KNOWLEDGE MANAGEMENT: PROJECTS, SYSTEMS AND TECHNOLOGIES

Proceedings
of the 4th International Conference
on Knowledge Management: Projects, Systems
and Technologies

"Carol I" National Defense University,
ROMANIA

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Toma PLEŞANU
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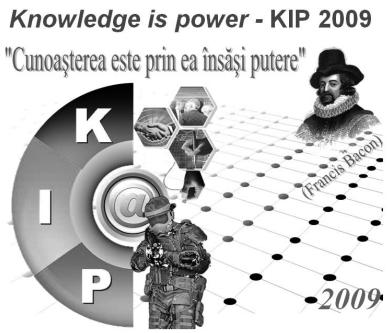

November 6th -7th 2009,
Bucharest, ROMANIA

FOREWORD

Throughout the last decades, a wide variety of organizational practices have been proposed to support the acquisition, storage, retrieval, application, generation, and review of the knowledge assets of an organization in a controlled way; despite this, it is often unclear how these practices relate to one another in their contribution to organizational performance.

In the information age, rather than physical assets or resources, knowledge is the key to competitiveness. What is new about attitudes to knowledge today is the recognition of the need to master, manage and use it like any other asset. This raises issues not only of appropriate processes and systems, but also of how to account for knowledge in the balance sheet.

The management literature of these last few years suggests a variety of practices meant to support the creation, storage and transfer of information and knowledge. Knowledge Management (KM) is a relatively new subject matter, being integrated in the curricula of some North-American universities and debated in a few dedicated journals starting with 1995.

As a new scientific area, there are at present quite many schools of thought referring to Knowledge Management, which therefore accounts for the difficulty or even impossibility to set the conceptual framework of this domain, starting from a unanimously accepted definition for it. As a consequence, the approach to the matter differs with each school or even author.

KM can be regarded from the following perspectives :

- The technocentric perspective, stressing technologies, especially those contributing to knowledge enlargement and sharing;
- The organizational perspective, seeking to answer questions such as: How should the enterprise be designed to facilitate the knowledge processes inside it? or, Which organizations work best and based on what processes?
- The ecological perspective, regarding the human interactions, the identity, knowledge and environment factors as a complex adjustment system.

In addition to the above, as the subject matter becomes more consistent and gains ground, more and more academic debates are taking place in the epistemological area, emerging both at the theoretical and practical level of Knowledge Management. Outstanding standardization institutions in the United Kingdom and Australia produced reference documents in a common attempt to outline the conceptual framework and scope of the subject, but so far all of them have been only slightly accepted or insufficiently grasped and adopted.

The papers gathered in this volume are all meant to facilitate communication between international multidisciplinary teams. This year's Knowledge Management Conference itself provides – as its organizing committee has stated – a forum for discussion of topics related to the development of Knowledge Management and related subject matters.

This event follows the 3rd KM Conference hosted in Bucharest, by the Academy of Economic Studies, the 2nd KM Conference hosted in Bucharest by "Carol I" National Defense University in November 2007, and the 1st KM Conference hosted in Bucharest in November 2006.

The mission of the International Conferences on Knowledge Management is to facilitate communication between international multidisciplinary teams. The Conference provides a forum for the discussion of topics related to the development of knowledge management and related disciplines.

The main areas of interest proposed for the submission of the papers covers the following sections:

- Knowledge, Learning and Cognitive Systems
- K-Organizations
- KM Projects
- Knowledge Dynamics

The Proceedings of the conference include the full text papers. The 4th Conference's active participants came from different parts of Europe.

The conference attracted over 100 papers but, in the end, after careful evaluation, 52 papers were accepted. We had 44 evaluators from over 20 countries, over 80% from outside Romania. 52% papers were rejected, 30% accepted with ammendments, and 18% papers accepted as such.

The papers are very interesting, of high quality and address a wide range of key issues. They are contributed by very different individuals, oganizations and countries, involved in Knowledge Management issues. The autors bring forth extensive experience and diverse views of the state and local governmental institutions, universities, small businesses, private industry and research institutes from all over the world.

We do hope that the conference will keep up the tradition and will continue to be organized every other year in the future.

Finally, we would like to thank all participants who shared their expertise with colleagues during the conference. We also hope that the papers included in this volume will give new ideas to the readers in their quest to solve various problems.

The conference would not have been possible without the joint effort of the organizing committee (*the Academy of Economic Studies*, *"Carol I" National Defense University* and *the Project Management Romania Association*) and the evaluating board, to whom we are deeply grateful.

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HOW KNOWLEDGE CAN ENHANCE ACTION COMPETENCE IN THE MILITARY HIGHER EDUCATION

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One of the aims of the paper is to stress out the imperative of training military language learners as people meant to become intercultural 'speakers' as well as 'mediators' in order to be successful not only in communicating information in foreign languages, but also in developing a human relationship with people of other languages and cultures.
The prime objective of the project conducted in "Carol I" National Defense University of Bucharest, Romania, was to analyze critically the way in which cooperative learning methods towards education for intercultural understanding and conflict resolution are used in our institution to promote greater mutual understanding, team work, joint decision making and acceptance of difference and 'otherness' in order to prepare our military students for exposure to the present multicultural environments.
Key words: *knowledge management, cooperative learning, intercultural competence, intercultural education, military higher education*

In the information age, rather than physical assets or resources, knowledge is the key to competitiveness. What is new about attitudes to knowledge today is the recognition of the need to master, manage and use it like any other asset.

In the days of globalization, intercultural communication plays an important part in English Language Teaching, for certain reasons: one of them refers to the fact that English has assumed an ever-increasing role of international language used extensively by millions of people outside its original geographic boundaries, to "convey national and international perceptions of reality which may be quite different from those of English speaking cultures" (Alptekin: 1984, p. 17). As English continues to spread as an international language, the number of second language users of English will continue to grow, by far outnumbering the native speakers of English. It is also the case of the Romanian military, as an integral part of NATO. Within the multinationality of forces which make up NATO and its PFP partners, the military learners of English in Romania use this language to communicate even more with the second learners of English rather than its native speakers. It is apparent that "English is the main link language across cultures today" (Schnitzer: 1995, p. 227). Therefore, the goal of learning English shifts to enable learners to communicate their ideas and culture with not only the speakers of English, but also with those of other cultures. Consequently, the question of intercultural communication is clearly indispensable in English language learning and teaching if the aim is to develop students' communicative competence, as well as to enhance action competence in general.

Why cooperative learning in the military higher education?

Maybe there is no other group in which in real-life situations teamwork is more important than the military one. Let us take for instance the example of the task forces - *combined* as in CJTF[1] or *deployable* as in DJTF[2] - , of the pilots engaged in dog fights, the Special Forces in which the survivability of the group depends on individual performance and vice versa, etc. The adjective *joint* has acquired a special meaning in the military domain, by designating two or more services operating together. The idea of 'togetherness' is of utmost importance in current military collocations, such as *joint warfare*, *joint operations*, *combined/deployable joint task force*, *joint decision-making*, *joint planning*, and the examples are very numerous.

In addition to the above, NATO's Article 5 of the Washington Treaty states that an attack upon one member of the Alliance is an attack upon all members. Moreover, in 1994 the *Partnership for Peace* was set up beyond the NATO geographical borders, both as a concept and practical ground in order to prepare accession to the Alliance of other European countries: we may therefore conclude that the philosophy of unity in diversity, togetherness, partnership, team work and cooperation prevails in everything the servicemen and women think, carry out or plan to do.

But, in order to be able to work in teams and to cooperate, training methods need to be used which recreate in the classroom environment the atmosphere of cooperation, sharing and learning from each other.

---

[1] Combined Joint Task Force, a multinational task force which can be used rapidly as a peacekeeping force.
[2] Deployable Joint Task Force, a task force which can be rapidly moved to a war zone or area of operations.

The task is the more so difficult as we are talking about an organization based on hierarchy, chain of command and a very rigid distribution of roles in keeping with the pyramid of military ranks.

The main outcomes of CL methods used in the military higher education, as far as English language courses are concerned, have proven successful for endowing military students with the ability to:

- use teamwork as a guiding principle for both classroom and job-related tasks;
- lead and take part in a discussion using various language functions in order to hypothesise, support opinion, agree and disagree, etc.
- reach consensus;
- choose jointly the best course of action;
- interpret adequately cultural resemblances and differences and mediate cultural misunderstandings;
- build a successful multinational team;
- develop interpersonal skills, by communicating and sharing knowledge, beliefs and experience;
- become more flexible and tolerant.

The general student profile: military personnel, ranking from junior lieutenants to colonels and sometimes higher, participating in peace support operations in various areas of the world, carrying out missions ranging from conflict prevention, crisis response, peace enforcement, peacekeeping, to humanitarian aid. Moreover, in peacetime, they may work in multinational regional or North Atlantic Treaty Organization (NATO) commands, whereas in times of crisis they are deployed to the theaters of operations where they support the peace process under UNO mandate. This two-fold role requires linguistic competence in a foreign language in order to communicate and process information and, more importantly, the ability and availability to develop a human relationship with people of other languages and cultures.

Description of the project: designed to be implemented on one intensive, pre-deployment course (70 hours) of PSO English, delivered for two similar groups, as follows:

Course language: English

Student criteria: Officers ranking from Second Lieutenant to Colonel

Language competence: 2222 or 3232 measured on the STANAG - 6001 or B2, according to CEF[3] standards

Students from other countries: NATO and PfP member states (up to 4 foreign students per group)

Note: in the sample group (further referred to as Group 1) there were 8 Romanians, 1 Croat, 1 Azerbaijani, 1 Greek and 1 Moroccan.

In the control group (or Group 2), there were 8 Romanians, 1 Croat, 2 Bulgarians and 1 Georgian.

For Group 2 the traditional student-centered approach was used, while for Group 1 a different teaching and learning principle was tried, in which students were put to work together to accomplish shared goals; more explicitly, students were trained to work together to maximize their own and each other's learning.

The goal of the project: to identify and experiment ways in which language courses can contribute to greater mutual understanding and acceptance of other perspectives, can build up character by building group confidence and cohesion, train people to work in teams, and share knowledge. We also sought to empower students and transfer responsibility on them for the achievement of the course objectives and the success of the overall as well as separate activities.

With this in mind, we needed a demonstrated successful teaching strategy in which small teams, each with students of different levels of ability ranging from B1- B2 to C1 on the CEF, by using a variety of learning activities, improve their understanding of a subject, in our case both general and military topics. The syllabus was the generally accepted one for this type of course. Within this project, each member of a team was made responsible not only for learning what was taught but also for helping team-mates learn, thus creating an atmosphere of achievement. Students were supposed to work through the assignment until all group members successfully understood and completed it. The method or - better called - process we chose was **Cooperative Learning**.

Cooperative efforts were expected to help enhance the course participants' striving for mutual benefit so that all group members:

- gain from each other's efforts;
- recognize that all group members share a common fate;
- know that one's performance is mutually caused by oneself and one's team members;
- feel proud and jointly celebrate when a group member is recognized for achievement.

Research made during and after the project development has shown that by using cooperative learning techniques it was possible to:

- enhance student satisfaction with their learning experience;
- help students develop skills in oral communication;
- develop students' social skills;
- promote student self-esteem;
- increase self-confidence in using English;
- help promote intercultural understanding.

Throughout the course we could notice that continuous improvement of the learning process results from the careful analysis of how members are working together, by thus determining how group effectiveness can be enhanced.

The implementation of CL methods required from the project designers to operate changes at the

[3] Common European Framework for Reference

lesson level so that students could in fact work cooperatively with each other. What we actually had in mind was to:

1. take the existing topics and course contents and structure them cooperatively;
2. tailor CL lessons to meet the military instructional circumstances and needs of the course type, syllabus, subject areas, and students' profile;
3. foresee and be able to diagnose the problems students might have in working together;
4. intervene whenever and wherever necessary to increase the effectiveness of the learning groups.

The activities included in the project addressed the basic skills, involving reading materials, taking notes, listening to each other, delivering presentations, and discussing/debating. There were some pre-set groups, to ensure an equal balance of language ability, nationality, age and service/arm. At some points the groups were inter-changed, so that in the end all the students had had the opportunity to work closely together with as many other students as possible, by that experiencing as many different working styles, perspectives, brands of English, behaviours and human reactions as possible.

On the whole, the goals of the cooperative activities were of two kinds:

1. Language-related, meant to:

- develop students' sub-skill of understanding spoken and/or written materials on concrete or abstract, familiar or non-familiar, job-related or not, complex topics;
- develop students' sub-skill of delivering a speech or presentation on a complex topic, integrating pertinent examples, secondary arguments, and specific points so that to reach an adequate conclusion;
- develop students' capacity of leading and taking part in a group discussion using various language functions in order to hypothesize, support opinion, agree and disagree, etc. so as to reach an agreement and build consensus.

2. Intercultural education-related, aimed to:

- develop students' capacity of adequately interpreting cultural resemblances and differences and mediating cultural misunderstandings;
- increase their effectiveness in working as a group by developing interpersonal skills, sharing beliefs and experience, becoming more flexible.

Why intercultural education in the armed forces?

The prime objective of embedding an 'intercultural dimension' in the military foreign language teaching is to develop learners as *intercultural speakers* or *mediators*.

When designing the project, we started from the premise that in order to successfully accomplish the peace support operations, our students need to be prepared not only from the military viewpoint, but they should also be able to face the challenges of multiculturalism, i.e. to engage with complexity and multiple identities and to avoid the stereotyping which accompanies perceiving someone through a single identity. The intercultural dimension of foreign language learning is based on acquiring the skills complementary to linguistic competence which allow the learner to perceive the interlocutor as an individual whose qualities are to be discovered, rather than as a representative of an externally ascribed identity. In addition, intercultural communication is communication on the basis of respect for individuals and equality of human rights as the democratic basis for social interaction, an approach discussed by Byram (2002: pp. 5-6).

So, language teaching with an intercultural dimension helps learners to acquire the *linguistic competence* needed to communicate in speaking or writing, to formulate what they want to say/write in correct and appropriate ways. But it also develops their *intercultural competence*, i.e. the ability to ensure a shared understanding by people of different cultures, and to interact with people as complex human beings with multiple identities and their own individuality.

Therefore, the intercultural dimension of foreign language teaching in the Romanian military higher education is embedded through the following learning objectives:

- to give students intercultural competence as well as linguistic competence in the target language;
- to prepare them for interaction with people of other cultures;
- to enable them to understand and accept people from any other culture as individuals with other perspectives, values, beliefs and behaviors;
- to make them tolerant and flexible to 'otherness' in order to avoid passing judgements in this respect;
- to help them perceive exposure to another culture and interaction with it as a positive and enriching experience.

Ways to ensure the intercultural dimension of the foreign language teaching in "Carol I" National Defense University

In order that the linguistic programs conducted in the Romanian Ministry of Defense successfully meet their objectives and commitments under the Common European Framework for Reference (CEF: 2002) provisions, i.e. to train not only foreign language speakers, but first and foremost intercultural speakers/mediators, the following practical ways have been developed in our institution starting from 2005 (Kraft: 2007, pp. 5-12):

- inviting target language(s) native speakers to participate in the students' debates focussing on intercultural topics, in order to facilitate expression of different perspectives, as well as to answer the students' questions;

• creating opportunities for officers or military instructors who have participated in missions on the theatres of operations in the Middle East or Africa, to share their own experiences and to highlight the cross-cultural impact in those areas, both during and post-conflict;

• including in the foreign language course syllabuses activities which might help raise awareness of one's own culture as well as of the target one;

• asking the foreign students of „Carol I" National Defense University to take part in the debates on intercultural topics and encouraging them to express their points of view, with two precise objectives in mind:

- to facilitate the information exchange on traditions, values and attitudes in their own culture, and
- to facilitate understanding by their Romanian mates of the way in which foreigners perceive our traditions, culture and values;

• including in all the foreign language syllabuses some students' research topics based on intercultural issues and materialized into briefings or end-of-course projects which the students have to prepare as part of the intensive or extensive linguistic programs, irrespective of the level of training (i.e., graduate or postgraduate);

• organizing group discussions/seminars on intercultural education, whose aim is to facilitate perception of the latter as a solution to certain current issues, e.g. interethnic violence, immigration and demographic change, historical conflicts, prejudices, etc.

• solving some specific problems by applicative exercises and case studies in order to develop the cognitive complexity towards other culture, as a response to the challenges of a cultural environment different from the Romanian one. In this sense, the following topics have been used:

• An analysis of models of social cohesion, integration and problem solution within some contemporary multicultural societies, such as the USA, Canada, Australia, Switzerland, Belgium, etc.;

• A conflict analysis of societies divided from the cultural viewpoint;

• Cultural relativism and reciprocity of influences;

• The perception in different cultures of: time and space; the two sexes and their role; human relationships; family relationships; humor; non-verbal communication, etc.

• Principles of education in different cultures, and so on.

Let us therefore keep in mind that, in order to develop the intercultural openness of the representatives of the military institution, the role of any foreign language teacher is to develop in their students skills, attitudes and value awareness, complementing the language acquisition for both short and long term purposes.

The results of the project

The analysis of the project results has shown that students in sample Group 1, who had opportunities to work collaboratively,

- learned faster and more efficiently,
- met the course objectives to a greater extent,
- had greater retention,
- felt more positive about the learning experience, as compared to control Group 2.

The course critique for Group 1 clearly and unanimously stated that the CL methods used to deliver information and create knowledge helped students learn essential interpersonal skills and develop the ability to work collaboratively - a skill now in great demand not only in the national military workplace, but also in the NATO multinational environment Students rotated different roles - depending on the activity - such as briefer, teacher, facilitator, group discussion leader/participant, mediator, monitor. During the activities designed or adapted for the cooperative group, every participant had a specific task, tailored to their competencies, so that everyone could be involved in the learning or project and contribute to the overall success of the group.

According to the end-of-course questionnaire, we can classify the outcomes into three major categories: achievement of the course objectives, positive relationships, and excellent rapport. The analysis clearly indicated that cooperation, compared with competitive and individualistic efforts, resulted in higher personal achievement, on the one hand, more supportive and committed relationships, on the other, as well as greater social competence and self-esteem.

Moreover, Group 1 students were more positive and caring about each other, regardless of differences in linguistic competence, ethnic background, experience or education. From the interpersonal viewpoint, they were also more effective, in the sense that they gradually became better prepared to take the perspective of others, more positive about taking part in controversy or conflict situations, had better developed interaction skills, and had a more positive expectation about working with others than their peers in Group 2, trained in a competitive and individualistic setting.

As to the latter, they worked mostly against each other to achieve an individual aim. As in any competition, there was negative interdependence among goal achievements, insofar as students perceived they could meet their goals if and only if the other students in the class failed to meet theirs (Deutsch, 1962; Johnson & Johnson, 1989). Consequently we could notice that Group 2 students either worked hard to do better than their classmates, or they 'took it easy' because they did not believe they might have a chance to win on their own. All in all, students worked alone to accomplish goals unrelated

to those of their group mates, which clearly resulted in focus on self-interest and personal success and ignorance as irrelevant of the successes and failures of others.

Nevertheless, as in any human activity, there is always room for improvement. Even seemingly positive innovations can have unintended and negative consequences, and students may resist collaboration even while, simultaneously, recognizing its value.

In the course feedback, there has been some criticism as to the method used, and some (but very few) of the students were not very satisfied with certain aspects of cooperative learning. These might be classified in three major categories, as follows:

- related to student involvement and sharing responsibilities;
- related to teachers;
- related to assessment.

As far as the first point is concerned, there were opinions which revealed dissatisfaction with the method, because they felt that in each group *'some'* people carried out the tasks and, said they, made the group successful, whereas others sat comfortably and indulged in being 'hitchhiked' through most of the activities.

Some of the flaws have been diagnosed as originating from the fact that certain people are reluctant to sharing and cooperating as far as learning and especially assessment activities are concerned; consequently, the issue here is to enhance socialization at an early age with focus on fostering team work and cohesion-building.

In addition, the project results have proven that in order to get interactional classrooms, more needs to be done in point of teacher training. Let us remember the words of Fred Korthagen (2006: pp. 1020-1041):

"Consciously, teachers teach what they know. Unconsciously, they teach who they are." It is therefore the teacher's role to observe students, to create equal opportunities for expression, to give clear, unambiguous instructions, examples, demos, and, last but not least, to produce and use objective assessment criteria in an environment where 'think-pair-share' is the guiding principle. These skills need to be taught to teachers, and more emphasis needs to be placed on this issue in the teacher training seminars and workshops.

Another critical remark is that the effects of cooperative learning were not automatic. Partnerships in the classroom took some time to develop, and the course was quite short to harvest the full crop.

The assessment-related criticism relates closely to the aforementioned points. Some students were surprised to be assessed collectively too, considering that certain people got high scores because others did the work.

Conclusions

The project on cooperative learning for intercultural education has resulted in positive aspects and outcomes. Consequently, one of the on-going tasks of the people responsible for the project is to translate the concept of cooperation into a set of practical strategies for use by the foreign language teachers in "Carol I" National Defense University. On a short-term perspective, we are planning to organize a set of methodology workshops meant to train the teaching staff on the strategies of structuring cooperative interactions and teaching students the skills needed to work effectively with others (i.e. communication, leadership, confidence-building, conflict resolution). A basic model has been adapted to meet military foreign language training needs, focused on what decisions the teacher needs to make before a lesson, what to tell the students at the beginning of the lesson to activate the cooperative goal structure, and what role the teacher takes as the students are working.

An outline of the model should include, among other aspects, the following:[4]

a. selecting a type of lesson and adapting its contents. Our cooperative learning groups have shown to be especially effective where problem-solving and joint decision making are involved.

b. selecting the group composition. We could notice once more that heterogeneous groups tended to be more powerful than the homogenous ones. One explanation would be that by learning in cooperative groups the need for discussion, explanation, justification, and shared resolution on the material being learned arises. Quick consensus without discussion does not enhance learning as effectively as having different perspectives discussed, arguing different alternatives, explaining to members who need help, etc.

c. providing the appropriate materials and appropriate technique, for instance "jigsawing" the material and giving different responsibilities in the group, so that each student has a part and duties associated with their piece of the assignment (i.e., reading to the group, researching and reporting back for discussion, explaining and offering support, etc).

In conclusion, the implementation of the project has demonstrated that students working together cooperatively progress faster and the overall learning process not only has positive effects on the classroom climate, but also teaches them to accept differences, to become more tolerant and to change attitudes into positive ones. Being able to perform language skills such as listening, speaking, reading, writing is valuable indeed, but of little use if the person cannot apply those skills in cooperative interaction with other people in career and/or multinational settings.

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CONTINUOUS PROFESSIONAL TRAINING WITHIN THE LEARNING ORGANIZATION

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Continuous professional training represents a systematic approach of learning and development, having as purpose the improvement of the individual's, team's or organization's efficacy. This can play a very important part and can affect not only the human resources strategy, but also the general strategy of the organization.

The concept of "learning and development" used by Rosemary Harrison (3, 2003), signifies a change in terminology, marking the moving forward from the traditional term of "human resources development" or "employees' development". The new concept describes in a more emphasized manner the importance of learning in a company and underlines the fact that the people who work in and for an organization have to be seen rather as "people who are learning" than as human resources.

Just as the human resources term, the one of "learning and development" shows the purpose of the activity but it also extends it to the ones who are not legally employed by the organization but contribute to its success: volunteers, external vendors, suppliers.

Thus, Rosemary Harrison states that the terminology of *learning and development* suggests that learning is a process that sustains the development of the organization and of the people who work for it; learning must generate and develop knowledge, which is important for the organization as well as for the individual; the workplace environment influences learning in a direct manner and through this it influences the development and use of knowledge.

The improvement of performance is measured by the degree in which learning resulted from training leads to significant changes at the workplace. Thus, we need to follow the degree to which changes in the level of knowledge, abilities and attitudes are transposed in the fulfilment of tasks, leading to an increase in the individual's efficacy. But employees' training can be seen from a more general point of view as a mechanism of pointing out the team work and organizational efficacy. This way, training is seen in an integrative manner, as facilitating the organizational change and development on a large scale.

What is a "learning organization"? For several years, the information and communication technologies were seen as a way of enriching the content of the educational packages and of development of the continuous training programs. Today it has become clear that the information and communication technologies change the way in which the continuous training is approached. If training used to control learning, now the one that is learning (who is, at the same time, the representative of "demand") dictates the purposes, methods and processes. The information and communication technologies are changing the context of learning. The question is whether learning remains an activity that distinguishes from other human activities or if it might become a transversal problem, connected to other individual or group activities? The learning organization, according to Senge (6, 1990), represents that institution "in which permanently developing the capacity of creating the results they truly desire, in which the new and exploratory methods of thinking are protected and stimulated, in which the collective aspiration is free and people are learning all the time how to learn together".

It is that type of organization that facilitates learning for its members and that is continuously transforming, that is permanently extending its capacity of creating its own future, that recognizes the need for change and acts in this direction. On the level of the management of the organization we can notice the commitment towards continuous training by ensuring resources, creating strategies and learning opportunities.

Organizations must become more cooperative from the point of view of the way in which they perceive problems and opportunities, as well as in the way they are trying to solve them. The philosophy a learning organization relies on is the best accomplishment of goals by exploiting the reservoir of knowledge, skills and qualities of the organization members. In the attention paid to the accomplishment of general purposes the employees can find occasions for personal development, for increasing the professional satisfaction and even more possibilities for development in their career.

In this new organizational culture the individuals have to take on more responsibility for their own development by identifying their training needs and by establishing provocative objectives. Each employee has to be encouraged to learn

regularly and rigorously from the work experience and to search new experiences.

Learning oriented towards work sustains the change in organization; it helps in solving the recurrent production problems; it helps employees understand better the processes through which the business is run and the ideas that represent the foundation of the procedures put into practice by the organization; it introduces media means that make the information accessible and connect theory to practice.

Here are a few characteristics associated to the learning practices of the organization:

- an approach of learning included in the strategy;
- an increased level of the employees' and stakeholders' participation in the realisation of the organization policies;
- using the information technology in order to share knowledge;
- reward systems that are consistent with the employment philosophy and include rewards for learning;
- the existence of border workers – employees who work on the borders of the organization, collecting and offering information from the environment, involving the stakeholders in the improvement of organizational processes;
- the desire and ability of learning together with and from other organizations;
- a culture and a climate that encourage responsibility and sharing the results of learning, from success to failure;
- mechanisms and relationships among employees that encourage and support development.

The new type of organization, named the *learning organization,* can be represented as a spiral: the innovation in practices or work methods offers learning opportunities that lead to the development of new competencies which, in exchange, influence and change the way in which tasks are fulfilled. While training at the workplace was preoccupied only by the learning capacity of the individual, the integration of work and learning on an organizational level was preoccupied by the company's learning capacity. This requires organizational flexibility on the level of strategic planning and on that of the organizational structure.

Workplaces, by developing, become *learning places*, and this way the role of traditional training is reduced. The introduction of team work, of production islands, creates new possibilities and challenges for the individual's learning capacity. These changes are not only the result of the employee's efforts and adaptation as an individual; decisions need to be taken at organizational level, social conflicts need to be solved, and creative solutions require an autonomous and systematic learning process of the employees, process that is facilitated by managers and organizational culture. The role of managers is crucial: they have to become moderators, counsellors, to sustain the future training programs. In the same way, the managers at the top of the organization will change their attitude and working practices, because the learning organization does not need autocratic control, but moderators and facilitators. The learning organization requires managers to become educators or trainers and to trainers to become managers.

Integrated learning at the workplace reduces the transfer problem, a problem that has affected the traditional training systems. In reality, training outside the workplace ignores, up to a certain point, the specific situation in an organization. The new competencies gained by the employes may not be transferred to the workplace due to the incompatibility between the message transmitted by the continuous training and the situation in which the new abilities have to be used. For instance, promoting autonomy, responsibility and participation to the decision making for the employees on the basis of the organization has no meaning in a rigid hierarchical structure that remains unchanged. The projection of learning and training in a consensus with the real activities in the organization reduces the risk of not applying the newly gained competencies.

The concept of *"learning organisation"* is sometimes reduced to*"the organisation that learns"* or *"the qualifying organisation" (5, 2002)*. The organization of the company and of work implies at the same time an organization of learning as well. Moreover, it should be understood as a process through which the organization reacts and determines people to respond to the new challenges raised by the rapid and constant change of the environment: on the markets, in technologies, in regulations on environmental protection, in constraint and values.

The status of training in the learning organization. The place and role of continuous professional training in an organization depends on its capacity of leading to **innovation** through feedback and raises the problem of **self-learning** as a key qualification. The responsibility for the success or failure of the training depends in a great measure on the employee himself/herself, and the complementary actions of managers and trainers can only encourage the training process.

An indicator of the training department status may be noticed by looking at the **organizational chart.** Usually, training is placed in a box next to other functions in "personnel". Moreover, the level the responsible manager is on is rarely equivalent with that of other managers with whom he has to plan and negotiate resources. Thus, we will not find

a representative from "training" directly in the company's board of directors.

Another indicator refers to the **personnel that were recruited in training positions**. In the past these were people who proved out not to be very good performers in the operational area, and their naming in this department was a sort of pre-retirement. On the other hand, when people who are very good professionals were named in such positions they did their best in order to stay for as short as possible, in order not to endanger the opportunities of a career in operational positions.

There is, also, the preoccupation for the **effects of the training**. By comparison with other departments, there has always been a question referring to the measurable effects on individuals that take part in training programs. Researches suggest that the incidence of training is not always related to performance, and certain companies that did not have training programs had the same success as other companies that had organized a lot of training programs.

The efficacy of training is also made more difficult by the **pressures and demands of the operational departments**. The line managers have to face a dilemma: they know the value of training and its necessity for their people, but they cannot stop people from working so that these ones go to a training program. In many cases this led to apathy in the whole organization and the manager of the training department recognized that the programs proposed, especially those referring to managerial development, are only a little bit more than cosmetic – an internal public relations exercise.

The *"A challenge to complacency" (4, 1985)* report points out the differences between the organizations in Great Britain and their European competitors. The authors of the report challenged the organization leaders and trainers to change their attitudes towards training, to make bigger efforts and become more efficient.

The organizations responded through **new requirements for the training departments**. For instance, the traditional long courses have lost ground in favor of the shorter ones, based on learning of abilities, the purpose being for the people who are instructed to become more responsible and have better control of their development.

The training departments can no longer activate in vain and then be judged depending on the stability and number of courses they organize, on the low budget they operate with and on the "happy papers"[5] that show how happy are the course participants at the end of that course. Training courses need to be correlated with the objectives of the organization, the training must be appreciated depending on the efficacy at the workplace of the people who went to the courses and on their contribution to reaching the objectives. And this way, training will take its well deserved place in the board of directors.

All these lead us to the idea that the **trainer** will have to develop a new role that requires and at the same time demands a higher level of professionalism. Training was many times accused – and not unfairly – that it is too slow and reacts too slowly to the demands of the organization. And by the time training offered an answer it was already too late, as the social and business environment had already changed and the demands were already different.

The training department cannot "stand still" while everything else is changing. The trainers need to change their attitudes towards the demands in order to be able to provide answers more quickly. This way, an understanding of the "ideal" approach and of the theoretical aspects of training becomes even more important. In the past, trainers were quite cautious so that they would not be seen as the "bad boys" when something went wrong, but we have to admit that without a new professional approach things could be a lot worse.

The place of the training-development departments within organizations. In order to fulfill their attribution at a satisfactory level at least, the personnel of the training-development departments also needs to know very well, besides the specialized issues, the mission of the organization they work in and they need to harmonize the individual and departmental objectives with the general organizational ones. No matter how many human, material and financial resources, professional competency and support from the management they would have, the training-development departments must not forget the fact that they deliver internal services to the personnel in the other departments of the organization, that have to contribute (significantly) to the fulfillment of the organizational tasks.

The place of the training-development structures, implicitly their formal and informal status, the range of activities or services requested by the management, their level and complexity are strongly influence by several organizational factors, amongst which the most visible are: the field of activity, the size of the organization and how old this one is, the position on the services/products market, the degree of centralization, the technological level etc. The continuous professional

[5] The term "happy papers" refers to the final evaluation reports of the training program. Filling in those papers is usually just a formality and nobody was preoccupied of the real value/importance of a program.

training is not restricted only at the act of learning in itself, but it also sustains the innovation and change in organizations and helps in solving the recurrent problems that refer to production or organization of work.

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CRITICAL THINKING - A PEDAGOGICAL APPROACH

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1. Critical Thinking - purpose of education. A subject of present interest

The qualitative and quantitative investigation of the curricular documents that regulate high school education (the model of the graduate of compulsory and high school education, the plan - framework and the curricula) reveals that the concept of "critical thinking" is used constantly by curriculum designers when formulating competencies, values and attitudes that high school education proposes to generate. Thus:

- the model of the graduate of general and compulsory education includes the following wording: "the graduate [...] should demonstrate creative thinking [...] by building and using critical judgment skills " [1];
- the model of high school graduate emphasizes the need to develop "the functional competencies essential for social success" wich include "communication", "critical thinking", " decision-making", "processing and using complex information contextually " [2];
- out of the 37 high school curricula selected as sample from the 7 subject areas, in 32 curricula we have identified the concept of "critical thinking" (or correlative concepts such as: argumentative thinking, reflective thinking, formulation of substantiated points of view, critical appreciation) as educational goal.

Also, the curriculum reform implemented in higher education in order to correlate university education with the labor market needs continues to bring to attention, also at this level of education, the growing need for "critical thinking" as a functional - action professional competence[3] .

Therefore, "critical thinking" is, at all levels of education, a competence whose formation is highly valorized in light of a creative and at the same time autonomous approach to the social and professional environment. The emphasis on the acquisition of this fundamental competence, in undergraduate and university education, shows that every individual, graduate of various types of education, is encouraged to produce and validate knowledge and not to take it in a mimetic and non-critical manner.

2. Conceptual Clarifications: thinking - critical thinking

Thinking, as a tool and a possibility to gain knowledge, was also the object of study for philosophers, psychologists and logicians. The philosophical approach to thinking refers to all types of manifestations of the spirit while the psychological approach defines thinking as "the act of mediated, complex, abstract reflection of reality which operates with symbols and logical connections" [4]. Moreover, thinking is the mental activity that helps humans explain the present and anticipate the future, what might happen [5]. Therefore, thinking is involved in carrying out three major tasks:

- the first one is quantitative, cumulative and progressive (the development of the notional system through generalization, abstractization and notion ordering);
- the second one is qualitative, it implies hypothesis checking and creation of coherent mechanisms to approch them (the development of the system of logical operations);
- the third one is a prospective type - continuous prospecting of the future.

When limiting the scope of our analysis to identify meanings associated with the concept of „critical thinking", we can see that this concept is not defined in the psychological literature, unlike divergent / convergent, thinking, deductive / inductive thinking, lateral thinking, creative thinking, etc. The concerns for defining and operationalizing critical thinking in the education sphere are rather common in the fields of logics, philosophy and pedagogy.

In his book "How we think" J. Dewey associates critical thinking with the willingness to filter through our mind the things that we encounter in our daily experience, which contrasts sharply with the urge to judge based on our habits, traditions, prejudices. To this willingness the author added also the required resources that an individual should have: information (set of premises) and experience (logical skills). Critical thinking is an attitude, a philosophy and a tool [6]. Its formation presupposes to build in pupils / students a certain attitude orientation (reflexive type), on the one hand, and to form analytical – evaluative skills on the other hand.

The above-mentioned idea is present also in the book „Retori, simulacre, imposturi" (2003) the author Ciprian Siulea tries to define critical thinking as opposed to the patterns of ideological thinking - characterized by intellectual sterility, lack of realism and pragmatism, abusive simplification of reality by cultivating univocal judgments. For the author, critical

thinking is "the kind of intellectual lucidity supported y firm policy and a good dose of skepticism, as well as irony".

Common sense mistakenly perceives critical thinking as a synonim for negative, destructive thinking (which destroys and looks for weaknesses, negative aspects). This meaning is derived from the central feature of critical thinking: "willingness to susbtantiate one's assertions and to ask others to provide arguments, together with the ability to evaluate the relevance and value of these arguments" [7], which often leads to invalidation of certain assertions presented as conclusions or the absolute truth.

In conclusion, critical thinking manifests itself in the individuals' availability (to want) and skill (to be able to) of continuosly evaluating the beliefs (things considered true) they share or that others want to transmit to them by assessing the plausibility and relevance of the grounds (premises and evidence) and correct ness of the inferred or proposed correlations (way of reasoning) to support the effects they noticed (the conclusions reached).

3.Operationalizing the concept of critical thinking

Critical thinking does not develop by itself and cannot be taught as a ready-made cognitive product (as a theor, for example). Rather it is formed, it is built, it is acquired and refined in a friendly formative environment. To be able to design and propose a set of pedagogical processes for developping student's critical thinking, we need to answer to the following question: What kind of attitudes (value orientations) and skills reveal a person with critical thinking?

Dragan Stoianovici highlights the following features of critical thinking, useful to those who are eager to cultivate it [8]:

ATTITUDES	SKILLS
• Open minded (as opposed to dogmatism, anchylosis, thick-head, but also to radical skepticism); • Impartial attitude (neutral); • Attention given to alternative possibilities (including errors and suspension of judgement); • The acceptance and castigation of one's own beliefs; • Rational assessment against infra-rational (affectivity); • Availability for communication;	• To recognize the difference between matters of opinion (where there might be differences between subjects) and demonstrative reasoning (where rigorous procedures are used); • To recognizes the difference between the argumentative speech (which gives grounds) and one whose aim is to tell something, to express an opinion, to make a recommendation or give an order, to approve or disapprove of something (don't give grounds); • Identify the correct sentence/ idea from a text / context of speech; • To identify and assess logical connections between assertions (Argument's conclusion is derived from the set of premises?, Type and number of specific cases in which a generalization is based on an argument is satisfactory?; Authority invoked when there is no other way to refer to an idea, is competent, well-informed?); • To suspend the judgment when the premises are weak / deficient; • To reconsider one's own beliefs when • the grounds are disrupted (the most important thing in critical thinking are the grounds / reasons for different causes or reasons); • To address things calmly.

Daniela Cretu [9] considers, in addition to those presented, that to think critically means:

- To show curiosity;
- To ask questions;
- To search for causes and implications;
- To search for answers;
- To find alternatives to attitudes / beliefs that are already set;
- To take a stand based on substantiated grounds;
- To listen carefully to others and to provide feedback to them.

Why is the competence of critical thinking in post-modern educational system so useful and important? The consequences of using critical thinking in ral life can be found in:

- resistance to manipulation, disinformation, propaganda, indoctrination;
- overcoming stereotypes and prejudices;
- identifying the gaps in the basic foundation of some truths taken as such;
- transition from the personal to the public sphere, from heteronomy to autonomy, from intuitive and emotional to logical and rational, from a particular perspective to multiple perspectives.

4.How to form "critical thinking"? Pedagogical corollary

Besides the undeniable fact that there is a formal curriculum that aims at developing the argumentative and evaluative ability of thinking - Logics, Philosophy, the competence of critical thinking can be formed and cultivated in the context of any subject. Starting from this premise, the formation of the competence of critical thinking does not require that pupils / students activate and assimilate a certain content, but rather it depends on the processes and practices developed by the teacher during classes for organizing learning situations for the pupils or students. Moreover, critical thinking is not taught in a lesson and, forgoten immediatly after, but it requires a constant stimulation and cultivation along the entire educational interactions between teachers and pupils / students.

Critical thinking can't be formed and cultivated by teachers unless they have this competence themselves. Therefore, a necessary (but not sufficient)

ondition to achieve this goal is that teachers should also be competent in critical thinking. Furthermore, in the organization of each lesson the teacher must provide a set of conditions that favor the expression and exercise of critical thinking:

- Promoting the active involvement of pupils / students in the learning process (using students' past experience in the subject of learning, awareness of their learning needs, identifying the importance / relevance of new concepts in terms of their applicability and knowledge of individual interests, etc...);
- Acceptance of diversity of ideas, viewpoints, different approaches (transition from the deficiency model to the difference model);
- Eliminating students' fear of being ridiculed in class (critical thinking dismantles and analyzes judgments, not individuals);
- Fostering the educational value of the errors (an error is not a sin, it is rather a source for learning);
- The teacher should assume other roles in the dialogue that takes place in the classroom: transition from the role of main interlocutor of the students to that of facilitator of dialogues between students, the transition from the role of evaluator of students' responses ("good", "that is correct", "not good, "wrong") to the "transmitter" of these answers to other students who will analyze and evaluation the asnwers;
- Encourage the students to come up with questions (questions of translation - the reformulation of information, interpretive questions - to discover connections, applied questions, analytical questions - identifying spare parts; synthetic questions - to solve problems creatively, to imagine original solutions; evaluative questions - value judgments on facts, phenomena, behaviors based on criteria or newly-acquired information) from teacher and colleagues and from oneself (as introspection, self-examination);
- promote "thinking time" as a waiting practice when developing an answer in the process of thinking (critical thinking needs time to run the processes of analysis - assessment of the reasons);

The teachers also have a wide range of teaching methods and processes that can enrich critical thinking competences in pupil / students : method of reciprocal teaching / learning, "Jigsaw", "Thinking hats" method, " Lotus Blossom " technique, "share - pair circles" method, case study method, 6/3/5 technique, Philips 6 / 6 method, pyramid method, cause and effect diagram [10]. All these methods and techniques stimulate the students' interrogative capacity, a nuanced approach to the subjects, the identification and assessment of the relevance f information and proposed solutions in relation to various criteria, the issue of views from different perspectives, substantiation of conclusions. The essence of all the above-mentioned methods lies in the creat8ion of a forum for dialogue, multiple interrogation and construction of answers, an area of diversity and flexibility in the argument.

In this forum the students:

- Will observe, describe, compare, identify, associate, contradict, review, anticipate, conclude;
- Will ask questions, develop and judge definitions, will identify problems, formulate solutions, they will judge the credibility of sources and information, will deduct implications, will consider the validity of arguments, will draw conclusions, will make generalizations, will deduce, all to reach an impartial approach to various topics discussed in the classroom.

5. Conclusion

When promoted in the educational process, critical thinking gives learners the opportunity to distance himself/herself from content, to analyze it, to find its relative value, reliability, usefulness and significance in light of what the learning subject already knows, believes and understands. In an age of information inflation the competence of critical thinking is a useful tool in the production and validation of knowledge, free from egocentric or socio-centric determinations.

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EVALUATING DISTRIBUTED COLLABORATIVE SYSTEMS FROM A KNOWLEDGE MANAGEMENT PERSPECTIVE

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This paper presents the evaluation of distributed and collaborative systems from the knowledge point of view, the most important asset of these kinds of systems. The paper analyses the quality characteristics of distributed collaborative systems and proposes a metric to evaluate the aspects of knowledge management process.

***Keywords**: distributed systems, collaborative systems, knowledge management.*

1. Distributed systems

Nowadays the number of multi-national enterprises is constantly increasing. Knowledge is seen more and more as central to the success of organizations and an asset that needs to be managed. The concept of distributed systems solves the problem that arose from the previously mentioned facts: resources, information and knowledge need to be shared between different points of work of the same company.

Many organizations, in an effort to remain competitive, have taken measures to outsource, downsize and specialize. Moreover, many companies now employ trans-national work teams. Many opportunities for informal collaboration and sharing of knowledge could be lost by such teams. Collaborative work in internationalized teams also means that individuals are constrained to confront geographical distance and also time, culture and most probably linguistic differences. Knowledge Management is an approach that tries to overcome these issues by concentrating on techniques that manage the common base of the organization's knowledge and encouraging it's sharing and reuse.

There are several definitions and view points on what distributed systems are:

- A system in which hardware or software components located at networked computers communicate and coordinate their actions only by message passing. [1]
- A collection of independent computers that appear to the users of the system as a single computer. [2]
- A distributed system consists of a collection of autonomous computers linked by a computer network and equipped with distributed system software. This software enables computers to coordinate their activities and to share the resources of the system hardware, software, and data. Users of a distributed system should perceive a single, integrated computing facility even though it may be implemented by many computers in different locations. [3]

The main features of a distributed system are:

- Reliability, a distributed system is designed in such a way that if part of the system fails, other nodes in the system take over the job of the affected node(s), so that the system as a whole would keep fulfilling its functions. Long term data preservation and backup (replication) at different locations
- Functional Separation, by implementing multiple processors in a distributed system, the execution time of parallel applications is dramatically reduced thanks to the fact that complex calculus is done by dividing tasks between several processors
- Inherent distribution, entities such as information, people, and systems are inherently distributed. For instance, different information is created and maintained by different people, which could be generated, stored, analyzed and used by different systems or applications that may or may not be aware of the existence of the other entities in the system.
- Economy, sharing of resources by many entities to help reduce the cost of ownership [4]
- Scalability, the addition, subtraction or replacement of one or more nodes (resources) is easy, in order to increase performance or availability

During the design of a distributed system, several requirements are to be met, as follow:

- Heterogeneity, that means variety and difference at several levels such as network infrastructure, hardware and software (for instance the differences between Windows and Linux way of handling sockets) or programming languages;
- Scalability, increasing number of users and addition of a resource should conduct to the system's performance, enhancement and efficiency increase;
- Security, a distributed system should provide the following: confidentiality (protecting data leaking to unauthorized parties), integrity (avoid data corruption) and availability (ensuring that data and applications are always available to authorized entities with no interferences);
- Failure handling/reliability, failure of one or more elements should be isolated and not cause the entire system to fail;
- Openness, protocols should be known to developers so that maintainability and upgrade is allowed. This is achieved by providing documentation and even published interfaces along with the components related to a system;
- Concurrency, providing simultaneous access to shared resources. A common problem is deadlock conflicts, which may be surpassed by using signalised operations (synching);

- Transparency, the various operations that take place between components are typically hidden from the end user, which actually perceives the system as a whole.

