Collaborative Learning Framework in Business Management Systems

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This paper presents a solution based on collaboration with experts and practitioner from university and ERP companies involved in process learning by training and learning by working. The solution uses CPI test to establish proper team for framework modules: Real-Time Chat Room, Discussion Forum, E-mail Support and Learning through Training. We define novice, practitioner and expert competence level based on CORONET train methodology. ERP companies have own roles for mentoring services to knowledge workers and evaluate the performance of learning process with teachers' cooperation in learning by teaching and learning by working module.
***Keywords**: Web-Based Collaborative Learning, ERP Systems, User Model, Psychological Scale.*

1 Introduction

The Internet cannot supply one important factor in education and that is physical interaction of the students. The lack of face-to-face interaction renders almost impossible for the collaborative skills of the students to be well nurtured. That is why the industrial collaborative systems have been especially modified to incorporate the learning paradigm, which has led to the emergence of collaborative eLearning systems. The broadest definition for collaborative learning is that it is a *situation* in which *two* or *more* people *learn* or attempt to learn something *together* [Dill99]. A more comprehensive definition states as follows: "a coordinated, synchronous activity that is the result of a continued attempt to construct and maintain a shared conception of a problem" given by [RoTe95]. Many researchers have devoted their efforts to developing collaborative learning systems. The work of M. A. Swaby, P. M. Dew and P. J. Kearney [SDK+99] focusses on the description of a model-based approach for the construction of collaborative software systems that reflects the heterogeneous and dynamic characteristics of virtual teams. In their opinion, a model-based architecture is appropriate for providing an abstraction of the interaction between users and the supporting software services within an application context. There are two related objectives in their approach. Firstly, to improve the ability of software engineers to rapidly develop customized collaborative applications that are tailored to the heterogeneous requirements of virtual teams and secondly, to improve the ability of these applications to dynamically evolve over time as requirements change.

A more practical aspect of the collaborative activities, the work of [Dust04], namely the Caramba process aware collaboration system, present an implemented collaboration system that focuses on the exchange activities that users make use of during the virtual teamwork activities. The above mentioned paper analyzes the relevant criteria for process-aware collaboration system metaphors, the coordination models and constructs for organizational structures of virtual teams as well as for ad hoc and collaborative processes composed out of tasks, and architectural considerations as well as design and implementation issues for an integrated process-aware collaboration system for virtual teams on the Internet. Although the paper is not about eLearning, the collaborative paradigm is clearly outlined and easy to adapt to the learning activities like human interaction, knowledge exchange and collaborative processes.

The work of J.A. Campbell [Camp00] presents the issues that the students and

teachers were confronted with after the opening of the "first purpose built flexible learning campus in Australia" the Logan Campus in January 1998 at Griffith University. In particular, the students were disoriented because of the large number of courses to choose from, which lead to a difficulty in understanding which courses were compulsory and which were optional. Another student issue that was outlined was the lack of students' experience in choosing their own schedule for learning activities. Apart from the usual concerns of having to acquire computational equipment in order to participate to the online courses, other anxieties were expressed, such as the fear of overlooking important information due to the large amount of material that the students were confronted with and frequently choose to pay extra money for printing out their materials so as they would not miss out on any information.

2. The Framework for Learning through Training ERP

2.1. Collaborative eLearning modules

This work has been developed based on collaboration agreements between our Business Information Department and some ERP companies from Romania and abroad (Microsoft with Dynamics NAV, Thinvest with Mentor ERP, Transart with B@rg EBSRomania with Clarvision ERP and Rent IT Systems from England with 123mrp). Framework was developed after were studying works of two Chinese research teams concerning the web-based collaborative learning. The first and most important is the Web-Based Collaborative Learning Environment (WBCLE) [Xin+04], where students can make use of real-time chat and discussion forum to study through the web, and the Web-based Adaptive Collaborative Learning Environment of Yonggu Wang, Xiaojuan Li, and Rong Gu [YoXR+04] where WBCLE is completed by the User Model through which users can select an appropriate learning companion that can help them easily solve any problems that may appear. The work of Elena Gaudioso and Jesus G. Boticario [GaBo03] also focuses on the User Model by trying to bring a level of flexibility to it in order to cope with the changes in the collaborative model.

