicts, but makes them explicit and tries to settle them” or “Is self confident and determined”.

The functional flow of the tool is:

- ✓ Model design and customization: Identification of the Areas of Intervention, Identification of the Capacities, Definition of the Items.
- ✓ Competence Tracking: creation and configuration: Identification of the participants. A participant could be an “evaluator” with an assigned profile (colleague, customer, boss…) or a resource that must be evaluated. Creation of questionnaires for the resources who have to be evaluated and for each evaluator profile.
- ✓ Competence Tracking Activity Start-up: Mailing of the start-up announcement; Mailing of the user-id and password to each participant.
- ✓ Collection of answers: Trace the competence profile for each evaluated resource; Create Reports.

At the same time the system allows the definition of “ideal” profiles for each company role to be used as a baseline to carry out an automatic gap analysis and to compute personal training objectives. “ideal” profiles can be computed identifying the “best in class” for each role or as an average of the best profiles.

2.2 Automatic Setup of Needs Analysis

Once an overall aim for a training course is defined, it is not always obvious, while organizing the detailed course program, how to obtain the analysis of the precise needs, in order to avoid “general” lessons or focusing on the wrong aspects on one hand and to avoid missing some aspects on the other hand. Therefore, once the general topic is defined and the target user has been identified, a first step is to obtain a simulation of the interview to collect all relevant information: the system has to tell the training designer who should be interviewed (apart from the students of the course!) and where the focus of the interview has to be put on. [3]

2.3 Simulation and Automatic Setup of Training Schedule: the “Beaver” project

The “Beaver” project: “Engineer a solid training path” concerns the last module: the construction of the training path (which was called course schedule).
Once the Needs Analysis has been established (it is the output of the above described interview), the single objectives of the whole training courses must be focused on in order to meet them.

Starting from a set of registered Training Methodologies and Approaches (e.g. computer simulation, business game, case study, coaching, group discussion, psycho-social exercises, in-basket, out-door training, project, (field) research, role-

playing, training on the job, individual studies) which are weighted according to their potential application to meet pedagogical and psychological objectives, the system is able to suggest the best mix of different approaches and to distribute them quantitatively inside the constraints of the course, which have to be indicated at the beginning (e.g. costs and time and the characteristics of the group which has to be trained). The system also suggests corrections for example to the time dedicated to each of the chosen training activities according to a set of minimal and maximal durations of the single techniques, to priorities between the methods and to the possibility of repetitions, i.e. according to predefined pedagogical elements.

The structure of the tool allows focusing efficiently on complex training objectives. The application of what is being learned to real situations is usually particularly difficult especially in academic training courses. The tool allows to overcome this difficulty presenting a simulation which reflects the whole problems a training designer has to cope with, i.e. to match the training objectives with general context variables (number of participants, possibility to organize the workshop in a residential form, the typology of the group, etc) and with specific variables related to the participants (company origin, professional seniority, starting expertise, etc).

The tool is based on a system of "corrections on the job" accompanying the student through several steps always offering specific feedbacks. This allows him to exercise his theoretical knowledge as well as to test his ability in reading the data which constitute the context he will have to take care of during his design phase.

Therefore the real innovative aspect of the tool is the creation of an integrated theoretical-practical model starting from which students can start already in a classroom during their own training to collect professional competences. [1]

3 Applications

Industrial application: The tool is meant to give the head of the training department the possibility to build a complex training schedule quickly, with a sound help for the best choice of training techniques.

Academic application: students of Training Sciences know a lot of theory about pedagogical techniques, but they lack experience working with constraints and objectives which are often in contrast with one another.

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