2. Collaborative systems

In the knowledge-based society activities are conducted within the systems. When these systems cooperate in order to achieve their goals, we speak about collaborative systems.

Collaborative systems are an important subject of knowledge-based society and an important part of the human activities is involved in this field. Science has great impact on the development of different types of collaborative systems from various activity fields.

The quality characteristics of collaborative systems are as follows:

- the *complexity*, which describe the density of fluxes between the components of the system and their links;
- the *reliability,* determined by analyzing the number of problems solved by the system and the total number of specified problems;
- the *maintainability*, measures the effort needed to make modifications on the collaborative system in order to make it suited for current needs;
- the *usability*, defined by the ability of a system to be useful for his agents or the capability of a system to be used easily;
- the *stability* is the characteristic of a collaborative system to identify and correct weaknesses. [11]

When collaborative systems are used in a voluntary way, one of the most important factors that leads to success is the manner in which the users feel their experience with the system: do they enjoyed it, does the system offer what is expected from it, are they capable of freely and natural communicate with other participants and do they want to recommended to other persons. [5]

3. Evaluation of knowledge management

The knowledge in a distributed collaborative systems can be explicit or tacit. Explicit knowledge can be expressed in words or numbers and shared in the form of data, scientific formulate, audio, video, etc. Thus, explicit knowledge is easy to share and formalize. On the other hand, tacit knowledge is that which is in people's brains and is more personal and difficult to formalize, being harder to communicate and share with others. [6]

A problem related to knowledge is the transfer, because knowledge should flow in order to generate new knowledge or to be improved. Thus, Nonaka and Konno [7] define a flow of knowledge composed of four steps, shown in Figure 1:

- socialization;
- externalization;
- combination;
- internalization.

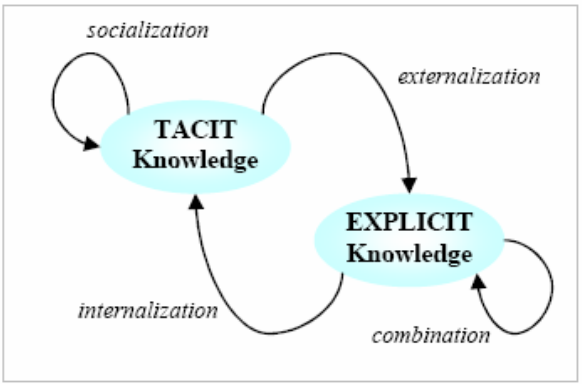

Figure 1. Steps of knowledge flow [6]

The evaluation of knowledge management has become increasingly important since it promotes strategic organizational learning and generates the capabilities required to meet system expectations. As collaborative tools are nowadays used to transfer and share knowledge, we think that evaluating the collaborative tools that a distributed collaborative system use would help to evaluate, in an indirect way, the knowledge management that a distributed collaborative system has. [6]

In order to measure the degree of knowledge management that a distributed collaborative systems has, we define a knowledge management performance indicator, *KMPI*, as follows:

$$KMPI = \frac{KC + KA + KS + KU + KI}{5}$$

where:

KC is the knowledge creation in a distributed collaborative system;

KA is the knowledge accumulation in a distributed collaborative system;

KS is the knowledge sharing in a distributed collaborative system;

KU is the knowledge utilization in a distributed collaborative system;

KI is the knowledge internalization in a distributed collaborative system.

4. Evaluation of distributed collaborative systems

Most distributed collaborative systems are divided into three main categories, based on a main purpose that they serve (communication, coordination or production), which most of the time overlap with each other, as can be observed in the figure 2:

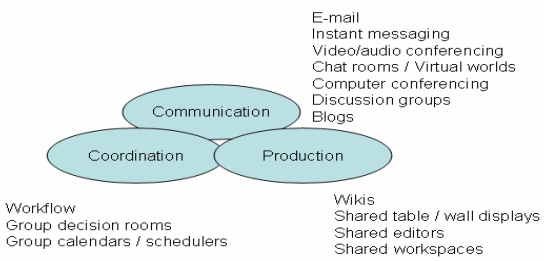

Figure 2. Examples of Distributed Collaborative Systems

There are many techniques and approaches to evaluate distributed collaborative systems. For instance, Cugini et al [8] propose a frame divided into four levels: requirements, capability, service and technology. Baeza-Yates and Pino [9] focus on evaluating the quality of the output, the number of people and time spent on the overall task and the total work done. Sonnenwald et al [10] propose an evaluation of collaborative systems based on an innovation diffusion theory. And so we could continue describing different approaches as:

- organizational impact and impact on work practices;
- end product produced through using the software;
- efficiency of task performance using software;
- user satisfaction with the software;
- task support provided by the software;
- specific features of the groupware interface;
- patterns of system use;
- user interaction while using the software.

Some of these proposals contain some factors related to knowledge management but none of them is specifically focused on evaluating it. [6]

Conclusions

In this paper we are developing a metric to evaluate a distributed collaborative system from a knowledge management approach. The distributed collaborative system is developed based on a set of specifications that were defined in the analysis stage in order to define objectives for the development process. The system must behave and must give the results the users want and that they have stated at the start.

The knowledge-based society evolves only through the high quality of distributed collaborative systems.

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ADVANCED PERSONALIZATION OF LOCATION BASED SERVICES

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This article explores possible solutions for improving Location Based Services (LBS). For the purpose of this paper context, user profile, previous choices and the choice profiles of similar users are aspects taken into consideration. A possible implementation of an LBS system, in the form of a public transport route finding application based on genetic algorithms is also presented. The proposed application uses semantic tagging to integrate data from multiple sources and sensors into a single interpretation.
Key Words: *Knowledge Management, Geographic Information Systems, Location-based Services, Semantic Web*

1. Introduction

The rapid advancement of technology, including the spread of mobile phones, personal digital assistants and net-books connected to fast data networks makes it possible to offer online services to people on the move. Based on the possibilities to identify the users' position either through the mobile network or by using the integrated global positioning system (GPS) module provided by the handsets, a new type of online services, called location based services (LBS) [1] is rapidly developing [2]. Location based services include services to identify the position of nearby objectives like museums, restaurants and pharmacies, vehicle tracking services, personalized weather services and advertising services that deliver targeted ads based on the location of a user.

This paper analysis several ways to improve LBS efficiency based on context, users' profile and his previous choices. A prototype of a collaborative system for route generation in public transport networks is also presented.

2. Location Based Services (LBS)

Location based services are defined as applications that have as a main input the geographic position of the user, generating content based on that input [3]. Existing LBS can be classified as trigger-based and user-requested. While the second category of services are specifically requested by the user, such as finding shops nearby or generating routes, triggered services are usually unrequested and take the form of Location Based Advertising (LBA).

Given the importance of geo-processing and the extensive usage of maps, most LBS applications are in fact full-featured Geographic Information Systems (GIS) made available through mobile devices. As opposed to classical GIS applications however, GIS-LBS applications usually need to dynamically handle heterogeneous data from multiple sources and sensors such as weather information, traffic information and pollution information. Moreover they must be accessible from a wide range of mobile devices, making interoperability an important issue [4].

A possible solution for data heterogeneity is the use of ontologies: service type ontology (concepts such as museum, pharmacy), product ontology (concepts related to products), payment ontology (concepts related to types of payment), and context ontology (concepts related to weather, traffic) [5].

3. Geographic Information Systems (GIS)

Geographic Information Systems are "organized collection of computer hardware, software, geographic data, and personnel designed to efficiently capture, store, update, manipulate, analyze, and display many forms of geographically referenced information" [6]. Such software is designed to process, model and identify geographically referenced data and its properties in a computerized system with the intent to solve further problems in management or planning [7]. Sadagopan [8] already affirmed the widespread appeal of GIS in different fields such as transportation mapping, functional analysis, exchange of data, and location based services. It is only expected that the revolution in GPS (Global Positioning System) usage in the last decade, alongside with the explosion in availability of user-submitted data contributed to a further explosion in GIS usage [9].

4. Personalization of LBS

In order to appeal to mobile users, LBS need to correctly understand their requests and provide information in accordance with the users' preferences and context.

Context includes aspects that are not related to any user, such as time, weather information and traffic data. By taking context into consideration LBS will be able to make a preliminary selection through the list of available information. Thus the user won't receive information regarding outdoor restaurants when it rains, or regarding closed shops or museums. The context is highly dynamic and must be constantly updated while the user is on the move [10].

While context helps eliminate irrelevant information, users' profile represents the solution to deliver only those services that might prove interesting for the user. The profile can be created when the user first uses the application and should contain information such as the user's age, sex, profession, income, known languages. Besides these, important aspects that have to be taken into consideration are the

current activity of users [11] and their previous choices.

For better results the choices of other users featuring similar profiles should be taken into consideration. This implies determining several general profiles and classifying users using an algorithm based on Bayesian learning.

5. LBS for route finding in public transport networks

A frequent challenge for inhabitants of large cities wishing to use public transportation is identifying an optimal route. The difficulty is given by both determining the location of the destination (workplace, park, cinema, university etc.) but also by identifying an optimal routing in a complex transport network. A potential solution for solving the difficulty is represented by using a computer-based application for guiding travelers while increasing the efficiency of the transit network. However, in the current context, such applications are implemented in few cities and lack a number of features that make their usage inefficient and non-user friendly – features such as lack of support for multi-mode networks, lack of support for multi-operator systems, limited number of objectives available in the system, lack of user-based customization of preferences in the route-generation process (e.g. impossibility to select preferred transit mode; impossibility to select solely disabled-access vehicles/routes etc.).

Many of the current implementations are not accessible from various mobile devices and don't allow finding near-by objectives [12, 13].

The proposed system intends to solve the problems presented above by means of using a restriction-controlled parallel genetic algorithm allowing for multi-mode and multi-operator enquiries. It also allows users to add and modify objectives in a collaborative manner. The mobile version, currently under development will allow finding near-by points of interest based on context, on users' profile, on his previous choices and also based on choices made by other people with similar profiles. The users' current position is determined either using the mobile devices' GPS sensor or if such a sensor is not available, by using cell triangulation.

Given the variety of mobile devices, the heterogeneity of data sources and in order to allow easy addition of new data sources, the proposed application uses web services to communicate like shown in **Error! Reference source not found.**. Context information includes weather, traffic and pollution data. It can be retrieved either through web service calls or by using XML (Extensible Markup Language) or RSS (Really Simple Syndication). The same approach can be taken regarding the actual data that will be used to provide information regarding near-by points of interest. Using ontologies proved to be an appropriate solution to overcome data heterogeneity [14].

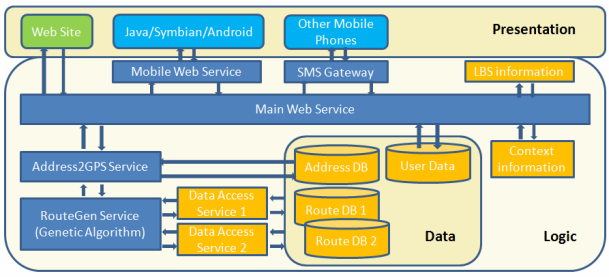

Fig. 1 Architecture

Route generation for transit networks is a more complex endeavor as opposed to that used in a standard GPS route-finding solution. For public transport networks, additional restrictions exist – existing lines, types of vehicles in use (transit bus, long distance rail, light rail, train, funicular etc.), their schedules, the ability to connect between nearby stops without using another vehicle, the overall cost of the trip, etc. Moreover, unlike software dealing with automotive route finding, where the start and the end-points are clearly defined by the user, in a transit-based model, the start- and end-stations are multiple, depending on a mix between the optimality of identified route, total restrictions introduced by the user and his/her ability and desire to walk a certain distance. Furthermore, if accessibility is taken as a factor in route finding, the algorithm further complicates, as disabled-accessible facilities may only be available on certain routes and on certain stations.

In order to generate routes that would better reflect user preferences, the proposed algorithm allows for using fixed and flexible restriction within the generating process. Flexible restrictions allow users to assign different weights for criteria such as length of trip, total cost, number of transfers or maximum walking length. Fixed restrictions include selecting only certain classes of vehicles for transit, or forcing the usage of disabled-accessible routes. The proposed algorithm does not use predefined transfer areas like in [15], but rather chooses a more flexible approach. Two or more stations are considered in the same transfer area if the walking distance between them is smaller than the maximum walking distance selected by the user.

Most approaches used in route generation solutions use modified versions of Dijkstra's algorithm [16]. Albeit extremely fast, this algorithm is inefficient for multiple restrictions. An alternative to such an approach is represented by the use of genetic algorithms. These allow the inclusion of a large number of restrictions, both fixed and variable, with different weights, by changing the parameter sets for the *fitness* function. The proposed system implements a parallel genetic algorithm that allows using multiple restrictions.

Great care has been taken when designing the user interface for mobile devices in order to make it accessible and easy to understand even on small screens (Fig. 2).

Fig. 2 The application for mobile devices

Conclusions

Several ways to improve location based services are discussed in this paper, together with a prototype system that allows identifying points of interest near-by and finding routes in complex, multi-modal, multi-operator networks. The system uses a service oriented architecture that allows using semantically annotated external data sources.

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DATA MINING AND PATH FINDING ALGORITHMS IN NATURAL COMPUTING

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Natural computing elements are presented. Data mining algorithms are discussed and quality characteristics of the algorithms are analyzed. Than domains of application for the data mining algorithms are shown. Experimental results are obtained using the simulation application NetLogo through a custom path finding algorithm.
***Key words**: natural computing, data mining, optimization.*

Introduction

From the oldest times, humans have been searching solutions for the problems facing in the animal world. So, by close observation of the animals that have social organization, humans managed to see that through organization, communication and cooperation, these animals can reach goals that were impossible to achieve by an individual [BANK08]. An important role in the activity of the animals with social organization is played by the communication. The communication methods are distinct from species to species. Every species developed the most efficient communication method based on the natural conditions and the undergoing social activities. The pheromones released by ants seem to be the perfect solution for the species communication system. The ants can communicate through pheromones regardless the time of day, light or other variables that could limit or stop the communicational process for other species.

By observing different species, humans realised that in order to achieve goals, they must communicate and cooperate. They also concluded that the solutions in the natural world are optimised for the solved problems and, if they faced a similar problem, it would be a good idea to try to adapt the natural solutions. The appearance of computers have not changed things and humans still try to solve problems using the behaviour of the social organized animals in somewhat similar situations.

Natural Computing

Natural computing is a discipline inspired by the operation of living organisms, and merges computational techniques with natural systems. The purpose of natural computing research is to develop computational tools for solving complex problems. The understanding of complex natural phenomena and essence of computation is enhanced when natural phenomena are viewed as computational processes.

The main components of natural computing are computing inspired by nature (nature is used as inspiration for development of problem solving techniques), simulations and emulation of nature by means of computing (synthetic process that tries to create patterns, forms, behaviors, organisms that reassembly life and helps to understand the nature and computer models), computing with natural materials (natural materials are used to perform computation). Each component involves special techniques or methods:

- Computing inspired by nature: evolutionary computation; neural networks; artificial immune systems; swarm intelligence.
- Simulation and emulation of nature by means of computing: fractal geometry; artificial life.
- Computing with natural materials: DNA computing; quantum computing; optical computing for NP-complete problems.

In this paper we are interested in swarm intelligence, a type of artificial intelligence based on collective behavior of decentralized, self-organized systems. Swarm intelligence systems imply a group of agents interacting with one another and with their environment [HAND07]. The agents follow simple rules, but there is no centralized structure to control individual agents' behavior, and interactions between agents lead to an "intelligent" global behavior.

Data mining

Data mining is a process of extracting patterns from large amounts of data. In the last years, data mining has become an important tool to transform data into information. Data mining is an inter-disciplinary field, located at the intersection of machine language, statistics and databases.

The principal task classes for the data mining process involves classification, clustering, regression, association rule learning.

Data mining algorithms are very important for the development of the knowledge society. Having information extracted from data and knowledge from information is a task that cannot be done manually and therefore must be automated. Data mining process must be optimized for speed and accuracy. Data can be recorded from different sources therefore the data volumes tend to reach very large amount in a short time. In order to process very large amount of data, the data mining algorithms must be characterized by the following quality properties:

- speed; for large data volumes, the lack of speed of an algorithm quickly gets it crippled, and, as a general rule, data mining algorithms are used only on large volumes of data;
- accuracy; this quality characteristic is measured through the number of rules found by the algorithm to characterize the dataset and the complexity of the found rules [PARP02]; the lower the number of rules, the better the algorithm is considered; the complexity of the discovered rules must be kept as simple as possible;
- scalability; is the ability of the algorithm to attain higher performance with the increase of the hardware processing capacity; in order to attain higher performance the algorithm must be able to use the new added hardware resources;

The data mining algorithms can be successfully applied in various domains:

- ✓ surveillance; two aspects of data mining used for surveillance are pattern mining and subject-based data mining; pattern mining is the process of finding patterns in data; subject-based data mining refers to associations between individuals in data;
- ✓ games; data mining process extracts human strategies from oracles for combinatorial games;
- ✓ business; it is very important to focus on the target group of the product in order to attain high levels of sales; the difficult part of the process is to establish the target group; based on historical data, data mining processes are able to determine patterns of customers and, based on these patterns, the organization is able to discover new customers;
- ✓ science and engineering; as science and engineering constantly developed during the last century, new methods of research and problem solving were created based on data mining algorithms; medicine benefits on data mining are visible in the patients clustering area, DNA based disease treatments [PAUN08]; engineering solves complex problems using natural computing and data mining algorithms;

Even though the data mining algorithms are used in many more domains, these are the most advantaged ones.

Ant algorithms

Ants have always amazed humans with their achievements. Such small creatures are able to create amazing structures, to devour prey bigger and stronger and, meanwhile to assure the perfect functioning of their colony.

A) Patch sorting is best known through the ants that practice it by sorting the bodies of dead mates. The ants' model is based on decentralized control and memoryless interactions between the individuals and environment. Communication is limited to environment modifications made by individuals and perceived by other individuals. As ants explore the environment, they are likely to pick up objects that are not similar to the surrounding set of objects and, if already loaded, to drop an object where the similarity with the surrounding set of objects is maximum.
B) Annular sorting is used by ants at sorting their larvae. These are sorted by the development stage they are in, their nutritional and metabolic needs. The sorting is done in order to increase the efficiency in the colony. The algorithm assumes the formation of a central cluster and other clusters around the central one.
C) Path optimization is used by ants in order to find the shortest path to food sources. As mentioned before, the ants use a pheromone based communication system. While they advance on a path to the food source, they release a pheromone trail. On return, they follow the strongest trail [LABR03]. Because the shortest path is used by much more ants that the longer one, the pheromone trail is stronger for the shorter path. As all ants use the path that has the stronger pheromone trail, the longer one is avoided.

All these algorithms are examples of very efficient methods of solving problems using agents without central control and ad-hoc cooperation.

Experimental results

In order to test the ants' algorithm we have used the NetLogo simulation application. The simulation implements the pheromone trail algorithm and also the diminishing of the pheromone intensity. The ants use the shortest path to the food source until they consume it. Figure 1 shows an output sequence of the algorithm.

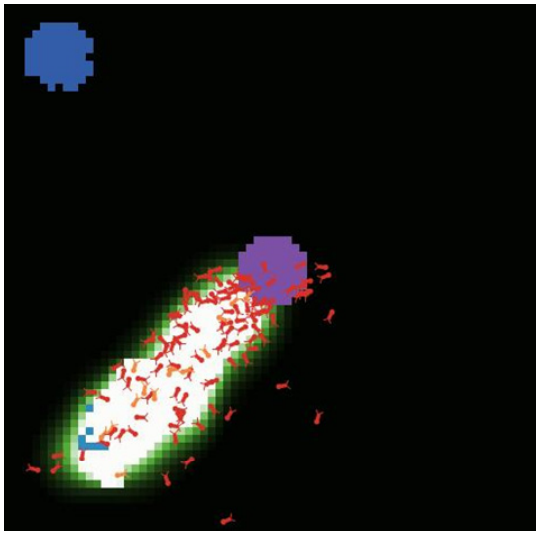

Figure 3 Ant algorithm

Conclusions

The proved efficiency of natural algorithms along time sets the ground of implementing these types of algorithms in complex enterprise level computational packages. The implementation of these algorithms offers a new perspective of computing optimizations and creates new innovative paths for research and development projects. Using these algorithms for data mining will lead to the development of automated observation and modification tools for the natural algorithms.

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E-LEARNING STRATEGIES IN THE CONTEXT OF KNOWLEDGE SOCIETY

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Given the actual society, called often knowledge society, most organizations are experimenting with some form of computer-assisted instruction, in order to train their employees.
This article presents briefly the main characteristics of the knowledge society and of the e-learning systems, and how these two concepts interact and affect each other. Also, there are identified the most important informatics technologies which can be used in the e-learning applications. In order to analyze the actual e-learning systems, some of them are identified and compared based on various criteria.
***Keywords**: e-learning, Web Based Training, Knowledge Society, informatics technologies*

1. Introduction

The core of the new economy is by no doubt the knowledge-based company, in which learning plays a fundamental role. This is why it bears the name of learning organization. Learning organization means, first of all, employees who learn. Their involvement in continuous learning processes is a major coordinate of the new company. Although we still support typical training approaches based on classical training methods (lectures, discussions) and active (case studies, games, simulations etc.), knowledge management requires the permanent need of information and continuous training using modern, economic and easily accessible through the Internet means.

Starting from this point of view, we can say that permanent need of knowledge generated by the new economy has major implications in the field of informatics, requiring development of new technologies. Thus, information society proposes for continuous informing to use the global Internet network, which caries relevant information for knowledge-based organizations, particularly in the light appearance of online platforms such as e-learning, e-commerce, e-government, etc.

2. Some aspects regarding e-learning

Relatively new, but knowing an increasing development, e-learning means electronic information distribution, a path that tends to capture the activities of most areas.

The advantages of an e-learning system are evident in the context of the new economy, given that the student has flexibility and opportunity to manage the time for study, encouraging their own learning style.

Therefore, in recent years, traditional education begins to lose ground, leaving place for the computer based education. Mainly this is due to low cost, flexibility and the possibility of leaving the student to share free time as it wishes.

On the teaching context, online education creates two situations regarding the need/desire of all ages people to teach [8]:

- on the one hand, interest in obtaining a new "virtual" degree. It is the case of those who are professionally involved in various activities and for which distance education is the only way to get a diploma;
- on the other hand, the desire to complete the heritage of knowledge and to obtain new skills. It is for those who are interested in a particular field of study, which offers them the possibility of developing knowledge in the area.

3. The Knowledge Society

Knowledge-based economy is characterized by the growing importance that has the knowledge in all economic processes and their contribution to sustainable economic growth.

Each of the previous economic approaches raises the profound implications of changes in the whole economy, so it is justified an analysis of the new society as a whole, society being in the process of raising on every continent and called information society or knowledge-based society (knowledge society - KS).

The main element that stands at the knowledge society basis is considered to be the knowledge management (KM).

The knowledge management approaches vary by author and school. As the discipline matures, academic debates have increased regarding both the theory and practice of KM, to include the following perspectives [4]:

- technologic: with a focus on technology, and especially those that enhance knowledge sharing and creation;
- organizational: with a focus on how an organization can be structured to facilitate knowledge processes best;
- ecological: with a focus on the interaction of people, identity, knowledge, and environmental factors.

In all this three domains, KM has as principal objective the transformation from of tacit knowledge into explicit knowledge.

Tacit knowledge represents internalized knowledge that an individual may not be consciously aware of how he or she accomplishes particular tasks. At the opposite end of the spectrum, explicit knowledge represents knowledge that the individual holds consciously in mental focus, in a form that can easily be communicated to others.

Using the knowledge within an organization can increase the competitive advantage on the market, and considering this as an important asset can be used as a production input factor for company's line of business. The knowledge as primary decision factor is becoming a trend for companies worldwide. [5]

4. E-learning technologies in the context of knowledge society

In the actual case of the knowledge based economy, any e-learning application should use a range of informatics technologies, such as:

- various Web technologies, so that the application can be used dynamically, through a simple Internet connection;
- access to the Internet, with the possibility of extending in the Grid Computing environment;
- multimedia technologies, which offer interactivity required for applications like this through: animated tutorials, audio files etc.;
- data storage technologies using databases or data warehouses.

The grid environment consists of multiple distributed and heterogeneous individuals/organizations providing different resources/services. Each of them confronts with a diversity of access technologies among its participants. Therefore the grid environment has to provide flexible, secure and coordinated resource sharing [6].

A Knowledge Grid is a software system which uses Grid Services to enable the knowledge sharing along distributed systems. In the case of e-learning applications, KG can be an intelligent and sustainable Internet application that enables people to effectively capture, publish, share and manage explicit knowledge resources. It also provides on-demand services to support innovation, cooperative teamwork, problem-solving and even decision making.

When talking about the technologies used in the Web pages development, have to specify the following: Markup Languages like HTML, XML, and SGML; CGI (Common Gateway Interface) describing the implementation of the client to server web interface; The HTTP Protocol; PHP scripting language; JAVA programming language; Programming Web Applications with Servlets; Programming Web Applications with JSP; Web Services and SOA integration [3]; MIME (Multipurpose Internet Mail Extension); Graphics - Gif files used to add graphics to web pages.

A database system is a set of inter-elements that contribute to developing and working with database applications [7].

Under tiered architecture of a database system it results its following components:

- data (collections of data themselves, database dictionary, annex files)
- software (database management system, application programs)
- auxiliary elements (set of automated and manual procedures, laws and administrative regulations, hardware, types of users)

5. Web Based Training - WBT

Web-Based Training (WBT) is a part of e-learning and it is widespread in Europe in a large number of institutions, providing educational services at academic or pre-academic levels, using the Web facilities.

WBT facilitates, supports, reinforces and even replace traditional education activities.

WBT involves two main aspects: first, give students online access to information without being physically present in a study hall and on the other hand, allows accessing information through modern tools available in a study hall.

In the context of the knowledge society, any e-learning application and especially the WBT applications must use at least a part of the information technologies described above [1].

In general, the WBT systems involve the use of information technology to facilitate access for students wherever they can and in any place where there is at least one Internet connection.

6. Examples of WBT solutions - comparative analysis

To be understood and used easily, an e-learning application should be designed according to the structure illustrated in Figure 1:

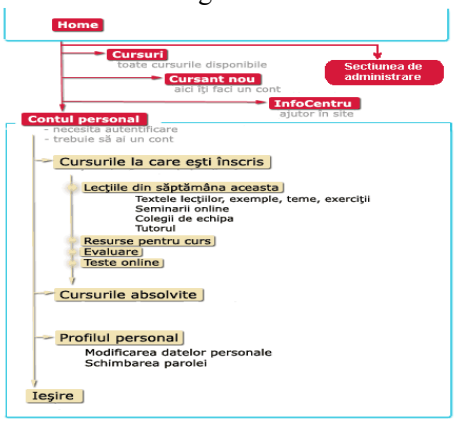

Figure 1 – *The general structure of an e-learning application*

[Source: http://www.academia-online.ro]

The user interface must be made through a Web site that will provide students, based on their authentication: electronic courses; multiple choice tests; links to other useful documents or the necessary software etc. Also, instructors will be allowed the access to the private area of the site, in order to manage courses and tests [2].

Based on the research realized, has been identified and analyzed several Web e-learning applications. Briefly, the characteristic elements of each application are outlined in the following table. Are highlighted here the structure of the Web applications, the informatics technologies used and also the content and teaching awareness:

Table 1. – Comparative analysis of some WBT applications

Site Criteria	http://cisco.netacad.net/	http://www.academiaonline.ro/	http://www.docnmail.com/	http://www.e-training.iatp.md
Content	▪ 10/10	▪ 8/10	▪ 8/10	▪ 7/10
Graphics	▪ 9/10	▪ 7/10	▪ 6/10	▪ 6/10
User interface	▪ 9/10	▪ 9/10	▪ 7/10	▪ 8/10
Information novelty	▪ 10/10	▪ 8/10	▪ 8/10	▪ 7/10
Items structure	▪ crowded pages ▪ good structure of the Web pages items	▪ good structure of the Web pages items	▪ crowded pages ▪ pages with too many Web sites references	▪ simple ▪ airy pages
Access to information	▪ username & password ▪ registration fee	▪ username & password ▪ registration fee but also free courses	▪ free access ▪ registration fee but also free courses	▪ free access ▪ free courses
Online exams	▪ YES	▪ YES	▪ NO	▪ NO
Instructors interaction	▪ YES	▪ YES	▪ NO	▪ NO
Technologies	▪ JSP ▪ JavaScript ▪ Flash ▪ databases ▪ XML	▪ PHP ▪ HTML ▪ CSS ▪ JavaScript ▪ MySQL databases	▪ HTML ▪ JavaScript ▪ PHP ▪ databases	▪ HTML ▪ CSS
Interactivity	▪ YES	▪ YES	▪ NO	▪ NO
Extension possibility in the Grid environment	▪ YES	▪ YES	▪ NO	▪ NO

7. Conclusions

Given the increasing phenomenon of e-learning in the context of the actual society, the article highlights the benefits of using various informatics technologies for computer-assisted instruction. It is identified an architecture model to allow greater use of WBT systems, starting from a general, modular structure, easy to understand and use. In addition, it is identified the possibility to optimize the infrastructure for WBT systems by extend it in the Grid environment, which will solve scalability problems caused by reduced or limited availability.

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BAYESIAN APPROACH TO RISK ASSESSMENT IN KNOWLEDGE BASED AUTHENTICATION

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1. Introduction

Knowledge is quantified according to [1] as expertise and skills acquired by a person, the theoretical understanding of a specific subject or facts and information with respect to a specific field or domain. According to [2] knowledge is information possessed by an individual which can be used in profit generating activities. Knowledge in the context of KBA is represented by common information known by the individual who will be used to confirm his identity.

According to [1] authentication is the act of establishing or confirming something or someone as authentic. Considering access control, authentication is the process through which the identity of an individual is established through the use of a diverse set of credentials.

Establishing the identity of an individual is an important aspect according to [4] in each application in order to avoid exposure of confidential information. This is achieved most commonly using user-password systems. Knowledge based authentication is meant to enforce already set constraints and increase the security level present in the system.

2. KBA systems

According to [3] knowledge based authentication is used as a primary system or as sub-system for authentication in informatics applications. This type of authentication is based on a set of factoids which represents knowledge possessed by the user used to identify him from a set of users.

A factoid consists of a pair

$$f=(k,v)$$

where:

k – is the key given by the user;

v – is the value associated to the key k.

The factoids have the following characteristics according to [3]:

- memorbaility represents the ease with which the users remembers the data he entered;
- simplicity represents a characteristic which is closely tied to memorability, if the factoid is simpler then memorability increases;
- familiarity is related to the guess factor amplitude and regards the personal character of knowledge within the factoid.

The environment of the factoids is composed from two major elements the user and the system. The user supplies the factoids to the authentication system which after running a cross reference with the factoids stored by the user beforehand accepts or denies access to the privileged resources.

Interference is caused by network communication issues between the user and the system or by deliberate attacks meant to intercept the user credentials in order for the attacker to be able to impersonate the user and gain access to his resources. Considering the user set $SU = \{U_1, U_2, \ldots, U_m\}$ where each user U_i has associated a factoid set $SF_i = \{F_{i1}, F_{i2}, \ldots, F_{in}\}$ which identifies him in the user set SU an identity matrix, M, is generated and presented in table 1 according to [3] and [4].

Table 1 Identity matrix.

Users	Factoids			
U_1	F_{11}	F_{12}	…	F_{1m}
U_2	F_{21}	F_{22}	…	F_{2m}
…	…	…	…	…
U_n	F_{n1}	F_{n2}	…	F_{nm}

Each user U_i from the M matrix is identified using any factoid from the set SF_i. The user is identified upon providing a valid value for a random key picked arbitrarily by the system from the factoid set assigned to the user.

3. KBA system risk estimation

Considering two facts A which is considered to be true and another new piece of information B which might alter the probability of A to be considered as true. This varies according to the degree of veridicity contained by B with regard to the context set by A.

The Bayesian probability considering a prior probability of A and a new piece of information about B is computed using the formula:

$$P(A \mid B) = \frac{P(B \mid A) * P(A)}{P(B)}$$

When knowledge based authentication is considered, A is represented by the belief that the individual is who he claims to be and B is new evidence to support this affirmation or to discredit it. Considering a simple KBA system consisting of one thousand users each of them with three recorded factoids. If an attacker possesses a certain degree of information about the common knowledge that the individual with identity A has, the probability that the identity theft will take place is computed using:

$$P(A \mid B) = P(A \mid B_1) * P(A \mid B_2) * P(A \mid B_3)$$

where:

A – represents the identity of the individual;

B – represents the set of information possessed by the attacker;

B_1 – represents the information regarding the first factoid;

B_2 – represents the information regarding the second factoid;

B_3 – represents the information regarding the third factoid;

Thus P(A|B) will show the identity theft probability for each user depending on the individual correctness probability of each factoid known to the attacker. Table 2 presents the risk probability matrix for the whole system considering $P_i(A_i|B_i)$ to be the identity theft probability associated to the A_i identity and $B_i=\{B_{i1}, B_{i2}, B_{i3}\}$ is the set of common knowledge related to identity A_i the attacker possesses.

Table 2 Risk probability matrix.

Identity	Factoid 1	Factoid 2	Factoid 3
A_1	B_{11}	B_{12}	B_{13}
A_2	B_{22}	B_{22}	B_{23}
...	...	...	...
A_i	B_{i1}	B_{i2}	B_{i3}
...	...	...	...
A_{1000}	B_{10001}	B_{10002}	B_{10003}

The probability of identity theft is directly proportional with the common nature of the factoids. KBA is most efficient when used in correlation with another authentication type, like a secret password because it makes brute force attempts more difficult to complete.

4. KBA integration and risk aggregation

By integrating KBA systems in classic password based systems the level of security increases considering a brute force attack. The KBA system is most efficient when the attacker already knows the user password or he can easily guess it thus making it easy for the attacker to gain system access. KBA will strengthen the existing security level and hold off the attacker until the intrusion detection systems identify him and block access. This is due to the fact that the even thought the attacker is in possession of the password, the factoids are unknown, as they are common knowledge to the user.

In order to integrate KBA in a security system the following must be considered:

- the flexibility of the existing security framework, which must provide the technical context of the integration;
- database flexibility as structural modifications are needed;
- user agreement and understanding without which the system will lose its purpose;
- training sessions for administrators to find out how they will get the best out of KBA;
- full compatibility between the software product in use and the new KBA module.

Considering a brute force attack on a six character birth date field with the value "091184" is represented in figure 1.

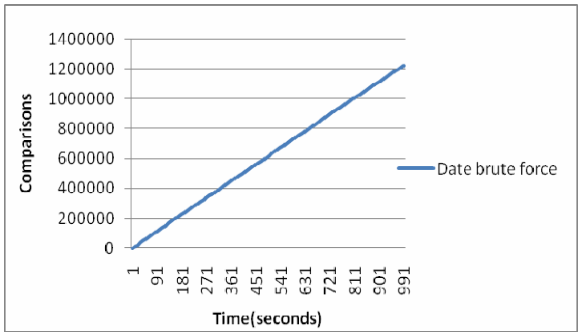

Figure 1 *Date brute force, time-comparison correlation*

Considering a brute force attack on a numeric only password with the value "141389" the time-comparison graph is represented in figure 2.

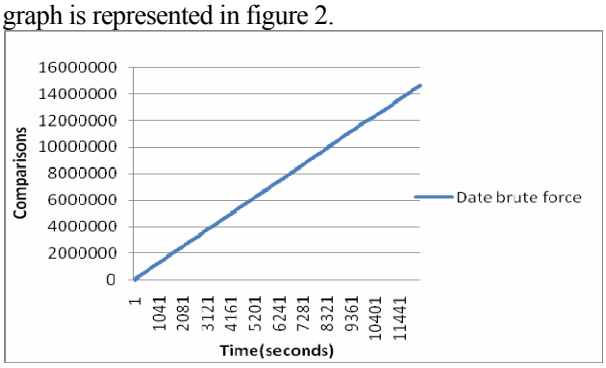

Figure 2 *Password brute force, time-comparison correlation*

Considering the attacker knows that the user is using a factoid out of the initial three as his birth date, and also knows that only two of the factoids are numeric the risk probability is:

$$P(BD \mid D) = \frac{P(D \mid BD) * P(BD)}{P(D)} = \frac{0.5 * 0.33}{0.66} = 0.25$$

Thus there is a 25% probability that even though the attacker gained some knowledge of the factoids, a brute force attack will be correctly oriented to target the exact factoid that holds the birth date. Also considering that brute force is time consuming and there are three factoids the risk is greatly reduced by using KBA.

In these experiments fixed length was used due to time economy, without knowing the maximum length of the factoid the time consumption would be much higher.

5. Conclusions

Knowledge based authentication has the following advantages:

- it is easy to implement;
- it has a low hardware cost;
- it easily increases the security level;
- the factoids are easy to remember as they are common knowledge to the user;
- it is flexible and easy to integrate in classical security systems.

Bayesian computations bring a quantitative assessment to risk and give a better image of the risk environment that the knowledge based authentication faces.

Even though the number of attack techniques is increasing the benefit of using KBA to enhance the security of the system with a minimum cost is unbeatable.

Future research possibilities include:

- developing a KBA quality system;
- building KBA metrics;
- development of a KBA risk management model;
- development of a KBA cost estimation model.

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The last decade has witnessed an exponential growth of interest in organizational learning and Knowledge Management. This comes as a natural consequence of the ever more widespread understanding of the knowledge-based economy as a revolutionary change in the global economy. The rise of the service economy, the increasingly flow of global information, and the growing recognition of the importance of intellectual capital are turning knowledge into a key critical resource and a source of competitive advantage in the global economy, making from KM an evolutionary rather than a revolutionary development.
Key words: knowledge management, knowledge workers, learning organization

1. Knowledge Management – A Concept developed from Practices

Improving the productivity of knowledge workers is one of the most important challenges for companies that face the transition from the industrial economy to an economy based on information and knowledge (Drucker, 1999).

However, most Knowledge Management efforts have failed to address this problem and focused on information management instead. The literature of KM continues to reflect a techno-centric focus, similar to that of information management, which in essence regards knowledge as an entity that can be captured, manipulated and leveraged. This is a limited perception that disregards the social characteristics of the employees and the realistic understanding of knowledge and its incorporation into the management of organizations, its awareness of a range of views on the concept, including perceptions of knowledge as an entity (and not simply as information), as a resource, as a capacity and as a process.

Knowledge Management is a concept that has grown and developed from existing practices following an integrated approach of the *knowledge-information-knowledge worker sequence*. Many enterprises downsize to adapt to more competitive environments. But unless they have captured the knowledge of their employees, downsizing can result in a loss of critical information. Similarly, as employees leave, organizations are likely to lose access to large quantities of critical knowledge. And as companies expand internationally, geographic barriers can affect knowledge exchange and prevent easy access to information. These kind of contextual situations determine enterprises to explore and develop methods for knowledge management.

Our approach of KM is based on focussing on the needs of the individual knowledge worker rather than the industrial perspective, which is focussed on organisational goals and defines Knowledge Management as "the attempt by an organization to explicitly manage and control the knowledge of its workforce" (Alvesson and Karreman, 2001). As other authors also noticed, „the fatal flaw in thinking in terms of Knowledge Management is in adopting the perspective of the organization as the relevant beneficiary. Discussions of Knowledge Management start from the premise that the organization is not realizing full value from the knowledge of its employees. While likely true, this fails to address the much more important question from a knowledge worker's perspective of what's in it for me?" (McGee, 2003).

Knowledge management can be formally defined as managing knowledge resources, typically by using advanced information technology, "the explicit and systematic management of vital knowledge and its associated processes of creating, gathering, organizing, diffusion, use and exploitation. It requires turning personal knowledge into corporate knowledge that can be widely shared throughout an organization and appropriately applied."

As the discipline, Knowledge Management promotes an integrated approach to identifying, capturing, retrieving, sharing, and evaluating an enterprise's information assets. These information assets may include databases, documents, policies, and procedures as well as tacit expertise and experience resident in individual workers. The resource-based view of the firm suggests that organisations will need to be able combine distinctive, sustainable and superior assets, including sources of knowledge and information, with complementary competencies in leadership and human resource management and development to fully realise the value of their knowledge. The specific outcomes of KM are: shared intelligence, improved performance, competitive advantage, higher levels of innovation.

2. The growing importance of KM. The Knowledge Workers

A term first used by Drucker in his 1959 book, *Landmarks of Tomorrow: A Report on the New «Post-Modern» World*, the *knowledge worker* includes people working in the information technology fields, such as programmers, systems analysts, technical writers, academic professionals and researchers. In other words, a knowledge worker is anyone who works for a living at the tasks of developing or using knowledge. For example, a knowledge worker might be someone who works at any of the tasks of planning, acquiring, searching, analyzing, organizing, storing, programming, distributing, marketing, or otherwise contributing to the transformation and commerce of information and those who work at using the knowledge so produced. If in the case of knowledge we encounter a wide range of theoretical acceptations in the specialized literature, *knowledge workers* can be simply defined as those employees whose work is primarily intellectual in nature and involves extensive and regular use of established bodies of formal, codified knowledge. From this perspective, knowledge workers represent occupational elite, that are in the vanguard of the knowledge economy and their work contributes significantly to the performance of their employer.

"Knowledge workers appear to be the ideal employee" (Alvesson, 2006), because: they find their work intrinsically interesting and fulfilling; working patterns represent the norms within the communities they are a part of it; they provide the organization with their efforts in return for good pay and working conditions; they have the sense of identity as a knowledge worker.

There are some factors that contribute to the *distinctiveness of knowledge workers*: high qualification; greater importance knowledge and expertise; highly tacit and difficult knowledge and skills; relatively scarce knowledge and simultaneously highly valued which provides them extensive opportunities to change job; distinctive norms and expectations. Work tasks are highly specialized in nature, as they are focused on the process of knowledge creation, utilization and application. These aspects determine organizations to consider managing knowledge worker in distinctive ways, motivating and retaining them through HR effective practices.

In today's economy, where so much importance is attributed to the search for sustainable resources knowledge-based theory underpins much of the strategic thinking in organisations. In the knowledge-based view, this organisational knowledge is acknowledged as the most valuable organisational asset and the ability to manage knowledge strategically as the most significant source of competitive advantage (Barnes, 2002). Knowledge is both the key resource and a basis for sustainability, but knowledge and associated Knowledge Management practices must also be sustainable. In the wider search for sustainability, issues of context, of culture and appropriateness are of paramount importance. In the realm of context, the focus should be on community as well as on process. Thus, Knowledge Management can enhance the potential for knowledgeable practices that are "envisioned, pursued and disseminated, with other actors encountering these new practices and learning from them to develop their own local knowledge" (Cushman et al, 2002).

Knowledge itself is not of any value to an organization unless these contextual aspects are clearly understood. Much of the knowledge, both tacit and explicit remains largely untapped in most organizations; without a thorough understanding of context, it will not be possible for KM to support the development of management and leadership capabilities to support innovation and creativity. Much work in HRM has focussed on identifying facilitators and inhibitors of innovation, such as people (e.g. effective leadership behaviours), structure (e.g. the impact of centralisation, formalisation, complexity, stratification, double-loop learning) and organizational size or resource availability. Other approaches have found that strategic type, organizational climate and culture, and organizational environment are also important facilitators or inhibitors of innovation. For example, Taylor et al (2000) using a large-scale survey have shown that the significance of inter-firm networking for innovation differs markedly between industry sectors, and that high innovating organizations often seek long-term, secure relationships with employees. Organizations also seem to adopt very different strategies towards staff directly involved in innovation as compared with staff in general, with less use of flexible employment policies for this group. An alternative is to see innovation as more dynamic and fluid, allowing for groups, individuals and collaborative partners to differ in their perceptions and interpretations of events.