The human interaction in collaborative eLearning systems is also the interest of [YoXR04] by the presence of a learning companion. Here, a framework for integrating learning companions into collaborative strategies is presented. The framework focuses especially on interactive chat, discussion forum and peer-to-peer chat as the main collaborative learning tools. The interaction is on a request basis, meaning that a certain student can post a request for assistance in a certain learning subject and his companion will have the free choice of accepting of refusing the request according to his own study schedule. What is more important for the particular framework is the coupling of a User Model that stores different student learning features (i.e. Knowledge Level, Learning Interests & Hobbies, Cooperative Consciousness, Cooperative Ability, Cognitive Styles, Accepted Companion and Rejected Companion, Accepted Topics and Learning Burden) and an Adaptive Component that will help the students select an appropriate learning companion. Its main features are:

- Abstracting the characteristics of learners from their behaviors.
- Reasoning based on the collaborative strategies of the framework.
- Selecting the companions from the User Model that are suitable for the present student.
- Creating cooperative sessions between the student and his companion.

Another important feature of the framework presented here is the Learning by Training module, based on structure and training technique in the case of the software engineering workforce [PAD+01]. The authors have meticulously divided the Learner role into eight sub-roles that follow the Learning through Training paradigm and have identified three learner competence levels:

- Novice – the learner that has rudimentary theoretical knowledge and no practical knowledge (work skills) or experience in the sub-

ject-matter area.

- Practitioner – a learner who has basic to advanced theoretical knowledge but rudimentary practical knowledge or experience in the subject-matter area.
- Expert – the learner who had advanced knowledge in both theoretical and practical (work experience) fields of the subject-matter area.

From sides, university and ERP companies we have practitioner actors and experts involved in learning by training process and also in learning by working process (figure 1).

Many of novice learners became practitioners after receiving training and coaching based on collaboration with experts and practitioner but experts and practitioners are involved in both process learning by training and learning by working. ERP companies gives us mentoring services to knowledge workers and evaluate the performance of learning process with teachers' cooperation. Other aim of its framework is to developing proper skills for several levels of ERP deployment in order to offer students an opportunity to be employed.

Case Based Learning are made according to curricula and companies' profile, every student (novice) will be placed in proper role of ERP system according to his knowledge, skills, programming abilities and psychological profile. In this phase we try to follow Re – Responsibility and So – Social Conformism indicators. In every module they can join in brainstorming module but all the process are made by reciprocal learning based on bidirectional relation between teaching, coaching and mentoring (practitioner and expert). Also we try to develop professional and social competences based on CPI scoring individual characteristics. In this manner we follow Lp- leadership abilities, Sy – Sociability, Sp – Social Presence, Sa – Self Acceptance.

After they are evaluating during courses period, they follow second form Theme Based Learning with experts and practitioners. Many students are now learner and become practitioner during practice period (Learning by Working). For whose students which has high value of CT – Creative Temperament we try to give them a research tasks in order to increase them intellectual capital and conduct them to research activities (in companies or in universities). This aim offers opportunity to identifying transition between practitioner and expert.