3. The Process View of Knowledge Management

Traditionally, organizations have rewarded their professionals and employees based on their individual performance and know-how. In many organizations, a major cultural shift would be required to change their employees' attitudes and behavior so that they willingly and consistently share their knowledge and insights. An effective way to motivate knowledge sharing is through the organizational reward and incentive mechanisms. Both McKinsey & Company and Coopers & Lybrand LLP (a management consulting and a professional services firm, respectively) use this mechanism to promote knowledge sharing among their consulting and professional staff. To make information resources productive, organizations should be converted to actionable knowledge, such a process introduces challenges relating to knowledge creation, capture, sharing, and maintenance. (Alavi, Leidner, 1999)

Also, the research made by Yahya and Goh (2002) suggest that a knowledge organisation requires a

different management approach than the non-knowledge organisation. In terms of employee development, the focus should be placed on achieving quality, creativity, leadership, and problem solving skill. The design of a compensation and reward system should be on promoting group performance, knowledge sharing, and innovative thinking. The performance appraisal must be the base of evaluation of employee's knowledge management practices, and an input for directing knowledge management efforts.
Knowledge workers interpret information, generate outputs and solve problems according to their internal structures as individuals rather than according to external rules or procedures. By its human nature, each knowledge worker develops his own subjective configuration based on past experiences, the information he has absorbed and the particular context in which he has used his skills and abilities. Neglecting this aspect, corporate software programs aim to level or standardise the differences between individual workers. We suggests that should be provided to knowledge workers tools which enable diversification of individuals' outputs.

4. The Capacity View of Knowledge Management

KM initiatives generally take several forms, but they usually involve selection of priority areas for initial effort in the attempt to make formal/explicit knowledge more visible and usable and private/tacit knowledge more explicit, public and useful. The key objective is to convert informal personal contextualized knowledge to formal systematic organizational knowledge, exemplified by creating databases of frequently asked questions searchable by both employees and customers, and lists of past mistakes and success in projects as guidelines for similar future undertakings. In addition to improving the *visibility* of knowledge, another aim is to develop its *intensity,* by creating a climate to encourage generation of ideas within workgroups, and generalization to other areas. At the same time, as organizations are concerned about information overload, a further objective is to achieve a better balance between *pushing* and *pulling* it, by giving people just-in-time access to knowledge, allowing the need to know to be determined by the information user (not the owner).

Determining effective knowledge strategies suitable for different types of organizations has emerged as an important topic in the knowledge management literature (Hansen, Nohria & Tierney 1999, Zack 1999, Earl 2001). The Hansen *et al*. model was developed from the analysis of consulting firms approaches to knowledge management, given the nature of the business of these organizations and distinguishes between two main KM strategies:

- *The Codification Strategy*, focused on capturing, storing and codification of knowledge in explicit forms so that it can be readily transferred and used by others within the organization and is linked to a business strategy of knowledge re-use. Information technology is used to support the storage of this knowledge. Codification can be viewed as a «people-documents approach». (Hansen *et al*. 1999)

- *The Personalization Strategy*, focused on person to person sharing of tacit knowledge, linked to a business strategy of knowledge creation. Personalization can be viewed as a «people-people approach». (Hansen *et al*. 1999)

Conclusions

The present work suggests that tools which enable diversification of individuals' outputs should be provided to knowledge workers. In addition to discussing the challenges posed to HRM in general, it has also been discussed the ways in which specific functional areas of HRM (career management, HRD) can respond to these challenges, as well as discussing the implications of the knowledge worker in implementing KM. Tools that have been developed in KM focused on information management and do not support many of the key knowledge work processes. Neglecting the fact that each knowledge worker develops his own subjective configuration based on past experiences, the information he has absorbed and the particular context in which he has used his skills and abilities, corporate software programs aim to level or standardise the differences between individual workers.

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THE STRATEGIC IMPORTANCE OF LEARNING ORGANIZATION – A FRAMEWORK FOR HUMAN RESOURCE DEVELOPMENT

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Modern concept of Learning Organization

Learning and intelligence are multi-dimensional concepts that cannot be determined with a single measure. Much as individuals learns in different ways (Kolb, 1974) too with organizations. To some extent, differences are a function of the diverse environments in which organizations must operate.

Learning Organizations develop as a result of the pressures facing modern organizations and enables them to remain competitive in the business environment (McLean, 2006). Elaborated by Arie deGeus (1988) and Peter Senge (1990), the Learning Organization is a template for an organization that continually creates its future by adapting to environmental change.

There are varying definitions of a Learning Organization in published literature, although the core concept between them all remains clear and has been summarized by Pedler (2006) as, "an organization that facilitates the learning of all its members and continuously transforms itself". Some definitions are broader and encompass all kinds of organizational change rather than just change through learning, whereas others include specifics about how a Learning Organization works. Pedler later redefined this concept to "an organization that facilitates the learning of all its members and consciously transforms itself and its context", reflecting the fact that change should not happen just for the sake of change, but should be well thought out.

Senge defines Learning Organizations as "organizations where people continually expand their capacity to create the results they truly desire, where new and expansive patterns of thinking are nurtured, where collective aspiration is set free, and where people are continually learning to learn together." Consequently, the Learning Organization has become a powerful vision and metaphor for change (DiBella, 2006). The concept of learning organization represents an ideal type. It suggests a philosophy of and approach to organizing and managing which is responsive to changed and changing conditions, and which facilitates and supports effective change management (Moss-Jones, 1994).

A Learning Organization has five main features: systems thinking, personal mastery, mental models, shared vision and team learning (Figure Nr. 1). *Systems thinking* is a conceptual framework that allows people to study businesses as bounded objects and measures the performance of the organization as a whole. *Personal mastery* is the commitment made by an individual to the process of learning. It highlights the similarity with being committed and able to manage one's own self development. *Mental models* are the terms given to ingrained assumptions held by individuals and organisations. To become a Learning Organization, these mental models must be challenged, by replacing confrontational attitudes with an open culture (Kelly, 2001) that promotes inquiry and trust. *Shared vision* emphasises the need for individuals to hold and articulate a personal vision. In a Learning Organisation the basic purpose represented by a genuinely shared vision will promote real commitment. *Team learning* is the accumulation of individual learning (McLean, 2006) that allows employees to grow more quickly and the problem solving capacity of the organisation to improve through better access to knowledge and expertise (Kelly, 2001).

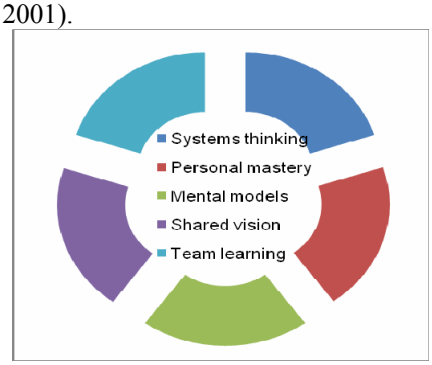

Figure Nr. 1: The five main features of a Learning Organization

These five disciplines establish a Learning Organization (Senge, 1990). Learning does not occur through chance or random action but through the development and use of specific skills. Organizations learn under disciplined action or intervention from their leaders. Duncan and Weiss (1979) explain that learning occurs when organizations mach their structures to their environments in order to maximize the relationships between its members.

To create a competitive advantage, companies need to be able to learn faster than their competitors and also develop a customer responsive culture (McLean, 2006). Argyris identified that in light of

these pressures, modern organizations need to maintain knowledge about new products and processes, understand what is happening in the outside environment and produce creative using the knowledge and skills of all employed within the organization. This requires co-operation between individuals and groups, free and reliable communication, and a culture of trust.

Achieving Organizational Performance through Learning Activities

Learning differences between organizations also occur as a result of differences in history, culture, size and age. New, entrepreneurial firms are apt to learn differently from larger, established firms (Smith-Easterby, Lyles, 2006). When learning is used as an adjective to describe a particular type of organization, one assumption is that some organizations learn and other do not. Such division suggests that learning is optional and not indigenous to the life of organizations.

For organizations to learn, they must have the right culture, a learning culture. Mayo and Rick (1993) claim that a learning organization can be recognized by the interdependence of learning and culture. In a similar manner, Beckhard and Pritchard (1992) discuss building a learning organization by creating a culture that values learning and rewards progress, not just results.

Purser and Pasmore (1992) claim that in order to maximize learning the design of knowledge must be formalized and aligned with the influence of decision-makers. Becoming a learning organization is predicated on having the right organization structure and design.

Argyris and Schon (1978) have made the distinction between single- and double-loop learning. More recently, "triple-loop learning", learning about learning has been identified as yet another learning style (Bartunek and Moch, 1987, Torbert, 1994). Learning organizations promote double- and triple-loop learning since those styles are considered more advanced. Single loop learning results in amendments, refinements and improvements in current practice. It arises from questions concerning how to do existing things better. Double loop learning is more concerned with questioning existing and establishing practices and with challenging the assumptions which lie behind them. The result is more likely to be innovation in processes and practices. Individual and collective learning determine change in organizational behavior and performance. A key focus of this learning is through "learning to learn" (Swieriinga and Weirdsma, 1992). Deutero-learning is concerned with the processes of learning which lead to single and double loop learning. The result of such learning is therefore learning about learning, with the effect of improving learning processes (Stewart, 1999).

Main connections between Learning Organization and Human Resource Development

To create a competitive advantage, companies need to be able to learn faster than their competitors and also develop a customer responsive culture (McLean, 2006). Argyris identified that in light of these pressures, modern organizations need to maintain knowledge about new products and processes, understand what is happening in the outside environment and produce creative using the knowledge and skills of all employed within the organization. This requires co-operation between individuals and groups, free and reliable communication, and a culture of trust.

Human resource development encompasses activities and processes which are intended to have impact on organizational and individual learning. A Learning Organization can be described as a sum of individual learning, which is acquired through human resource training and development (Figure Nr. 2).

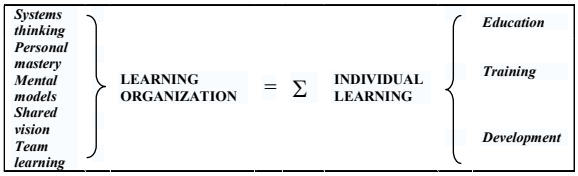

Figure Nr. 2: *Relationship between Learning Organization and Individual Learning*

Education is defined as activities which aim to develop the knowledge, skills, moral values and understanding required in all aspects of life rather than a knowledge and skill relating to only a limited field or activity (MSC, 1981, quoted in Reid and Barrington, 1997, p. 7). Training is a planned process to modify attitude, knowledge or skill behaviour through learning experience to achieve effective performance in an activity or range of activities. Its purpose, in the work situation, is to develop the abilities of the individual and to satisfy the current and future needs of the organization (MSC, 1981, quoted in Reid and Barrington, 1997, p. 7). Development people as part of an overall human resource strategy means the skilful provision and organization of learning experiences, primarily but not exclusively in the workplace, in order that business goals and organizational growth can be achieved. Such development must be aligned with the organization vision and longer term goals in order that, through enhancing the skills, knowledge, learning and innovative capability of people at every level , the organization as well as the individual can prosper (Harrison, 1997, p. 7). A cursory examination and comparison of these definitions reveals many similarities. Training and development directly refer to learning, while the third, education, imply learning since the activities referred to are intended to develop knowledge and skills, among other characteristics. The definitions of training and development share a

focus on and concern with the needs of organization and work. The term assumes that organisations can be constructively conceived of as learning entities, and that the learning processes of both organisations and individuals are capable of influence and direction through deliberate and planned interventions. Thus, HRD is constituted by planned interventions in organisational and individual learning processes (Steward and McGoldrick, 1996, p. 1).

Empirical research conducted over a number of years indicates that there is a variety in the approaches adapted to human resource development within work organizations. Variety in approaches is related to models of human resource development in at least two ways. First, different models inform practice in ways which lead to variety in approach. Second, discovery of variety in approaches leads to formulation of different and sometimes competing model of human resource development.

Benefits of Learning and Human Resource Development

The result of learning capacity and knowledge sharing within organizations consists of maintaining levels of innovation and remaining competitive, being better prepared to respond to external pressures, improving corporate image by becoming more people orientated. There is a competitive advantage for an organization whose workforce can learn quicker than the workforce of other organizations. At the organizational level, a successful human resources development program will prepare the individual to undertake a higher level of work, "organized learning over a given period of time, to provide the possibility of performance change" (Nadler 1984). In these settings, human resources development represents the solution that focuses on the organizations competencies at the first stage, training, and then developing the employee, through education, to satisfy the organizations long-term needs and the individuals' career goals and employee value to their present and future employers.

Barriers to Learning and Human Resource Development

Even within a Learning Organization, problems may be encountered that stall the process of learning or cause it to regress. Both individual and organizational barriers can be identified. Some organizations can find it hard to embrace personal mastery because as a concept it is intangible and the benefits cannot be quantified (Senge, 1990). Additionally, personal mastery can be seen as a threat to the organization because if individuals do not engage with a shared vision, personal mastery could be used to advance their own vision. In some organizations a lack of a pro-learning culture can be a barrier to learning. It is important that an environment is created where individuals can share learning without it being devalued and ignored, so more people can benefit from their knowledge and the individual becomes empowered (O'Keeffe, 2002). Resistance to learning can occur within a learning organization if people feel threatened by change or believe that they have the most to lose.

Conclusions

Knowledge has always been an important driver of competitive advantage, but changes in the economy have made it increasingly so. In order for knowledge to provide competitive advantage, it must be explicitly integrated into a firm's strategy. Knowledge development lies at the heart of organizational innovation and growth and can be achieved through learning activities. Human resources, main owners of knowledge, develop especially within organizations.

Human resource development had gained a permanent role within organizations, agencies and nations, increasingly as not only an academic discipline, but as a central theme in development area. Being a combination of training and education, in a broad context of adequate human resource policies, that ensures the continual improvement and growth of both individual and organization.

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THE CONCEPTION OF THE COMPOSITION, ELABORATION AND WORKING OF THE UNITARY INFORMATIONAL INFORMATIV FUND (U.I_L.IV.F.) OF THE ECONOMIC UNITARY KNOWLEDGE BASE (E.U.K.B.)

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From on the conceptual positions, taking into account of the systemic nature and based on the functional content, is elucidated a general version of the composition, creation (elaboration, implementation) and work of the unitary informational informative fund (U.I_l.I_v.F.) of the unitary economic knowledge base (U.E.K.Bs.)

Keywords: conception, composition, elaboration, working, economic unitary informative fund, unitary economic knowledge base (U.E.K.Bs.)

Content

According to [1] – [3], has been established that the informational compartment (I_l.C.) of the unitary process of economic leadership ($P_{u.e.l.}$) consists of two sub compartments – programmatic (P.$S_{c.}$) and informational (I_l.$S_{c.}$). From the compositional point of view, the last include in oneself the unitary economic knowledge base (U.E.K.$B_{s.}$) and economic informative database (E.I_v.D.$B_{s.}$). In one's turn, from the hierarchical point of view and the succession of working, on the first level of the I_lC. is found E.I_v.D.$B_{s.}$, as in result of the analysis of the values of obtains informational informative products in it medium finally are formulated and accept the informational decisional products of the U.E.K.B_s.

Also, in [3] has shown what by evolution various forms of organization and operation of informative economic information (I_v.E.$I_{t.}$) come to need of establishment and put into functioning an unitary integrated informational nucleus on the form of the unitary informational informative fund (U.I_l.I_v.F.) of the economic unit (E.U.). Therefore, in external (functional) aspect the informative substrate of the U.E.K.B_s is organized under form of unitary economic informational informative fund (U.E.I_l.I_v.F.), while in aspect of his informatics realization he is created in form of the economic informative data base (E.I_v.D.$B_{s.}$).

As in the present and in foreseeable perspective, because of negligent raisons and even arrogant attitude towards the elaborative (projectede) activities, hence- and the lower level of theory and practice of organizing of the economic informational informative resources (E.I_l.I_v.R.), has not succeeded and is very problematic the establishment of such shape, it is considered what the idea U.E.I_l.I_v.F. is neither more than a generale tendency to adequate and improvement realization of organization of E.I_l.I_v.R. Objective, the failure in cause is decisive motivated by that fact what up to the present don't is elaborated and organized the unitary system of the economic information (U.S.E.I.).

After the volume and content, the process of creation of U.E.I_l.I_v.F. of U.E. consists of three basic stages-organizing, of elaboration (projection) and adoption.

In the first stage are fulfilled works of appreciation the necessity and possibilities of the organization and implementation in activity this fund.

For organize the rational and effective functioning the U.S.E.I. is necessary determine first the composition and functional content of the U.E.I_l.I_v.F.

From on these positions, the varieties of the informations of the economic management system organized in form of the U.E.I_l.I_v.F. may be followings:

1) input information in management system received from the external environment (another economic agents, management bodies and others);

2) output information derived from processes of processing, reference and offering for others objects and management bodies.

Both varieties of information are external and therefore differ in difficulty from of their accommodation after composition and content to environment of real information system;

3) internal information, which consists the content of the information system forming for himself led object. That is why they are collected, processed and used exclusively only in the management system of economic unit. Through this and explained that fact what at present the content and the object from organization of U.E.I_l.I_v.F., consists the information of this variety.

From point of view of content, destination and role in process of establishment-functioning of U.E.I_l.I_v.F. and solution economic problems (the decisive factor) all internal information can be highlighted the followings two varieties:

1) basic information, which are informative (descriptive) content and is organized and processed in the purposes of obtaining certain results (information products). That is why they consists the informational base (part) of leardership process of economic unit which may be realized in the form of the U.E.I_l.I_v.F.;

2) service information, through which is ensures the automaticale organization, transformation and utilization of basic information. From this motive the variety in cause include all operating systems,

programming environments and facilities, and any product-software.

Since the present work is concerning in particular from the content of U.E.I_l.I_v.F., we note the varieties of basic information, which according of functional destination, frequency of application and evolution of their values may be systematized in the followings two groups:

1) information with relatively constant values;
2) information with continuously variable values.

After functional content the first group of information include various norms of consumption of economic resources, prices, rates, coefficients planned, contract, indices, permanent describes of the economic objects and activities and other.

The second group of information consists from various information units (mainly, indicators and arrays) of the operative, current and long term (archived) order. All these three categories of information (operative, current, archived) after content may be from appointed functional destination (of accounting, management and analysis). Also, after stages from forming these information can be primary, intermediate and effective. It emphisized once more what if the basic information are the functional content and do description economic objects and processes, then these of service are programatics and ensure automatic organization and function of the U.E.I_l.I_v.F.

At a conceptual level the composition of U.E.I_l.I_v.F. of economic unit (E.U.) may be presented as a scheme of fig.1.

Ascertaing the composition, structure and content of the U.E.I_l.I_v.F. of E.U., can be initiated it elaborative works, but inevitably must be taken in advance of knowledge and analysis of possible concepts of organization and function of this fund, selecting in base of the results of such analysis of the most effective.

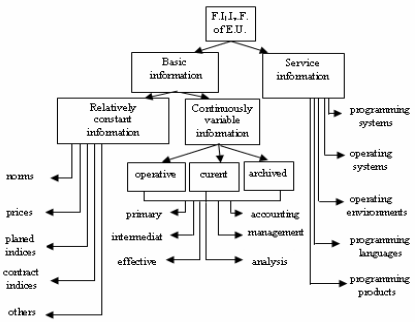

Fig.1. *Scheme of composition of content of unitary economic informational informative fund (U.E.I_l.I_v.F.) of economic unit (E.U.)*

So aspects are conditioneds from the forms of the organization information resources.

In this regard mentioned resources have run two evolutionaries stages of their organization:

1) stage to organization in the shape of separate data files;
2) stage to organization in the shape of interconnection data files.

The concept of first stage of organization and working of information resources in the composition of U.E.I_l.I_v.F. is reduced to that, that information units are organized into isolated (autonomous) files, focused their exclusive to utilization for solution the separately problem, without taking into account the information connections and homogeneity of problems.

The essence of concept of the second stage is reduced to that, that both the organization and utilization U.E.I_l.I_v.F. is based on informational interconnections of the solutioned problems at any management level, including and the led object on the whole.

The principles shortcomings of the first concept on achievement of U.E.I_l.I_v.F. are followings:

1) as separated files are organized only successively and at this reason may have only one version of the presentation, them utilization for solution various problems, evidently, required the respectively reorganizations, related to multiple structural processings, rewritables, corrections and other procedures of this sort. In his turn, these procedures are of additional and preliminary category, which to slowling down and removing in the time immediate processing for obtain information product required;
2) as in the event of separated files one thing and the same information are repeat (are set in memory) of so many times, whenever they ar used for solution various problems, for this concept is characteristic the considerable redudance (dubling) of data, which to contribute to waste of informatics memory space;
3) increase of labour and evidently complication of informational and structural processing;
4) diminuation of the value of activity of reliability and protection of data, as the latter is recorded (transcribed) only in moment, when each concrete problem soluting, in which their are involved.

About to these and other shortcomings, the concept of the separate files have and the certain advantages, among what the principals to consist in those, what within every solutioned problem to obtaining major economy of memory space and a maximum speed of solution of the problem. Essential economy of memory is conditioned of the fact, that the sequential data files do not require associative information, which occupie about the same volume of memory that the values of content information. Maximum speed is ensured by the fact that for every problem before to be solutined always the files with the initial data already are prepared in necessary variant of organization and, therefore, the processor is concerned only computer processing. At the some time, it is known what the labor of solution of one economic problem of the computer, the informational and structural processing in average occupies 70-75%

of time. Also, the automatically elaboration of one economic synthesis document soliciting in average approximately 98% of the all time for entry the initial data and print the result indicators with the respective concluding, and only 2% of the total time are consumed for immediate processing of data.

The concept of organization the U.E.I_l.I_v.F. in the shape of the joined files may be achieved informaticaly modality in the followings two variants:

1) under form to integrated system of processing data (I.S.P.D.);

2) under form to database (D.B_s.);

The first variant were fulfilled in environment of electronic computing machine (E.C.M.) of third generation and their were based not both on the existing tehnical constructive and programmatic potential and on the properties of information, what originating from the specific nature of their and information connections among economic issues. Such properties are reduced to the followings:

1) unlike material resources, the information is not consumed in the process of utilization and there fore can be formed and transformed of so many times, whenever is necessary. At the same time, the information is necessary so long as it is current;

2) the environment of the I.S.P.D. contribute to the cancellation of multiple doublings of the values informational units, as the latters are organized in base of the one unitary scheme in the forme of integrated informational massive, which provide with information the solution of the any problems of the management system;

3) significantly reduced the number of informational connections, because the informational units are assigned on memory space starting from the frequency addressing of they and sequence of soluting problems, in which they are involved;

4) as initial data is recorded in memory once, or in the worst cas a few times, and their utilization occurs of multiple times, the weight of the expenses from one informational resultant unit (informational product) decrease.

Out the mentioned priorities, the I.S.P.D. has and certain shortcomings, among which the most essential are the following:

1) required the organization and processing of the values of the informational units especially in a centralized manner, what is not adequate for economic informational activities;

2) required strict unified organization, in base of one and same unitary scheme of system of information of the led object, which is practically unattainable and completely devoid of flexibility concerning multivariantic handling, in the same number and unforeseeable, of the data, also, suitable for the economic informational system;

3) the interconnection organization and handling of the informational units in environment of the I.S.P.D. lead to increased of the exactingesses concerning data reliability and protection, which complicat the "existence" and evolution (working) of U.E.I_l.I_v.F. of E.U.

The achievement a U.E.I_l.I_v.F. in the second organizational variant – in the forme of database – using in the maximum manner both priorities of information and possibilities of technical, programmatic and technological resources. This is enough explanation in the fact that the environment of the automatized banks of informative data (A.B_n.I_v.D.) from the outset foreseeng such organization of informative information, which (thanks to the disposing of associative information) should provide at any time any proceeding (procedure) with the necessary data. Therefore in such variant U.E.I_l.I_v.F. truly at any time himself found in state due to involvement in the processes of solution of problems.

Besides those mentioned, the concept of A.B_n.D. impose in automatically manner to ensure as well as adequate reliability and as well as demanding protection of data.

However, this form of organization and working of U.E.I_l.I_v.F. of E.U. has that peril that the perpetration a somebody errors regarding the fixing and manipulation of somebody or even of one informational unit can be influencing negative the solution of many issues and possibly even and a management system completely. At the some time, in environement of the separated files admited errors affect only results of solution each one particularly problem.

In this turn, for determine the characteristics of quantitative (volume) and qualitative (composition) parameters of U.E.I_l.I_v.F. it's necessary to involve one certaine system to estimate their at the expert (approximately) level. In this goal may de used and calculated the values of the various indexes and coefficients, on base which can be determined the categories of technical means necessary for solution the real problems .

After determinig the composition of the technical means to establishe their number for each their category. This number is calculated on base of values of quantitative parameters of U.E.I_l.I_v.F. – the volume of information and works effected on their.

Dispune of the composition and number of the informatic technical means serve the starting point for calculate the needs in other resources, the main being those human, financial, material and estate.

Based on the total sum of all necessary resources for to constitute and to ensure the daily working of U.E.I_l.I_v.F. it sets the level of disposition of financial resources of E.U. necessary for to buy this means, the other components and ensure every day their working and use.

In case when the E.U. having the necessary sum of financial resources, as well in base of the results of determine of content, composition, structure and of selection of the concept of organization of working of U.E.I_l.I_v.F. of E.U. objectively and logically following the elaboration of this fund, within the framework of

her to effected the followings works in the following sequence:

1) fixing of composition and functional structure of the management system through establishing owns his functions;

2) fixing of composition and sequence of achievement of complex of problems (issues) for each management function;

3) fixing of composition of issues owns for each complex of problems.

Through effected the enumeration works in performing sequence occur the functional decomposition of management system, which is shown schematically in fig.2.

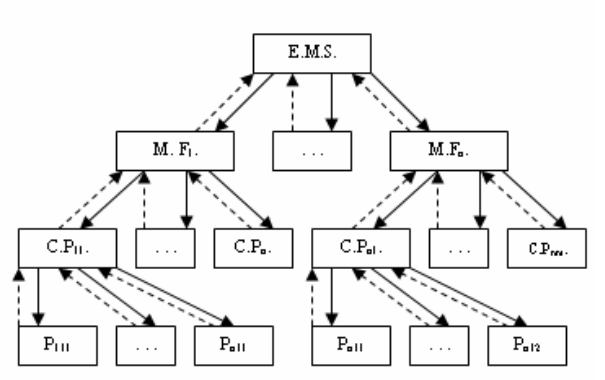

Fig.2. *The functional decomposition and seting up of informational resources of economic management system (E.M.S.).*

In this figure are used the following significances: E.M.S. – economic management system; M.F. – management function; C.P. – complex of problems; P – the problem (issue); → — decisional flows; — —→ — informational flows.

In such way, the cited decomposition finishing the works of establishing of composition and structure of decisional subcompartment of unitary economic management process, which require certain informational informative resources, what and constituted the content of the U.E.I_l.I_v.F. – the informative subcompartment.

Therefore further one determine the composition and the structure of input and output data files of each economic problem.

Through hunting out and adjustment (rationalization) of informational connections between problems one determine the composition and the structure of informational resources of each complex of problem. After this one determine the informational connections between complexes of problems and in such way it's determine the informational resources of each management function. Finally, through hunting out and adjustment (rationalization) of informational connections between management system of lead generally economic object, what and constituted not something else the content of the U.E.I_l.I_v.F.

At those exposed till now and at the fig. 1 it's obvious that if the establishment of the functional content, composition and structure of the economic management system is effected through decomposition, being oriented from superior (upper) to inferior (lower), then the determination of informational resources organized under form of U.E.I_l.I_v.F. is produced in the reverse direction – from inferior to superior and don't through decomposition, but through generalization (joining, syntetizing, composition).

The effectuation of the mentioned works in the indicated sequence permit to establish in objectively, on scientifically bases, mode the composition and the content of the U.E.I_l.I_v.F. But, for ensure one as exactly adequateted and as real correlation of the concrete management system more exist the necessity concomitantly with the mentioned works till now to effect the investigation and analysis of existing informational system.

The necessity of such works is justified and of the utilization of the possibility of comparing and performance of informational resources of concrete management system. Don't is excluded as the revision of the latter to be more operative and so require more reduced expences than their elaboration on the base of scheme at the figure 1.

At the third stage-the implementation of U.E.I_l.I_v.F. – is effected the followings works in the following sequence:

1) in the first place is calculated the necessary volume (space) of memory for repartition and keeping the content of elaborate U.E.I_l.I_v.F.;

2) elaboration of structure and recording (loading) the data files, what constitute the content of this fund;

3) verification of entiretity and authenticity of data files values of U.E.I_l.I_v.F. recordeds in computer memory;

4) elaboration and application of system of ensurance of data protection;

5) elaboration and approbation the unitary technological scheme of application the data files in processes of solution of each real informational problem, complex of problems, subsystems and generally system.

To note that fact, that in the present the elaboration and the organization of economic informational resources in form of the U.E.I_l.I_v.F. are partly effected, especially as concerns economic information with the relatively constant values.

In theoretical and practical aspects the projection activities are considered some of the most important, such how the determination of throughely composition, as well elaboration of the authentically and correctly structure of this fund influenced decisive the efficiency of working of the economic informatic system (E.I_c.S.). At this reason he must contain the information, what would characterize multilateral and adequate the evolution of the led object, at which belong this fund, with such condition that the latter is not overloaded with unnecessary (redundant) information. Being composed of many interconnection

data files, the U.E.I_l.I_v.F. must offer in the most operatively way only the information that is requested to timely moment for to formulate and take the respectively decision.

It is considered rational projected (constituted) that U.E.I_l.I_v.F., which hawining of the enormous memory space and volume, in the same time it's economical, flexible and in due time responsive to correction of data stored in it, "able" to spread without thorough going revision of all the connections, already established on the road of one long period, reliable and traditionale between his informational units, what have contributed and contribut to the compositional and functional stability of this fund.

In case of automatic solution of informational problems, the data can be placed on internal and external informatic supports. Therefore one of the important problems of projection of U.E.I_l.I_v.F. is the distribution of the data on their storage medium of internal or external memory or on the technical intermediately supports. For to determine and to select correctly the informatic medium from keeping of data is necessary to take into acont and to based on the several factors of the characteristics of informational units, how are, for exemple, the volumes of data files, the frequency of addressing towards at them, the degree of renovating, the level of activation (involvation) their in the processes of solution of the problems, the cost of maintaining (keeping) their and others.

In this sense the elaboration of U.E.I_l.I_v.F. starting still of the initial (preprojection) stage of elaboration of E.I_c.S., in the frame of which, in base of the content of the materials of investigation of existing system of information are subject to analysis the informational flows and formulated the demands advanceds given of subsequently projecteds (elaborats) data files Simultaneously, the elaborate informational models (of the level at the indicators, documents, problems and others) permit to determine the redundancy of information, informational interconnection between problems and contributing at the constitution of the base of the furthere projection at the logical structure of database.

At the general (technical) projection stage are formulated the decisions regards the optimal composition of U.E.I_l.I_v.F.. Precisely here for in informatic mode resolved every, problem (issue) itself establishing her conectionnes with all other issues in sense of organization, processing and utilization of her data in common with data of others problems. Is determine the list of data files, towards which itself addressing (resorting) the applied (applicative) program of solution the problem, itself effected the identification of problems and data files. Finally, the results of these works are concludings under shape of special document with the name "Passport of the document".

In base of the list of problems and the data files involveds in their solution, as well of tidiness (succession) their settlement, itself elaborate the graph of interconnection of issues and data files, which, essentially, is not something else than the model of the projected system of information. While maintaining the mentioned model in current situation, while knowing the temporary moment of solution of every problem and while having of the applied program of processing of this model at the computer, is possible to establishe the optimal succession of solution of problems, once in case of failure situations (unprepareds data files, the emergence at functioning of any devices of the computer and others) – in automatically mode is determine anothere way from solution the complex of the problems. After construction (elaboration) of model of the informational interconnections of problems, itself elaborate the lexical fund of the economic management system (E.M.G.) with the view to establish unitary terminology of data elements.

The results of projection of U.E.I_l.I_v.F. are concluding in special documents in the shape of descriptions of data files and descriptions of informational constituents (entitiens).

Finally, is necessary to mention what so much at the priorities of concepts and forms of achiement of U.E.I_l.I_v.F. both and the existing informatic environment ther in evidently mode indicates of that at in present and in forthcoming perspective the organization and working of U.E.I_l.I_v.F. of E.U. in integrated modality in variant of the database is most adequate and efficient.

Conclusions.

It's known what efficiency of economic management directly depend of the quality of respectively informational resources. This fact is especially obvious in environment of the market economy, which itself characterize by excessive intensification of economic relations between objects and activities of the same nature. Consequently, itself produced the essential increase of volume and higher complication of composition of economic information (E.I_f.). At the same time, increasingly stringent geting the qualitative exigencies advanced face of such information.

These circumstances, as well breathtaking development of informatic technic to contributing itself the necessary of constitution (organization) of informational resources in the interior of computer.

In the general plan, this necessity is primordial conditioned of the informational volume and the informational, structural and calculus processings of data of existing management system, of the varieties and complexity of the solutions problems in his sette.

The created circumstances, multiple and variouse informational bundles between economic informative problems are impose the constitution of unitars positions in interconnected (integrated) way all informational resources of the led object (activity) in form of U.E.I_l.I_v.F. not only in environment of his

leadership (management) system, but and in the interior of computer.

In such goal is necessary to underlake and to fulfil one series of actions, which in accordance to content and character are systematized in three categories – those organizational, of elaboration and of implantation.

In sette of the first at they firstly itself determine the composition and content of U.E.I_l.I_v.F., as since the others workings deriveed from these decisivs parameters. In the consequence of such works, in continuation fairly itself requeste the selection of the forme of organization of the resources in cause, which at present may be maximum of two categories – in the shape of the separated data files and in the shape of the interconnected (integrate) data files.

The first category itself characterized through one row of drawbacks (only successive organization, multiple reorganizations, excessive doubling, waste of memory space, considerable labour, diminuation of data protection and others), but and of certain advantages (economy of memory space on account to absence of associative information, preoccupation of the processor only calculus processing in base of external effectuation of informational and structural procedures).

The second category at once it's possible itself be achieved in the shape of integrated processing data system (I.P.D.S.) and in the shape of database (D.B_s.). The first way is bazed on the specific properties of information, what permite the cancellation of the doublings, the diminuation of the number of the informational interconnections, the recording only once in memory with further multiple data utilizations. At the same time, such way solicite the centralization of data transformation, what is not natural for economic information, strict untilie organization in base of one unitary concrete – scheme for the system of information of generally led object, absolutely lesse flrxibility and practical unachievable, excessive increase of exactingnesses regarding data protection and others.

The second way of realization of U.E.I_l.I_v.F.in the shape of D.B_s. utilize at maximum the propierties of information and possibilities of technic, programmatic and technological resources, this contributing to the finding of fund in due situation for implication in solution of any problem, but and pronouncede complication of data protection, as well may be affecting entirely management system.

In the sette of the organizational activities of constitution U.E.I_l.I_v.F. primordial himself determine the composition and volume of the informational resources and works effected of their, in base of which ulterior themselves establishe the composition and the number of the technic means, of necessities in others resources. True with the disposing of the all solicited resources, through the decomposition of management system and synthesizing of informational resources, himself traversing of the last stage of construction of U.E.I_l.I_v.F. - that of the implantation, in the sett of which itself the calculation the necessary volume of the memory for the distribution and keeping of data valuees, itself structured and load the data files, himself elaborate and proving the of their protection data system, the scheme of the technology of their implication in processes of solution of problems.

In composition of constitution activities the most importante for the ensurence the efficient working of the U.E.I_l.I_v.F. are those of projection, because their quality directly influenced the compositional and functional stability of this fund. On their rout is necessary to take into account the exactingnesses advancedings face of such fund, the results of the selection of informatic support for data repartition, of the analysis of informational flows, of the elaboration of informational and of data models, as well the modalities of concluding and others works of such category in the shape of diverse projection documentation.

So much at the priorities of concepts and (ways) of achievement of U.E.I_l.I_v.F. both and the existing and predictable informatic environment in evidently mode draw out in the relief the adequatity and efficiency of the integrated organization and working of his in the shape of database (D.B_s.).

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A METHOD TO COMPARE TWO MULTIVARIABLE COMPLEXITY FUNCTIONS

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The comparison of algorithms complexities can be reduced to the comparison of complexity functions. In two previous papers, we obtained some results related to the comparison of one-variable complexity functions using complexity classes. In this paper, we extend some of these results to multivariable complexity functions.
Keywords: *multivariable complexity function, complexity class, functions comparison*

1. Introduction

The complexity of an algorithm is usually expressed using complexity functions and complexity classes. A complexity function is a more exact way to express the complexity of an algorithm, while a complexity class is less exact, but easier to use.

Consider g(n) a one-variable complexity function. The definitions for the complexity classes $\Theta(g(n))$, $O(g(n))$, $\Omega(g(n))$, $o(g(n))$, $\omega(g(n))$ can be found in almost every textbook that includes elements of the theory of complexity, see, for example [1], [2], and [3].

Comparing the complexities of two algorithms can be reduced to the comparison of two complexity functions. Not every two complexity functions can be compared. In [4] and [5] we study the possibility of comparing two one-variable complexity functions using complexity classes.

In this paper we extend the definitions for the complexity classes for one-variable complexity functions to multivariable complexity functions and then we extend some results from [4] to multivariable complexity functions.

The paper is organized as follows. In section 2, we give several definitions. In section 3, we present some properties of the complexity classes. Section 4, contains the main results of our paper. Section 5, contains the conclusion of the paper.

2. Definitions

We will denote by N_+ the set of positive integers and by R_+ the set of positive real numbers. Let be k a positive integer. Consider the function $g:(N_+)^k \to R_+$ to be an arbitrary fixed complexity function.

Let be $k \in N_+$. Let be $x=(x_1,x_2,...,x_k)\in(N_+)^k$, $y=(y_1,y_2,...,y_k)\in(N_+)^k$. We say that $x \geq y$ if $x_i \geq y_i, \forall i=1..k$.

Definition 1: We define five complexity classes for multi-variable complexity functions:

$$\Theta(g(n_1,n_2,...,n_k)) = \{f:(N_+)^k \to R_+, k\in N_+ \mid \exists c_1,c_2\in R_+, \exists(n_1^0,n_2^0,...,n_k^0)\in(N_+)^k \ such\ that$$

$$c_1\cdot g(n_1,n_2,...,n_k) \leq f(n_1,n_2,...,n_k) \leq c_2\cdot g(n_1,n_2,...,n_k),$$

$$\forall(n_1,n_2,...,n_k)\geq(n_1^0,n_2^0,...,n_k^0)\} \qquad (1)$$

$$O(g(n_1,n_2,...,n_k)) = \{f:(N_+)^k \to R_+, k\in N_+ \mid$$

$$\exists c\in R_+, \exists(n_1^0,n_2^0,...,n_k^0)\in(N_+)^k \ such\ that$$

$$f(n_1,n_2,...,n_k)\leq c\cdot g(n_1,n_2,...,n_k),$$

$$\forall(n_1,n_2,...,n_k) \geq (n_1^0,n_2^0,...,n_k^0)\} \qquad (2)$$

$$\Omega(g(n_1,n_2,...,n_k)) = \{f:(N_+)^k \to R_+, k \in N_+ |$$

$$\exists c \in R_+, \exists(n_1^0,n_2^0,...,n_k^0) \in (N_+)^k \ such \ that$$

$$c \cdot g(n_1,n_2,...,n_k) \leq f(n_1,n_2,...,n_k),$$

$$\forall(n_1,n_2,...,n_k) \geq (n_1^0,n_2^0,...,n_k^0)\} \qquad (3)$$

$$o(g(n_1,n_2,...,n_k)) = \{f:(N_+)^k \to R_+, k \in N_+ |$$

$$\forall c \in R_+, \exists(n_1^0,n_2^0,...,n_k^0) \in (N_+)^k \ such \ that$$

$$f(n_1,n_2,...,n_k) < c \cdot g(n_1,n_2,...,n_k),$$

$$\forall(n_1,n_2,...,n_k) \geq (n_1^0,n_2^0,...,n_k^0)\} \qquad (4)$$

$$\omega(g(n_1,n_2,...,n_k)) = \{f:(N_+)^k \to R_+, k \in N_+ |$$

$$\forall c \in R_+, \exists(n_1^0,n_2^0,...,n_k^0) \in (N_+)^k \ such \ that$$

$$c \cdot g(n_1,n_2,...,n_k) < f(n_1,n_2,...,n_k),$$

$$\forall(n_1,n_2,...,n_k) \geq (n_1^0,n_2^0,...,n_k^0)\} \qquad (5)$$

Definition 2: Let $f:(N_+)^k \to R_+$ be a complexity function. The function $f(n_1,n_2,...,n_k)$ is comparable with the function $g(n_1,n_2,...,n_k)$ if

$$f(n_1,n_2,...,n_k) \in \Theta(g(n_1,n_2,...,n_k)) \cup O(g(n_1,n_2,...,n_k)) \cup$$

$$\cup \Omega(g(n_1,n_2,...,n_k)) \cup o(g(n_1,n_2,...,n_k)) \cup \omega(g(n_1,n_2,...,n_k)) \qquad (6)$$

We denote by $C(g(n_1,n_2,...,n_k))$ the set of all complexity functions comparable with $g(n_1,n_2,...,n_k)$. Consequently,

$$C(g(n_1,n_2,...,n_k)) = \Theta(g(n_1,n_2,...,n_k)) \cup O(g(n_1,n_2,...,n_k)) \cup$$

$$\cup \Omega(g(n_1, n_2, ..., n_k)) \cup o(g(n_1, n_2, ..., n_k)) \cup \omega(g(n_1, n_2, ..., n_k)) \quad (7)$$

Definition 3: We define the following complexity classes:

$$o\Theta(g(n_1, n_2, ..., n_k)) =$$

$$O(g(n_1, n_2, ..., n_k)) \setminus (o(g(n_1, n_2, ..., n_k)) \cup \Theta(g(n_1, n_2, ..., n_k))) \quad (8)$$

$$\Theta\omega(g(n_1, n_2, ..., n_k)) =$$

$$\Omega(g(n_1, n_2, ..., n_k)) \setminus (\Theta(g(n_1, n_2, ..., n_k)) \cup \omega(g(n_1, n_2, ..., n_k))) \quad (9)$$

3. Some properties of the complexity classes

Proposition 1: We have the following properties:

$\Theta(g(n_1, n_2, ..., n_k)) \neq \emptyset,\ O(g(n_1, n_2, ..., n_k)) \neq \emptyset,\ \Omega(g(n_1, n_2, ..., n_k)) \neq \emptyset$

$o(g(n_1, n_2, ..., n_k)) \neq \emptyset,\ \omega(g(n_1, n_2, ..., n_k)) \neq \emptyset$

$o\Theta(g(n_1, n_2, ..., n_k)) \neq \emptyset,\ \Theta\omega(g(n_1, n_2, ..., n_k)) \neq \emptyset.$

Proof: Using the definitions (1) - (5), we have:

$$g(n_1, n_2, ..., n_k) \in \Theta(g(n_1, n_2, ..., n_k))$$

$$g(n_1, n_2, ..., n_k) \in O(g(n_1, n_2, ..., n_k))$$

$$g(n_1, n_2, ..., n_k) \in \Omega(g(n_1, n_2, ..., n_k))$$

$$g(n_1, n_2, ..., n_k) / (\sum_{i=1}^{k} n_i) \in o(g(n_1, n_2, ..., n_k))$$

$$(\sum_{i=1}^{k} n_i) \cdot g(n_1, n_2, ..., n_k) \in \omega(g(n_1, n_2, ..., n_k)) \quad (10)$$

Proposition 2: The classes $o(g(n_1, n_2, ..., n_k))$, $o\Theta(g(n_1, n_2, ..., n_k))$, and $\Theta(g(n_1, n_2, ..., n_k))$ form a partition of the class $O(g(n_1, n_2, ..., n_k))$.

Proof: From (8) we have $o\Theta(g(n_1,n_2,...,n_k)) \cap o(g(n_1,n_2,...,n_k)) =$ Ø and $o\Theta(g(n_1,n_2,...,n_k)) \cap \Theta(g(n_1,n_2,...,n_k)) =$ Ø. Using (1) and (4), we have that $\Theta(g(n_1,n_2,...,n_k)) \cap o(g(n_1,n_2,...,n_k)) =$ Ø.