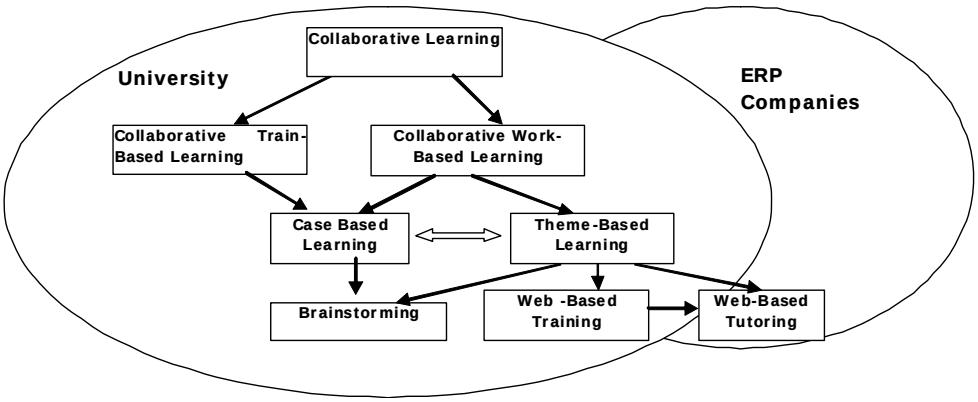

Fig.1. Relation between modules for the Collaborative Learning of ERP Systems

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2.2. Framework for Learning by Training

The framework modules are: Real-Time Chat Room, Discussion Forum, E-mail Support and Learning through Training, modules which are already implemented in other eLearning applications. The communication between users is provided by the real-time chat room for synchronous communication and user forum for asynchronous communication. The Learning through Training module uses a work-based learning approach in order to further enhance the interaction between users as well as to develop new skills in the users (more problem-solving and social competence skills for the tutor and new programming skills for the trainee). Finally, the E-mail support is used as the coagulating factor for all the other modules in the frame-

work. It can help in setting up new chat-room activities, as a notification agent for the forum posts and replies or as a means of communication for the tutors and trainees for the Learning by Training module.

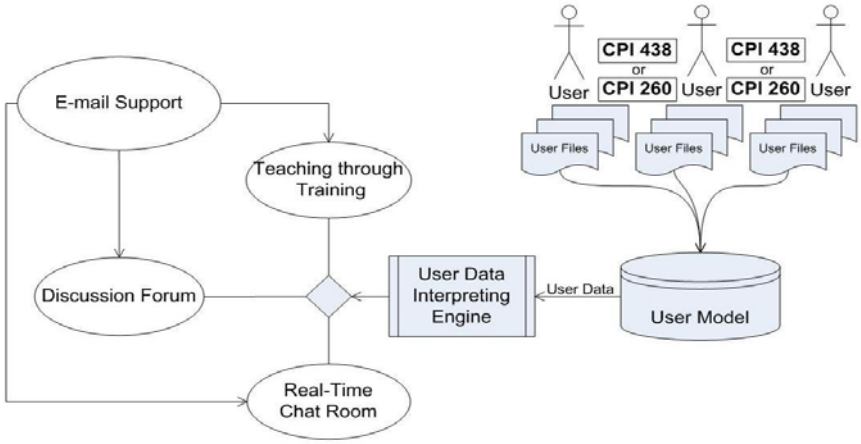

Fig.2. The Framework for the Collaborative Learning by Training of ERP Systems

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In order to correlate these modules, the framework makes use of a User Model component and a User Data Interpreting Engine. The reason for the use of modules when creating a framework is the flexibility and the adaptability to change. A framework built around modules is more likely to last longer than a non-modular framework because of its plug-and-play architecture and third party application connectivity. Another reason for the modular approach is the reduced cost of the final system, as well as the reduced development time due to the parallel development of modules. The modules of the eLearning framework for studying ERP systems and programming languages are interconnected *(<Figure No. 2>)*.

3. User Model and User Data Interpreting Engine

The modules that come after the User Data Interpreting phase are not interrelated and the use of the E-mail Support module is left to the users' free choice. Any new module that would be inserted into the framework will come after the User Data Interpreting phase with the appropriate features added to the Interpreting Engine in order to properly parse the User Data.

Another feature of the framework is the use of the CPI (California Psychological Inventory) 438 or 260 test in the User Data acquisition phase (*<Figure No. 3>*). The psychological test is used in order to acquire detailed data about the users that will be used in order to provide a personalized experience for the Learning through Training and Real-Time Chat Room activities.