From (8) we have $o\Theta(g(n_1,n_2,...,n_k)) \subseteq O(g(n_1,n_2,...,n_k))$. Next, using (1), (2), and (4), we have that $\Theta(g(n_1,n_2,...,n_k)) \subseteq O(g(n_1,n_2,...,n_k))$ and $\Theta(g(n_1,n_2,...,n_k)) \subseteq O(g(n_1,n_2,...,n_k))$.

Proposition 3: The classes $\Theta(g(n_1,n_2,...,n_k))$, $\Theta\omega(g(n_1,n_2,...,n_k))$ and $\omega(g(n_1,n_2,...,n_k))$ form a partition of the class $\Omega(g(n_1,n_2,...,n_k))$.

Proof: The proof follows the same idea with the proof for Proposition 2.

Remark 1: Using Proposition 2, Proposition 3, and Definition 2, we have:

$$C(g(n_1,n_2,...,n_k)) = O(g(n_1,n_2,...,n_k)) \cup \Omega(g(n_1,n_2,...,n_k)) \qquad (11)$$

Proposition 4: Let be $f(n_1,n_2,...,n_k) \in C(g(n_1,n_2,...,n_k))$. Then we have $g(n_1,n_2,...,n_k) \in C(f(n_1,n_2,...,n_k))$.

Proof: From (2) and (3) we have that $f(n_1,n_2,...,n_k) \in O(g(n_1,n_2,...,n_k))$ if and only if $g(n_1,n_2,...,n_k) \in \Omega(f(n_1,n_2,...,n_k))$. Next, we use this property and Remark 1. From $f(n_1,n_2,...,n_k) \in C(g(n_1,n_2,...,n_k))$ it follows that $f(n_1,n_2,...,n_k) \in O(g(n_1,n_2,...,n_k)) \cup \Omega(g(n_1,n_2,...,n_k))$. We have two cases:

1) if $f(n_1,n_2,...,n_k) \in O(g(n_1,n_2,...,n_k))$ then we have $g(n_1,n_2,...,n_k) \in$

$\Omega(f(n_1,n_2,...,n_k))$; consequently, $g(n_1,n_2,...,n_k) \in C(f(n_1,n_2,...,n_k))$.

2) if $f(n_1,n_2,...,n_k) \in \Omega(g(n_1,n_2,...,n_k)) \setminus O(g(n_1,n_2,...,n_k))$ then we have $f(n_1,n_2,...,n_k) \in \Omega(g(n_1,n_2,...,n_k))$. It follows that $g(n_1,n_2,...,n_k) \in O(f(n_1,n_2,...,n_k))$; consequently, $g(n_1,n_2,...,n_k) \in C(f(n_1,n_2,...,n_k))$.

Remark 2: If $f(n_1,n_2,...,n_k) \in C(g(n_1,n_2,...,n_k))$ we say that the functions $f(n_1,n_2,...,n_k))$ and $g(n_1,n_2,...,n_k)$ are comparable.

4. The main results

Theorem 1: The classes $o(g(n_1,n_2,...,n_k))$, $o\Theta(g(n_1,n_2,...,n_k))$, $\Theta(g(n_1,n_2,...,n_k))$, $\Theta\omega(g(n_1,n_2,...,n_k))$, and $\omega(g(n_1,n_2,...,n_k))$ form a partition of the set $C(g(n_1,n_2,...,n_k))$.

Proof: From Proposition 2, it follows that $o(g(n_1,n_2,...,n_k))$, $o\Theta(g(n_1,n_2,...,n_k))$, and $\Theta(g(n_1,n_2,...,n_k))$ are pairwise disjoint. From Proposition 3, it follows that $\Theta(g(n_1,n_2,...,n_k))$, $\Theta\omega(g(n_1,n_2,...,n_k))$, and $\omega(g(n_1,n_2,...,n_k))$ are pairwise disjoint.

Using (1), (2), and (3) we have: $O(g(n_1,n_2,...,n_k)) \cap \Omega(g(n_1,n_2,...,n_k)) = \Theta(g(n_1,n_2,...,n_k))$. Using this property, (1) - (5), (8), and (9), we have that $o(g(n_1,n_2,...,n_k))$, $o\Theta(g(n_1,n_2,...,n_k))$, $\Theta(g(n_1,n_2,...,n_k))$, $\Theta\omega(g(n_1,n_2,...,n_k))$, $\omega(g(n_1,n_2,...,n_k))$ are pairwise disjoint.

Next, using Definition 2, Proposition 2, and Proposition 3, we have:

$$C(g(n_1,n_2,...,n_k)) = o(g(n_1,n_2,...,n_k)) \cup o\Theta(g(n_1,n_2,...,n_k)) \cup$$

$$\cup \Theta(g(n_1,n_2,...,n_k)) \cup \Theta\omega(g(n_1,n_2,...,n_k)) \cup \omega(g(n_1,n_2,...,n_k)) \quad (12)$$

Theorem 2: Let be $f_1(n_1,n_2,...,n_k) \in o(g(n_1,n_2,...,n_k))$ and $f_2(n_1,n_2,...,n_k) \in \omega(g(n_1,n_2,...,n_k))$ two complexity functions. Then, the functions $f_1(n_1,n_2,...,n_k))$ and $f_2(n_1,n_2,...,n_k))$ are comparable.

Proof: From the hypothesis we have:

$$\forall c' \in R_+, \exists (n_1^{01}, n_2^{01}, ..., n_k^{01}) \in (N_+)^k \ such \ that$$
$$f_1(n_1,n_2,...,n_k) < c' \cdot g(n_1,n_2,...,n_k), \ \forall (n_1,n_2,...,n_k) \geq (n_1^{01}, n_2^{01}, ..., n_k^{01})\}$$

and

$$\forall c'' \in R_+, \exists (n_1^{02}, n_2^{02}, ..., n_k^{02}) \in (N_+)^k \ such \ that$$

$$c'' \cdot g(n_1,n_2,...,n_k) < f_2(n_1,n_2,...,n_k), \ \forall (n_1,n_2,...,n_k) \geq (n_1^{02}, n_2^{02}, ..., n_k^{02})\}$$

Let be $c \in R_+$. For $c' = c'' = c$ and $(n_1^0, n_2^0, ..., n_k^0) = (\max(n_1^{01}, n_1^{02}), \max(n_2^{01}, n_2^{02}), ..., \max(n_k^{01}, n_k^{02}))$ we have that

$$f_1(n_1,n_2,...,n_k) < c \cdot g(n_1,n_2,...,n_k) < f_2(n_1,n_2,...,n_k),$$

$$\forall (n_1,n_2,...,n_k) \geq (n_1^0, n_2^0, ..., n_k^0)\}$$

It follows that $f_1(n_1,n_2,...,n_k) \in O(f_2(n_1,n_2,...,n_k))$; consequently, the functions $f_1(n_1,n_2,...,n_k)$ and $f_2(n_1,n_2,...,n_k)$ are comparable.

5. Conclusion

In this paper we present a method of comparing two multivariable complexity functions using complexity classes. The paper extends some results obtained in a previous paper ([4]) which focuses on one-variable complexity functions comparison.

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COMPETITION BETWEEN KNOWLEDGE MANAGEMENT (KM) AND MARKETING

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Knowledge management has become, in recent years, a starting point for those that deal with business strategies, providing the opportunity to achieve competitive advantage and a great long-term increase of the organizational efficiency. The formation of a knowledge strategy appropriate to the economic realities enables organizations, whatever their nature, not only to survive but also in their future development. On a practical level it can be said that knowledge management works like an organization inside the other organizations.
The competitiveness of implementation of the knowledge management and marketing strategy is currently, and in the future, one of the viable ways by which the maximum efficiency can mobilize resources in order to meet the full needs of individuals, communities and of the whole society. This approach may be a modern solution of knowledge and prevention of economic risk under its various forms, but also a performance guarantee in an activity.
The purpose of this approach is to present a number of characteristics in a synthetic manner of knowledge management, bringing attention to the concept of adaptive management and the influences and intersections that are found in relation to the marketing process in the organizational environment.
***Key words**: knowledge management, adaptive management, information, marketing implementation, dissemination, collaborative education, organizational environment*

Introduction

The strategic alliances established from knowledge, influenced by the characteristics of markets and companies, confirm the general subject of the alliance and not least, the ones of the contractual arrangements, which are becoming more present in the contemporary economy.

It appears that in substance, when we refer to formal knowledge, namely in the form of documents, it is less valuable to a company, the informal one being much more useful. On the other hand, knowledge became obsolescent very quickly. It must be disseminated and even more processed. Regarding the organizations over the past ten years in Romania, they tend to focus too much on the training and less on knowledge management and on the adaptability. A manager that takes into account the informational aspects of the organization he is manage, will turn the organization experiences and abilities, skills and tacit knowledge, as well as the people near him, into a challenge to provide quality products and services.

From another point of view, the marketing is the main tool that the manager has available in an organization to develop strategies on short, medium and long term and to adopt appropriate tactics. Acquiring the concept of marketing and promoting broad requirements, the techniques and the methods of marketing should be a key concern in the microeconomic level, and then in the macroeconomic level. In this way the organization can ensure the responsiveness to the requirements of market society in general and in particular, flexibility, innovation, creativity, but also an overview of all actions that result in the obtaining a maximum efficiency.

1.1. The knowledge management – adaptive management

The organizations based on knowledge represent the collective intelligent actors of the information society, and they have an important role in the assertion of this society as a knowledge society.

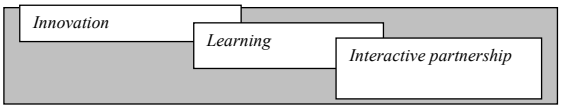
The concept of knowledge organization has its origins in the years 1984-1988 and then is crossed by a number of important steps.

Based on the research of Nonaka and Takeuchi [5], which aimed the developing the typology of forms for the organizational knowledge, in the area of literature it has been proposed to use the difference discovered and first referred by the epistemological Polanyi: that between explicit knowledge (articulated) that is formalized, accessible and shared, on the one hand, and implicit knowledge (tacit), which is subtle, deeply personalized, impersonalized and diffuse present in the organizational context. The specific management of the organizations based on knowledge requires collective competence as a source of systemic sustainability.

The problem of vision over the contemporary reality, marks the convergence of two phenomena defining human nature - the knowledge and the organization – in an emblematic social construction for ideas of collective responsibility, smart action and sustainability performance.

The foundation of knowledge means for organizations *to achieve full maturity stage*, consistent with the essence of the informational society to which they belong.

In the operation of such organizations, the processes are: innovation (creating new knowledge), learning (assimilation of new knowledge) and interactive partnership for knowledge.



To be successful, a management program focus on natural resources and human potential, requires the extension of the conventional mode of research, along a certain direction, from basic items, with a hypothesis, and continuing with the identification and collection of facts or situations that prove or demonstrate its falsity, and finally drawing some conclusions, which can then be

displayed in a theoretical model or methodological work published [2].

Collaborative practice education in management is an approach that has as the main objective the change of practice for management resources, by improving the use of information between different groups of social actors. Collaborative learning refers to the ability of a group to assess the results of its efforts, rethinking how they converge in the undertaken tasks, and using new ideas to change the practices previously established [4].

Adaptive management, characterized by the expression, "learning - by doing" is a research action with common elements of learning, which provides methodological guidance, contextual research and application programs. Adaptive management, from this point of view, is a structure in which the process of "learning by doing" involves more than monitoring or the response to the impact of the new "[9]. So, the adaptive management has a cyclical approach, with four major stages: the first relates to the action plan that includes assumptions and research objectives, followed by detailed methodological procedures, implementation and in the end monitoring and interpretation of the obtained data [10]. Kolb et al., 1979 [8] suggests that people can learn and create knowledge: a) based on the achievement of their own experience, b) by observation and reflection of experience themselves, c) by the development of abstract concepts and generalizations about what can be still done and d) testing specific implications of these concepts applied in new situations, leading to new experiences in a concrete mode and, therefore, to start a new cycle.

1.2. Emergence, development and future prospects in marketing

The emergence of marketing is the expression of objective practical requirements, focused on the need to introduce the rationality in the activity of the salesman which takes place in a complex social and economic environment, based on knowledge of the current and future market as the production orientation.

Kotler [6] argues that marketing has its origins in the fact that people have certain needs and desires. When there are several products that can meet a specific need, to choose one of them is determined by the concepts of value, cost and satisfaction. In the modern times most of these products are obtained by exchange, and all actions which made the potential exchange are part of marketing. In such conditions of amplification of the market size, where the trader is obliged to operate, there is a pressing need to know the market size and structure, which involves identifying the needs, desires, motives, preferences, consumer tastes, including the anticipation of changing them. To these stringent needs, the marketing has proposed to answer, both theoretically and practically.

The emergence of the scientific studies in marketing at the beginning of the twentieth century is not coincidental, it responds to the new needs, therefore to know and anticipate the consumer needs and the use of products in society, whereby to produce, an economy where resources are limited and the needs are growing, due to the economic and demographic dynamism. The rapid implementation of the marketing in the developed economies of the world has created a distorted picture of the causes that were imposed at that time, the belief that the abundance of goods and services consumed are behind of marketing grounding and development. In fact, the abundance is the result of unprecedented business development under the scientific and technical progress which led to the acceleration of the economic development.

It was found that marketing has been proved to be indispensable not only for the abundance, but also for the poverty that manifests itself in economic life. Thus, the company faced significant challenges in ensuring the minimum necessary of raw materials and energy, the researchers and the practitioners have shown that "the importance of marketing is not reduced, but changes occur in the use of it" [3].

A great contribution to the development of marketing by 1900 had the management, the implementation of the science of management [7] in the business which cannot achieve the goal without finding the necessary means and knowledge to distribute with the highest efficiency of created production.

The advances in technique and technology act both in the contemporary era as a cause and effect in the transformation of the content and the methods of marketing. Thus, they are causes of these changes through the continual introduction of new products, the disappearance of old ones, through the acceleration of product life cycle. At the same time, there are also effects of marketing activities, to the extent that they reveal or contribute to the spread of new needs of a new lifestyle.

Like all economic sciences, marketing has its foundation in scientific concepts developed by political economy, so they take and use with their own concepts, categories, idea. It also incorporates many concepts from the arsenal of the branch of economics (economics of industry, agriculture, commerce, tourism, etc.), the other theoretical and applied economics and the economics of the border, but also sociology, psychology, mathematics, etc., which gives it a wide opening to other spheres of human knowledge and possibility to develop very fast.

Since 1965, Halbert [3] pointed out that the marketing has taken over much from the disciplines related to business enterprises (economics, law, etc.), from behavioral and social sciences, from the methodological (mathematics, etc.), and that these loans include information, techniques and concepts.

Marketing is the one who actually applied some methods found in the other sciences and, therefore, assigned as their methods. The methodology has broad: with rigorous scientific and traditional methods, and integrated heuristic methods, but also operational research methods offered by futuristic study [6].

Referring to the connections with other disciplines and managerial functions Baker [1] stated: “Above all, marketing, like medicine and engineering, is a synthetic

discipline that seeks to bring together theory and ideas from a variety of disciplines that have a broader theoretical foundation, integrating a holistic interpretation that can be applied in practice".

The success in business of the organizations that has endorsed the marketing orientation [7] is because the marketing is the domain of knowledge needed for the amplification of effective efforts because it brings together these concepts, approaches, methods and appropriate methodology, this base the relations with the socio-economic environment in general, with the market specifically.

1.3. Conclusions

The concurrence between knowledge management and marketing is based on a set of technical practices in the organization, but also on human resources that are found within it.

Organizations "realized" that there is a need to promote knowledge exchange. To do this there are required solutions to represent the two facets of knowledge and marketing strategies.

The Romanian organizational environment concerns are still in its interpersonal information brokering, informal transactions with knowledge in and between organizations, professional assistance given ad hoc; companies and large institutions are more strongly attached to the configuration and functionality of hierarchical organization, even in conditions of the transition to the computerized assistance.

The marketing management in an organization is based on a number of items like: ensuring the communication with all organizational actors, systematic analysis of the situation of the organization, strategic and instrumental of internal marketing, the offer of individual incentives, removing barriers from the implementation of new procurement information and knowledge in the field and the systematic evaluation of the results of marketing.

Through a similar process, the dealing of knowledge management is based on five very important operations: the identification of the strategy; the style of the collaborators and of informational structure; the creation of effective communication systems of new knowledge and benefit sharing of experiences; storing the knowledge base of the organization; strategic sharing of the amount of knowledge and the fact that to know means to be strong in the approached field, and finally the systematic use of knowledge to optimize business of organizational actors.

The organizational environment requires that these bearings to operate in a dynamic manner, the consistency of knowledge management and marketing, allowing the collection of knowledge held by all members of the organization and used in achieving performance results.

The knowledge management provides the next dissemination of excellence within the organization and the ability to make better decisions, reducing the decision cycle and the subjectivity and capacity of innovation.

The knowledge, the thinking and practical action of organizational actors also involve the use of a marketing tool, or in other words a set of methods, procedures, research and action techniques like analysis, forecast, control and organization to ensure adequate and relevant information that must be reached in time. The information obtained from studying the market, processed and interpreted with an arsenal of methods and techniques is the basis for the decision making segment of adaptation in the organization.

The knowledge society is essentially a new economy where the innovation process, the ability to absorb and convert the new knowledge to create new services and products is crucial and includes a marketing policy centered on the study of markets that are still in financial uncertainty. The smart organizations are a preferable solution in this context, the need for social continuum arising from this.

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A NEW KNOWLEDGE CYCLE

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Paper focuses on knowledge cycle, essential element of knowledge based organisation. It starts from knowledge revolution, indicating knowledge roles—as raw material, production factor, product and capital—which transforms them in "the engine" of knowledge based economy. Based on these elements author's original contribution is presented—knowledge cycle—made up of seven modules and structured in five phases. Presented knowledge cycle is highly different from knowledge cycles of McElroy, Wiig, Bukowitz and Williams, Meyer and, Zack. Knowledge cycle is useful both for better understanding of organisation's mechanisms and knowledge based management and for increasing their functionality and performance.

1. Knowledge roles

The wording "knowledge revolution" is new for many of our contemporaries. Some may consider that it even represents a simple replacement for information and/or IT revolution, a tautology. Even there is a close connection between information revolution, on which specialists refer to for more than three decades and knowledge revolution, the latter is sensibly different from the point of view of its scope, nature and finality.

Essentially by **knowledge revolution we designate fundamental change from predominantly physical resources based economy to knowledge based economy** (1). At the base of this revolution is the decisive role of knowledge in modern economy. In the last decades it was noted and taken into consideration the growth of economic importance of technologies, information, economic processes, human capital, organisation's capabilities and competences—factors organically connected with knowledge. Each one of them, approached individually, reveals extremely valuable elements, with high pragmatic implications. Their common background is represented by knowledge, they constituting as a matter of fact, individualization and operationalizational modalities of knowledge.

Since the early days, wealth and power were associated with possession of physical resources. Traditional production factors—land, equipment, buildings etc.—were of physical nature predominantly. That's why the necessity to have vast and thorough knowledge was limited. Industrial revolution of past centuries was based predominantly on steam power, man's physical strength and cash assets.

For the future a sensible different situation can be seen. **Wealth and power in the 21st century will result mainly from intangible intellectual resources, from knowledge capital** (2). Knowledge revolution, which consists in this movement toward knowledge dominated economy, is a very far-reaching and profound process, generating essential changes in all economic activities components', analogue as intensity with the ones produced by industrial revolution.

Knowledge in the new type of economy fulfils **four essential roles or functions** (see figure no. 1).

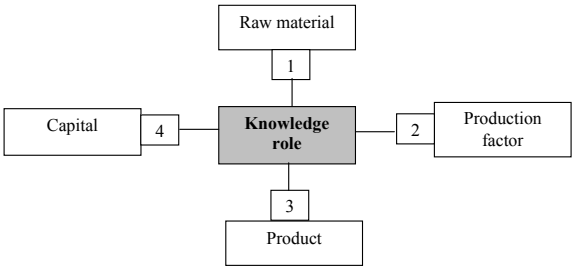

Figure no. 1. Knowledge role in economy

As raw material, knowledge takes part widely to obtaining modern products. It is obvious for anybody that production of a computer or of a TV set incorporates not only metal, plastic and other materials but also others numerous knowledge. Even more, in the cost of a several thousand dollars computer the effective cost of incorporated metal and plastic and of energy used to obtain them are of about scores of dollars, representing only a few percents of its total cost.

Knowledge represents also an essential production factor, for it participates, together with other classical production factors—labour power and means of production—to development of all production phases, starting with obtaining raw material, continuing with their processing and ending with selling the made product. Obviously, the more modern a company is, the more the impact and role of knowledge as a production factor is bigger.

Knowledge represents also a final product, by itself. The most known shape of it are software, technical projects, inventions, quality standards, management and marketing studies and analysis, data banks, business plans, feasibility studies etc. It must be noted that a diversification of the product range is taking place together with increasing weight in company's turnover and in national economies GDP.

In parallel, we mention also the fact that numerous physical products tend to incorporate knowledge at large. High-tech products—computers, cameras, satellites, TV sets, telephones, cars, etc.—are made up predominantly by knowledge, thus conferring practical usefulness and value to them.

For the whole value of modern companies the **knowledge capital**, for which is used frequently the name of intellectual capital, tends to hold a bigger and bigger weight. Even though intangible, personnel's knowledge inside the companies, technological, commercial, managerial, financial etc. know-how presents a value which with increased frequency is expressed in money. Stock market quotation of known IT or electronic equipment companies—Microsoft, Alcatel, Nokia—fully demonstrate it. Their stock market value is several times—for some more than ten times—higher than the value of buildings, equipment, land etc. these own. We can anticipate that in a not too far away future, for an appreciable proportion of the companies, including some of the classic ones, when evaluating their capital we will include also knowledge as a distinct component and often substantial. Besides, in business world such a tendency is obvious and strong. One of its expression is that entrepreneurs or investors often state that they want to buy "x business" and not plant or shop "x". It is obvious that they take into account aside from their tangible capital also intangible capital.

From what was presented above it results without any dought the multiple and essential roles that knowledge have in contemporary economy which, practically, could not function and survive without it.

2. Components and structure of knowledge cycle

Analysis we performed revealed that inside knowledge based companies took shape numerous specific processes and they have as object knowledge, both explicit and implicit ones, of the organisation and of its stakeholders. All specific processes to knowledge treatment from an organisation and their way of linking together constitute **knowledge cycle** briefly presented in figure number 2. Knowledge cycle elaborated by us is significantly different from the ones elaborated by McElroy M. (3, 4), M. Meyer and M. Zack (5), Wiig (6) and, respectively, W. Bukowitz and R. Williams (7). As it can be observed in our cycle of knowledge the processes are grouped in **five specific phases,** which correspond to, at large, functions specific to knowledge based management:

- **Evaluation of company's available and accessible knowledge,** both internal—its organizational and individual ones—and to the ones of external stakeholders and to the ones of potential partners
- **Provision for necessities and sources of knowledge,** starting, of course, from existing knowledge and from company's strategic mission and objectives; special attention is given to allotment of resources for knowledge and for establishing main ways to obtain knowledge by the organisation
- **Obtaining knowledge necessary to the company** from within and outside of it; in this phase is included generation of new knowledge when the existing ones in the company are not enough and when from outside they cannot be obtained, are too expensive or their creation inside the company is preferred because of the strategic function they have it.
- **Operating, and developing knowledge** constitutes, most often, the largest of the knowledge treatment processes inside the company. In this phase a complex of actions is performed on knowledge, mostly repetitive, generating products and services, especially important, with innovative character for developing existing knowledge. The laborious character of these processes must be noted, with many technical, human and economic aspects
- **Capitalizing knowledge** confers purposefulness to previous phases, this being the step when the company picks up the business harvest of the previous intense work processes. Usually, this phase takes place on the market, by selling knowledge, frequently, in the framework of company's integration in various networks. It must be noted that capitalizing knowledge make take place with partners right inside the organisation.

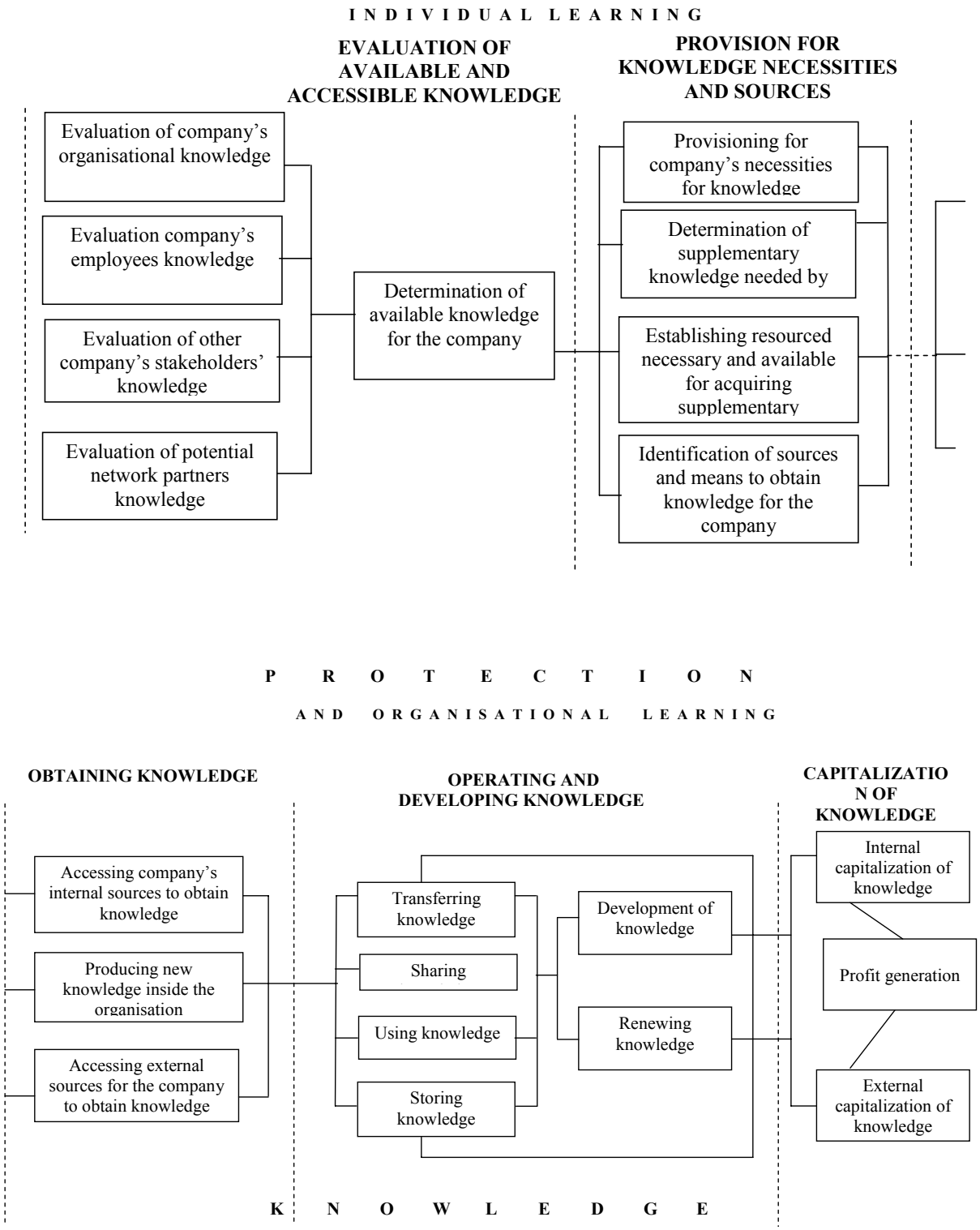

Figure no. 2. Knowledge cycle inside a knowledge based company

Besides these specific functions and phases, in knowledge based company, management exercises also two other quasi-permanent functions which accompany the previous ones—**organisational learning and individual learning and**, respectively, **protection of organisation's knowledge**.

Learning, in its both shapes—individual and organisational—represents essential quasi-permanent processes inside the knowledge based company. **Learning is present during each one of the five phases of knowledge,** with a very high intensity during the phases where knowledge is obtained and respectively, operated and developed. Management is involved in managers' own learning processes and, simultaneously and substantially, in employees' and other stakeholders ones. Managers capacity to continuously and intensely learn and to stimulate and determine all other stakeholders to do the same,

subordinated to reaching organisation's objectives, determins, finally, the quality and performances of all other processes inside the company.

Taking into account that company's existence, functioning and development depend on volume and quality of processed knowledge, **protecting them** presents a primordial importance. Its realisation is especially difficult because a large part of the knowledge is not tangible, part of it is individual, belonging to some employees or to other stakeholders. As a consequence, protecting knowledge involves much more than classic actions for protection of company's resources and products. Efficient protection of knowledge incorporates mandatory processes and activities not tied, at first sight, to knowledge protection, like training for employees development, fostering a climate favourable to individual development and innovation inside the organisation, complex motivation of the employees, inclusively by participation to sharing obtained profit or by association to company's ownership, initiation and realisation of special actions for intensifying external stakeholders participation to company's actions, attracting potentially concurrent companies in production and trading networks controlled by the company etc.

Knowledge cycle is usefull both for better understanding of organisation's mechanism and knowledge based management and for increasing their functionality and performance.

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SHOULD SOFTWARE ARCHITECTURES CHANGE TO ADAPT TO THE KNOWLEDGE ERA?

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1. Introduction

This paper aims to argue why software architecture, does no matter designed to manipulate knowledge or to support regular business activities, must change to adapt to the knowledge era. The first steps in this demarche will be represented in establishing a common meaning for different notions and concepts necessary. The last step will be represented by the proposed software architectures change. The distinction between data, information, knowledge, and wisdom is essential to the informatics theory of informatics systems to which software belongs to [1, 2]. Very briefly, data are the materialization, the representation of information or more simply a set of unconnected facts. The information is equivalent to knowledge and has to do with the semantic aspect of the meaning of data so that it is data associated with meaning (What?, Who?, When?, Where?) and relates to description, definition and perspective. Information obtained by corroborating data on the basis of the relationships deduced in the process of understanding that relations. Information in a work system can potentially take a variety of forms including numbers, text, sounds, pictures, video etc, and they can be created, modified or deleted with the system or other information can be simply received from other systems.

The information is not exactly knowledge. In fact knowledge is information associated with strategy or process (How?) and comprises strategy, practice, methods or approach flow. Generally information becomes knowledge by understanding and recognizing patterns. Wisdom embodies principle, insight, moral or archetype (Why?) and obtained from knowledge by understanding principles.

The knowledge is linked primary to employee or employees who carry it and can be commonly categorized as:

- implicit or ill-defined that is specific to every employee and accumulated over years of experience and training. This knowledge is extremely valuable to employers even extremely vulnerable to loss (if employees leave);
- explicit when knowledge is defined, explained, or communicated to other person, even informally.

The knowledge can be formalized by business people that posses them into formalized rule sets, by using descriptive languages, and can be used later on to automate critical, recurring business decisions, for example. Generally, formalized rules, do not allow for ambiguity and uncertainty so that are an ideal means to keep intact the meaning of knowledge.

2. Knowledge Management

Knowledge Management (KM) concerns with identifying, creating, representing, and distributing knowledge for reuse, awareness, and learning across the organizations [3, 4]. For every organization "KM must be a practical aspect of the general organizational culture [5]". Knowledge management has been one of the dominant IT research theme in last decade. The sustainability of an organization and its success in the face of competition lie in its ability to manage and increase its stock of knowledge [6].

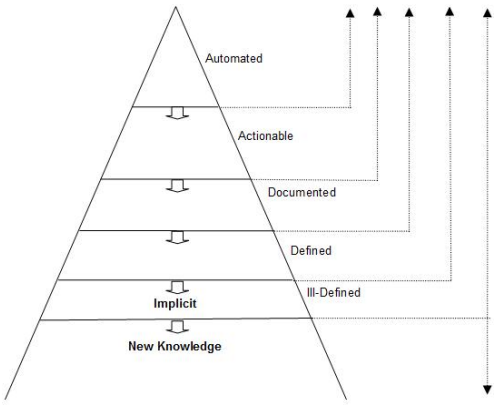

Figure 1 The Knowledge Pyramid
(Source: CORTICON Technologies, Inc., www.corticon.com)

Figure 1 shows the knowledge categories as defined by the company CORTICON Technologies, Inc. [7], one of the leaders in business rules management systems (BRMS) software, and used as a reference for the following presentation. For every company that wants retain and preserve the valuable business knowledge, as the most valuable asset - his intellectual capital, the creation of policies and definition of procedure is a beginning critical step. In order the knowledge permit consistent application throughout an organization it must be documented, organized, published, revised, shared, and managed. Documented knowledge is the source for training employees and held them to uniform standards. Since the human language can induce uncertainty and create

ambiguity, by his nature itself, the documented knowledge is almost of cases inadequate for preservation, automation, and reuse of the intellectual capital. Knowledge uncertainty arises from the contradictory nature of knowledge given by his basic forms - absolute and relative - migration from one to another being the basis for changes. The ambiguity can make policy application dependent on the implicit knowledge of the individual applying the policies.

Disciplined refinement and structuring of documented knowledge creates actionable knowledge that can be used as source for business rules management systems to automate processes execution and don't require interpretation when executed. Business rules management software and associated methodologies allow business people to transform their knowledge into formalized rule sets that can be used to automate critical, recurring business decisions.

When used in knowledge management systems it becomes automated knowledge and those systems are capable even to create new knowledge, as down arrows in the pyramid try suggest (Figure 1).

3. Knowledge Management and Software Categories

The increasing complexity of business relationships and competition induces an increasingly complexity and dependence on information technology and makes more and more important the usage of both business and IT best practices. Brand software, sell and delivered by leader IT companies, for business support such as SCM, CRM, ERP, HRIS, BI etc incorporates good practices inspired from those of leader companies in vary domains, or in other words they incorporate the knowledge allowing applying and operating those practices. A company adopting and using such software in his currently operation will start their activities and competitiveness at least from that point of good practices and associated knowledge.

In this context, regarding the used software, the knowledge management will have two aspects:

- Knowledge management, in the classic sense, of knowledge about software product and operation of this;
- Knowledge management of knowledge incorporated in the products, that is, generally, knowledge about the way software processes the business itself (as business processes of that).

The knowledge incorporated in the products and inherited by a company at product adoption time is very difficult to be revealed to business people since generally this is included in the product documentation and revealed to the users when trained to use the product. This knowledge becomes generally explicit / implicit of business people. More than, almost of the time, even undesirable, is a lot of differences between what the documentation contains, how this is understood by business people, and how really implemented into the product.

Considering the way in which operation support application software incorporate and manipulate modeled domain knowledge I categorize software in three broad categories of products:

1) Business rules management systems (BRMS) that manipulates and executes business rules described, generally, as production rules grouped in rule sets. Production rules are easy for humans to understand and, since each rule represents a small independent granule of knowledge, can be easily added or subtracted from a knowledge base. Because the rules are independent from each other they support the declarative style of programming which considerably reduces maintenance problems but makes algorithms extremely difficult to represent, and flow of control is hard to supervise for a system designer. The rules formalism makes no allowance for uncertain knowledge.
2) "Knowledge externalized" that externalizes the business rules and knowledge allowing changing some aspects of the behavior without requiring to rewrite the application (only externalized business rules and knowledge changed, that means the source of problem). This architecture gives a high agility (but not the highest as given by using BRMS) to the application allowing this to adapt his behavior to the organization's policies changes.
3) "Monolithic" software that incorporate business rules and knowledge together with the procedural part and processing logic. They require rewriting the application if aspects of their behavior must change (triggered generally by business rules and knowledge changes). This architecture, even very used in practice, is rigid to changes and requires rewriting the involved modules. More than they hide the knowledge in code and make difficult to use and even extract by using different tools.

4. Proposed Change to Software Architectures

"Software architecture presents a view of a software system as components and connectors. Components encapsulate some coherent set of functionality. Connectors realize the runtime interaction between components. [8]"

A common definition for software architecture is "The software architecture of a program or computing system is the structure or structures of the system, which comprise software elements, the externally visible properties of those elements, and the relationships among them [9]".

Considering the previous definitions, and the benefits and requirements for extensive knowledge management toward the organizations, my answer to the title question of that paper is that the software architecture must change, does no matter the software category in which fits. The change refers to add a component in the form of one or many knowledge repositories to systematically acquire, structure, store

and maintain knowledge, formalized as business rules, for all business rules that are incorporated in the software product itself. This knowledge do not refers to the knowledge used in the knowledge intensive tasks executed during the system development steps to analyze, model, develop, code etc the applications as defined in [12]. This knowledge refers to the domain knowledge of the business domain modeled by the application software. For every company adopting software having this architecture the companion repository acts as "software inherited knowledge", for that reason I call the software companion knowledge repository "software inherited knowledge" (SIK). SIK must be accessible to all persons and/or applications having the rights to access and manipulate. The knowledge involved here will be captured and maintained in the context of analysis, design, coding and testing phases (and/or every reiteration of these required in implementation or current operation), and expressed in the form of business rules statements, as defined and understood by the software developer, since this incorporates the rule in the application body. The documented knowledge in the form of business statements or even sentences of a programming environment will be transformed into "actionable, formalized, automatable software asset [7]". The formalized rules should be tested to identify ambiguity, incompleteness, redundancy and contradiction, to ensure truly actionable business knowledge. The rules defined can be incorporated, eventually after an adaptation/translation in the language used by a BRMS, into business applications and/or standard services enabling broad, reusable, scalable, automated distribution of these knowledge assets when and where they are needed.

I don't reiterate here the benefits of describing business policies and procedures as business rules investigated in [1, 2]. I give in the following sentences some arguments issued due to the today business requirements. Since "The sustainability of an organization and its success in the face of competition lie in its ability to manage and increase its stock of knowledge [11]" the SIK will act as a source of enriching every knowledge base deserving / assisting knowledge workers with the contained knowledge.

Since one of the knowledge management cornerstones is improving productivity by effective knowledge sharing and transfer the adoption of the software architecture, at least for both knowledge externalized and monolithic categories, which provides the knowledge companion containing the incorporated-knowledge, will be a source and solution for the knowledge extensive implementations and even future automation.

The SIK can be visible to any authorized person preventing the "black-box" syndrome common to all "monolithic" applications. The user can learn and understand from the system behavior making easier his interaction with the application.

Since both, the adoption of a standard language to define business rules and the adoption of a standard for Knowledge Interchange Format (KIF), appears to be to far in time the proposal for description of the SIK is to use RDF (Resource Description Framework) as shown in [13, 14]. RDF has a simple data model, a formal semantic and provable inference. Because it uses an XML-based syntax it allows to anyone to make statements about any resource. This format allows for a better portability being adapted to Web and usable in all intranet, Internet, and extranet. In all these environments the application can be also delivered as a service and his SIK will allow for better communication of his capabilities.

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ANALYSIS OF E-LEARNING STRATEGIES USED TO DELIVERED KNOWLEDGE IN THE DIGITAL AGE

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This article presents a comparative analysis of e-Learning systems and strategies used to delivered knowledge in the digital age. The acquisition of new knowledge must be done with a purpose and this purpose is to add value to the individual, team or organization. Very few delivery processes will draw upon just a single knowledge currency. Any human activity will generally draw upon all knowledge currencies. For example, trainers have to use their bodies to teach, their minds to map the learning process and their affection to engage the audience. For any action where knowledge is being delivered, we might need to understand what currency is being used, what knowledge has a greater priority and which of the three currencies (head, hand or heart) needs to be improved. Building an e-Learning strategy requires two fundamental things: enough knowledge about what you want to accomplish, and a willingness to articulate your plan in a way that is meaningful to all your stakeholders.

Introduction

E-Learning is about connecting learners to other learners, teachers to professional support services and providing platforms for learning. The challenge is to transform e-Education into a range of learning activities that meet educational objectives. This adds new quality to teaching and learning and enables entirely new approaches to the education process. Regarding the experience of other countries, it is advisable to remember that most energy should be devoted to obtaining new education resources of high quality. Online learning takes on its forms, structures and discourse, in the same way as traditional classroom-based and face-to-face learning. What is fundamentally different is the nature of the medium and its added dimensions in time and place. The change of medium offers new opportunities to move some of the contemporary and the traditional approaches towards learning in more interesting and efficient ways.

1. General aspects of knowledge delivery systems (KDS)

KDS is a leading provider of professional learning courses for teachers. Well-known experts work together to deliver the courses in a web- and video-based format on a platform that includes several interactive features, helping teachers improve their classroom practice. KDS help teachers by providing them with approved courses, which earn them salary increases, recertification and graduate credit with a number of universities, and even full master's degrees. These systems provide dynamic professional learning experiences that help educators reach personal career goals and promote student success. KDS employs an award-winning and dynamic learning platform to deliver relevant, high-interest courses that improve instruction. This is capturing some of the nation's best educational experts on video, and their presentations with a number of useful resources that help teachers implement innovative and effective strategies in their classrooms. Video presentations include research-based foundational theories, classroom demonstrations, interviews, panel discussions, and workshops that focus heavily on strategies and useful teaching tips. Each of KDS's courses includes a discussion forum where teachers can share their thoughts, questions, lesson plans, and ideas related to a wide variety of teaching strategies and approaches. Courses also include syllabi, navigable video presentations, searchable and printable transcripts, and downloadable resources that teachers can use right away. Instructional leaders use KDS courses to take a fresh approach to the facilitation of professional learning communities.

2. E-learning environments design

An efficient learning has to integrate a courseware with some classic methods of teaching. Just the courseware itself cannot achieve the purpose. The initiation of e-learning environment development should be performed by answering some standard questions:

a) WHY the courseware is necessary?
The answer of this question is concerned with the motivation of the e-learning environment development. The analysis should be done at different levels of the instructional process:
b) micro level – the level of the learning unit interaction between learner and computer. Learners and teachers are the main actors involved at this level;
c) meso level – the level of teacher/classroom interaction, provides information of the classroom metaphor that must be included in the e-learning environment;

d) macro level – the school or the organization where training takes place, provides the general curriculum, the facilities infrastructure and logistics for the instructional process

e) WHAT is to be learned?

The answer is focused on the subject matter the e-learning environment deals with. In this stage, is useful to distinguish at least the following basic categories of information to be delivered:

f) factual information and concepts (verbal information);

g) problem solving and reasoning (cognitive strategy);

h) procedural skills.

c) HOW the subject matters to the learners?

The question includes both the didactic/educational strategies and interaction style that the e-learning environment should deliver. The greatest problem with educational software is not to specify the subject matter as it is often well described in textbooks. The learning environment designers have to take into account two perspectives concerning learning:

- one learns by doing something;
- one learns by pursuing an instructional goal.

Also, some basic misconceptions about learning have to be avoided:

- reading and seeing does not imply much learning;
- even being able to recall knowledge does not mean being able to apply knowledge;

efficiency is not measured by mastery of the exercises and tests, but by mastery of the task

the complexity of learning environment must be adapted to the learning skills.

Once the answer of the above mentioned question is done, the decision concerning the development of an e-learning environment focused on a specific subject matter can be drawn up. The development of an e-learning environment follows an incremental prototype methodology. Each of the phases of this methodology has to deal with some specific issues that are presented in table 1 [3]:

Table 1. Phases of e-learning environments development

PHASE	ISSUE
Feasibility study	-marketing of the final product
Start-up phase	-project management
Macro-design	-instructional strategy and generic educational activities
Meso-design prototyping	-structure views
Micro-design prototyping	-instructional design prescriptions; -interactivity; -presentations metaphors; -visual style and "cosmetic" issues
Final prototyping and acceptance	-project management
Technical design	-structural interfaces
Realization	-resources; -interoperability
Integration	-interface
Formal evaluation and acceptance	-project management

3. Comparative analysis of e-Learning systems used to delivered knowledge

This paragraph presents some advantages and disadvantages of the most popular e-Learning systems used to delivered knowledge. One of the most known project is Open Knowledge Initiative Project. This project defines open architectural specifications that support the development of educational software by simplifying the methods of assembly, delivery and access to educational technology resources. The advantages of this system are: [7]

- Learning technologies appropriate for a range of teaching and learning requirements can be integrated together into a common environment. The needs of the Math department are not those of the English department, and tools that work well for new users may not be adequate for seasoned users.
- Learning technology and content can be more easily shared among schools and departments. This provides a catalyst for cooperative and commercial development.
- There is a lower long term cost of software ownership because single components can be replaced or upgraded without requiring all other components to be modified.
- Modularity makes learning technology more stable, more reliable, and able to grow with increased usage, and allows components to be updated without destabilizing other parts of the environment. OKI is based on technologies that have proven to be scalable and dependable in large scale enterprise computing environments.
- The architecture offers a standardized basis for learning technology software development. This reduces development effort and encourages the development of specialized components that integrate into larger systems.

At the core of OKI is a set of application programming interfaces (APIs) that realize the OKI architecture. Higher education leaders recognize that learning environments are a core component of their information technology infrastructure. These environments must successfully support faculty and students, and they must be flexible enough to adapt to a range of instructional requirements and styles. The

technologies must be robust and must scale up to support an ever-increasing demand.

Another well-known delivered knowledge system is Interact. Interact is a platform for the delivery and support of online learning. It differs from many other e-Learning platforms in that its aim is to concentrate on the social/interactive aspects of teaching and learning. It is an open source online community environment designed with the intention of making it easy for people to interact online, based around constructivist views of learning. The key advantage of Interact is the ability to structure a learning space the way you want it, rather than being stuck with a predefined separation of content and interaction. The user starts off with a blank slate and can build their space up anyway they see fit using a selection of 'Components'. There is no preset structure that forces the user into any particular pedagogy. Interact is a flexible, open source, online learning and community management environment. It can be used as a full intranet/portal as well as an online community environment. Features include a user-centered interface that works on most browsers, and powerful, feature-rich, interactive content and multimedia components for creating new and dynamic online experiences. In essence this means that people learn best as they interact and engage with others. With Interact, use of discussion forums, blogs, and sharing areas mean that communication occurs frequently between members. Interact is committed to providing tools that encourage and facilitate online collaboration and interaction. [6]

WeBWorK is a web-based method for delivering individualized homework problems. It gives students instant feedback and allows instructors to track their progress in real time. Problems are written in a flexible and easy to use language. Now it is supported by a team of developers from several institutions and is used for a variety of subjects. WeBWorK enhances the educational process in several ways. By providing students with immediate feedback as to the correctness of their answers, students are encouraged to make multiple attempts until they succeed. By individualizing problems, cheating is discouraged. By providing instructors with real-time statistics, lesson plans can be customized to better serve students. The major way in which WeBWorK differs from other web-based homework systems is in the way problems are written. The PG ("problem generation") language allows the inclusion of both Perl and LaTeX code, allowing problem authors to take advantage of the syntactic efficiency of Perl and the typographical flexibility of LaTeX (which is pretty much necessary for rendering mathematics expressions). The process of defining a problem is highly modular, with various pluggable display macros, answer evaluators, and graders. This allows for a high degree of freedom in defining how problems behave. A library of canned problems is provided, with over 12,000 problems contributed to the National Problem Library (or NPL) at last count.

JavaScript Optimizer is a technical component designed to organize Web resources on the server side and to optimize (compression, merge and versioning) their delivery to the client's browser. This tool will let you optimize your JavaScript (JScript) code by removing comments, white spaces as well as other unnecessary characters as well as by optionally shortening function / variable / class names. Other than regular JavaScript code, this tool accepts extensions (based on C/C++ preprocessor syntax) which allow further optimization, in particular shortening custom names (e.g. of functions, variables, classes) and conditionally removing unused portions of code (e.g. used for debugging purposes or versions for different browsers). Optimizing JavaScript code is very useful. You can expect size reduction of 20-50% depending on your coding style and the use of tool's extensions. On one hand it will make your pages load faster and, on the other hand, it will cause your pages to work much faster, once they're loaded. The reason for this is that the browsers must interpret JavaScript code so its size is very important. Another advantage (especially when using the name-shortening feature) is that your JavaScript code will be less readable making it very difficult to steal it. On the other hand, for you as the developer, the original code will stay well formatted, also allowing you to use meaningful variable and function names and to add lots of comments etc. without the normal size overhead. Each system has his advantages and disadvantages and there is not a perfect system.

4. E-Learning distributed knowledge modules

This learning is typically conducted in small groups however large organizations need to get many employees up to speed quickly and efficiently develop some online training modules and tools. Typically an organization will purchase a course for a block of users to attend a series of training events including some online training modules. The users are presented with an easy to use and feature rich environment that either: [8]

- Leads them through a series of questions to discover their readiness for change.
- Helps them to develop a plan of action to take back to their teams.
- Assesses their understanding of the subject.

At the end of the training the users can either adapt their change plans and communication plans to a new challenge or continue their training with further modules. The database has been designed so that various cuts on the data of individuals and groups can be compared and benchmarked if required for research whitepapers.

Distributed knowledge modules describe how the content of the module will be available to the students. Two types of modules are proposed: distance learning module, in which the student has all material and

necessary resources to use through the Web; and the complementary module, used by the teacher as an in-class or out-of-class activity, which can be assessed in the computer laboratory of the school or at home, as a complement to the classes. This process describes the nine stages that the teacher or module developer should proceed for the elaboration of the conceptual project of a module. These are:

1. Decide the subject to be developed in the module;
2. Define the student's profile;
3. Describe the module;
4. Define the strategies;
5. Relate the contents to the chosen subject;
6. Describe the sequence of the module;
7. Look for alternatives for presentation of the content;
8. Draw a sketch of the module;
9. Fill out the proposal of the conceptual project.

The figure below gathers dimensions and elements of learning process which have to be discussed and made decisions on when planning and implementing courses, modules or study entities.

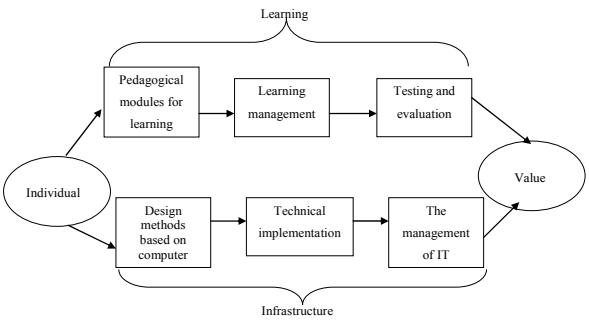

Fig1. Elements of learning process

We use the information technology in the teaching-learning process, with special emphasis in the distance learning. Here, the pedagogic methodology and the domain of support tools are crucial for the efficient application of the Multimedia contents under demand. In this context, three aspects need to be approached: [10]

- Development of didactic multimedia content: to produce texts, videos, audio, images, and animations, with base in appropriate pedagogic orientations, using appropriate tools to the production of each media type. These contents will support the teachers' activities in the schools.
- Study, adaptations and implantation of the course management systems.
- Teachers' and computer technicians training. The teachers are qualified for the use of the computer resources, the use of the course management systems, elaboration and project of new modules, and use of the developed PGL modules. The technicians are trained to give technical support and to assist the teachers in their work.

5. Conclusions

E-learning is the solution for people who want to gain education but don't have time to go to school. The infusion of the ICT in the educational systems, at different levels and different forms, as a possible solution for identified problems, became familiar. But use of ICT in the educational landscape assembled a lot of other questions marks concerning the educational value of this use in terms of learning quality. Instruction appears to be a complex matter and simple “look and feel” in front of computer does not signify learning and/or teaching. The literature focused on ICT use in education report its benefits in enhancing aspects of the teaching/learning processes. But those benefits are not only the result of putting a student in front of a computer. The computer must provide a learning environment, a space where learning process is enhanced in some aspects of teaching process are also included. The aim is to provide an overview concerning the development of the learning environments provided true computers, emphasizing the design phase that has the most important role in the prediction of the learning quality.

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CONSTRUCTION OF A GENERALIZED MODEL FOR DETERMINATION THE BROKER BEHAVIOUR FOR CAPITAL MARKET

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1. Introduction

The model checkers are tools which can be used to verify a given system satisfies a given temporal logic formula. The model is a directed graph where the nodes represent the states of the system and the edges represents the state transitions. The nodes and the edges can be labelled with atomic propositions what describe the states and the transitions of the system. In order to be verified by a given model, a property is written as a temporal logic formula across the labelled propositions from the model. A model checker is an algorithm that determines the states of a model that satisfy a temporal logic formula. The algebraic methodology and its utilization in developing instruments for model checker specifications as maps in form $C:L_s \rightarrow L_t$ [5], where L_s is the source language of temporal logic, L_t is the target language representing sets of states of the model M and $C(f \in L_s)=\{s \in M | s\, f\}$, where $\models$ is satisfaction relation. This allows the possibility of automatic generation of the model checking algorithms for temporal logics into algebraic specifications sets. In paper [1] we showed how this algebraic context can be used to the specification of *CTL* (Computation Tree Logic) model checker.

2. Syntax and semantics of the CTL model checking

A Kripke model M over AP is a triple $M=(S, Rel, P:AP \rightarrow 2^S)$ where S is a finite set of states, $Rel \subseteq S \times S$ is a transition relation, $P:S \rightarrow 2^{AP}$ is a function that assigns each state with a set of atomic propositions.

A CTL formula is evaluated on a Kripke model M. A path in M from a state s is an infinite sequence of states from S, denoted in the following with $ð = [s_0, s_1, \ldots, s_{i-1}, s_i, s_{i+1}, \ldots]$ such that $s_0=s$ and $(s_i, s_{i+1}) \in Rel$ holds for all $i \geq 0$. We write $(s_i, s_{i+1}) \subseteq ð$ and $s_i \in ð$. If we express a *path* as $ð = [s_0, s_1, \ldots, s_i, \ldots, s_j, \ldots]$, for $i < j$, we say that s_i is a state earlier than s_j in ð as $s_i < s_j$.

Syntax Definition of CTL model checker is given by [2]. A CTL has the following syntax given in Backus-Naur form: $f ::\ \top | \square | p | (\neg f_1) | f_1 \wedge f_2 | f_1 \vee f_2 | f_1 \subset f_2 | AX\, f_1 | EX\, f_1 | AG\, f_1 | EG\, f_1 | AF\, f_1 | EF\, f_1 | A[f_1 U f_2] | E[f_1 U f_2]$ where $\forall p \in AP$.

Semantic definition of CTL model checker is provided in [2]. Let $M=(S, Rel, P:AP \rightarrow 2^S)$ be a Kripke model for *CTL*. Given any s in S, in [2] is defined whether a *CTL* formula f holds in state s. This is denoted this by $(M, s) \models f$. The satisfaction relation $\models$ is defined by structural induction on fourteen *CTL* formulas [2].

3. Algebraic structure of CTL model checking

In an algebraic compiler $C:L_s \rightarrow L_t$ the source and the target language used are defined using heterogeneous Ó-algebras and Ó-homeomorphisms [5]. The operator scheme of a *Ó-algebras* is a tuple $Ó=(S,O,ó\square$ where S is a finite set of states, O is it a finite set of operator names, and $ó:O \rightarrow S^* \times S$ is a function which defines the signature of the operators. These signatures are denoted as $ó(o)=s_1 \times s_2 \times \ldots \ldots \times s_n \rightarrow s$, where s, $s_i \square S$, $1 \leq i \leq n$. A Ó- algebra is a tuple defined through $L=(Sem, Syn,\ L:Sem \rightarrow Syn\square$ [5], where *Sem* is a Ó- algebra called the *semantic language*, *Syn* is a Ó- word or a term algebra called the *syntax language* and L is a partial mapping called the language learning function. In order to define a *CTL* model as a Ó-language, shall define an operator scheme $Ó_{ctl}$ as the tuple $\langle S_{ctl}, O_{ctl}, ó_{ctl}\square$ where the states $S_{ctl}=\{F\}$ are mapping the formulas f and $O_{ctl} = \{true, false, \neg, \wedge, \vee, \rightarrow, AX, EX, AU, EU, EF, AF, EG, AG\}$. The model $M=(S,Rel,P:AP \rightarrow 2^S)$ is structure as a Σ-language whose syntax algebraic contains the *sets of the expressions* and whose semantics algebra contains the sets of 2^S.The operator scheme for this language is $\Sigma_{sets}=(S_{sets}, O_{sets}, \sigma_{sets})$. The operators in the algebra and their signatures as defined by σ_{sets} are shown in [1]. We retain that semantic Sem_{sets} and Sem_{ctl} have the carrier sets in the relation $Sem_F \subseteq Sem_S$. This allows due to similarity to show in the scheme all elements of

carrier sets of Sem_{ctl} through their occurrences in the carrier sets Sem_{sets}. A *CTL* model checker defined as an algebraic compiler $C:L_{ctl}\rightarrow L_M$ by pair of embedding morphisms $\langle T_C,H_C\rangle$. T_C: $Syn_{ctl} \rightarrow Syn_{sets}$ maps *CTL* formulas from word algebra Syn_{ctl} to set expressions in Syn_{sets}, which evaluate to the satisfiability of sets of the *CTL* formulas. The morphisms T_C and H_C thus constructed make the diagram commutative. Commutatively assures the fact that T_C keeps the meaning of the formulas from Syn_{ctl} when mapping them to set expressions in Syn_{sets}. Construction of T_C can be entered into an algorithm which implements the *CTL* model checker. This algorithm is universal in the sense that being given operator scheme Σ_{ctl} and a model *M*, the model checker L_{ctl} is automatically generate from the specifications of $\langle\Sigma_{ctl}, D_{ctl}\rangle$. We don't detail the algebraic implementation of *CTL* because it's presented in paper [1], but we retain that *CTL* rules set are directly specified in the algebra Sin_{ctl} can be ambiguous, therefore it is necessary that the set *F* from Sin_{ctl} to be divided in the non-terminal symbols denote with *Ctlformula, Formula, Factor, Termen* and *Expresie*. Thus, the defined rules deliver non-ambiguous specification in algebra Sin_{ctl}.

4. Study case for Determination the Broker Behaviour for Capital Market

The *operation* is a financial instrument which is emitted usually for a long term. The operation produces some finances which can receive or can convert periodic. It's important to known as the operation is not reimbursed. As follow the operation confers it holder permission of he explained about the way in which were placed his money. For bought an operation or invested in to operation or became the shareholder means paid this price at a given moment for can obtained then a flux of future finances. The fluxes on which waits them shareholder consisted of some parts from his interest or from profits, as well as from his process or for sale a value at a given moment. The symbols on which use them in *credibility operations financier* [3] formula is given by: C_0 is the *operations value* to zero moment of this purchase immediately after dividends pay or exactly to the moment it purchase after emission. Its name is *price of getting* or *price of purchase*; D_0 is the *dividend pay* exactly before evaluation process or evaluation C_0 price; *nr* is the number of year's placement or investment into *operations* where $nr=1,2,\ldots,k,\ldots$; *per* is the *annual percent* of an *operation process*, that is $per=100*uai$, where *uai* is the *unitary annual interest*.

The paradigm on the base of fundamental principle of the *financial reciprocal commitments* equivalence (expenditures and finance of issuer or of shareholder) accordingly the investment into *operations* needs to be in progress the relation:

$$C_0 = \sum_{k=1}^{nr} \frac{D_k}{(uai+1)^k} + \frac{C_{nr}}{(uai+1)^{nr}} \qquad (1)$$

In this relation the evaluation takes place with a unique annual percent. The instalment pays will be in progress afterwards. The relation showed hereinbefore is referred to the equality among the of an operation process to purchase and its future values, dividends and its value of resale through the update percent or of operations profitability. This relation can be view as a function $C_0=C_0(uai,D_1,D_2,\ldots,D_{nr},C_{nr},nr)$.

The price evaluation of resale is can do if is known the purchase price and the dividend received. The relation for this case becomes:

$$C_{nr} = C_0 \cdot (uai+1)^{nr} - \sum_{k=1}^{nr} \frac{D_k}{(uai+1)^{nr-k}}$$

In this formula appears the globally fructify factor $(uai+1)^{nr}$. It is can remarked the fact as the resale price is function of getting prices, of dividends, of the market interest and the lending course, that is $C_{nr}=C_{nr}(uai,D_1,D_2,\ldots,D_{nr},C_0,nr)$. In the situation discussed before we have two cases in which is can decided if one person want to buy or to sell the operations on which they detain. In first case we interest the dividend. In this case we verifies to don't diminishes the operation such in kind that when selling to don't miss from the operation value. In second case we don't interest the dividend and is due to verifies specifically the way to offer and demand from on sale. In the construction of our model shall attend both cases. The model is builder in order to help to the decision bought or sold operations. The discussion is put from viewpoint of which person which makes speculations, broker, of the operation price. The minimum threshold which we consider is the purchase price C_0. The broker behaviour is gives by too gain only that exist some amount of money denoted by α on which considers satisfactory, $C_0+\alpha$, for to determinate to continue this activity. That is, $C_0 < C_0+\alpha \leq C_1<C_2<\ldots<C_{nr}$. Broker against acts the market conditions given by demand, offer, price and the number of operations. Hereto is added the way of the company as the activity result through its profit related on the bursary market into dividends. His act on the market is determinate of three decisions: *(a) buy; (b) sells;* or *(c) waiting*. These three decisions are conditioned by two situations: *(I)* high price and operations number is low (means high offer and low demand); *(II)* low price and operations number is high (means low offer and high demand).

The time steps are:

t1) he buys the operations that means he begins with C_0 t2) he is needed to decide if keep, sell or buy the operations depending on the market (I, II) and α is obtained:

t2′) keep operations if α is not obtain;

t2″) if α is obtain then is sure to sell operations, (I)

t2‴) buy other operations in (II) situation and going to (t1)

t3) if is not obtain C_0 then out of market.

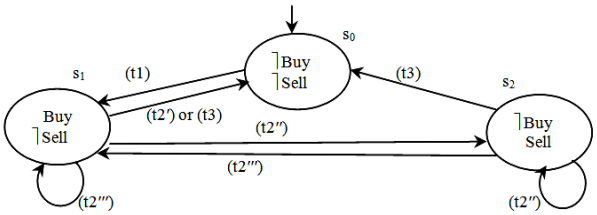

Fig. 1 Model Representation for CTL structure

As example we present in Fig. 1 the representation of model for CTL structure. The state-transition diagram showed in Fig. 1 has three locked-state events. These locked-state events occur because the offer and the demand, in most instances, take one action and then await a response before moving for a new state. In fact, only two event flows *Sell* or *Buy*. *CTL* structure for the determination the *broker behaviour for capital market* control is presented in the Fig. 1 and states of the system are denote with s_0, s_1,s_2.

The Kripke model has three states and the propositional variables are from the set {*Sell,Buy*}. *Sell* represented when the broker decides sell the operations, *Buy* represented when the broker decides buy other operations. The formal definition of the Kripke structure for *broker behaviour for capital market* control is given by: $M = (S, Rel, P)$, where $S=\{s_0,s_1,s_2\}$, $Rel=\{(s_0,s_1),(s_1,s_0), (s_1,s_1), (s_1,s_2), (s_2,s_0), (s_2,s_1), (s_2,s_2)\}$, $AP=\{Buy,Sell\}$, P assigns state s_0 in M with *not Sell, not Buy* that is set $\{\neg Buy, \neg Sell\}$, means in this case that the broker waits for buy the operations. P assigns state s_1 in M with $\{Buy, \neg Sell\}$, the state s_2 in M with $\{\neg Buy,Sell\}$.

It can observe that the process with simpler situation is $s_0 \rightarrow s_1 \rightarrow s_2 \rightarrow s_0$. All the state satisfies the $f_1 =_{def} AG \neg(Sell \wedge Buy)$ formula. That means we can't sell and buy in same time. We can observe in Fig. 2 that our formula is satisfied in all three states. In following we will present the f_1 formulas that were checked by our implementation [1] using the ANTLR tools. The ANTLR 3 [4] tools we used because the construction of software instruments as translators, compilers, recognition and parser of static/dynamic programs. In Antlrworks was implemented all macro-operations of CTL model checker. The program receives as input the model M where are defined the sets S, *Rel* and P. We use Java as target language for the implementation of our model checker tool. For checking the first formula, f_1 for our example we will use the ANTLR debugging facility to visualize the parse tree and execution of actions of grammar rules, i.e. evaluation of the CTL formula.

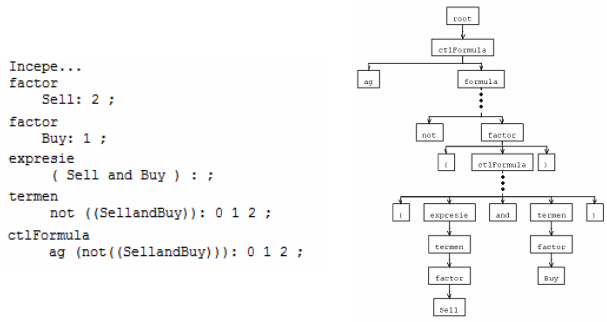

Fig. 2 Debugging in ANTLRWorks

The complete implementation of our CTL model checker from [1] is provided as a Netbeans 6.1 project, which include the java code generated by the ANTLR. The behavior of the model checker algorithm presented before consists of identifying the sets of states of a model M which satisfy each sub formula of a given *CTL* formula f and constructing the set of states, from these sets, that satisfy the formula f. This is certainly the behavior of the algorithm for the homeomorphism computation performed by an algebraic compiler. Thus is evaluated an expression by repeatedly identifying its sub expressions and replacing them with their images in the target algebra. In the case of the model checking algorithm, sub expressions are *CTL* sub formulas and their images are the sets of states in the model satisfies the sub formulas.

5. Conclusion

Evaluation construct in certain condition of a general model of operation placement he permits of a broker the possibility established all the possible situations for a tacked decision for capital market. In these conditions is making it clear that a real configuration with possible different situations could be transpose to a mathematic model.

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CONSIDERATIONS ON USING KNOWLEDGE MANAGEMENT PRINCIPLES IN THE DEVELOPMENT OF E-LEARNING PLATFORMS

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Developed in the business sector, where it proved to increase employee motivation, enhance customer support services and overall business efficiency, Knowledge Management found its way to higher education institutions. This paper tries to argument the benefits of using KM principles when designing an e-learning platform as well as point out a few practical implementations.
Keywords: knowledge management, e-learning, higher education

1. Knowledge Management from Corporations to Higher Education

According to a dictionary definition, *knowledge* is the sum of what it is known, the body of truths, information and principles held by mankind. Knowledge is directly linked to intellectual abilities but also to observation, experience, study and investigation. Thus knowledge is different from data or information: while data consists of raw facts and numbers, information is data put into context and knowledge is information combined with experience and judgment [1].

Knowledge Management is thus a complex concept, including but not limited to information technology, based on the following main principles:

- collect, collaborate, capitalize: gather information and put them to use in collaborative systems to capitalize on the knowledge generated;
- support explicit knowledge as well as tacit knowledge;
- use specific IT tools and techniques that are customised for the specific needs of the organization;
- do not base KM on technology alone, but take into account the social dimension of Knowledge and Knowledge Sharing;

The development of Knowledge Management (KM) started in the business sector, mainly in larger, more complex organizations. Case studies published by several companies that successfully implemented KM systems, show positive effects such as decreasing personal turnover[2], increased sales[2] or better customer support and increased customer satisfaction (mainly in help-desk type activities) [3].

Moving on towards institutions and more specific – higher education institutions, even if some of the fore-mentioned benefits do not apply (such as profit increase or personnel retention), other opportunities arise: universities are in the "business" of knowledge creation and dissemination thus it is in their core mission to create knowledge repositories, provide open access to such repositories and encourage knowledge sharing.

As pointed out in literature [1], KM systems can be implemented in Higher Education Institutions on five main levels:

- In the research process where it can facilitate interdisciplinary research, reduce turnaround time for research or increase competitiveness.
- In curriculum development, that can lead to enhanced quality of curriculum and programs by identifying and leveraging best practices as well as improved speed of curriculum updating.
- Application in strategic planning to improve the organizational ability to support the trend toward decentralized strategic planning.
- Application in administrative services that can improve the efficiency of administrative services and responsiveness and communication capabilities.
- Application in student services with improvements in services for students and also in the learning processes by creating open, collaborative learning environments where students and faculty work and support each other.

Thus knowledge management is very well suited to Higher Education Institutions, both on an administrative level – to allow for increased process efficiency, but also in the learning and research activities where *knowledge repositories* and *knowledge sharing* can change the way education is perceived: "Using knowledge management techniques and technologies in higher education is as vital as it is in the corporate sector. If done effectively, it can lead to better decision-making capabilities, reduced "product" development cycle time (for example, curriculum development and research), improved

academic and administrative services, and reduced costs. [...] Knowledge management should not strike higher education institutions as a radically new idea; rather, it is a new spin on their raison d'être." [1]

2. Knowledge Management and E-Learning: Practical Opportunities

Defined in a wide sense as a sum of technologies, methodologies and pedagogies that allow anytime-anywhere access to educational resources and activities, e-learning is currently used on a large scale all over the world, either as a supplementation of in-class educational activities, either as support for distance education.

E-learning implementation is based on different IT platforms generally defined in literature as LMS (Learning Management Systems) which offer several common functionalities such as:

- Educational resources management: content can be represented as hypertext, text files or other data files and even multimedia files. The content is stored in centralized databases and can be accessed at will by users.
- Communication: both synchronous communication (chat) and asynchronous communication (forums / email) are usually implemented.
- Evaluation: e-learning platforms offer a wide range of tests and assignments from usual multiple-choice tests to adaptive tests.

As seen in literature [5] [6], the integration of knowledge management and e-learning has been a frequent topic of discussion in recent years, but the idea has rarely been implemented and usually at the level of organizational learning or corporate e-learning.

In this sense, we acknowledge the work of Mihalca et al [6], and agree that „an efficient e-learning system should also be based upon knowledge, and not exclusively on information." (where knowledge is defined as „an understanding of information acquired by study, investigation, observation, or experience" [6]), but we move further from their work into the area of university teaching and general LMS to propose that all of the fore-mentioned functionalities of e-learning platforms (educational content management, communication and evaluation) can benefit from knowledge management and knowledge sharing principles both on a technological level and at a conceptual level.

In the case of educational resources management, a first step we propose is the creation of a general all-users, all-information resource section. Usually, e-learning platforms have students grouped and assigned to specific courses that they can access; however, sometimes the information required is either interdisciplinary or hidden in the resource pages. Thus a general common section where students can search a particular topic, browse through other questions and answers or even answer questions asked by others would help them find the answers they need more quickly. This section, that could be implemented in the form of a Frequently Asked Moreover, with the advance of E-learning 2.0, where students are encouraged to contribute to the educational resources available in the system, knowledge sharing could help by connecting students from different institutions and even different countries that are interested in a particular subject. Students themselves would then answer peer questions as well as propose other questions to be answered.

Collaborative learning is also a common ground of both e-learning and knowledge management where the main point is moving from static web pages or text files with educational resources to wikis, blogs and blog networks and designing the courses using these tools in mind (for instance creating students assignments such as adding own contributions to a specific wiki).

In the case of communication functionalities, offered by e-learning platforms we consider implementing solutions that proved effective in a corporate setting: the creation of an integrated portal with personal pages, communication tools and automated notification and reminders (such as online notifications and birthday reminders) could increase student motivation as it increased motivation for Frito-Lay employees: "the tool has become extremely valuable for communication [...] The portal has also helped foster a sense of camaraderie and relationship building"[2]

On the third level – evaluation – we would like to start from the findings of Bunderson et al [7] who propose that recent trends in the filed of computer aided testing imply moving from computerized testing (applying conventional tests by computer) and adaptive testing towards ccontinuous measurement and monitoring that attempts to estimate dynamic changes in student result trajectory.

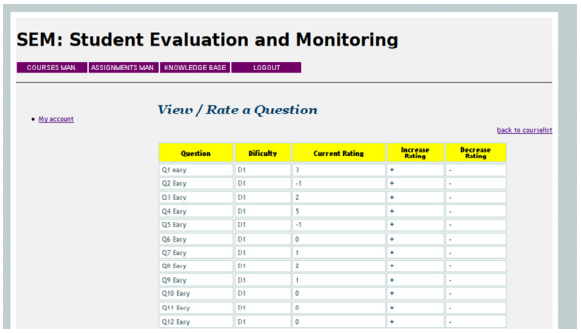

Figure 1: Question rating in a student evaluation application

In a recent application developed by the authors – *Student Evaluation and Monitoring* – we found an important opportunity for integration of knowledge management principles – the creation of a test question knowledge base. The application can provide automated tests (with results generated by the system itself) by pseudo-randomly choosing questions from a database. The questions can be added by any professor who uses the application and the knowledge sharing

value is increased as more professor from the same field but different institutions use the same database.

Moreover, each pro-fessor can rate any question (figure 1), the application choosing for tests only questions with rating above zero and favoring questions with higher rating thus contributing to the continuous improve-ment of the knowledge base as well as of the professors who participate.

Further opportunities to implement KM principles in this application are considered in its further development, such as providing students with visual comparative analyses to allow them to monitor their trajectory in comparison to themselves and to their peers.

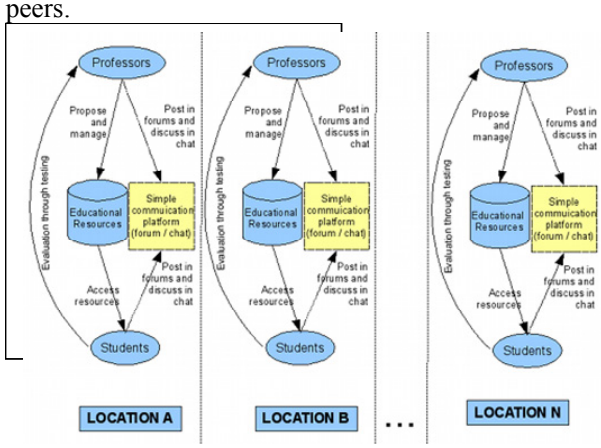

Figure 1: Typical e-learning system

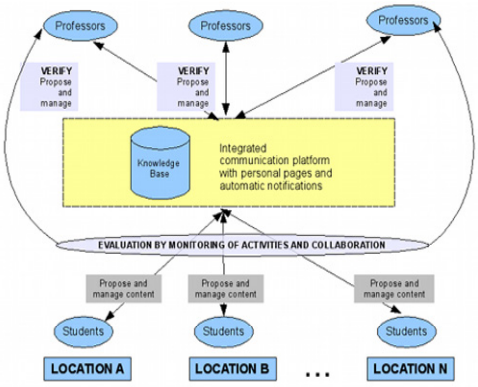

Figure 1: E-learning platform consistent with KM principles

A perspective on our views regarding the knowledge management – e-learning relationship in available in figures 2 and 3 that show the differences between typical e-learning systems and KM consistent e-learning 2.0 systems.

3. Conclusions

Developments in the field of Knowledge Management and also in the technologies and methodologies of e-learning can bring interesting opportunities to enhance e-learning platforms and educational processes. By using KM principles when designing e-learning platforms we believe we can increase the efficiency of the learning process and support the paradigm switch towards e-learning 2.0.

The current paper tries to justify the link between Knowledge Management and practical e-learning implementations and offers several ways to implement KM principles in e-learning platforms, such as extending the regular resource base to a wide-access knowledge base or creating a question knowledge base.

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AN ONTOLOGY-BASED COMPETENCE MANAGEMENT SYSTEM FOR IT COMPANIES

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The paper presents a generic framework of an intelligent information system for competence management based on ontologies for information technology companies. The advantage of using an ontology-based system is the possibility of the identification of new relations among concepts based on inferences starting from the existing knowledge. The inferences may be performed in our approach by a reasoning engine, using classifiers in the Descriptions Logics tab associated with the Protégé ontology environment. The user can choose to query instances of one type of concept, based on the relations that are displayed for him/her in a dropping menu. In addition to choosing relations modeled in the ontology, the user may also query inferred relations that are not explicitly stored in the knowledge base. The paper also presents some use-cases and further developments.
***Key words**: competencies, ontology, competence management system, information technology, knowledge acquisition.*

1 Introduction

The paper presents a generic framework of an intelligent information system for competence management based on ontologies. In a first step, the system will be applied in an information technology (IT) small enterprise and then its applicability will be verified for other organizations of the same type. Our research question is whether it is possible to build such a generic framework. The work presented in the paper is performed under the project "CONTO – Ontology-based Competencies Management in Information Technology" funded by the Romanian Ministry of Education and Research, involving technical, economics universities, a research institute and an IT private company.

A competence management system (CMS) can be seen as a part of a Human Resource Management system, which gives it the ability to store dispersed and unstructured corporate knowledge, such as corporate competencies characteristics. Competence management is the process of determining what human resources are required to meet organisational objectives, determining what the organisation has, and developing strategies for either recruiting or internal development of the required competence levels. Accurate competence knowledge may be used also for planning what the organization is able to do in the future.

The developed competence management platform delivers the following processes for the organization [1]: (a) a flexible competence infrastructure model to meet the most diverse organisational structure; (b) self assessment processes for gaining insight into current competence levels; (c) structured assessment processes (workplace assessment) for validating levels of competence; (d) individual development plans linked to organisational performance objectives; (e) gap analysis tools; (f) future prediction tools.

A CMS, which is not based on ontologies, actually concentrate on the manual definition of competencies by employees, a simple tree-hierarchy of relations between competencies and focus on the personnel department. This can hardly satisfy basic business demands. For example, because of focusing only on managing existing competencies, the strategic human resources development is not supported and often the CMS is not integrated in the existing IT infrastructure. As a result, the organization does not benefit from sources of knowledge about its employees' skills. In addition, to get acceptance of a CMS, it is essential to gain a high actuality of the administrated knowledge about competencies, so the users can rely on the statements the system gives. Usually, the competence management treats the processes at the level of an organization, by reporting strictly to the internal environment. Significant references are: [6], [7], [8].

A CMS, in our vision, has to achieve three functions: (a) to support the complete and systematic acquisition of knowledge about the competence of the members of an enterprise; (b) to provide the knowledge about competences and their owners; (c) to apply the available knowledge to serve a purpose.

2 The Ontology for CMS – Knowledge Acquisition and Conceptualization

An ontology is, in the context of intelligent, knowledge-based systems, a declarative knowledge base containing the concepts and the relations that exist in a given domain, it is "a *specification of a conceptualization*. That is, an ontology is a description of the concepts and relationships that can exist for an agent or a community of agents. This definition is consistent with the usage of ontology as set-of-concept-definitions, but more general" [1]. The name is obviously inspired from philosophy, where it means a "branch of metaphysics concerned specifically with what (kinds of) things there are" [4].

From a knowledge representation perspective, ontologies are semantic networks that state what kinds of concepts exist and what relations (e.g. abstraction-particularization or "part-of") hold among them. If a concept is a particularization of another concept, it has all the features of the more abstract concept and, maybe, some particular ones.

In the *knowledge acquisition* phase the project team collects all the relevant information that is

needed to conceptualize the ontology. Because the activities of acquisition and structuring of knowledge accompany each other, the phases of knowledge acquisition and conceptualization have to be done within an iterative loop. There are different sources that can be used to create a knowledge base. First of all the employees and their superiors of an organization may be interviewed about the employees´ skills. Another way could be to extract knowledge from electronic documents to ascertain skills or to evaluate the employees using quizzes or other means. In all cases it is important to pay attention to the fact that will be raised knowledge (or meta-knowledge) about the employees' knowledge.

A model-like account of the ontology will be developed in the phase of *conceptualization*. On one hand this model contains a conceptual system of the domain (terminology) and on another hand it contains rules for the interpretation and the use of the concepts. Not only the members of the project team conceptualize, but also the users, who have been interviewed during the phase of knowledge acquisition. As far as possible, the conceptualization should not be accompanied by a certain language or a technical requirement.

The core of our competence management information system is an ontology that plays the role of the declarative knowledge repository containing the basic concepts (such as: company-job, competence, domain, group, person etc.) (Fig. 1.) and their relationships with other concepts, instances and properties. The Protégé environment [5] was used for the development of this ontology. The domain ontology of our CMS is presented in Fig. 2. The part for the *Software Engineering* concepts (the subconcepts of "Technical-domain" in the domain ontology) was built using the *Guide to the Software Engineering Body of Knowledge* [2] (the authors explained this building in [9]). Additionally to the representation of concepts, relationships and properties, the ontology needs to be extended with rules of integrity and inference. The inference rules allow explicating implicit factual knowledge about the competencies of the employees. In the knowledge base, the knowledge about the competencies of the organization and the employees are hosted. The structure of the ontology is conceptualized so that description logics can be used to represent the concept definitions of the application domain in a structured and formally well-understood way. Knowledge acquisition is performed in our approach by enriching the ontology, according to the requirements of the IT company.

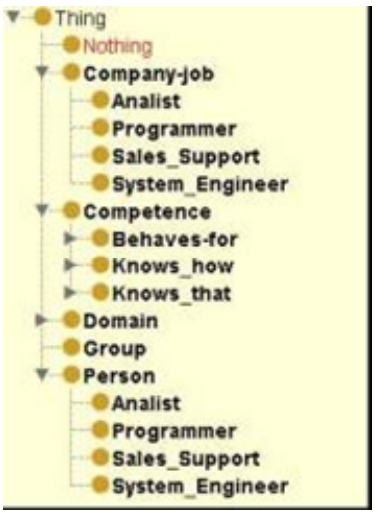

Fig. 1. Basic concepts of the CMS ontology

2 Usage Scenarios

An advantage of using an ontology-based system is the possibility of the identification of new relations among concepts based on inferences starting from the existing knowledge. The inferences may be performed in our approach by a reasoning engine, using classifiers in the Descriptions Logics tab associated with the Protégé ontology environment. The user can choose to query instances of one type of concept, based on the relations that are displayed for him/her in a dropping menu (Fig.3.). In addition to choosing relations modeled in the ontology, the user may also query inferred relations that are not explicitly stored in the knowledge base. The second type of search is browsing the ontology. The ontology skeleton is seen as a tree and its nodes are hyperlinks referring to other concepts or to instances. Starting from the main concepts, the user can get particular information about any instance of any other concept.

One use scenario is the determination of which person is adequate to the jobs of the company:
Query: has_competence some (Accuracy or Good_Time_Management or Patience or Resistance_to_stress or Self-control)
Query results: Thing, Person, Analist, System_Engineer, Gheorghe
Gheorghe is a person that may get the job "Analist" or "System_Engineer".

Fig. 2. The domain ontology of CMS

Other scenario is the identification of competencies that are not covered by the existing personnel in a company:
Query: has_competence some Project_Planning_and_Tracking
Query results: Thing, Person, Analist
The competence of "Project_Planning_and_Tracking" has to be carried out by the person(s) that occupies (occupy) the "Analist" job.

3 Conclusions and Further Developments

After representing the ontology the result has to be implemented into an information system (e.g. with a graphical user interface) so that users can fetch knowledge about skills from it. A possibility of use of our competence management information system is to link this ontology to another competence management ontology for project management and to deduce the optimal for teams building, as minimum of gap in educational needs.

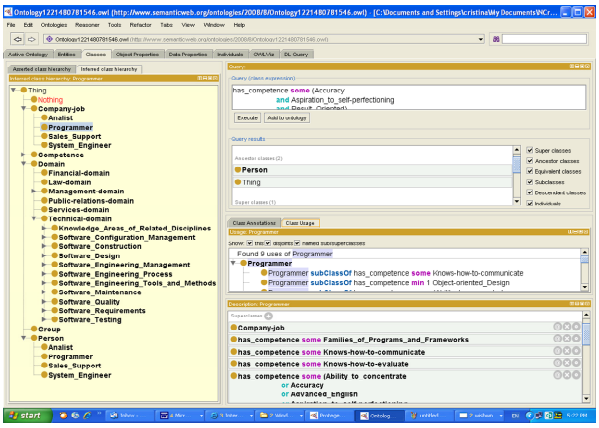

Fig. 3. Querying instances of one type of concept

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AN E-BROKERAGE APPROACH BASED ON MULTI-AGENT TECHNOLOGY

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In this paper the author tries to show the importance of multi-agent system in the e-commerce domain, specially for brokerage. He also propose an agent-based architecture for brokerage and a structure for the intelligent broker. The structure may be seen like a multi-agent system, having intelligent agents that are doing specific tasks for brokerage activity. In the end, conclusions reveal some aspects that may be start points for future researches.
Keywords *E-commerce, intelligent agent, brokerage, multi-agent systems.*

Introduction

The information directly connects millions of people. Everyone may be at its turn a consumer of information and also a potential provider of information . If their exchanges are to be efficient, yet the protection aspects on matters of privacy, sophisticated mediators will be required. Electronic brokers can play this important role by organizing electronic markets that promote the efficient production and consumption of information. One of many role of brokers is to collect and spread product evaluations. We discuss issues of information flow, management and storage mode for participation that would arise in such a shared evaluation service.

Based on traditional brokering, an electronic brokerage is an attempt to automate the brokering process and activities whereby human seller agents, buyer agent, and a broker bargain resources for mutual intended, gain to finalize a deal, using the tools and techniques of e-commerce [1]. With the rapid development of the Internet and WWW, the electronic brokerage market is growing exponentially based upon the promise of speed, convenience, and cost-effective access to markets. Further, most brokers on the Internet concentrate on the aggregation of information from underlying electronic catalogs. Anderson Consulting's Bargain-finder and Netbo'sjango are some of the most well known examples for brokers supporting dynamic data gathering. Guttman et al [2] analyze seven brokerage services and show which phases they support based on MAS technology. In overcoming many current limitations of e-commerce, e-brokerage is regarded as a main function of it.

Multi-agent Brokerage

Multi-agent technology has been applied to e-brokerage [3] in many cases. The multi-agent brokerage framework is similar to the e-commerce framework from a viewpoint of the functional relationship of the constituents, because agents share their information and cooperate with other agents to achieve a global goal through the communication channel, dialogue mand control mechanism. Many researchers have developed electronic brokerage frameworks based on multi-agents technology. CDNOW [www.cdnow.com] is an example of an intelligent broker who shops for CDs and fins the consumers' choice at the lowest price. This broker is a natural application for intelligent agents, and in a business with large volumes of transactions is absolutely necessary. The retailer agents may also play the role of info-mediary, negotiating for the exchange of products and services as well as data. Finnie, Sun and Weber [4] propose an approach for a broker-centered multi-agent brokering process (BCMB). The original ideas behind this is that the work of a human broker, should be done by a few intelligent agents in a MAS in a cooperative way. Further, as opposed to other multi-agents, in BCMB the broker's main task is bargaining in the e-marketplace on behalf of both agents of the sellers and the buyer.

Having activities similar with the human one (buyer, seller), the bargaining process of the multi-agent brokerage should have a certain level of autonomous agent agency. For example, buyer agents act independently of a buyer, but take into consideration the buyer's request (e.g. search and filter new data based on their buyer requests). They should also have certain adaptive behaviors to obtain the best performances they can get to improve their understanding of the user's (seller's and buyer's) desire and intentions. Further, they should have to cooperative ability to work with other buyer agents or seller agents to some extent. However, intelligent seller agents and buyers agents do not necessarily have the ability of mobility and reasoning in some situations. In contrast, the intelligent broker being a smarter intelligent agent, should have very strong mobility and reasoning ability, so that it can search information from all available Web servers proactively, and select the most useful information according to the requests specifications, which might meet the offers of a seller agent of the needs of a buyer agent. The intelligent broker then uses as many different reasoning methods as possible such as cased-based reasoning (CBR), adductive CDR , model-based reasoning (MBR) and rule-based reasoning (RBR) and reasoning with trick, to negotiate with the buyer agents and seller agents, if necessary [6].

The Propose Architecture of Multi-agent Brokerage

As already mentioned, brokering, in particular bargaining, is one of the important business activities, in which the buyer agents, seller agents, and the broker are the most important players. The broker plays has a main role in the bargaining process. This section views the brokers involved in the bargaining process as a business agent and proposes an architecture to model it using MAS technology, which is an intelligent broker-centered multi-agent system for automating brokerage in e-commerce domain.

Using MAS technology, one could develop a broker-centered MAS to assist the broker to work in the bargaining process and realize its necessary connections with the environment [5]. The system architecture from Figure 1 mainly consists of three multi-agents systems: intelligent seller, intelligent buyer and intelligent broker.

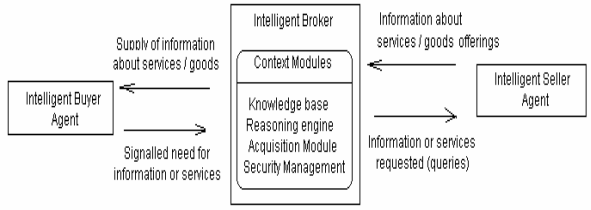

Figure. 1 The proposed architecture for a agent-based broker

While the intelligent seller agent subsystem consists of all available intelligent seller agents on-line , the intelligent buyer agent subsystem comprises all available buyer agents on-line. The intelligent broker is also a MAS. The intelligent broker contains some Context Modules like Knowledge base, Reasoning engine, Acquisition module and Security management.

In this system, the buyer agents, seller agents and intelligent broker are cooperating with each other. The seller agent tries to cooperate and negotiate with the intelligent broker to find a most satisfactory deal to sell goods/services of his seller. The buyer agent also tries to cooperate and negotiate with the intelligent broker to get what his buyer needs with least price. The intelligent broker proactively searches all available information about the supply and demand of goods on the e-market.

Every intelligent buyer and seller agent in this system is semi-autonomous, in that, once entering into the e-brokering process, the intelligent buyer (seller). Agent bargain makes decisions on his own, without requiring his buyer's (seller's) intervention. The intelligent broker autonomously bargain with the intelligent buyer agents or the intelligent seller agents in order to successfully achieve a deal.