California Psychological Inventory (CPI™) has been in use for more than 50 years and has known different versions (CPI-480, CPI-462, CPI-434, and the latest, dating from 2002, CPI-260). The CPI-434 uses 18 scales for scoring individual characteristics. The purpose of the scales as stated by the author, Harrison Gough, is as follows: "Each scale is designed to forecast what a person will say or do under defined conditions, and to identify individuals who will be described in characteristic ways by others who know them well or who observe their behavior in particular contexts *(<http://www.hr-romania.ro , http://cps.nova.edu>)*. The scales are grouped for convenience into four broad categories, bringing together those having related implications" (*<Figure 3>*).

Of this category there are four relevant scales to be taken into consideration when constructing the User Model:

- Do – Dominance. A user with a high score on this scale is a person with a high degree of self-responsibility being oriented towards leadership tasks. This scale is relevant for the Real-Time Chat Room and Learning through

Training activities, where the high level users make for good tutors. It is important to mention that a good deal of attention should be paid when creating chat room teams according to the Do factor.

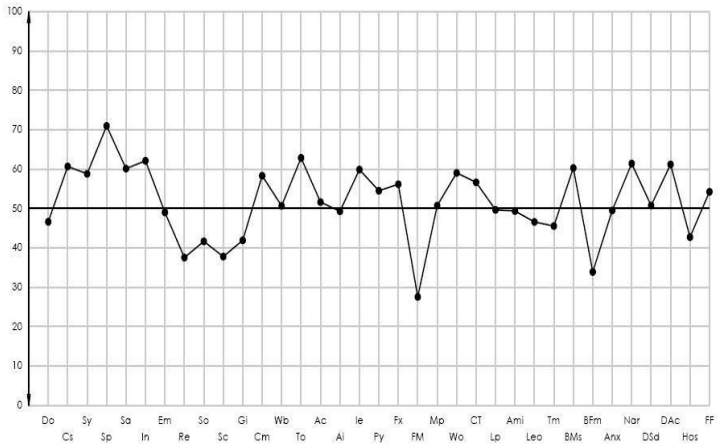

Fig.3. The CPI 438 Psychological Scales

It is impossible to comprise a team of a high Do user and the rest of the team members with low scores because the collaborative activity will soon turn into a one-man show, so the team members should have similar dominance abilities.

- Sy – Sociability. This scale shows the social participation of a user. It is relevant for all three main modules of the collaborative environment (the Real-Time Chat Room, the Discussion Forum and the Learning through Training groups).
- Sp – Social Presence. A person with high scores in this scale is spontaneous, versatile and is comfortable in the presence of an audience. This scale is relevant for the Chat Room activities where such users are good team members or even team leaders.
- Sa – Self Acceptance. A good score in this scale shows a person with a high degree of trust in his\her own personal abilities. This scale is relevant for both Chat Room and Learning through Training activities. Trainees with high Sa scores will always have confidence in their own capabilities, making them suitable for individual learning activities.

The second category of scales identifies the internal values and the normative expectancies like maturity, personal values, self control, and responsibility. Of this category there are two relevant scales:

- Re – Responsibility. The person proficient in this scale can be said to be thorough in the fulfillment of his\her own responsibilities. This scale is very important for the identification of efficient trainers and trainees in the study groups, but is unlikely to have a significant impact on the Chat-Room or Forum activities.
- So – Social Conformism. This scale shows the degree of acceptance of usual rules and conventions and it can be a good factor in deciding who will gladly take on the role of tutor in teaching\tutoring activities or what trainee will most likely follow the trainer instructions more thoroughly.

The third category of scales shows the measurements for the motivation, perseverance, tenacity and self-organizing potential. Here we have two relevant scales, namely:

- Ac – Achievement through conformity. Shows a person motivated for self achievement in a clearly structured environment; a goal oriented person. Such users make well for both trainees and tutors in the study group activities.
- Ai – Achievement through independence. These users prefer independence to rules and are good at setting his\her own goals. Therefore such persons will be bad trainees but on the other hand they will be good tutors because they will tend to let their trainees a certain amount of freedom in deciding their ac-

tions. The independence factor will also be an influence factor in the Discussion Forum activities, where solo work is usually sympathized.