As shown in Figure 2, the intelligent broker is mainly comprised of a buyer (seller) collaborative agent, an knowledge search agent, an interface agent, a management agent, a transaction agent, a negotiation agent, a knowledge database, a requests database (for buyer), a solution database (for seller). Also another source for information are servers that contain useful information, some context aspects (devices, intelligent spaces and agents).

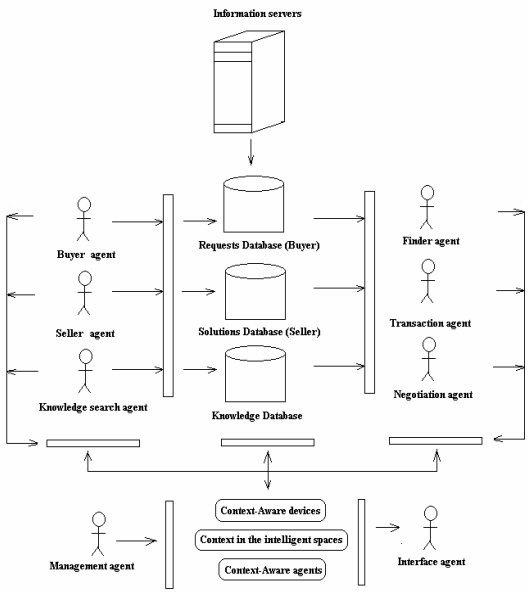

Figure 2. An intelligent broker structure

The buyer (seller) agent is an agent that interacts and cooperates with the buyer (seller) agents and gets supply-demand information and, at the same time, special information about the buyers and sellers, and then stores it in Requests database or Solutions database if necessary. In certain cases, the buyer (seller) collaborative agent decides if the related buyer agent and seller agent can directly contact each other in order to reach a deal.

The knowledge search agent is a mobile agent that proactively roams around the knowledge database on the internet such as Excite and Yahoo. It interacts and collaborates with the in order to search and analyze the required market information indirectly from individual Websites, and then puts it in the corresponding data or knowledge bases.

The interface agent interacts with buyer/seller agents, buyer/seller collaborative agents, the managing agent to transfer the transaction message.

The management agent plays an important rule in this subsystem. His main task is to decide which agent should do what and how to deal with an important transaction, according to some specific conditions. Another task is to coordinate the tasks among all other agents.

The finder agent searches related databases and matches a request for goods from a buyer agent and a supply of those goods from a seller agent using appropriate matching algorithms. It also matches the goods-requesting buyer agent and goods-supplying seller agent. Then, it sends the matched information to the interface agent or buyer/seller collaborative agent after cost analysis by the transaction cost analysis agent.

The negotiation agent is a mobile agent that performs integrative and distributive negotiation

strategies during negotiation with the buyer agent and seller agent. The negotiation agent may use all available human inference methods such as case-based reasoning (CBR), model-based reasoning (MBR) rule-based reasoning (RBR), fuzzy reasoning, and even reasoning with trick in different cases, if necessary.
The transaction analysis agent analyses and computes every transaction cost of deals, which the negotiation agent and the matchmaker agent suggest, and submits the recommendations to the negotiation agent and the matchmaker agent or the managing agent.

Requests database and Solutions Database store the information about goods provided by the buyer (seller) collaborative agent through the buyer (seller) agent.

Knowledge database consists of knowledge extracted from Request database and Solutions database. It also comprised of the (rule model, case, fuzzy, trick) knowledge about the market and negotiation. Knowledge database cooperates to facilitate all of the agents in the intelligent bases and making decisions in bargaining processes.

Conclusions

Based on the characteristics of buyer agents, seller agents, and brokers, this paper proposed an architecture of a multi-agent based intelligent broker for the brokering process and argued that such an architecture is an abstraction of human agents and brokers working in bargaining process of brokerage. These approaches will facilitate research and development of multi-agent e-commerce.

It should be noted that the multi-agent e-commerce is far away from a real world one, because several aspects such as human behavior are not considered. Human behavior in real world commerce negotiation involves difficult points such as multiple attribute negotiation, similar product suggestion, correlated product suggestion, learning of the experience of previous negotiations and take the decisions based on them, tricky reasoning in negotiation and the use of them as better it can, bargaining and compromise in negotiation. Until present, only the first four aspects have been mentions and examined, and only the first of the above feature has been incorporated by many e-commerce negotiation system so far, and the rest has not been used in multi-agent negotiation.

Bargaining and compromise is an art in traditional commerce. The essential secret for a successful businessman is that he is good at this art; that is, he can select the right bargaining and compromise at the time to complete a good deal or transaction. Therefore, how we treat bargaining and compromise from a logical and computational viewpoint is an important topic for automating bargaining and compromise and for applying them to multi-agent e-commerce.

Electronic brokers will be required to permit even reasonably efficient levels and patterns of exchanges. Their ability to handle complex, albeit mechanical, transactions, to process millions of bits of information per second, and to act in a demonstrably even-handed fashion will be critical as this information market develops. Electronic brokers can also run pricing systems, charging and crediting slight amounts to individual accounts as bits careen along the superhighway.

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TEXT MINING – PREREQUISITE FOR KNOWLEDGE MANAGEMENT SYSTEMS

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Text mining is an interdisciplinary field with the main purpose of retrieving new knowledge from large collections of text documents. This paper presents the main techniques used for knowledge extraction through text mining and their main areas of applicability and emphasizes the importance of text mining in knowledge management systems.
Keywords: text mining, knowledge systems, information retrieval

1. Text mining – interdisciplinary field

Text mining represents the retrieval of new information and knowledge with character of novelty from electronic documents content. Text mining field is placed at the intersection between artificial intelligence, linguistics, database technologies and web technologies (Figure 2).

Like data mining, the main objective of text mining is to retrieve useful information from data sources by identifying and exploring interesting models. In text mining, the data sources consist in document collections and the models are discovered in the unstructured content of the text they contain. Text mining and data mining have many architectural similarities, both of them applying preprocessing methods and techniques, model discovery algorithms and results visualization tools.

The natural human language the documents are written in led to the development of natural language processing (NLP) field which is at the boundaries between artificial intelligence and linguistics. The main objective of NLP is to provide machines with the ability to understand and to generate the natural language used by humans. The use of natural language processing techniques allows text mining systems to get closer to the semantics of source texts and to the knowledge they contain.

The Internet evolution led to the development of information retrieval systems with the main objective of quickly identifying documents whose content is relevant for users' need of information. The huge number of documents on the Internet generates a number of documents returned by classic search engines too big to be read by those who look for a specific piece of information. Text mining developed technologies may be used by search engines and by information retrieval systems to lessen the number of returned documents and to increase the degree of their content relevance to the information searched by the users.

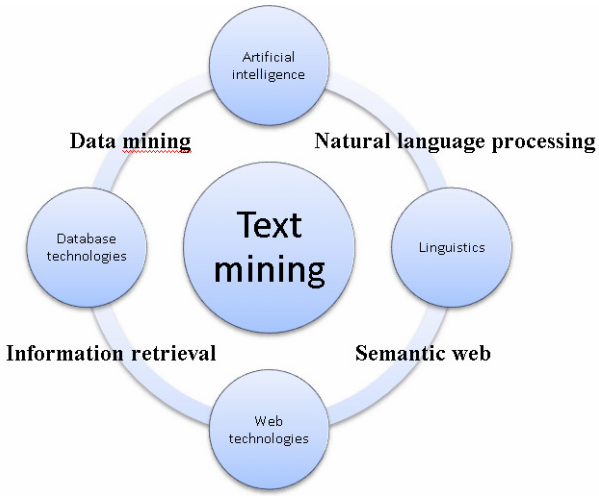

Figure 2 - Text mining – interdisciplinary field

Most of the text documents on the Internet are written in order to be read by humans and not to be processed by software applications. Semantic Web represents an extension of WWW which structures the semantic content of web documents so it can be used by information retrieval systems and by systems which extract knowledge from text documents.

2. Text mining approaches

Text mining systems are based on algorithmic or heuristic approaches which consider distributions, frequent sets and different association at document level. Their effort is driven to allow the user to discover the nature and the relations between concepts as they are reflected in the whole document collection.

For instance, the increasing number of articles about company Y and product type Z may indicate a reorientation of the strategy for company Y which should not be ignored by its competitors. Or, a potential relation between two companies C1 and C2 may be deducted through a model generated by more articles mentioning the relation between company C1 and product P1, some articles describing the relation between product P1 and product P2 without referral to any company name and some other articles that describe relations between product P2 and company C2. In these examples, the information is not provided by a single document but by the entire collection of documents. Text mining methods for model analysis are meant to discover the relations

between concepts as they are reflected by the whole corpus of documents.

Text mining provides a variety of approaches to facilitate the knowledge acquisition from text documents (Figure 3): automated text classification, clusterization, information extraction, information retrieval, the use of association rules, relation discovery or trend analysis.

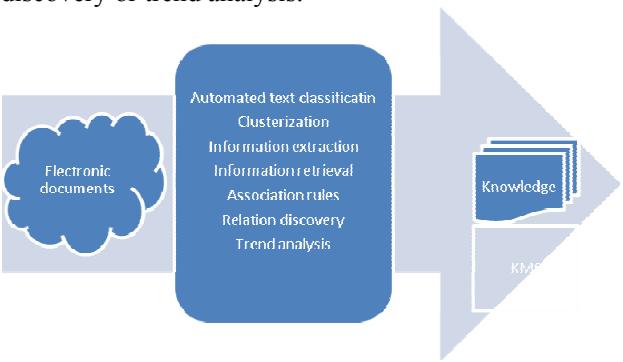

Figure 3 - Knowledge extraction from text documents

Most of existing electronic text documents is written in a free natural language. The automated preprocessing of this documents aims to transform these documents from their original free, unstructured format into a vector representation which may allow further processing of their content. Each document d_i belonging to a document collection D is represented this way by a weights vector $d_i = <w_{i1},w_{i2},\ldots,w_{im}>$, where m represents the number of all features that are present in at least one document of the collection D and w_{ij} represents the way that the feature *j* contributes to the semantic of document d_i. The features may be represented by words, terms or concepts. Although preprocessing operations in text mining have an essential role in transforming the unstructured content of a document collection into a data representation which is easier and more accessible for processing, the base functionalities of a text-mining system consist in the analysis of models for concept co-occurrence inside the documents of a collection.

Automated classification of texts accomplishes the association of a document with one or more pre-established document categories, based on their content. This way, if there are *n* documents d_i belonging to the document collection D and *m* pre-established categories c_j, each pair (d_i,c_j) has a Boolean value associated which represents the appurtenance of document d_i to category c_j. Clusterization is a completely automated process through which a document collection D is segmented in N groups (clusters) on the basis of their content. Documents inside the same group tend to have common features and a high degree of similarity and documents belonging to different groups present a low degree of similarity.

The objective of information extraction is to automatically extract information which is very well defined semantically and contextually, like entity names (peoples, organizations, places), dates, numeric expressions or relations between entities: a PERSON works in an ORGANIZATION, deducted from the sentence "Dragos Vespan is an employee of the Academy of Economic Studies".

Information retrieval aims the identification of documents whose content is relevant to a user query formulated as a question or as a set of words, representing the formalization of the need of information. The most used information retrieval systems are the search engines.

Association rules may be used to establish relations between documents that do not contain common terms. Considering an association rule between terms T_A and T_B, $T_A \rightarrow T_B$ with a trust level greater than a predefined threshold, the collection of documents that contain T_B may be extended with the set of documents that contain T_A. This allows the users to retrieve documents that do not explicitly contain the term T_B but are related to it.

Relation discovery may be used to suggest new connections and relations between concepts. Suppose that, in their content, documents belonging to a sub collection relate concepts C_A and C_B and documents belonging to another sub collections relate C_B and C_C. The analysis of the entire collection of documents, which includes the two sub collections, may result in the extraction of knowledge which states that C_A and C_B concepts are related, by discovering some relations between C_A and C_C.

Trend analysis is based on tagging documents inside a collection with the date and time of their creation or modification so that it is possible to compare document sets from different periods of time. Montes-y-Gomez, Gelbuk şi Lopez-Lopez proposed a set of questions which should be answered by the trend analysis made on a collection of news (Montes-y-Gómez, Gelbukh, & López-López, 2001):

- Which is the general trend of the news between two periods?
- Are there any significant changes in news subjects between the two periods?
- Which are the emerging subjects and which are the disappearing ones?
- Is there any subject which kept the same level of appearance in both periods?
- Which subjects behave against the trend?

Related to these illustrative questions, individual news subjects may be seen as specific concepts inside the document collection. Different types of trend analyses tend to compare the frequency of such concepts (number of appearances) inside the documents from the sets of documents belonging to the two periods.

Text mining methods are often based on searching knowledge inside very large document collections and usually provide a small number of models. This results in a supra abundance of identified models which is more severe than data mining applications which analyze structured data sources. An

important task of systems for knowledge acquisition from text mining is that of allowing the user to limit the supra abundance of models by providing tools for refining resulted models, focused on different measures of interest degree and of relevance for the search results. Results provided by the knowledge acquisition systems must be not only relevant but also presented in some way which facilitates their management and interpretation.

3. Text mining – Domains of applicability

Text mining may be successfully applied in any domain where there are a great number of documents in electronic format. In business, text mining technologies is applied for analyzing research and development strategies of competitors or technological trends, in order to apply a strategic management of technology and of intellectual property (Isamu, 2005), (Fujitsu, 2008). In marketing, text mining technologies is applied for analyzing the reputation of products or brands, the effects of commercials or consumers need for new products (Nifty, 2008). In risk management, processing incident reports through text mining results in trend and factor analysis which reveal the dynamics of the accidents.

In education, the use of a text mining system allows teachers and professors to find information related to their subject of interest, more quickly than by using a classical search engine. Text mining allows the analysis of the impact of the research results presented in a highly cited article, without the need of reading entirely all the hundreds of citing articles.

In medicine, text mining technologies is applied on on-line document collections in order to automatically discover interesting hypothesis which constitute a basis for scientific discoveries (Srinivasan, 2003), to automatically identify viruses used as biological weapons (Swanson, Smalheiser, & Bookstein, 2001) or to find functional connections between genes (Chaussabel & Sher, 2002), (Shatkay, Edwards, Wilbur, & Boguski, 2000).

Another domain where text mining may be applied is the fight against terrorism, where security agencies have to analyze as quickly and as correctly as possible huge quantities of texts. IBM developed a text mining system that analyzes transcripts of phone conversations, web pages, blogs, e-mails and other sources of unstructured content in order to discover hidden models that identify terrorist or potentially delinquent (IBM, 2005).

Conclusions

The concept of knowledge cannot be represented anymore without considering the development of Internet and of Information Technology and Communications. The huge amount of documents in electronic format represents a most valuable source of knowledge for any domain of interest. Still, the fact that most of these documents are unstructured and written in free human language makes their processing a very challenging task. Therefore, the use of text mining methods and techniques for knowledge extraction from documents represents a prerequisite for all knowledge management systems, no matter the domain they belong to: business, education, medicine.

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ORGANIZATIONAL FLEXIBILITY AND COMPETITIVENESS IN THE KNOWLEDGE-BASED ECONOMY

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In the context of the knowledge-based economy, marked by increase moral depreciation of products, technologies, as well as of theoretical and applicative models, organizations need to show flexibility and to be permanently connected to change. This paper refers to the issue of organizational flexibility from a multiple perspective and presents relevant aspects regarding flexible organizations. Also the paper proposes a set of courses of action by which Romanian firms can obtain competitive advantages through flexibility and orientation towards change.
***Key-words**: organizational flexibility, strategic change, flexible organization, the knowledge-based economy, competitiveness.*

1. *Introduction*

In the knowledge-based economy, flexibility and orientation towards change represent important sources of the competitive advantage and also a fundamental premise for the organizations' accession to excellence. Flexibility basically reflects an organization's capacity of permanently adapting to the complex evolutions in the business environment.

The viable organizational system is the flexible one, which can favourably answer to any challenge of the external environment [7].

Managers and entrepreneurs from the modern firms have to identify, to analyze and evaluate in a Cartesian and systematic manner the main impact variables from the internal and external organizational environment. In order to maintain themselves in the economic and social efficiency area, firms have to manifest flexibility, to set up and adopt proactive strategies in business, which include processes of initiation and periodic implementation on adequate organizational changes.

It is essential that the managerial team designs organizational change considering the current and prospective market evolutions. Otherwise, the change implementation will only result in a temporary improvement and the organization will not reach the system of set out objectives and will undergo a continuing restructuring process [5].

Organizational flexibility and the manifestation of a pro-change attitude from managers, employees and the firm as a whole, call for some new systems, methods and managerial techniques to become operational, which would lead to achieving strategic objectives and, by default, to increased competitiveness. Managerial practices aim at the creation and development of some connections between human resources and organizational activities, as well as the establishment of some rules and principles to govern the firm's working processes.

Relevant aspects regarding the organizational flexibility and the strategic change are mentioned in a series of studies and representative papers recently published in specialized literature [1,2,3,4]. These studies reveal the major importance of organizational learning and of the human resources' complex motivation in increasing the firms' flexibility and in obtaining some long-term competitive advantages.

2. *Flexibility, Change and Organizational Equilibrium*

An essential premise of the organizational flexibility is represented by the products and processes' flexibility. The flexibility of a product comes from the number of ways it can be used in, while a process's flexibility is conferred by the number of possible configurations of adapting to the conditions of environment, to cost and to the necessary time for the change of the configuration.

The organizational flexibility represents a function of more variables which outcome from the firm's functional approach, namely: production flexibility, commercial flexibility, informational flexibility, research and development flexibility, organizational flexibility, human resources flexibility and geographical flexibility.

Approaching the flexibility from another perspective, Volberda [12] considers that four types of flexibility exist: conservative, operational, structural and strategic. The conservative flexibility resides in static procedures for optimizing the organization's performances providing that results are maintained constantly in time, the operational flexibility, the most frequently encountered, consists of a set of almost exclusively routine abilities, by which it is particularly aimed at the increase in activity level, structural

flexibility is aimed at background changes on an organizational and decision-making level, in view of adaptation to the external environment's evolution, while the strategic flexibility generates changes in the sphere of objectives and the incorporated activities, and is especially manifested when unique changes are made in the business environment. The strategic flexibility has two sides: qualitative and innovative.

Managerial flexibility is reflected in the content and manner of fulfilling the various forecast categories (prognoses, plans, programs etc.), as well as in the so-called "sliding planning", which ensure the harmonization of objectives and the continuity of strategic and tactical approaches, thus constituting a support for maintaining the organization in the competitive area.

A flexible organization periodically initiates and develops strategic changes. The organizational change corresponds to a new fundamental and radical orientation regarding the ways in which the firm is going to carry out its activity, of essential implications over all of its members' behaviour [8].

In the opinion of most management specialists the first step in initiating a strategic change is identifying the factors that have significantly influenced the firm's evolution. These factors are mainly related to the organization's environment, the organizational structure and management [11].

Like any other system an organization aims towards balance. A flexible organization is the one in which management creates and maintains a balanced combination between stability and change. In other words, organizational balance calls for proper proportionality between stability and change. Organizations need to adapt to the changes which occur in the external environment, maintaining also the guidelines of the business strategies it promotes.

3. *The Flexible Organization*

The flexible organization is the one that understands the essence of change.. The key-question that the management of a firm needs to answer is: "What is happening in the external environment and what we need to do in order to adapt?" [5].

In the specialized literature the concept of change-adept organization also appears, introduced by Rosabeth Moss Kanter, management professor at Harvard Business School [6]. The flexible organization is the one which anticipates, initiates and implements change. This type of organization approaches the changing process in a proactive mode, meaning that it takes the necessary steps to adapt to the evolutions of the business environment. The flexible organization treats organizational change as a phenomenon resulted from the interactions between economical, technological, social and political factors that act in the environment.

Motivating the human resources represents an important aspect. Employees need to be stimulated by the medium of motivational mechanisms in order to fulfil their tasks and understand the existing rapports between their own objectives and those of the firm [10]. To such end, it is necessary for the managerial team to design jobs in such way that the tasks, competencies and responsibilities related to such need to be congruent with the organization's new strategic orientation [9].

The flexible, change focused organization is by excellence a learning organization. In such an organization new thinking methods are developed and promoted, the human resources are permanently involved in the learning process in order to gain competencies and every experience is considered to be an opportunity to learn. In our opinion, investing in learning and getting the human resources involved in the continuing learning process represent fundamental coordinates of the flexible, change focused organization.

The flexible organization is focused towards the future and the managerial team's strategic vision is reflected in the human resource's behaviour, which need to manifest the same involvement in the current organizational problems, as well as in the change projects.

4. *Recommendations for Romanian Firms regarding the Growth of Organizational Flexibility and of Competitiveness*

At present, most of the Romanian firms do not manifest flexibility in business, and approach organizational change in a reactive mode, with managers and entrepreneurs resorting to implementing change projects only under the pressure of the environment evolutions. The activity of the human resources in these firms is almost exclusively connected to the present and the organizational behaviour is preponderantly a routine one, without being focused on innovation, creativity and change.

The main directions of action which Romanian firms can undertake in view of increasing the flexibility of processes and activities are, in our opinion, the following:

- designing and implementing some flexible organizational structures;
- creating and implementing an integrated system by strategic management;
- creating and developing evolutionary cultural models;
- continuing training of human resources;

The organizations in Romania need to manifest preoccupation towards creating and developing flexible organizational structures, which are able to rapidly adapt to the mutations of the internal and external organizational environment. Managers and entrepreneurs have to aim at identifying an optimal level of formalizing the organizational structures, namely designing and delimitating the structural components (jobs, functions, compartments etc.) consistent with specific features and extent of the

involved organizational processes, as well as with the endorsed strategic objectives.

The organizational structures recommended to the firms in Romania are the family owned organizational structure in the case of micro-enterprises, the hierarchical organizational structure in the case of micro-enterprises which are not family owned and for small firms which in terms of number of employees are similar to micro-enterprises, and the hierarchical-functional structure, in the case of large enterprises, medium and expanding small firms looking to enter the category of middle enterprises.

In order to be permanently connected to change, firms in Romania need to put into practice an integrated system of strategic management. In our opinion, Romanian firms may opt for a procedural model of strategic management structured into three stages: strategic planning, strategy launching or implementing and the strategy evaluation. Strategic planning includes three phases: diagnosis analysis, organizational change and strategy design. The sequence of these phases of strategic planning has to be viewed from a corollary and interdependent vision, meaning that the strategy gradually takes shape along the phases of diagnosis analysis and organizational strategic change. Based on the information achieved in the first two stages of the strategic planning, the trajectory to be followed by the organization in the next period is defined in the strategy design phase.

In order to reach and maintain operational excellence, Romanian firms need to promote evolutionary cultural models, focused on results and economical performance. Basically, an evolutionary organizational culture, focused on results and economical performance, is based on four main coordinates: accepting the necessary rhythm of change; human resources creativity used as basis for change; focusing the change efforts mainly on achieving strategic objectives; the organization as a whole manifesting a positive attitude towards change. Management needs to adopt politics that have as a source of inspiration the outstanding results of its own employees. Developing such a cultural model implies that the managers and Romanian entrepreneurs should treat with respect their human resources, to give them freedom of creation and sufficient autonomy, in order to excel.

The most important investment of a firm's management refers to the human resources segment because they posses an inexhaustible creative and developing potential. Furthermore, human resources have the ability to produce and properly combine all the other resources of the organization. In this context it is our belief that the continuing training of the human resources has to be in the foreground of the concerns of managers and entrepreneurs in the Romanian firms.

The continuing human resources' training has to be put across into a series of actions, among which we mention: the systematic enrichment of theoretical and practical knowledge from the specific activity area or related areas; the personnel re-qualification according to the requirements imposed by the changes occurred in the internal and external organizational environment; the attainment and improvement of economics, management, informatics etc. related knowledge.

In conclusion, we consider that the Romanian managers and entrepreneurs have an essential role in transforming the firms which they lead into flexible organizations, focused on change, whereas they create and implement the planned strategic change projects, while correlating the involved organizational variables and coordinating their interactions. A new mentality is necessary of the managers and entrepreneurs towards change, which has to be gradually induced to the employees, within the framework of an adequate cultural model, in order for such to pass from the situation of change acceptors to that of change initiators.

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USE OF COLLABORATIVE TOOLS AND SOCIAL NETWORKING APPLICATIONS FOR KNOWLEDGE MANAGEMENT INSIDE IT COMPANIES

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In this paper a presentation is given of how collaborative tools and social networking applications can be used inside IT companies. The field of IT was chosen for its particularities and the particularities of the companies in it. Driven by these singularities, IT companies are one of the early adopters of Knowledge Management and of the tools that help in adopting it. The paper ends with a case study of the iCamp project.
***Key Words**: Knowledge Managements, IT, Social Networks, Collaborative Tools*

Particularities of IT Companies

Knowledge Management is used in all kind of organizations, from public to private, from non-profit to for-profit and in any field. One of the fields that has embraced Knowledge Management very early on and on a wide scale is IT, and this is not arbitrary. IT companies have a series of singularities:

- small project success rate;
- great importance of the human capital;
- rapid evolution of the technology used by them.

In any IT project the human capital plays a considerable part. The knowledge possessed by the project team determines if the project will be a success or failure. This must not be underestimated. Studies like the CHAOS report by the Standish Group show that only around 30% of all IT project are completed on time and on budget [HART06]. Over the years the numbers have not improved, despite the progress of technology and management. The 2009 CHAOS report found a market decrease in project success rate, according to standishgroup.com. Among the factors that influence the success of IT project greatest influence is attributed to the human resource [MCCO96]. Besides all these, technology evolves at an astonishing pace and there is no sign of slowing down. For this very important resource, represented by the employees of IT companies, it is becoming increasingly difficult to keep up. All this dynamism, combined with the particularities of IT projects make it crucial for IT companies to have an well oiled, highly efficient system of training, acquiring and developing new skills, storing and passing along knowledge and learning from its own mistakes. With other words, Knowledge Management must be a part of any IT company's efforts.

Challenges IT Companies Face

Any IT company has to pay great attention to its human capital. IT workers are typical of Knowledge Management workers. They usually are highly educated, which is required in order to be able to keep up with the evolution of technology, and are harder to retain. If we look beyond the current situation given by the Credit Crisis, only a few months ago Romanian IT companies were looking at the fluctuation of its human capital as a real problem. When an IT worker leaves the company it takes far more than the workforce he bears. Every employee has an unquantifiable amount of knowledge and skills. Some were developed by training, others were previously acquired and some represent unique know-how of the company that may as well be the competitive advantage of the company. Being hard to say "Employee X has $Y worth of knowledge" [GOVE07] it's up to common sense to figure out which are the most valuable employees.

Fluctuation of personnel can be slowed by motivating the employees but it will never be stopped, therefore companies must assure themselves that:

- crucial knowledge and know-how is not concentrated in the hands of a few employees;
- training of employees must be an continuous seamless process, no matter of the level of experience;
- communication between teams must be very good to enable the dissipation of know-how and favor the creation of new knowledge;
- any acquired or existing knowledge must be stored and made available to any that may need it;
- analysis of lessons learned must be part of project.

To achieve this, companies must implement KM at all levels. In [SUNA03] is mentioned that there are three interlinked components that must be kept in mind:

- Knowledge Management of the Organization;
- Knowledge Management of the People;
- Knowledge Management of the Infrastructure and Processes.

Simply put, KM must be done at all levels, in order to be successful. There must be no beaurocratic hurdles in free communication and the top level management must encourage open communication. The correct corporate cultural must be in place and people must be encouraged to exchange knowledge. Tools that allow this communication must be available

to all. This paper focuses on the tools that are available

The Tools That Are Out There

Among all the tools that can be used for communication and exchange of knowledge lot o hype is generated by social networking applications. Not so long ago these were regarded as yet another type of tools that are getting their 15 minutes of fame. And this is understandable as most of the early users were teenagers. However, these tools have matured and it is now becoming evident that are excellent instruments for making connections. They took networking to a whole new level. There are many companies that already use such applications.

It is important to keep in mind that there is no silver bullet here. Social networks only act as communication channels and help at the creation of some the tacit knowledge [COST08]. Without encouraging their use as part of the corporate culture, these are useless. Another important aspect is to combine them with good collaborative tools like wiki's and blogs.

A lot can be learned from virtual communities, which are not tied by any bonds yet function efficiently. A good example is the tech scene. There are many good tech specialists, like programmers or administrators, journalists, enthusiast that are interested in the same subjects. Together they form an impressive community that talks about technology and exchanges knowledge. The connection between them is done through social networks, forums, chat rooms, but the knowledge ends up as articles on blogs and wikis.

Besides the dynamics of this groups and how they use the available tools it is important to see the drivers behind their actions. As many of the people that do it are not paid for their efforts, the drive is given by personal reasons which span from making ones name known in the field he works to satisfaction of the ego. Human resource specialist and the higher management must make use of the same drivers to give a boost to communication inside their company.

One question that arises is which tools must be used to achieve this and in what configuration. The answer is not simple and there is no unique pattern, every company being different in some way. There are a few principles that can guide a company:

p1. Use social networks as the backbone of all communication as these provide a proven, efficient method of making new connections and making each other known. The biggest professional social network is now LinkedIN.

p2. Make use of collaborative tools like wikis and forums, combined with the profile of the employees, to store and make accessible the acquired knowledge.

p3. Use tools that add a personal touch to the whole knowledge management process. Blogs are excellent tools for storing knowledge and starting a conversation. Another advantage is that being personal, blogs provide add a very important personal touch.

p4. Add any other communication device that works for the company. This can be Instant Messaging, chat clients like Mirc, ICQ, voice or video chat, micro blogging. As long as these enhance communication they are the right tools. Choose those tools which the employees would use for personal use too.

Information Overload and Productivity

As mentioned, these tools are not a silver bullet, furthermore overusing or misusing can have undesired consequences. A known fact about social networks is that they tend to create a lot of noise. Noise, in this context, is defined as vast amount of information, potentially interesting, but not useful at the given moment in time. This noise creates two major problems:

- it makes hard to filter through it to get to what is needed;
- provides a lot of distractions.

If not managed appropriately it can drive to information overload [PERE08]. In the same time there is great value even in the noise. By using simple techniques it is relatively easy to see trends and most discussed topics in real time.

There are still a great number of companies that are weary of adopting collaborative tools and social networking applications or granting access to their employees to public networks for fear of distracting them and having them face the problems of information overload. But as these tools mature and evolve so do the users. A recent study has shown that companies that allow the use of public social networks at work have more productive employees [KIRK09]. The study shows that many use them for work alongside their personal reasons. Encouraging the use inside the company makes employees much more eager to share their knowledge. A great example for this is Microsoft. When blogs first took off at the beginning of the 90', employees were discouraged to maintain a blog for feat that they would write about confidential projects or write negative articles about the company. When it became clear that it would be impossible to prevent employees from writing a blog, Microsoft accepted the situation and started encouraging their employees, guided by a somewhat general code of conduct, to maintain one. This evolved into a great professional network on which a great deal of information can be found.

The evolution of these tools cannot be separated from the evolution of the human abilities and perspective on the matter. An eloquent example is the evolution of the office space [KUAN09] as the attitude towards work changed. Same can be applied here. Companies must use the tools and adapt to the constant changes.

Case Study – iCamp

Recently the final report of the iCamp project [KIES09] was released. From their own website iCamp is "*a research and development project funded by the European Commission under the IST (Information Society Technology) program of FP6. The project aims at creating an infrastructure for collaboration and networking across systems, countries, and disciplines in Higher Education*".

What they did is they created geographically dispersed, multicultural teams and tried to connect them by using a very interesting mix of loosely coupled tools from social networking applications to blogs and IM clients. Although the project was aimed at developing a learning tool for the higher education, the goal is exchanging knowledge among diverse teams. Companies try to do almost the same, in order to be able to better achieve their strategies. What is important to take from this project, in the context of this paper is that

- it took a combination of tools to achieve the desired effect;
- a series of adjustments were needed before system was efficient.

This farther stresses out what it was said earlier, that each company must adopt and adapt those tools which suit best its culture and specifics.

Conclusion

IT companies have a series of particularities that make them pay special attention to Knowledge Management. On how well they manage their employees and the knowledge they posses depends the success of their projects. Effective knowledge management is achieved when there is a good communication infrastructure in place and the appropriate corporate culture. Using collaborative tools such as wikis alone does not yield the best results as these do not spark good communication, but more serve as a storage for knowledge. Social networking tools are becoming the tools of choice for creating the communication backbone. There is no one standard set of tools that can be used for knowledge management. Depending on the particularities of each company, the tools used may vary and with them the way these are used. Any tool used must not be regarded as a silver bullet solution that will work alone. The use of any tool must be done with the full support of the management that must encourage open communication and integration it in the corporate culture.

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SEMANTIC WEB BASED APPLICATION FOR KNOWLEDGE MANAGEMENT IN BUSINESS FLOWS

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This article presents the architecture of a framework designed to facilitate the interoperability between organizations based on knowledge management. The framework has four components: business flow design, rules developing, semantic networks and ontologies design, automated semantic web service composition. The latter, is based on fractals theory and agent supervision so that to determine the boundaries of the research environment and to enhance composition performance.
Key words: *semantic web, business, knowledge, interoperability, services, fractals*

Introduction

In order to survive in the present business environment marked by competitiveness and globalization, most managers are striving to change management strategies and business processes' organization so that they become product and customer oriented structures. In the context of dynamic business, maximizing and optimizing business performance is a critical requirement for profitability.

Nowadays, economic performance is attained by performing an efficient knowledge management, by increasing the level of interoperability and collaboration among enterprises and nevertheless by using the IT developments both hardware and software to automate these processes. For these reasons, terms such as virtual enterprise or activities' virtualization and also IT based knowledge management are frequently used [1].

Knowledge management can be defined as an approach, strategically targeted, so that to motivate the members of an organization to develop and use their cognitive capacities, sources of information, experience and abilities by subordinating their own objectives to the overall objectives. In the organizational environment, knowledge is derived from the information that is processed by those who have the capacity to effective action, by assimilation and mainstream understanding, followed by operationalizing the given contexts [2]. Through this paper we propose a software agent based solution's architecture for modeling business flow and enhancing the performance of knowledge management based on enterprise interoperability.

Framework architecture

The solution uses semantic networks, ontologies for structuring business rules and automated enterprise semantic annotated web services for modeling business flow and enhancing enterprises' ability to collaborate to each other.

The proposed architecture is composed of the following:

- a component for business flow design
- a component for developing business rules
- a component for developing semantic networks and ontologies
- a component for automated semantic annotated web service composition and discovery

The picture bellow presents the framework's architecture [3]:

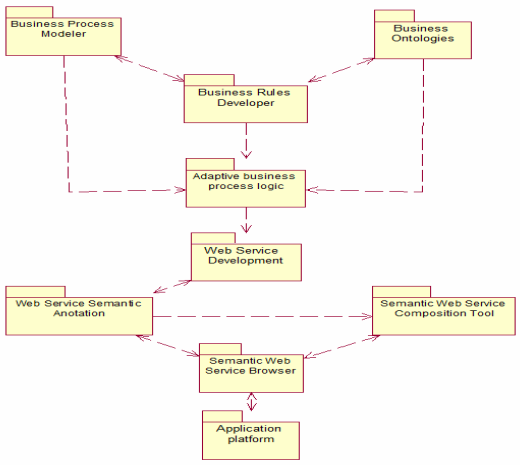

Fig 1*. Solution architecture*

Automated Semantic Web Service Composition Tool

The elements of novelty brought up by this solution refer to the automated semantic web serivices composition and discovery. This component facilitates the interoperability and cooperation between enterprises. While in the automatic composition of services, numerous research was carried on, there are still a lot of problems: lack of interaction with the user, the high complexity of composition and retrieval algorithms, consistency and accuracy of data input, etc.

[4] presents a model for dynamic and automatic composition of services including the following: a mechanism for services modeling, a mechanism for composing services based on graph theory and a hierarchical structure of services. Semantic description of services is useful in guiding their organization and retrieval for certain activities. Composition mechanisms based on graph theory are intended to combine existing services so that to achieve complex services. The hierarchical model is necessary to treat a number of challenges such as resource heterogeneity, mobility of users and resources, location services, etc.

The problems this solution faces refer to the amount of data. It does not implement a control module for search relevance related to requests.

Other problems facing the existing solutions concern that automatic composition tools that are not sufficiently developed to deal with situations in which some web services are not available or their descriptions are not sufficient to ensure retrieval (although that these services are available and can be composed).

Sometimes, determining the values of input parameters that are necessary to achieve desired results in an automatic manner is difficult, or impossible. Therefore, it is essential to have expert human intervention.

Current tools for composing services are unable to provide automatic control of a variety of problems that can occur when service composition to model complex business flows.

[5] proposes an approach for designing a tool for the composition of services based on identifying the users that are able to solve some problems that may occur when composing. This solution exploits the semantic metadata to annotate services and users' models. This idea also appears in paper [6] which describes a framework for composing interactive services. The tool called CAT (Composition Analysis Tool) assists users in achieving a set of calculations based on semantic description of services.

The problems facing these solutions refer particularly to dimensioning the search field for services.

The solution that we propose, aims to implement a component for the composition of semantic web services so that to determine the search space size and implementation of user interaction. This will be achieved by developing a semantic web browser and retrieval algorithms based on the fractal theory. The semantic web services composition would be "coordinated" by agents and "supervised" by experienced users.

The module for automatic composition of services will consist of two sub modules:

- one which will achieve and manage the inferences on which semantic services will be retrieved
- one that deals with achieving the composition itself

The retrieval sub-module will be attached to a knowledge database that will retain information on previous experience. It will also include algorithms for assessing the degree of semantic similarity. The automatic composition of semantic web services sub-module will also contain elements for user interaction.

The OWL-S service description can be converted into RDF and stored in the knowledge base. The rules for structuring information in OWL format and those for processing RDF triplets will also be stored in the knowledge database.

The composition of services is done according to the description stored in the knowledge database. If the services that are to be composed do not perfectly match, access will be restricted. On the other hand, if the mismatches between the two are minor, the user will be informed about it and should make the decision if the two services are to be composed or not.

The component in charge with retrieval will contain a semantic web services browser. The services will appear in a hierarchical form starting from those that assure the best match. In order to determine the "matching" degree between the two semantic networks that describe web services semantic similarity assessment algorithms will be implemented.

The retrieval of services will be "coordinated" by agents that will "review" and delimit the search space and move in this area.

The automatic service composition flow is represented in the picture below:

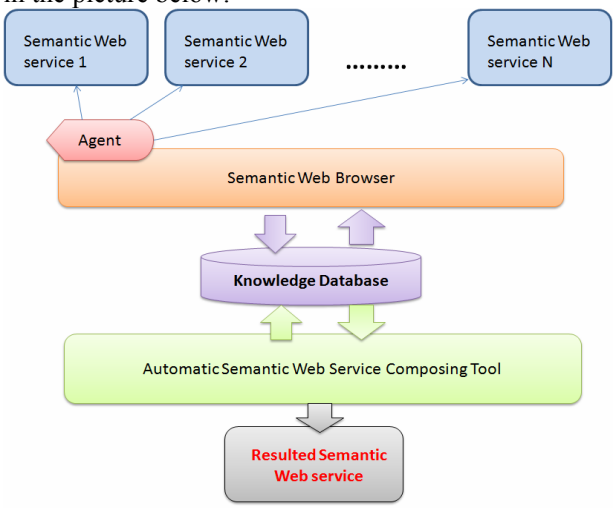

Fig. 2 *Automated Service Composition Flow*

In order to calculate the level of semantic relevance the fractal theory will be used.

According to [7], the web systems will be fractal and be composed of overlapping communities of all sizes. Each community will have its own ontologies but will also develop shared ontologies with communities it interacts with. Some basic ontologies will be used globally by all communities. Communication between agents either in the same or different community will contain terms from both global and local ontologies. The amount of data that

will be understood and reused by interacting agents will depend on how many communities they have in common and how many ontologies they share.

The fractal algorithms that we propose are designed, on one hand to determine semantics' level of depth and the relevance of the determined depth. For this, in the ontology structure a parameter for the importance (relevance) level that depends on the starting points (how far is the original meaning of the term in the semantic hierarchy) will be added. This parameter (distance) will be calculated on the one hand, as a distance in an *n*-dimensional space defined by the search word meanings and on the other hand in a statistical (probabilistic) way based on previous experiences (what is the most likely level to stop). This statistical approach infers the effect of previous behavior in creating a semantic border probabilistically determined. This two-angle approach gives a higher degree of significance to the level o relevance.

Future Work

In the future, we will develop the automated semantic web service composition tool according to the presented architecture and including the fractal based algorithms for determining the boundaries of the semantic search space, that is presently in work. Furthermore, we will test the implemented architecture in the business environment.

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KNOWLEDGE STRATEGIES TOOLS FOR MANAGING ENTERPRISE CRISIS

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The current economy is granting a widely interest to any activities involving knowledge. In the recent years, the number of the so-called knowledge-based organizations has reached a phenomenal rate of growth. Along with knowledge organizations, knowledge management started to play an important role in building the business strategy. Current paper identifies the knowledge gaps which threaten companies' existence and underlines some knowledge tools based on competency-models to mitigate these gaps. Some statistical measurements for quantifying the strategic impact of using such intelligent tools are also described.
Keywords: *knowledge, management, enterprises, crisis, competences*

1. Introduction

In the knowledge-based economy, management literature started to focus on the competencies of companies and especially on their internal resources, mostly on the intangible ones. From this particular category of intangible resource, knowledge is, without doubt, the most important one [1].

Now, if we are wondering how knowledge has been able to intervene in the predominantly industrial economy, characterized by land, capital and labour, we can identify two relevant ways of action: the development of the areas whose primary output is knowledge and of the areas involved in transmission and incorporation of knowledge into the output.

The new economy is granting a widely interest to so-called "knowledge society", to the employee who owns the knowledge, to the intellectual capital and to the learning organizations. Information society in which humankind is living is defined as a knowledge society and, at the same time, as a society of organizations. [2] Meanwhile, with the new economy, appears the idea of a new type of organization, a knowledge based organization, which is gaining more and more interest. In 1996, Grant conceptualized the "knowledge-based firm" and argued that the capability of integrating knowledge in a company is one of the key for success. [3] According to Liebowitz, "knowledge includes the set of facts and rules of thumb that experts may have acquired over many years of experience." [4]

In the recent years, the number of knowledge-based organizations has reached a phenomenal rate of growth. [5] Yahoo and Google are some edifying examples of knowledge-based organizations. The stock price and the market value of these companies are continually rising each year.

Zack [6] summarizes the main characteristics of a knowledge-based organization, characteristics that can offer a complete image of the firm's knowledge degree: process - mainly referring to knowledge creation and to practical application of the new knowledge, place - knowledge limits, purpose – knowledge strategy and perspective – regarding the knowledge oriented image of the company.

Along with the building and rising of knowledge organizations, knowledge management started to play an important role by transforming individual knowledge into organizational knowledge. For this purpose, knowledge management combines concepts from various disciplines like information technology, organizational behavior, human resources management and artificial intelligence. [4] One of the main goals of the knowledge management targets the improvement of business performance of a company. From this perspective, any knowledge management strategy must address three components [7]: the work processes or activities that create and leverage organizational knowledge, a technology infrastructure to support knowledge capture, transfer and use and a set of behavioral norms and practices that are essential to effective knowledge use (the so-called "organizational culture").

But, as Zack [6] says, "even a highly effective set of knowledge management processes does not guarantee that an organization will perform well or better than its competitors". Over the years, enterprise reality has demonstrated that the companies that succeeded were the ones that manage to rethink their knowledge management processes from their strategy point of view.

2. Knowledge Gaps - a Source for Enterprise Crisis

At present, enterprise crisis became one of the worst enemies of enterprise and it can be seen as an event which has threatened or will threat the organization and that may break out anytime and anywhere [8]. Some of enterprise crisis' characteristics which are responsible for its negative impact on company's efficiencies are the following: harmfulness, abruptness, complexity and dynamic tendency.

Believing that crisis has a life process as people do, many scholars tried to identify the periods of the crisis' "lifecycle". Fan and Chen developed in 2004

the "PPRR model" arguing that a lifecycle of crisis has four periods: prevention, preparation, response and recovery. Later on, Li and Wang [8] divided the crisis lifecycle into five periods (prevention period, outbreak period, treatment period, evaluation period, reconstruction period), and analyzed the required knowledge base for each of them.

Starting from these five periods, this paper analyzes the impact of the knowledge gaps on enterprise crisis' lifecycle and what a company needs to know to overcome a moment of crisis, as we will see in the paragraph 3.

First of all, we will define knowledge gaps as being "the difference between the enterprise's current capability and the capabilities required for knowledge management". [9] For each period of a crisis' lifecycle we can identify a gap: period 1 (prevention) - the gap regarding the knowledge acquisition and storage; period 2 (outbreak) - the gap concerning the environment knowledge, the new intellectual values, the symptoms information, the history information of crisis, etc; period 3 (treatment) - the gap regarding the process of taking a proper and right decision; period 4 (evaluation) – the gap concerning the professional knowledge needed to evaluate the performance of event handling; period 5 (reconstruction) – the gap regarding the responsibility assumed by each management department in reconstruction of the whole company.

According to the missing knowledge from each period, the time interval of crisis can be longer and the gravity of crisis can be higher.[10] That is the reason why we consider necessary to identify the knowledge needs of companies as early as possible, in order to avoid or to easy overcome a moment of economic instability.

3. Tools for Implementing Knowledge Strategies in Organizational Environment

Knowledge strategies are a "set of guidelines that shape the decisions that an organization makes regarding the acquisition, storage, manipulation and application of its knowledge base" [11] and can have multiple dimensions, as one can see in Figure 1.

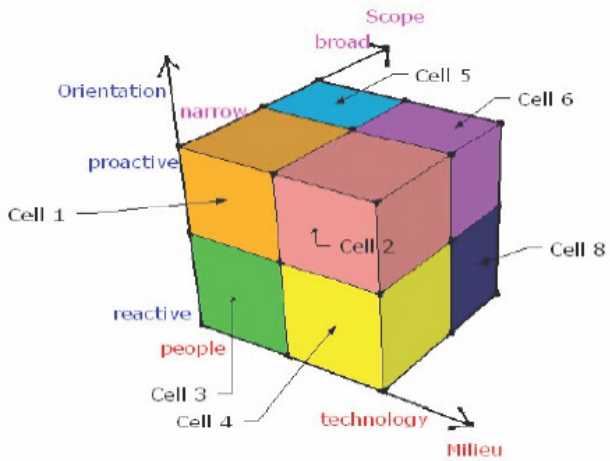

Figure 4. Kasten Model of Knowledge Strategy Dimensions [11]

Knowledge strategies are about creating the competitive advantage through the knowledge stored in products, people or processes. Studies of international best practices [12] determined that there are two directions in firm strategies which aim to maximize the returns on their knowledge asset: the first is to make better use of the knowledge which already exists and the second one is the creation of new knowledge from the existing one. Aligning the firm strategy to the knowledge gaps discovered in an organizational environment will lead to a considerable mitigation of the so-called enterprise crisis. In order to implement this, knowledge has to be mapped into manageable units.

Common ways of mapping people knowledge are the competency-based models. For strategic purposes, firms use systems or methodologies to manage individual professional competences or available worker knowledge. The intellectual capital managed in such a way is a part of the company's core business and competitive intelligence strategy. The competency-based models are able to identify in no-time any gap between required and available competencies in enterprise personnel. IT tools are the main ingredient in this identification process (Figure 2).

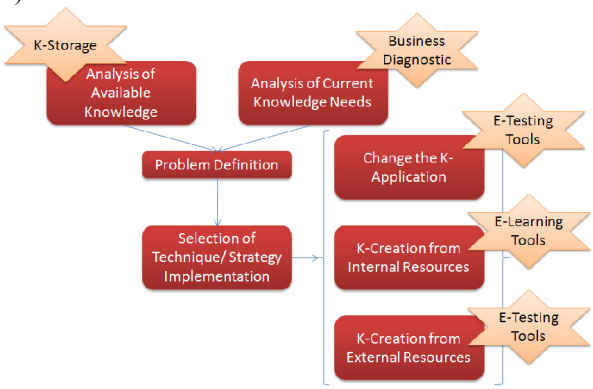

Figure 5. Enterprise K-Strategies Tools

For knowledge modeling in a more efficient way, it is recommended to store the knowledge in semantic networks [13]. If e-testing results prove that a certain employee has skills and competencies which aren't properly used, then that employee should receive tasks which will bring value both to his/her work and to organizational activities, in general ("Change the K-Application" phase from Figure 2). If business diagnostic processes bring to light the fact that certain competencies are required to overcome a company crisis, then these competencies can be created internally, by engaging employees into e-learning activities or externally, by recruiting new employees through e-testing tools.

4. A Statistical Measurement of the Impact of Knowledge Strategies Tools to Business Crisis

The benefits of inserting knowledge management components into the business processes were extensively listed so far [14]: greater process ownership, increased organizational knowledge

sharing, strengthened core competencies, improved standardization of tools and documents used to perform daily activities, but are they really useful in overcoming an enterprise crisis? What do numbers say? A questionnaire was developed for this purpose. The questionnaire contained three questions (see Table 1); each question had four possible answers and valued 33% from the final grade. The questionnaire was filled by 15 IT Romanian firms and tried to establish a relationship between the number of dismissed employees and the existence of knowledge strategies tools, in a six-month period.

Table 1. Questionnaire about KM Use in an IT Company

Question	Answers
Identify the number of k-strategies tools used in your organization during the last 6 months.	a)0; b)1;c)2;d)more than 2
How do you appreciate the importance of knowledge management to your business?	a)null; b)less than 25%;c)less than 50%;d)more than 50%
Will you invest in knowledge management systems in the near future?	a)I am not interested in KM systems; b)no; c)maybe; d)yes

The applied statistics (the ordinary least squares method was applied) proved a correlation of about 10% between the number of dismissed personnel and the use of knowledge management tools in business strategy. The dismissed personnel rate was calculated as a percent from the total number of employees in the considered period. The knowledge tools indicated to be valid were: e-testing tools, e-learning platforms, any IT system used to manage the personnel competences. Although the number of interrogated firms wasn't enough and the formula used to calculate the presence of knowledge strategies tools in the firm management systems wasn't highly elaborated, the final statistics shows a connection between a form of enterprise crisis and knowledge strategies tools.

5. Conclusions

Because knowledge is rapidly becoming a very important measure of the companies' performance it is therefore vital to use advanced tools for managing this intangible asset. Indictors and measures are more and more developed in order to allow upper management to handle this variable better. The questionnaire described in this paper proves that a link between knowledge management tools and enterprise crisis exists: it can be exploited to create a solid strategy for companies' development in today's economy. This article is a result of the project „Doctoral Program and PhD Students in the education research and innovation triangle", co-funded by European Social Fund through The Sectorial Operational Programme for Human Resources Development 2007-2013, and coordinated by The Bucharest University of Economics.

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THE GENERAL FRAMEWORK OF COMPETENCIES IN THE CONTEXT OF VIRTUAL ORGANIZATIONS

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It is widely accepted that one of the virtual organizations great advantages, is that the participating firms can join in larger and more complex projects in a more flexible and swift fashion than would be the case for an individual. The shaping of the VO's architecture in order to be able to react quickly to market demands as well as the immediate coordination of a number of partners requires not only flexibility but also predefined rules and roles. This is why I consider there is need of an analysis regarding the possibility of creating a general framework of competences. The result of this research includes a number of elements and processes that have influence on the general framework of competencies and proposes a topic for future evaluations.

***Key words**: virtual organization, competence management, contextual complexity, complexity of task.*

Introduction

The current circumstances (generated by the economic crisis) require an increased adaptability from the firms to market demand, as well as an efficient usage of available resources in hope that they shall survive on the market, and a possible solution to this might be operating within the virtual organizations (VO).

The primary characteristic of a virtual organization, according to (Jägers, Jansen & Steenbakkers 1998), is that the VO's operability is based on the pooling of the participant's core competencies or core activities. The more complex demands on the market which confront individual organizations can no longer be solved with lesser efforts, but in the case of a VO the participants complement each other, making it possible to complete a project collaboratively. Therefore, we can notice that, from every participant's perspective, their interest consists in getting the non critical competencies or activities from the other participants with which to achieve greater results.

Providing an increased dynamic of the VO's configuration is of particular importance. The VO must be capable of treating change as a natural process, not as an exception. This includes change of all kinds and at all levels, from alterations in the source network to changes of the VO's goals. At the same time, it must be able to treat exceptional alterations as easily as predictable ones. The flexibility of virtual organizations refers to the possibility of redefining goals, as well as to the quick and competitive reconfiguration of resources in order to offer a prompt response to the market's opportunities. Efficiency is determined by the flexible relations between the network's partners and by the fact that these relations could be fast to break.

Searching and qualification of feasible competences for constituting a VO, in a reasonably short time, is a key issue. Therefore, recent research has shown that the quick formation of such VO requires some kind of stable platform called "breeding environment". When configurating virtual enterprises, we must notice the great effort made during the initial stages in order to identify competences, to adapt them to the VO's specific features, as well as to provide an efficient interaction between these. This is why I consider there is need of an analysis regarding the possibility of creating a general framework of competences entailed by the management of a virtual organization by identifying the maximal standardization levels of the elements specific to their structure, without affecting the general efficiency and flexibility of the VO.

Theoretical background

Within the context of the virtual organization, it is essential for a firm to be able to identify its core competences and to connect them with the competences of other firms. (Gruber & Nöster 2005) highlighted that according to theory, "cooperation and concentration on core competencies are two complementary strategies regarded as a possible loophole from inflexibility and inefficiency". Virtual organizations have been proposed as an organizational form suitable to combine the two aspects.

The shaping of the VO's architecture in order to allow a quick reaction to market demands, as well as the immediate coordination of a number of partners requires not only flexibility but also predefined rules and roles. Thus, a first step was taken when a breeding environment was defined, representing a collaborative network made up of the co-opted firms or organizations and aiming at long-term cooperation. Each firm is represented by its own competences. Its purpose is to assure the readiness of companies to form a VO whenever a business opportunity occurs.

The concept of core competency was developed in the management field. C.K. Prahalad and Gary Hamel introduced the concept in a 1990 Harvard Business Review article entitled "The core competence of the corporation". They wrote that a core competency is "an area of specialized expertise that is the result of harmonizing complex streams of technology and work activity". Today, the term competence is generally accepted to encompass knowledge, skills (know-how), experience and habits related to a superior job performance.

It is well known that a greater diversity of the conditions of the environment wherein a system must

work shall generate an increased complexity level for the system requirements in order to ensure its adaptation to the environment's conditions. So, (Kokko, Vartiainen & Lönnblad 2007) have outlined two major factors that influence the complexity of the required competences: the complexity of tasks and the complexity of context.

The complexity of tasks is generated by the intellectual requirements and by the technical performances necessary in order to reach the goals, as well as by the interdependence of tasks. However, in order to outline the complexity of context, the following six features have been considered: location, mobility, time, temporariness, diversity and mode of interaction. The task complexity and the contextual complexity generate a set of particular requirements which eventually affect the performances of the value chain because these constitute a set of requirements for virtual team members. The more complex the context, the more developed intra-team processes, regulations, and competences are needed for successful communication and collaboration.

(Conklin 2009) considered that is a need of a competence mapping to ensure a good administration. He also proved that whenever a business opportunity occur an examination of completeness is needed. Completeness is the idea that all competences will be mapped to a task, and all tasks will be used in the mapping.

Each classic enterprise has a set of essential competences which define the main reason of its existence and its interest consist in getting the non critical competencies from the other participants. Therefore, the breeding environment must include the sum of competences necessary to the management of a VO, which leads to a need for competence management. (Balint & Kourouklis 1998) have came up with such a management and have structured it in four key activities: competence identification, competence development, competence leveraging and competence protection.

In order to facilitate the processes of identifying, assessing and developing new competencies across all domains (Aitken & Crawford 2002) has designed a generic framework of competency assessment. The results of this research included a general framework for competency assessment, development and selection in relation to a set of benchmarks which can be considered as tasks.

Practical approaches

(Katzy & Sung 2003), analyzing 30 projects from this domain, in order to identify the evolution of modeling approaches for managing virtual organizations, have concluded that when the effort for modeling will increase, the flexibility to change the models will decrease. Similarly, I have produced another analysis of 6 projects in this domain, in order to identify the way competences constitute and interconnect.

The St. Gallen Management Model has as main feature an important dynamic due to the great number of connections which come up between the members of the source network. The configuration of a virtual enterprise which has to answer an order is accomplished after negotiations, and as soon as all the necessary partners are identified, the activity will be managed by an order manager. This particular type of collaboration encourages competition, and the participants provide their competencies in various ways in order to gain a place. This makes it impossible to describe a referential model.

The fractal company concept has become known worldwide and is an excepted instrument to optimize the value chain within manufacturing companies. The fractal company suggests an organization in which the fractals act autonomously within their goals. The mechanism of dynamic structuring is based on the analysis of the fractals inter-relationing, while at the base of the fractal company we have the proper allocation of duties to the fractals. It must be said that a fractal doesn't represent just a part of a single company but that he is constituted through the contribution of several companies or subdivisions.

Another example of virtual enterprise is the project of KAO company regarding the centralized operability of several factories from different areas. The suggested model requires a centralized coordination of the entire route that a product follows from the beginning of the production process right up to the buyer. Thus, the following processes have been integrated: device management, production control, logistics and maintenance. It becomes quite clear that the model requires a hierarchy of the partners, and that the partners' competencies have been approached from the perspective of processes and resources.

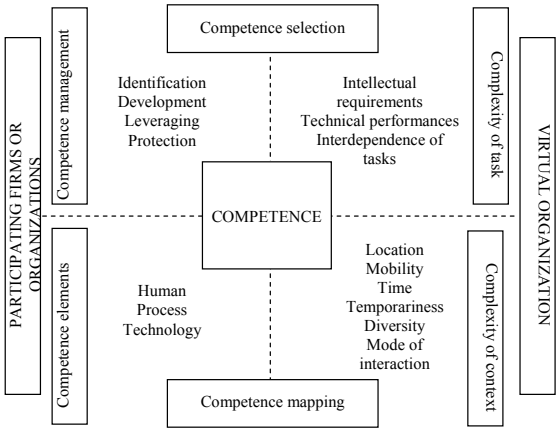
In the first stages of project Value System Designer (VSD), setting-up resources and processes from scratch has been attempted, but later on a series of other activities (such as engineering, testing, accreditation) have been identified, activities that could not be found in the original model but that were of great importance in order to provide the output. (Katzy & Dissel 2001) also noticed that these could not be integrated separately from resources and processes, which led to a change of attitude within the value system from resources to competencies. Competencies were developed within the individual companies as well as at the level of the network as a whole, and later on the role of the competency manager became of greater importance.

Generalised Enterprise Reference Architecture and Methodology – GERAM (IFIP-IFAC, 1999) uses a pragmatic approach for describing the components needed in all types of enterprise engineering/enterprise integration processes, by combining two perspectives: one based on product models and one based on business process design. Three categories of concepts have been used in order

to implement the methodology, and they have been classified as follows: human oriented concepts, process oriented concepts and technology oriented concepts.

Rosettanet, unlike any other models, features a high degree of standardization. The model has been applied in the domain of information technology, electronic components, and semiconductor manufacturing industries, while the acceptance of a new partner in the organization comes after a rigorous process of accreditation. The emphasis falls upon the collaboration interfaces between partners, with regard to the types of information that are transmitted, but it doesn't follow the internal processes specific to each partner. Thus, everyone has the freedom to organize his internal activity in the best possible way in order to correspond optimally to the imposed standards.

Identifying the general framework of competences



We can see that the general framework of competencies, as it is described in the figure above, is influenced by: the nature of constituents, the management operations, complexity of task and complexity of context. To be able to design a general framework it must be considered all the elements highlighted in the figure and identified interdependencies of these.

As a preliminary conclusion from the data I gathered and the analyses I produced is that, when the model's complexity increases the level of standardization for competences proportionally increases as well. Therefore, in order to validate the deduction, I shall formulate a set of hypotheses which shall constitute the topic of future evaluations and will concern the testing of the interdependences between the following elements: the nature of the competence, competence management activities, competence elements (human, process and technology) and the elements that generates the complexity of task and context.

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PROJECTS COMPETITION FOR PREPARING THE BUDGETS - A POSSIBLE SOLUTION FOR EASTERN EUROPEAN COUNTRIES

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The recent global financial crisis has affected seriously the public sector from all the countries and has determined the governments to search for short and medium term measures in order to tackle its effects. A serious preoccupation of the Eastern Europe countries represents the budget cuts in the public sector. Before this crisis, the budgets allocated in the public sector were generous and the main concern for the management was especially to spend the money. In this different context of a crisis, the experts consider to be important for these countries to continue the process regarding modernization of public administration and financial management.

Now, the governments from Eastern Europe are facing difficulties in procuring the necessary funds for public entities. Many activities, projects and programmes have been affected, being postponed or abandoned. But what is following? How to share fewer financial resources to an increasing demand of public entities? Obviously the old "budget based approach" in which "you get money if you succeed to spend it" is not appropriate any more, and has to be left apart.

One interesting solution for those questions above is to use a "results based approach" in which the government will ask for measuring outcomes and assessing efficiency of the financed activities.

This approach is not a new one. One of the budgetary principles[6] in the European Union is the Principle of sound financial management, which is defined by reference to the principles of economy, efficiency and effectiveness. According to that principle, verifiable objectives should be defined and then carefully monitored, using measurable performance indicators. Applying this principle will ensure transition from resource-based management to results-oriented management.

So, any public entity should first define for its functions, activities, processes relevant objectives and measurable performance indicators and ensure other necessary conditions to make comparisons between entities regarding outcomes and their efficiency. Based on these comparisons, the decisions factors will allocate funds to public entities, but demanding in return for specific outcomes and a certain level of efficiency. That approach will determine public entities to treat every activity, process, function as a project or programme, in which there is an input (including financial resources) and it is intended to achieve defined objectives in a determined period of time.

In this way, the budget of any public entity will be a sum of projects and programmes budgets. So, using project management in allocating the scarce budgetary resources in the public sector, the government will stimulate the management of public entities to fundament carefully his demands and also to monitor the outcomes compared with the programmed results.

This approach will ensure a high level of competition between public entities in order to obtain more funds for their budget. But, besides the competition in obtaining necessary funds, the entities will have to prove that they have met the objectives and the required level of efficiency. If one public entity fails to meet its objectives and the standard level of efficiency, will be penalised based on predefined criteria (for instance the management and the persons that didn't achieved the objectives will not receive a bonus).

The benefits of financing in the public sector projects and programmes rather than activities are the following:

– it is considered about an activity that is repeatedly performed ("a beaten path"), while a project is carried out only once;

– usually an activity in the public sector has a beginning but not a determined end, while a project has a beginning and a definite end (a deadline);

– every project has a clear objective while an activity can be only a part of a project;

– a project usually is intended to solve a problem identified in society or to meet the needs of a community (it has an impact), while an activity is

[6] Council Regulation No 1605/2002 of 25 June 2002 on the Financial Regulation (http://europa.eu/legislation_summaries/budget/l34015_en.htm);

structure oriented (for instance an entity could finance activities without any demand from society;

– key performance indicators are better defined for a project than for an activity;

– a project is a real challenge for a manager, while an activity can be boring for him;

– in a project the manager has to exert his specific attributes like planning, organizing, coordinating, control, while for an activity one of these are not mandatory.

"The results based approach" is not a new one for the public sector. Previous steps have been taken in this direction but only for isolate projects or programs. So, an entire budget based on competing projects or programs doesn't exist for the moment.

The main steps in this approach are the following:

1. establishing the organizations that apply this approach (ministries, agencies, other entities);
2. identifying the beneficiaries' problems and needs (community, society, organizations, persons), related to these organizations (the list of beneficiaries' demands);
3. setting priorities for these demands in every organization;
4. defining projects and programs;
5. setting objectives, targets, time and resources constraints, key performance indicators, results and benefits expected from the project;
6. project competition;
7. budget preparation process;
8. projects and programs implementation;
9. projects and programs evaluation;
10. taking measures and actions regarding project continuation.

In the first step it will be suitable to implement this approach for a few less important organizations, to identify the problems that could appear and to draw a feasible methodology. In step two will result a list of needs. Previous surveys have to be done in order to ensure that this list contain real needs of the people.

Three ore more levels regarding the outcomes are considered in the next step. Base level takes into consideration the minimum amount of outcomes necessary to be realized for a demand. Also, it will be considered a medium and a maximum level. Then, all demands will be prioritised starting with the most important.

In the fourth step, some important data regarding the projects are given (name, necessity, strategic objectives). In the next step, it will be given all the necessary data: strategic and operational objectives, targets, constraints regarding time and resources, key performance indicators, results and benefits that are expected from the project. The performance measures should ensure a comparison from one year to another and between different entities.

The competing step is the most important. In this step, all the projects are competing in order to obtain the necessary funds. There are many possibilities: the funds for a project could be allocated considering a certain level of outcomes (base, medium, maximum or between) and some projects could be postponed or abandoned. The criteria in making such decision are the levels of performance measures that a competitor engages to achieve. If the competitor comes with higher targets for the same amount of money than others, or with the same levels of performance but cheaper than others (or standards), he will obtain funds for the project according to the maximum level. At the same time, other competitors could be eliminated from this project or could obtain funds for the base level.

After this competition, the organizations will prepare the budgets according to the specific process. After budgets approval, the projects and programs will be implemented during the fiscal period. At certain moments of time, independent and objectives evaluation are carried out for the projects and programs. In this step, could be used internal auditors. In the last step, the results of these evaluations are analysed and measures are taking into consideration regarding project continuation.

In conclusion, this approach could represent a useful tool for Eastern Europe countries, by orienting the management perception on achieving the desired results and a high level of efficiency. Implementing and using this approach would be the one professional and practical way of "doing much more with less"

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KNOWLEDGE MANAGEMENT FOR BUSINESS ORIENTED FOREIGN LANGUAGE TEACHING AND LEARNING

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A research team from two universities and two IT companies took the challenge of developing a business foreign languages program implemented in a web environment, aiming the effectiveness of the communication in a working multicultural environment, using foreign languages. The online educational portal for applied foreign languages teaching and learning addressing the cross-cultural dimension represents the core of the Romanian academic research project (eMulticult), financed under the national Romanian research scheme (National Council for Project Management - Partnership Program). The present contribution summarizes the concepts and the methodology of the project, aiming at increasing professionals' adaptability to a specific corporate cultural environment in order to create conditions for openness, tolerance, harmony and cooperation in the working and social environment. The studies will end up in creating a knowledge portal for the development of adequate cultural attitudes and skills specific to a foreign language professional environment. The project develops a holistic approach for the design of a conceptual framework based on a web educational model for foreign language acquisition and the internalization of its cultural values and the implementation of the model in a virtual environment using an adequate pedagogical approach and complex training tools. The foreign language educational model makes reference to the Anderson's and Krathwohl's taxonomy, articulating it with the dimensions of the specific corporate culture. The web based paradigm and tools of the educational model will facilitate for the beneficiaries the online learning process.

The originality of this approach consists in the synergy among various views and models such as person oriented education, multicultural approach, use of the virtual environment for providing educational services. The portal integrates educational packages for individual beneficiaries, virtual classes, formal or informal educational networks, and the tools for e-content developing. The educational platform offers the premise for building the empathic attitude, through a deep understanding of the own cultural matrix and a greater permeability to the behavior and values of another cultural & organizational environment, increasing the degree of communication and integration at European level.

***Key words**: Foreign language teaching, cross-cultural approach, educational model, training engineering*

1. Foreign Languages and Cross-Cultural Approaches in the Global Knowledge Society

The idea of the project emerged in the context of the global knowledge economy where success depends more on knowledge, than on labor and capital. The increased globalization requires specific knowledge and skills for an efficient communication, i.e. foreign languages knowledge and intercultural dialogue abilities. The global economy enforces new interactions based on the intercultural approach and the use of the virtual space. The global markets and the increased external connectivity of the organizations, including the e-business processes implementation, involve the permanent international interactions and new partnerships development. The challenges of the global knowledge economy (the spread of the multinational corporations, the technological revolution, the innovation and creativity oriented processes, the free movement of human resources) lead inevitably to new approaches to business and international relations, based on cross-cultural communication skills in the human and professional relationship.

The actual global knowledge economy relies mostly on the capacity of the organizations to produce knowledge products and services. The core of the progress in the new context is represented by the knowledge workers, and their capacity to generate good ideas and innovative solutions. "The knowledge workers require a great deal of formal education and the ability to acquire and to apply theoretical and analytical knowledge. They require a different approach to work and a different mind-set. Above all, they require a habit of continuous learning [Drucker P., 1994]." The potential of the knowledge workers will be multiplied through an adequate team working environment and efficient communication within a multicultural working community. Consequently, the major needs of the actual global economy are represented by knowledge, acquired through an almost continuous learning process, and the efficient communication skills, avoiding the ambiguity of different interpretation, due to different sets of cultural values. According to these major requirements, the plurilinguism and the intercultural sensitivity represent conditions for an increased accessibility to education and training, and for a better adaptability to a specific social and organizational environment, dominated by intercultural interactions. The foreign languages knowledge represents a premise for the efficient social and organizational communication, and the accessibility to various information resources and services provided by the global market.

In this perspective, the knowledge workers are confronted simultaneously with the need of participating to the learning process and the lack of

time, for investing in education. According to this specific situation, a major training re-engineering process is started, aiming at redefining the e-learning paradigms in terms of the multicultural approach, increased flexibility and instrumentality. The actual e-learning models are more individual centered, addressing the trainees' needs and allowing the individual training path definition. In the same time, the e-learning process is open and universally accessible. The increased accessibility raises some new issues: the language for the communication, which could be different comparing to the trainee's native one (frequently the e-learning programs are delivered in English or maximum 2-3 other languages) and the specific cultural context. The issues addressing the cultural context involve a multidimensional approach, i.e. the trainee's cultural set of values, the cultural dimension of the training program revealed through the e-learning/ education model implemented, the specific cultural context of the knowledge delivered through the training program.

The transition of the European Union economy to the knowledge-based society, relying on a wide cooperation, and increasing the investments in human capital, involves the restructuring of the socio-economic processes, in order to ensure an increased competitiveness and the accessibility to the global market. These goals of the European growth strategy have to be reached by the year 2010, which represents also the deadline for the i2010 Initiative, promoting the transition to the e-society dominated by the production of digital information and the various online services, which replace the traditional transactions and interactions.

In order to support the knowledge workers needs and the approach of the European Union, the eMulticult project, through its approach, models and tools developed, focuses on the foreign languages training and the cross-cultural skills developing, increasing the capacity of the people to cope with the challenges of the global knowledge economy.

2. Foreign Languages and Intercultural Communication in Business

The first phase of the project focused on the development of the conceptual educational model for the business foreign languages training. The proposed model, based on the conception of Ulla Lundgren (Lundgren U., 2004) which integrates three areas of competences, introduces an additional view, related to the organizational culture, as it is illustrated in the figure 1. The four perspectives of this model integrate communication skills in a foreign language, cultural competences specific to the foreign language, intercultural competences facilitating the natural behavior in the cultural environment of the foreign language, and the organizational communication competences, representing the ability to have an efficient interaction in an organizational culture, where the foreign language learned is the official language of the organization. The eMulticult model is translated in a reference framework of the needed competences to be acquired during the training process. This reference framework is built as a matrix facilitating the identification of the specific competences according to the conceptual model: communication competences representing the capacity to use the mother and foreign language (listening, reading, speaking, writing); cultural competences representing the general cultural behavior, ideas, perceptions, art, belief, literature history etc; intercultural competences representing the adaptability, tolerance, empathy, flexibility, cultural identity, social constructivism and organizational communication competences representing the capacity to recognize and use organizational patterns, communication stereotypes and procedures, according to a specific organizational culture.

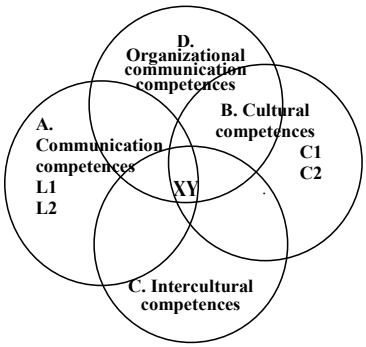

Figure 1 – Conceptual model for foreign languages learning and the development of the intercultural communication competences

The foreign language knowledge, the cultural knowledge and the organizational culture knowledge are compared with the trainee's own language and set of values, facilitating the development of a natural behavior and a mutual understanding. The conceptual model presented is articulated with the Bloom's taxonomy of cognitive development and the Krathwohl's taxonomy of the affective domain (Bloom 1956; Anderson, 2001; Krathwohl 2005), in synergy with a pragmatic perspective. The conceptual framework developed creates the connectivity among the knowledge related to the foreign language, its cultural context and the organizational culture dominated by the business model agreed by the owners of the company. The holistic approach is structured on various levels and facilitates the training

engineering process aiming at structuring the virtual learning units.

3. Training Engineering for Business oriented Foreign Languages Teaching

The implementation of the educational model involves the integration of the pedagogical dimension, reflecting the specific goal of the project. The pedagogical structure of the educational model articulates the multiple levels of the cognitive dimensions, from knowledge acquisition to evaluation and knowledge development. The generic pedagogical approach includes a socio-constructivism perspective and new pedagogical tactics, which stimulate the capacity of the trainee to efficient solve new problems and to have the adequate reaction in a new cultural and organizational environment. This pedagogical approach oriented to a virtual implementation of the educational model, supports the development of various scenarios combining the pedagogical strategies (instructionalism, socio-constructivism, colaborative learning, learning by project and by project etc.) and tactics (exercises, simulations, games, problem solving, brain storming, project developing, innovative solutions finding etc.) with technologies (multimedia, hypermedia/hypertext, virtual environment, synchronous/asynchronous interaction, virtual classrooms etc.), learning types (attitudes, facts, concepts etc.), education formats (lecture, tutorial, independent learning, distance learning, face to face learning, small/large groups etc.). The pedagogical approach implemented in a virtual environment integrates the collaborative learning based on a specific topic, and the independent learning based on professional e-content (e-books, interactive games, articles, various external digital resources etc.). The knowledge portal will provide also the framework for the development of the learning community and advanced learning interfaces supporting both individual and group interactions (Byram, 2003), by integrating various collaborative tools, in order to offer the possibilities to the students of sharing their experience in a multicultural environment and to help them to find the appropriate solutions and attitudes in a simulated context.

Though, according to the main goal of the project, its core will be represented by the development of the virtual educational portal including tools for: the teaching management; the development and management of the standardized digital content; the semantically structured knowledge data base management; the interactive dissemination of knowledge; the virtual collaborative environments design, ensuring information exchange between trainees, trainers, researchers, practitioners. The portal provides dialogue and communication tools for the management of various resources and services shared by all the actors interested in the educational processes. The virtual environment will contribute to the development of a learning community, facilitating the collaborative processes oriented to the problem solving and new ideas and knowledge creation, as a result of the brain storming sessions, debates and projects development. The pedagogical model, including various tactics and tools stimulates the cognitive and affective processes, leading to the internalization of the new values and knowledge acquired and to the development of a natural behavior, according to the new cultural environment. The success of the e-learning process relies on the quality of the digital content and of the online services provided. The structure of the e-content is based on the hierarchy: course – module – learning unit (lesson) – learning object. The e-content generic architecture developed to design a learning unit contains various learning objects, some of them grouped in large objects collections, other independent. The most of the learning objects and learning objects collections are re-usable, being accessed in the context of other learning units. The e-content will be in accordance with the learning objectives for each learning unit, using various tools such as hypertext, multimedia presentations, interactive games and exercises, collaborative work, self-assessment instruments.

The portal will support various actors' interactions, such as: student to e-content, student to student, student to professor, student to tutor, professor to e-content, tutor to e-content, professor to professor, professor to tutor, tutor to tutor, professor to researcher, student to researcher, tutor to researcher, student to practitioner, tutor to practitioner, professor to practitioner, practitioner to e-content, researcher to e-content, practitioner to researcher, practitioner to practitioner, and other possible interactions depending on the interests of the potential actors. In order to increase the visibility and the usability of the educational portal, the access to the information and online services provided by the educational portal will be free for consumers and producers of digital content.

The educational portal will integrate various resources (courses, studies, scientific papers, comments etc) and online services (online surveys, online meetings, fora, e-mail, online debates and brainstorming sessions on various educational and intercultural topics etc.). The interaction of the student with the digital content will be specific for each educational path, designed by the student himself. The student will access the specific resources of one learning unit and also the shared learning objects accessible at the course/module level. The portal supports the students' asynchronous interaction with colleagues, professors, tutors, researchers and practitioners. Each course will benefit from two virtual classrooms/meetings, providing synchronous interaction between students and professor/tutor. One of the most important resources of the portal is represented by the e-learning courses for the foreign language training and the development of intercultural skills.

The generic architecture of a learning unit for the foreign language training (figure 2, Annex) is designed according to the educational model, the competence reference framework, the pedagogical approach and it is implemented in a virtual environment. The designed structure will be implemented for various foreign language courses structured on business area topics: corporate culture (corporate identity and design, corporate communication, corporate behaviour, corporate philosophy), time management, product management, foundation of a firm/company, organization of an enterprise, working hours, brand and advertising, trade fair/ exhibition, banking, business lunch, documents management in a company, waste management in a company. These topics will be presented in different languages (English, German, Spanish), including the specific approach and will include a comparison approach to the Romanian cultural dimension. In the second phase of the project the generic architecture of the learning unit was tested by developing a pilot e-content unit for the English and English-American languages. The tests on the pilot unit will contribute to the refinement of the model and to the improvement of the quality of the e-content and digital services provided by the educational portal in order to maximize the cognitive and affective sides of the learning units. Some additional functions of the portal will be represented by the knowledge creation and the intercultural dialogue mediation. The portal will have also the role to promote and implement the best practices, and the innovative experiences and solutions. In order to achieve this goal, the educational portal will be connected to relevant educational and research national and international networks.

5. CONCLUSIONS

The eMulticult project aims at increasing the social inclusion and mobility of the professionals through various provisions in business oriented foreign languages and intercultural skills. The portal promotes a democratic education approach bearing in mind the mother tongues, the languages of the minority or marginalized linguistic communities, immigrants' languages, early study of foreign languages, the development of a plurilinguism that would facilitate the access to international relations. The designed educational model emphasizes on treating the learners as problem-solving persons, by involving them in real-life situations and supporting the collaboration for problem solving. The portal provides also the assessment and testing tools for a self-evaluation and for the final certification, tracking the progress of the individual educational progress. The portal encourages also the wide participation and contribution, concerning the production of the digital content and the intercultural dialogue.

The innovative approach of the project consists in using the virtual environment and the digital content for foreign language knowledge improvement, mentality & attitudes changing, and tolerant behavior development, as main premises for a good social and individual communication and living.

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ANNEX

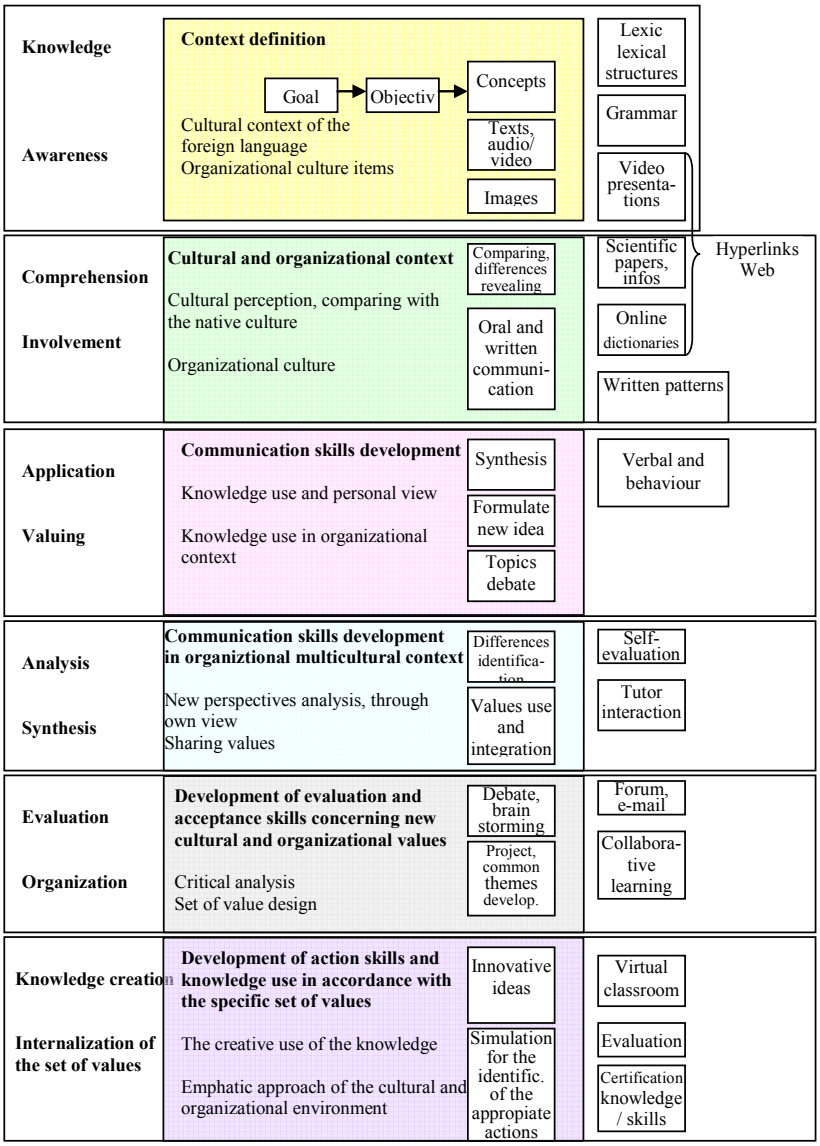

Figure 2 – Generic architecture for a learning unit

REGIONAL DATA AND KNOWLEDGE MANAGEMENT FOR THE DESIGN OF NEW E-GOVERNMENT SERVICES

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The paper introduces an innovative approach related to the sustainable regional strategy design and implementation, suggesting the process re-engineering according to the new knowledge management and citizen-oriented governance paradigm. The solutions proposed rely on the potential of the information and communication technologies (ICT) for knowledge management, inclusion, democracy and development, and represent the results of a Romanian research project: "Knowledge management architecture in environmental, social and economic areas, designed to support the sustainable regional development strategy", financed under the national research budget (Research and Development National Program – Ideas, National Council for Research and Higher Education).
The research was structured in three main steps: the first step was oriented to the identification of the main characteristics of the regional strategy design process, the second step focused on the critical analysis of the existing procedures in order to identify the strengths and the weakness of the process and to propose improved solutions, and the third one consists in the ICT-led process re-engineering. The first phase of the project involves desk research, direct observations, carrying out specific surveys in the framework of the strategy development in the Bucharest-Ilfov region. The SWOT analysis of the actual strategy design process emphasized the specific needed improvements of the process, especially a deeper analysis using various sustainable development models and benchmarking. Other important issue is represented by the lack of the citizens' involvement in the consultative and decision making processes. The proposed solution of the process re-engineering involves the use of specific ICT tools integrated in a virtual regional platform aiming at offering a complete and realistic picture of the region and collecting the regional stakeholders' opinions concerning the strategic regional development priorities.
***Key words**: regional knowledge management, e-Government, e-Consultation, e-Participation, sustainable regional strategy*

1. The Romanian state of the art related to the sustainable regional strategy design

The major challenge for the reform of the public administration is making government services more efficient and user friendly, as well as accelerating the transition of the public administration to the knowledge society, consisting in the use of advanced e-Government services, not only for reducing the bureaucracy, but also for increasing the transparency and democratic engagement. The fulfillment of this ambitious goal involves a complex process for translating the research results and advanced knowledge into practical applications, which enables transformational changes based on technology, as mentioned at the Ministerial Conference in Lisbon, 2007 (***, 2007). Beyond the intensive knowledge use and technological approach, the e-Government involves also advanced and efficient interaction with the citizens and various entities accessing public services and information. Simultaneously, through various e-Knowledge and e-Practice tools, the public administration could develop knowledge bases used for enhancing its services and especially for the design and implementation of the regional strategy. According to this new perspective, tools such as: e-Consultation, e-Participation and e-Voting services, facilitate the development of the regional actors' pro-active and participative behavior in relation with the local government and in the framework of local policies design, approval and implementation.

The research contextualizes the challenges for Romania, taking into consideration the specific situation of the transition from a centralized to a decentralized governmental system. The research took also into consideration the priorities stated in the e-Romania strategy, which creates the framework for the development and integration of the e-Government services (*** 2009b). The actual Romanian legislation creates the frame for the design of the regional development strategy, taking into consideration the European Cohesion Policy, the main challenges of the decentralization and the new created Romanian territorial structures (the eight development regions). The institutional infrastructure for the new territorial units is represented by the eight regional development agencies, non-governmental entities, providing public services and cooperating with the public local and central administration (*** 2004d). This new institutional infrastructure and the challenges of becoming a member of the European Union lead to important changes involving a wide re-engineering process. The public administration has the responsibility for the design of the regional strategy, as a participative and iterative process. The desk research and the observation phase of the process took into consideration the period between 2004 and 2007, dedicated to the design of the regional strategy for the period 2007-2013. The results stress the limited role of the regional partnership, which, according to the actual legislation and procedures (*** 2004a, 2004b, 2004c, 2004d), is reduced to the debates organized during the consultative phase, without any participation to the decisional process. In addition, the participation of the citizens in the process of the regional strategy design and approval is not stipulated in the actual procedures and laws. As stipulated in the legislative framework, the regional strategy design is an inter-institutional process, involving various entities during the consultative phase. The decisional phase is also an institutional process integrating the

views of various entities' representatives. The coordination of the regional strategy design represents the responsibility of the Regional Development Council (RDC), the main decisional actor at the regional level. The RDC integrates representatives of various public administration entities for the consultative and decisional processes, coordinates the activity of the regional development agencies (RDA) and validates the final version of the strategy, designed in the regional partnership developed by the RDA, under the coordination of the Committee for the Design of the Regional Strategy (CDRS). A key role plays the National Institute for Statistics (NIS), providing the main information for a quantitative analysis. Using the secondary data, the RDA calculates various indicators and compares the situation of the region with other Romanian regions or other similar European regions. The results of the benchmarking and the specific regional characteristics represent the inputs for the SWOT analysis, which provides the frame for the objectives and priorities identification. The RDC has the responsibility for the approval of the regional strategy, which will be articulated with other sectoral perspectives, leading to the elaboration of the Regional Development Plan (RDP), including concrete measures for the implementation of the strategy and providing the adequate financial means. The Ministry for the Regional Development and Housing (MRDH) has the responsibility for the design of the RDP, integrating the regional strategic frames and which represents the main input for the National Development Plan (NDP), under the coordination of the Inter-institutional Committee for the National Plan (ICP), acting under the direct supervision of the Ministry of Finance (MF).

In addition, the specific analysis undertaken regarding the experience of the Bucharest-Ilfov region identified other significant issues concerning the lack of the involvement of the citizens and the limited participation of the organizations, during the public debates. Other significant weakness is represented by the limited use of the ICT during the iterative process. The majority of the data are unstructured, stored as various files, and not organized in data bases, which makes difficult the access to specific information, according to the interest of each stakeholder. Accordingly, the research team's challenges were to find appropriate solutions for ensuring the open access to the information and creating the framework for the regional actors' participation, including the citizens, to the regional planning process, aiming at increasing the capacity of the local administration factors to reach tangible and appropriate decisions, in a democratic-centric approach.

2. Regional survey related to the citizens' interest concerning the Bucharest-Ilfov regional strategy design

In order to refine the results of the research, a survey was organized in the Bucharest-Ilfov region, aiming at identifying the perception of the citizens related to the regional strategy design as a collaborative process. The process of the design of the regional strategy was conducted during 2005-2007, and the interviews were organized in February-March 2008. The main objective of the pilot survey is represented by the identification of the citizens' interest and wiliness to participate to the regional strategy design process. The main hypothesis of the survey are: (1) the majority of the inhabitants of the Bucharest-Ilfov region are not informed about the process of the regional strategy design; (2) the majority of the inhabitants of the Bucharest-Ilfov region would like to be involved in the process of the regional strategy design. The survey used a framed questionnaire built on the objectives mentioned above, containing clearly formulated questions. The majority of the questions are closed, not leaving any room for personal subjective interpretation.

Aiming at conclusive results, a heterogeneous sample was random selected including a diversity of profiles, concerning the age, education, profession, ocupation and socio-economic status. The sample was represented by 152 persons, all residents of the Bucharest-Ilfov region (126 persons from Bucharest – 84% and 26 from Ilfov – 16%). The distribution of the sample related to the age reveales that the majority of the respondents were under 45 years , i.e. 90% (30% belongs to the group 18 – 25 years old; 25,3% belongs to the group 26 – 35 years old and 30,7% belongs to the group 36 - 45 years old) and only 10% belongs to the group of 46 to 60 years old. The analysis of the sample emphasizes also that the majority of the respondents were high qualified from the point of view of the education level and the professional status. The majority of the persons participating in the survey are graduated (64,7%) and the rest of the people (35,3%) had attended the upper secondary education. The respondents' domains of the activity demonstrate the involvement of the majority of the persons in important socio-economic areas.