The fourth category of scales is concerned with the evaluation of preferences towards aspects such as capacity of adaptation and sensibility, but there are no scales relevant to the collaborative environment. Besides the four main categories, the CPI™ has also special scales such as work related measurements. Here we have four scales:

- Mp – Managerial Potential. These persons are good at dealing with people, good at explaining solutions. Therefore it is obvious that those who have good scores on this scale can be good team leaders in the Chat Room activities but will also be good tutors in the study groups.
- CT – Creative Temperament. These persons like the new and the different; they like to feel "outside the box" and have a fast personal tempo. When grouped together in Chat Room activities, these users will surely provide a different and innovative solution to the problem, which is exactly the purpose of this collaborative framework. They will also be a likely active member of the Discussion Forum, especially when most of the variants have been exhausted and therefore they should be stimulated by the teacher to provide a new answer if a thread is inactive for a period of time.
- Lp – Leadership. The name of this scale speaks for itself. Users with high scores in this scale have good leadership abilities, are self-assured and will be good tutors in the teaching\tutoring activities. These users are also good team leaders in the Chat Room activities.
- Ami – Amiability. These are cooperative persons who like to come to terms with their teammates and therefore will make for great team members or even team leaders in the chat room activities. These users can keep a team united and therefore every strong team should have a member with a high Ami score.

The collaborative system is expected to handle a large number of users, so the activities of collecting the user data and the constructing of the User Model should be automated to save up time and resources. The CPI test has already been implemented as standalone software, but such software should be completed with the additional form results from the user data acquisition phase such as the programming language knowledge levels and learning preferences questionnaires. The learning preferences questionnaires are intended to find out if and how the user is willing to participate in the Teaching through Training activities.

The function of the User Data Interpreting Engine is to automatically analyze the User Data and give advices on grouping students during the real-time chat room and teaching through training activities on the basis of the psychological scales collected from the CPI™test and learning preferences questionnaires.

It is important to state that the users should not be imposed to participate in the Teaching through Training activities or be imposed an unwanted trainee or tutor. Another and more important free choice should be the forming of the chat room teams. The system should provide options and alternatives for choosing team members but should not be rigid in the forming of these teams because after all, the users know each other better and a team formed out of friends can be even more fluent than one formed on the basis of psychological scales.

For evaluation training we use on-line questionaries resides on (*http://www.bizcar.ro/c*) and interviews. Another feedback consists in analysis of ERP companies employers during a decade of collaboration. As a results we can talk about 17% of graduate students which are working in ERP companies, 1% has own ERP companies (B Logic) and several of them are working in software companies 37%. More than 20% students have half-time jobs in software companies, and Rent It System (England) was our guest at International KEPT Workshop.

4. Conclusions and the future work

The aim of our framework is to improve

knowledge acquisition and skill development. An ERP implementing process involves a huge team and a lot of skills and social communication between members of different management level. If we develop particular workforce and improve capabilities we can offer several advantages:

- Opportunity to learn and practice based on training and working in several ERP systems;
- Ability to work in team and follow project management plan;
- Support for long-term competence development
- Abilities to work in ERP development teams according to skills and abilities, based on CPI individual results
- Enhanced collaboration through companies and universities, based on learning by training and learning by working in them projects
- Opportunity to communication collaborations and experience exchange
- Possibilities to lean and compare several ERP solutions and establish criteria for comparison analyses or ERP performance and/or ERP selection.
- Dissemination of relevant internal and external knowledge and practical solution

5. Acknowledgements

The work presented has been founded by the research grant "Intelligent System for Business Decisions' Support", Director Nitchi Stefan, PhD., Professor, PNII Program, 91-049/18.09.2007 supported by Higher Education Ministry. ERP systems are implemented in educational scope in our Business Information Department by several ERP companies from Romania and abroad (Microsoft with Dynamics NAV, Thinvest with Mentor ERP, Transart with B@rg EBSRomania with Clarvision ERP and Rent IT Systems from England with 123mrp). Those agreements mention exclusive scope for learning.

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