The centralized results to the main questions are illustrated in the table 1 (Annex). The analysis of the answers to the main questions confirmed the hypothesis of the survey, demonstrating that the majority of the citizens of the Bucharest-Ilfov region was not involved in the process of the strategy design (93.3%) and even had no information about the strategy and the process (84.7%). In the same time, the respondents were interested to have information about the regional strategy (88%) and also to be involved in the design process (64%). The 10 persons involved in the regional strategy design (6.7%), acted as representatives of the public administration (7 persons – 4.7%) and NGOs (3 persons – 2%). Nobody declared the involvement as simple citizen, which confirmed the initial hypothesis (1). In addition, the respondents also confirmed the utility of the virtual platform for the information delivery and for the processes of consultation and deliberation: 53%

considered the virtual platform very useful, 39% appreciated it as useful, and only 8% considered this tool not so useful. These results demonstrate the great sensitivity of the inhabitants of the Bucharest-Ilfov region to the new web technologies, creating the favourable premises for the web based two ways interactivity between citizens and public administration.

The survey demonstrates the citizens' increasingly demand to be informed and to take part in decision-making processes, confirming the initial hypothesis (2). Beyond these conclusions, the survey reveals also the need of tools and mechanism to increase the accessibility to public information and to provide the opportunity of an effective public engagement.

3. Virtual regional platform supporting the e-Participation process to the regional strategy design

In line with the European framework, the Romanian procedure for the strategy design includes the participation of various actors in a formal or informal way in order to support decision-making for public policy purposes at any stage of the policy lifecycle (Smith, 2009). According to the results of the desk research, investigation of the regional strategy design process and of the pilot survey, the solution proposed, i.e. a virtual regional platform supporting the participation of the citizens to the regional strategy design, could offer a balanced approach of the decision making process and the public engagement of the citizens. The openness of the public administration (Lenk, K., 1999) and the extended use of the ICT tools, namely the Internet, increase the opportunities of creating interactive space between citizens and political actors (Tomkova, J., 2009). Simultaneously, the observers of the European e-Consultation processes noticed that the citizens' initiatives "have been poorly and arbitrarily integrated in the respective policies they intend to inform" (Tomkova, J., 2009).

Though the e-Consultation process represents a popular approach for the active civic engagement in policy making, in Bucharest-Ilfov region there are no such tools already implemented. Consequently, the research team focused on the development of regional e-Knowledge, e-Consultation and e-Voting tools representing new e-Government services for supporting the interactivity between citizens and local government. The stimulation of the public engagement relies first of all on basic principles (***, 2009a), consisting in: taking into consideration the real needs of the regional actors, promoting a culture of sustained engagement, increasing the inclusion and the demographic diversity, supporting and encouraging the wide participation, creating an open, transparent and learning environment based on trust, ensuring a real impact of the participatory efforts. In addition, the attractiveness of the virtual environment and its flexibility, due to the synchronous and asynchronous interactions, has a major contribution to increase the interactivity between citizens and local administration. Another critical issue is represented by the capability of the stakeholders to be involved as contributors to the strategy design. The regional stakeholders' expertise and other sources for data and knowledge could be integrated offering a realistic and accurate perspective for the regional development. The virtual regional platform, as a driver for regional knowledge management, integrates various functions, such as: acquisition of information and knowledge related to the sustainable development of the region, data presentation and interpretation, benchmarking and scenarious concerning the actual picture of the region and its future development trends. The new e-Knowledge services tools integrated in the regional platform represent a new generation of e-Government services, which provide the opportunity of creating a regional knowledge base and advanced interfaces for a more refined and holistic understanding of the opportunities and constraints of the development, as well as ensuring the infrastructure for the inclusive and democratic process of designing and implementing the regional sustainable strategy. The focus on the design of the knowledge base is represented by the selection of new sets of indicators and models for a better characterization of the human development, in a balanced environmental-social-economic approach, using various existing indexes: Human Development Index, Regional Innovation Performance Index, Environmental Performance Index, Lisbon Index, Sustainable Society Index, as it is presented in the table 2 (Annex). The scientific approach and the implementation of the models, using specific data for the Bucharest-Ilfov region and statistical tools, represent the guaranty of the knowledge based process of the design of the sustainable regional strategy. The proposed sustainable indexes and models, the data analysis results and the interpretation of the data will contribute to the design of various analysis and scenarious, as embedded knowledge, representing important tools for the decisional process of the identification of the objectives and priorities for the regional development on medium- and long-term.

The collaborative environment provided by the virtual platform, such as forum and virtual debates, will support also the wide interactions among specialists, citizens and local government representatives on a realistic and scientific base. As the European Commission emphasizes, "the discussion forums need to be better run and followed-up" (European Commission, 2007), in order to increase the effectiveness of the two-ways communication with the citizens. The various surveys and e-Consultations sessions will ensure the synergy between the quantitative and the qualitative views related to the perspectives of the regional development. For this purpose, the participants are invited to fill in various sets of questionnaires, according to their perception and satisfaction

regarding their own life, the regional environment, the social and economic context. The results of the surveys are automatically processed and the centralized data with their interpretation are available for the regional stakeholders, representing the qualitative information for the strategy design process. Beside the formal interaction through various surveys, the citizens have the opportunity to participate also in an informal way, contributing with suggestions to the debates and consultation process. In this case, the importance of the citizens as major contributors will increase and it is obvious that the decision-makers will be more sensitive to the outcomes of the e-Consultation process. This approach ensures a more accurate ex-ante evaluation of the regional strategy, increasing the quality of the process and of the outcomes provided. This advanced view is part of the public administration reform, having as main goal to reduce the gap between the public administration and the regional actors related to local development and the transition to the e-Government. The main online channels of the regional platform and the specific stakeholders' interactions are presented in the figure 1 (Annex).

An important step after the e-Consultation and the virtual debates could be the e-Voting phase for selecting the objectives and priorities identified and even validating the final version of the regional strategy. In this case, the citizens, with their opinions and views are integrated, not only in the design process of the strategy, but also in the final phase of its approval. The participative process ensures the accuracy of the analysis and the consensus building related to the future development of the region, and, accordingly, represents a guaranty for the further involvement of the regional stakeholders during the implementation process. This approach increases the transparency of the process of the regional strategy design and implementation, which stands for main goal of the European Union (Winter, 2000).

The generic structure of the e-region platform including the e-Participation tools is illustrated in the figure 2 (Annex). The structure of the pilot platform contains two major areas: the public information area and the e-Participation area. Each section is detailed according to the specific topic, containing maximum 4 levels. After the testing period of the e-region platform, its structure will be improved accordingly to the suggestions received.

The e-Participation approach "offers citizens a greater share in political discourse and the ability to contribute with their own ideas, suggestions, and requests" (Scherer, S., 2009). The citizens have the opportunity to become contributors to the regional strategy design, including their expertise and perception into the regional intellectual capital and the local administration could take advantage of this important unexploited potential. "The usability of the applications, tools, channels and devices through which e-Participation will take place in virtual space, need to be designed properly to support the citizens in this regard" (Scherer, S., 2009). In the same time, it is important to mention that the effectiveness of the e-Participation process represents not only the reflex of the technological approach, but also a change in the mentality and in the local government internal and external processes.

5. Conclusions

The analysis of the regional development strategy process in Bucharest-Ilfov region revealed a gap between rethoric and reality, such as the lack of a consistent dialogue between the local governance and the regional stakeholders, especially the citizens. Consequently, changing the system-oriented strategy design process to an knowledge-oriented and actor-driven one represented the main challenge of the research. The solution proposed is based on a regional virtual platform aiming at integrating knowledge and valuable experience for the benefit of the regional development and providing online channels in order to support and facilitate the participative actions in the bottom-up decision making processes.

The paper emphasizes the role of the advanced interactive web services provided by a virtual platform, as a single point of access, for the regional governance. This approach is in line with the actual public administration reform and of its transition to the knowledge society and e-Government. In this inclusive and democratic view, everybody, regardless of socio-economic background, is given an equitable playing role in the design of the regional strategy, being part of the consultative and decisional processes at the regional level.

The virtual regional platform proposed as a solution for supporting the regional sustainable strategy design introduces an innovative approach supporting both quantitative and qualitative sides of the process and creating the appropriate synergy within the regional partnership. The platform represents a new approach of e-Government aiming at creating a strong and stable local community and a good communication with the local administration in the interest of the sustainable development.

The main findings introduced by the research project are represented by the improvement of the scientific base of the regional strategy design and by the efficient interaction of the regional/local public entities with the stakeholders. This innovative approach represents a qualitative change at the regional/local administration level, involving major process re-engineering decisions. The decisions makers, represented by the various local/regional or central entities will have at their disposal accurate information, including the feedback obtained from the regional actors, in order to improve the process of the design of the sustainable regional strategy. The information could be used as well during the strategy implementation for the ongoing assessment of the

regional projects, aiming at meeting the strategic goals.

The platform articulates functions and components such as the regional knowledge repository and generator, the e-Participation and e-Voting tools, creating the premises for bridging the gap between local governance, main stakeholders and citizens. The platform offers also a solution for the decentralization process, which represents a real challenge for the Romanian local administration. This represents an efficient way to involve citizens and organizations in the regional development, as a knowledge based process. The design and the implementation of the regional/local strategy becomes an efficient and more realistic bottom-up process, integrating the best experiences and practices and better responding to the local needs.

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ANNEX

Table 1 – Summary of the answers to the main questions of the pilot survey

Questions	YES	NO
Participation to the RS design 2005-2007	6.7%	93.3%
Interest to know about the RS	84.7 %	15.3%
Knowledge about the RS design process	15.3 %	84.7 %
Knowledge about the actual RS	15.3 %	84.7 %
Interest to participate to the future RS design	64.0 %	36.0 %
Interest to have information about possible regional development scenarios	88.0 %	12.0 %

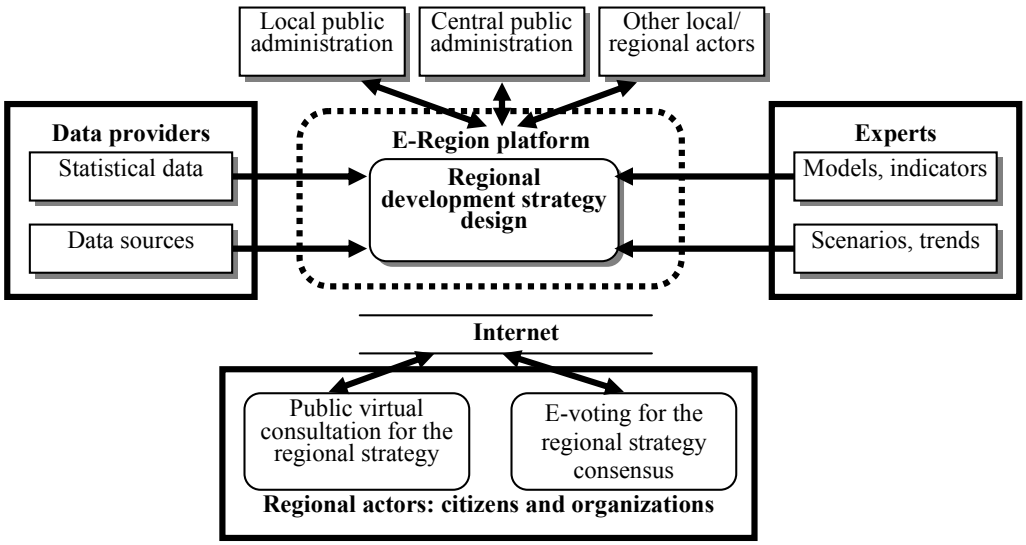

Figure 1 – Main actors' interaction through the virtual platform

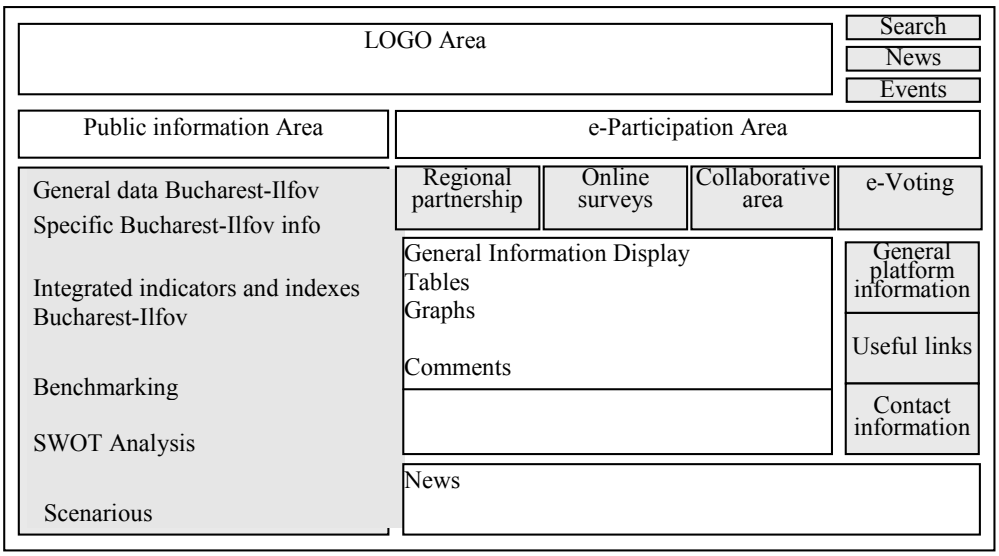

Figure 2 – General structure of the e-region platform

Table 2 - Relevant sustainable indicators

Type of indicators	Name of indicators	Components	Implementation
Indicators for monitoring the European sustainable development	Sustainable Development Indicators (10 Themes, 3 levels)	Theme 1: Socio-Economic Development Theme 2: Sustainable Consumption and Production Theme 3: Social Inclusion Theme 4: Demographic Changes Theme 6: Climate Change and Energy Theme 7: Sustainable Transport Theme 8: Natural Resources Theme 9: Global Partnership Theme 10: Good Governance	EUROSTAT National Institute for Statistics (Theme 1–8)
Composite index for monitoring Lisbon strategy	Economic Lisbon Indicator	1. Gross Domestic Product (GDP) per capita 2. Employment rate age15-64 years 3. Employment rate age 55-64 years 4. Research and development expenditure as percentage from GDP 5. Long term unemployment (% of total unemployment) 6. Rate of young people (age 20-24 years) who have attended at least the upper secondary level of education	European Commission
Composite index for the innovation	Regional Innovation Performance Index (RIPI)	1. Innovation engines 2. Knowledge creation 3. Innovation and entrepreneurship 4. Applications 5. Intellectual Property	European Commission
Sustainable development indicators	Sustainable Society Index	Table 2 (Annex)	Geurt van de Kerk
Composite index for the human	Human Development Index (HDI)	Life expectancy Education (literacy index and educational attainment)	United Nations Development Programme

Type of indicators	Name of indicators	Components	Implementation
development	Poverty Index (PI)	PIB per capita	
Composite index for the environment	Environmental Performance Index (EPI) - 6 categories, 16 indicators	Environmental Health Biodiversity and Habitat Sustainable Energy Water Resources Air Quality Productive Resource Management	Columbia University and Yale University, USA.

Source: Synthesis of (European Commission 2007c, Eurostat 2008, UNDP 2007, *** 2008a, *** 2008b, *** 2007c, Van der Kerk, Geurt 2008)

TEXT MINING TECHNOLOGY TO SUPPORT ENTERPRISE KNOWLEDGE MANAGEMENT

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A successful flexible enterprise must have an organization knowledge-based. In an era characterized by change, globalization and competition, knowledge is without doubt the most important asset for a company to gain a competitive advantage.
Nowadays, in the enterprise, there is a huge amount of unstructured information especially in textual documents. The Text Mining technology, in the Knowledge Management platform, is the most important tool to manage continually this information.
***Keywords**: knowledge management, text mining, unstructured information, enterprise information system.*

1. INTRODUCTION

In recent years the number of documents available in electronic form, has grown almost exponentially. The world produces between 1 and 2 exabytes (10^{18} bytes) of information per year [1]. The digital universe is growing by 60% every year. In the 2011 only half of the information will be kept, the rest will not find space on storage devices [2]. The active mailboxes are rose from 253 million in the 1998 to 1.6 billion in 2006 and that in 2006 have been created and copied 161 exabytes (1024^6 bytes) of information that will become 998 exabytes in 2010 [3].

The information that circulate, within a company, in most cases, are unstructured information (free text). Enterprise Information System (EIS) currently processes only structured information that correspond to 20% of the information that circulate in the company; the remaining 80% is unstructured information. From the annual survey Teradata 2006 [4], on a sample of about 1200 managers from 23 countries (56% from the Americas, 23% from Asia-Pacific and 21% from Europe, Middle East and Africa –EMEA-), 70% of interviewees who work in America and Asia-Pacific and 36% of interviewees of EMEA said that the use of unstructured data, can be a high competitive advantage to support decision and enterprise business.

The enterprise knowledge, internal and external, is mainly, made up from unstructured information: textual documents, news from newspapers, magazines off line and on-line, data from e-mail, interventions on forum, blogs, text files, sounds, video, … Therefore, for enterprise, it is necessary to have a module of Enterprise Information System (EIS) that process this unstructured information to extract useful knowledge for strategic business planning.

2. TEXT MINING FOR PROCESSING UNSTRUCTURED INFORMATION

The processing of enterprise knoweledge, structured and unstructure, can be respresented from an Extended Knowledge Management platform (Fig. 1).

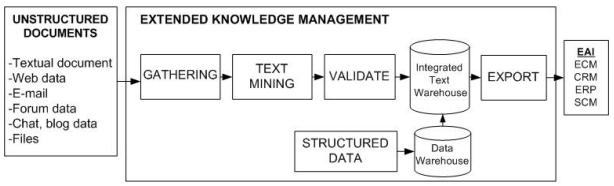

Fig. 1. *Extended Knowledge Management*

To support the processing of unstuctured information it possible to use Text Mining (TM) technology that, recently, has grown after the explosion of social media.

Unstructured information, after being collected, are processed by TM module and therefore validated and integrated into a Warehouse Text with structured information of a Data Warehouse. After this process enterprise data can be acquired and exported in the software of Enterprise Application Integration (EAI) like CRM,ERP, SCM, …

With the techniques of Text Mining [5], we can transform a large amount of textual documents into structured knowledge. From data apparently isolated and without meaning we can extract all the most relevant information and quickly identify significant correlations between specific entities. We can identify relationships between documents, independently of the format.

The Text Mining (TM) using techniques of statistics, natural language processing and semantic intelligence (SI) to index, categorize, extract, correlate the information asset.

In commerce there are many Text Mining solutions like software MOLE (Mining On Line Export) developed by Cineca, Cogito Intelligence Export System, Sophia from Celi srl , Syntema software solutions.

The process of Text Mining can be represented with the following figure (Fig. 2).

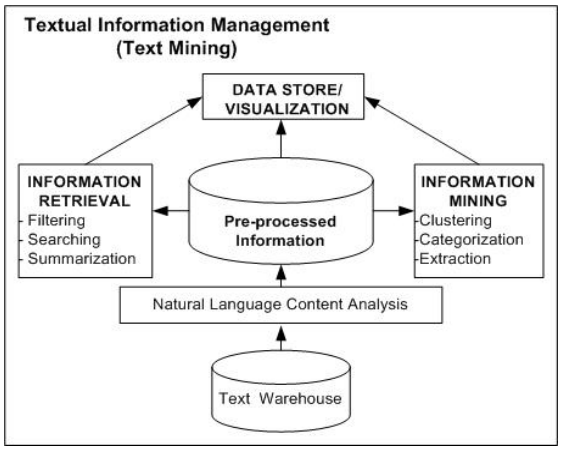

Fig. 2. *Process of Text Mining*

The texts is stored in a Text Warehouse with the Binary Large Objects (BLO) that is the standard to store high dimension data in binary format. The figure highlights 4 important stages: Pre-processed information, Information retrieval, Information mining and Visualization.

2.1 Pre-processing

Since opinions are written in Natural Language, we need a specific pre-processing techniques: elimination of stop-words (articles, conjunctions, prepositions), sentence extraction, division of the sentences into single words, tokenization, stemming (word root extraction), lemmatization and identification of different parts of speech (nouns, verbs, adjectives).

2.2 Information Retrieval

The main functions of Information Retrieval [6] are searching, filtering and summarization. For filtering and searching the TM use linguistic and semantic engine. The semantic technology adds to the basis linguistic (grammar and morphology) the logical analysis of the period and the disambiguation of polysemic terms for the identification of the correct meaning of all words.

With the summarization it is possible reduce the document content. Generally, the main topics of documents can be described with only 20% of the original text, without losing of the meaning.

2.3 Information Mining

The Information Mining [7] makes follwing functions: Data extraction, Clustering, Classification and categorization.

Data extraction allows to individuate particular information inside a text. For example if we talk about cameras, interesting data are: the model of camera, benefits, defects, technical characteristics, magnification zoom, lens, megapixels of images.

The Clustering is a technique used to group, with a scoring algorithm, similar documents on the base of dominant characteristics. An application of clusteirng is, for example, a suddivision of customer in families: customers who buy little but spend much, occasional customers, customers that are a source of high gain.

Classification [8], through specific algorithm, can automatically assign examined documents into predefined categories. The difference between the two methodologies is that the clustering doesn't need to group the documents in pre-defined categories.

The categorization use the knowledge of the meaning of the words to identify the topics of document. For example a document that talk about lens can be categorized as "Camera".

2.4 Visualization

The information, after Text Mining processing, can be visualizated in different types: textual information, main interesting information, information summarization, classes or categories to wich the document belongs (Fig. 3).

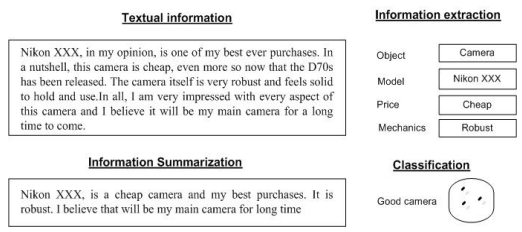

Fig. 3. *Different modalities of data visualization.*

3. APPLICATIONS OF TEXT MINING IN BUSINESS SECTORS

The Knowledge Management is based on three fundamental pillars: Document Management, Skills

Map and Workflow System. KM is an automated workflow system that manage enterprise document and the skills of employees. The KM can be considered the platform that support Enterprise Application Integration tools (ERP,SCM, CRM,..) and Business and Marketing Intelligence [9] (Fig. 4).

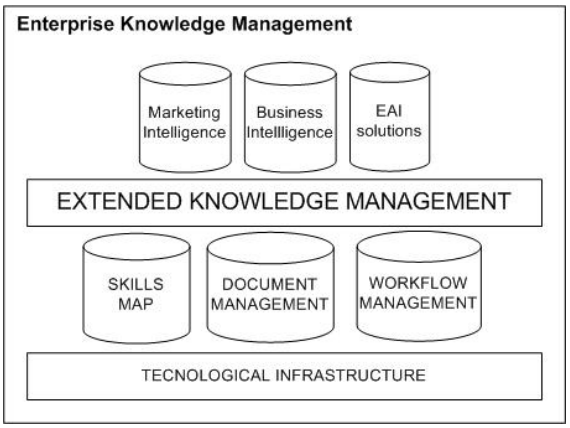

Fig. 4. *Enterprise Knowledge Management*

The Business Intelligence (BI) solutions add value to the KM enterprise strategy. The BI processes information with analytical tools allows predictions and forecasting. For example, in a large retailers, analysing the large amount of data on customer purchases it is possible discover that a lot of people who buy diapers after buy also beer (related consumer) . Many couples of young people, when childs born, decide to drink the bier at home and not in the pub and then they buy it at supermarket with the diapers.

The Text Mining can be used in Marketing Intelligence and in particular in CRM and Market Analysis. TM support the gathering, analysis and management of customer opinions contained in websites, news agencies, e-mails, chats, news groups, forums, and blogs. With these software solutions companies can monitor, continually, customers opinion and customer loyalty and after provide timely and efficient services.

The TM can be available in Customer segmentation (Database Marketing) and analysis of associations (Basket Analysis) to know which products customers purchase together.

With the Text Mining technology we can develop a software module (U.K.E.) to extract useful knowledge from unstructured information. This module is fully integrated to other parts of a Strategic Enterprise Information System (Fig. 5)

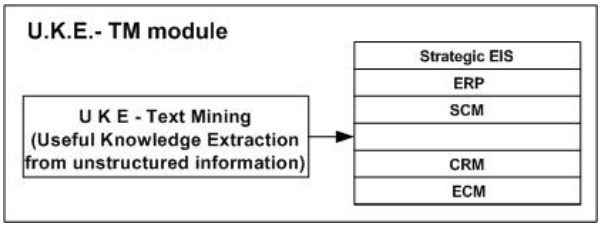

Fig. 5 *Useful Knowledge Extraction module*

4. Conclusion

In the enterprise knowledge there is an high percentage of unstructured information. This information is very important for enterprise strategic planning. To process this information the Knowledge Management platform requires a Text Mining software to extract useful knowledge. With the Text Mining, you can get high performances and discover interesting hidden relationships among overload enterprise data. Text mining uses semantic engine and artificial intelligence algorithms to mine, extract and classify useful knowledge for business goals.

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A PROPOSAL FOR A KNOWLEDGE MANAGEMENT SYSTEM FOR EMERGENCY SITUATIONS

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Integration of the information and multidisciplinary approaches in emergency situations can assist the crisis management board with accurate and actual information together with predictions regarding the evolution of the different phenomena.
The objective regarding the integration of the information may be fulfilled in a steady sustainable way only if a knowledge management system is conceived. At present, all the components exist, an upper level vision regarding the practical requirements, the field distribution of the parties involved in the crisis management and the system architecture to be conceived is therefore necessary.
The paper presents some of the basic ideas which can be used to create the concept of a knowledge management system for emergency situations.
***Keywords**: emergency, data center, readily access*

Introduction

One of the basic tasks of the NATO organization is the security and the crises management, which means to undertake military and civilian measures to respond to a threat in a national or international context.

Beside the crises management drills coordinated by NATO, the civil administration must be ready, endowed with modern equipment and properly trained human resources, so as to achieve the proper solution in an emergency situation.

Moreover, actual conditions like weather changes, terrorist threats, economic crisis can lead to frequent emergency situations whose final effect consist in financial and loss of human lives.

The crisis management board needs accurate and latest information in order to take the most proper decisions. Important aspects regarding the classes of information to be used and the methods to integrate the information are presented in the next sections.

Basic ideas

The decision making process in an emergency situation must be assisted with the most proper information as regards the volume, relevancy, accuracy and recentness.

Nowadays computer based methods to gather the necessary information may rely on field sensors and Internet data sources as well as on modern models created by experts which are remotely located.

The necessity of a data center concentrating the knowledge and allowing the access of the people involved in the crisis management is therefore necessary.

Information employed in crisis situations

Managing a crisis situation means deciding in problems like: filtration and hierarchization of the input information, categories and number of forces to be used, routes of intervention and evacuation, equipment to be used, medical facilities to be prepared, timing of the operations and cost evaluation.

All the events are included in a geographical context and the managing board needs information regarding the relief in order to assess the real situation and to choose the most effective methods of intervention. Hence, electronic maps and GIS are needed together with the GPS information of the forces in the field.

Weather conditions represent another class of information which is useful to predict the constraints in the field and to schedule the activities accordingly.

Models of the structures may be used to predict the conditions when the collapse occurs and to evaluate the risks accordingly. Statical entities like bridges, buildings, dams, sea walls and mobile objects such as cranes, ships, trucks, planes are evaluated with the help of a mechanical model.

Models of different phenomena are employed to predict the floods, the expansion of the fire or of the spillage and of the wind effects. Modern software are employed by experts in order to answer these questions. Other experts are also necessary to assist in technical problems regarding nuclear physics, petroleum industry, technology, transports and communication systems.

Specialists in international law may offer important information in cross-border emergency events.

In order to identify different subjects involved in the events it is necessary to grant access to the databases regarding the population, border police files, police internal information system.

Satellite visual information and urban reconnaissance systems are important in order to have a quick feed-back of the events in the field.

Most of the modern software applications employed to create the models can save the information as virtual reality objects which may be used at a latter stage in a virtual reality world.

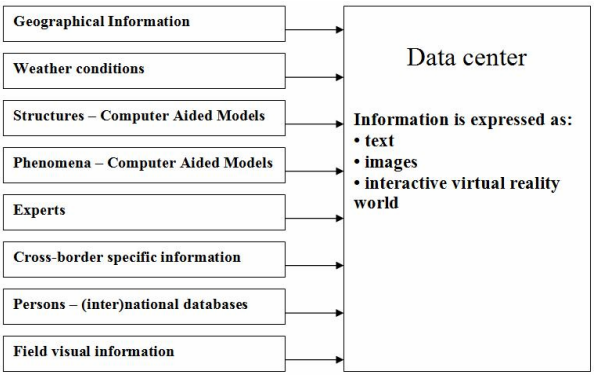

Figure 1 – *Classes of information required by the decision making process in an emergency situation*

As it can be noticed most of the scientific support may be found in Universities, where modern equipment and software are operated by competent researchers.

Aspects regarding the necessary equipment

The equipment employed to integrate the information will be located in the crisis management headquarters which is either in a building or in a specialized vehicle.

According to figure 2, the simplest equipments may be used when the managing board is hosted in a unique location which has computers, Internet connection and other special equipment.

In the second variant there is supposed that the board can be hosted by any administrative building which has several computers, being required a fast Internet connection and the special equipment. In this way the board is more mobile and it can be located close to the area where the event took place. There is a wide range of official building which can be used in this approach, such as city halls, schools, post offices, administrative buildings, police stations. The basic needs of the members of the managing team may be satisfied using the local resources.

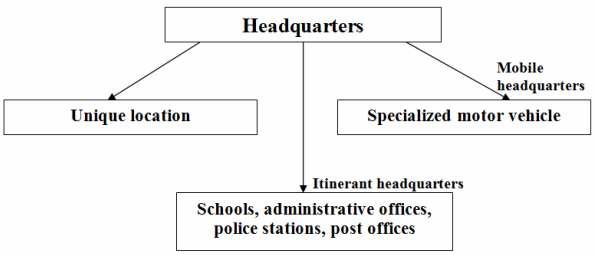

Figure 2 – *Location of the headquarters*

The third variant supposes that a reliable special vehicle with all terrain capabilities is employed. Beside the computer and the Internet connection, there is also necessary a power supply source. This variant offers a high degree of mobility of the managing team and it is proper for events which took place in remote locations. Other supplies and facilities are also necessary for the basic needs of the members of the team. If this solution is chosen, at first can be used the existing vehicles of the police, military and hospitals together with mobile equipment which can be easily transported and installed.

All the three variants have some common features, such as:

• the communication equipment is paramount and the according software application must take into account all the possible sources of information: cell phones, Internet, radio, TV, aso.

• the advanced computers employed by the experts can be located in remote locations; the experts can join the team and use remotely their advanced computers from a local terminal or they can work in remote locations and send images with the results of their studies; in this way there is not necessary an expensive hardware, but only advanced facilities regarding the communication;

• the team must include analysts and multi-disciplinary scientists in order to facilitate the support offered by the remotely located experts and the communication between the members of the board;

• special other facilities can be also necessary such as decontamination equipment or life support systems.

Advanced graphics are necessary in order to support the decisions with information expressed in a suggestive way.

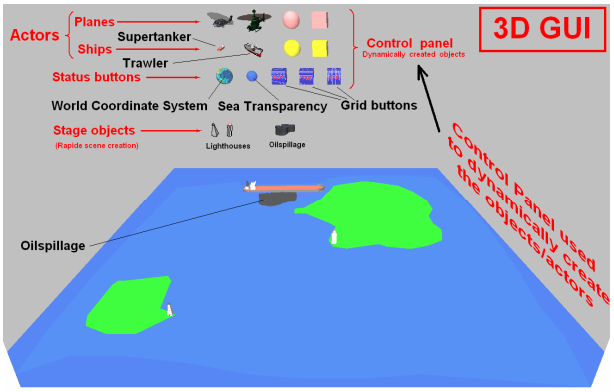

Figure 3 – *Virtual Reality ECMA original software instrument employed in an oilspill crisis management scenario*

Moreover, for the international teams it is necessary to use symbols and images which are accepted and understood in the same way it the original cultures of the members of the board.

Conclusion

Most of the scientific support in an emergency situation can be found in Universities and the professors and researchers can offer valuable technical information from their remote locations. Moreover, the modern equipment of the local administration purchased in the framework of the European projects can be used in emergency situations if a proper strategy is conceived.

Acknowledgement

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THE ROLE OF KNOWLEDGE MANAGEMENT IN CRITICAL INFRASTRUCTURE PROTECTION (CIP)

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Keywords: knowledge management, criticat infrastructures, security, threats, vulnerabilities, risks

1. What are "critical infrastructures"

The collocation "critical infrastructures" was officialy born in july 1996, when the USA president decreeted "The executive order for the critical infrastructures protection". Accordingly to the preface of this document: "critical infrastructures represent Certain national infrastructures that are so vital that their incapacity or destruction would have a debilitating impact on the defense or economic security of the United States."

These critical infrastructures include:

- telecommunications,
- electrical power systems,
- gas and oil storage and transportation,
- banking and finance,
- transportation,
- water supply systems,
- emergency services (including medical, police, fire, and rescue),
- continuity of government.

According to the NATO definition critical infrastructures are: "Critical infrastructure are those assets, facilities, networks and services which, if disrupted or destroyed, would have a serious impact on the health, safety, security, economic well being or effective functioning of a country".

Disruption to critical infrastructure in one nation can have serious implications and consequences for surrounding nations with potential cascading effects.
From the EU perspective the critical infrastructures include: "Telecommunications, water supplies, energy supplies, distribution networks, food production and transportation, health institutions, transportation systems, financial services, defense and public order responsible institutions (army, gendarmerie, police)".

2. What is "knowledge management"

Knowledge Management (KM) comprises a range of practices used in an organisation to identify, create, represent, distribute and enable adoption of insights and experiences. Such insights and experiences comprise knowledge, either embodied in individuals or embedded in organisational processes or practice.

Some expert say that there is no universal definition of knowledge management and they broadly defined it as efforts to generate organizational value from intellectual and knowledge assets such as information sharing and understanding risk.

3. The role of "knowledge management" in protecting critical infrastructures

Knowledge management is a core element of both public and private sectors. For the purposes of critical infrastructures protection, knowledge management incorporates operations-intelligence fusion to enable organizational capacity to absorb and adapt to shocks and disruption from a variety of causal factors (an acitivity called *resilience*). That essentially translates to the appropriate use of people, processes, and technology to provide insight or decision-support for risk mitigation.

Resilience is the ability to overcome threats and vulnerabilities to maintain competitive advantage. That means resilience is adaptive and is a mean of negotiating risk and uncertainty.

The scope of this paper, is to support the ideea that developing the knowledge necessary for resilience needed to achieve effective CIP requires integrated public-private intelligence analysis level to mange risk.

A recent paper on intelligence support to critical infrastructure protection published by John Sullivan at the Information Security and Assurance Conference in New York 2009 observed that "Intelligence professionals and their customers share the view that intelligence is at its best when it provides direct support to those charged with taking action to prevent harm".

A wide range of threats can impact critical infrastructures. These include natural and technological disasters, as well as attacks, crime and terrorism. Transnational criminal actors include terrorists, organized crime, and gangs. New forms of political, social, and criminal opportunity arise as networks and technology influence economic processes. A redistribution of strategic economic territories, where national units are no longer the primary spatial focus of transnational economic transactions is the result. This is especially true in metropolitan areas. Privatization, transnational firms, and technology enabling the participation of national economic actors in the global market, have created a

large network of critical infrastructures that depend one upon eachother.

Protecting critical functions therefore requires both public and private effort. Major infrastructure sectors include: communications and information; electric power; oil and gas; banking and financial services, transportation (air, land, sea); and Emergency Services. Add to these cultural and entertainment sectors, food and agriculture and a range of commercial efforts. Many of these key sectors are essential to providing national security and military capabilities, many are increasingly transnational and global in scope, and all are interdependent upon one or more external sectors to perform operations.

Traditionally, public-private interaction has been viewed as a means to support government security, intelligence, law enforcement, and civil protection (emergency and disaster response) efforts. The role of government was to protect the public and private sector. Private actors traditionally protected their own interests providing security and business continuity as an internal business practice.

European tendencies in critical infrastucture protection

The European program for critical infrastructures protection – EPCIP – starts from a very pragmatic approach: the EU can't protect "de facto" all the critical infrastructures of the members, but they will concentrate upon the transnational infrastructures while the members must protect their internal infrastructures after the common standards proposed by the UE.

On 17-18 June 2004, the European Council asked the Commission to prepare an overall strategy to enhance the protection of critical infrastructures. In response, the Commission transmitted on 22 October 2004 a Communication entitled "Critical Infrastructure Protection in the Fight against Terrorism" putting forward suggestions to enhance European prevention, preparedness and response to terrorist attacks involving critical infrastructures.

The Commission's intention to propose a European Programme for Critical Infrastructure Protection (EPCIP) and a Critical Infrastructure Warning Information Network (CIWIN) was accepted by the 16-17 December 2004 European Council.

The EPCIP program has the following objectives:

1. identification and stock taking, through national authorities, of the critical infrastructures of the member states.
2. corporations cooperation in their field of activity and along with the state authorities, for information dissemination and major risk mitigation or elimination.
3. unique approach to the CI protection and creation of public-private partnerships to support the activities related to the protection of critical infrastructures.

The EPCIP program has also another objective, that of creating a European alert system „Critical Infrastructure Warning Information Network" – CIWIN with the following objectives:

1. Encouraging the information exchange among implicated organizations,
2. The promotion of "best practices" and adequate strategies,
3. Risk mitigation or elimination in the protection of critical infrastructures.

Some eloquent examples of a critical infrastructure disturbance are the violent explosion of one of the main pipes that transported the gas from Russia to Europe on 7 may 2007 and the explosion from 22 January 2006 who destroyed two gas pipes and left Armenia and Georgia without gas.

Another exemple of major disturbance of critical infrastructures is the "Russian gas crisis" at the end of 2008 when most of the EU countries were severely affected when the Russian government shot down the pipes transporting gas to Europe, from political reasons. Many of the affected countries reported great losses.

In the past years the IT critical infrastructures have also been exposed to serious threats. As IT&C networks tend to be decentralized, highly interconnected and interdependent, failures of these infrastructures could cascade and spread beyond national borders. At the moment, national states approaches and capacities differ widely. A low level of preparedness in one country can make others more vulnerable.

The risks due to man-made attacks, natural disasters or technical failures are often not fully understood and/or analyzed. Cyber-attacks have risen to an unprecedented level of sophistication, also determined by the financial crisis, and are often performed by individuals or criminal groups for profit or political reasons. The large scale cyber-attacks on Estonia, Lithuania and Georgia from 2008 are eloquent examples of this trend. The huge number of viruses, worms and other malware, the expansion of botnets and the rise of spam confirm the severity of the problem.

Other exemples include:

GERMANY 2007 – The German newspaper "Der Spiegel" published an article about different cyber attacks upon the German Chancellery, the Ministry of Justice and Ministry of Economy from different servers in China. The intensity of the attack and the types of stolen information suggested that the attack could have been launched by the Chinese Government (they described the accusations as "irresponsible").

FRANCE – 2007 – the Hexagon Institutions were also attacked from some servers in China.

ESTONIA – 2007 – different servers belonging to the Estonian Government and some financial institutions were the target of some DDoS attacks. Over 20 000 networks were affected. The Estonian officials blamed the Russians for this great attack but the Kremlin denied everything.

ROMANIA – 2008 – The website of the "High Court of Justice" was attacked by hackers. For some hours the lawsuit lists could not be consulted.

As a response to these kind of incidents and in addition to the EPCIP program, on 30 March 2009, the European Commission adopted a communication calling for action to protect critical information infrastructures by making the EU more prepared for and resistant to cyber attacks and disruptions.

The subprogram Critical Information Infrastructure Protection (CIIP)" is an subpart of the EPCIP program that refers to the protection of the European critical infrastructures and treats IT systems and informational systems as an important part of the European critical infrastructures.

To achieve an enhanced level of awareness and preparedness throughout the EU, the European Commission's communication proposes the following set of actions:

- **Preparedness and prevention:** exchange of information and transfer of good policy practices between Member States through an European Forum. Establishing a European Public-Private Partnership which will help businesses to share experience and information with public authorities.
- **Detection and response:** supporting the development of a European information sharing and alert system.
- **Mitigation and recovery:** stimulating stronger cooperation between the Member States.
- **International cooperation:** driving a Europe-wide debate to set EU priorities for the long term resilience and stability of the Internet, with a view to proposing principles and guidelines to be promoted internationally.
- **Establishment of standards for European critical infrastructure in the ICT sector**.

The proposed actions are complementary to those already adopted in the field of judiciary cooperation for preventing and mitigating terrorist actions targeted upon IT systems. Also, the set of actions are following the international initiatives in the IT domain.

4. Conclusions

Critical infrastructures are a domain that must very well analyzed, evaluated and developed, and sharing information beetween parties is most important for the parties implied in the proces.

The majority of the developed countries, EU, USA and other countries, alliances or security structures are making intense efforts in order to identify, supervise, optimize and protect their vital critical infrastructures. Protecting critical functions requires both public and private efforts.

Romania, as part of EU and NATO, is still in an early phase regarding critical infrastructures, but efforts must be intensified in order to:

a) Develop a national strategy for critical infrastructures protection (event like the earthquake from 25.04.2009, when some telephony networks collapsed, can be fatal in case of major catastrophes).

b) Inventorize the critical infrastructures on every field of activity.

c) establish specific vulnerabilities and threats and the methods for risk mitigation or elimination.

e) Establish Public-Private Partnerships to share experience and information with public authorities. Both public and private actors should work together to ensure that adequate and consistent levels of prevention, detection, emergency and recovery measures are in place

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QUALITY METRICS FOR IT PROJECT MANAGEMENT

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Using metrics and indicators for the evaluation of the IT projects management have the advantage of providing rigorous details about the required effort and the boundaries of the IT deliverables. There are some disadvantages, as well, due to the fact the input data contains errors and the value of metrics depends on the quality of data used in models. Despite of its age, the Pareto Principle is still a strong mechanism constantly used in quality control of projects from various areas, including the IT field.
Keywords: Project Management, Information Technology, Metrics, Pareto Principle

1. Introduction

According to the *PMBOK Guide* [1], *a project is a temporary endeavor undertaken to create a unique product, service or result; the temporary nature of projects indicates a definite beginning and end.*

In the IT field, projects include the development or the implementation of software and hardware systems, data communication, video, voice or integrated systems [4]. Examples of IT projects are:

- the development of a new software;
- hardware equipments acquisition;
- software acquisition;
- designing and installing a network computers in a company;
- the maintenance of an existing system;
- implementation of a software system.

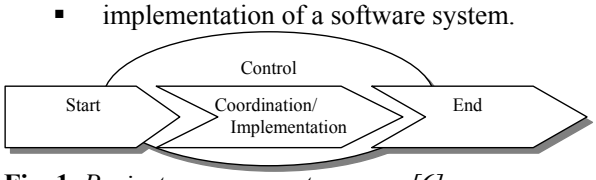

Fig. 1. *Project management process [6]*

Project management is a new way to manage in order to complete the goals having the cost minimized in different domains like industry, constructions, medicine, education, research [2]. The management of a project involves several sub-processes: planning, coordination (project implementation), project end, and on a regular basis project control (figure 1).

Project initiation (project start) is usually organized as a workshop, after the project manager was assigned. The project's plans are developed in this process. Project coordination/implementation is a continuous process, and it is based on the plans developed in the project start process [3]. Periodically is done the control process, in order to assure that the project is according to the plans. The close-down process is the last project management process, where all the project information is transferred to the organization.

The entire project management process has to be evaluated continuously for quality. This can be done using specific metrics related to the project management in the projects' field.

2. Project Management Metrics

IT project failure, especially on software projects, occurs frequently. In order to reduce the degree of failure for new projects, data have to be collected and metrics to be computed.

Poor management is a very important factor in the failure of IT projects. The completion of a project can take place through the achievements of all objectives, but unprofitable financially. Instead, other advantages can be obtained, like the increase team or organization prestige or the experience gained. Some projects, even they fail in the objectives achievement, can return through gained experience, new team members, some positive results etc.

The quality of the project deliverables cannot be obtained without a high quality process, but a quality process does not guarantee quality products. The quality of the process is certified through quality standards.

Also good trained personnel do not guarantee the quality of deliverables. In order to obtain quality results, the organization has to have trained and educated personnel, and standardized project management and technological processes.

The indicators and metrics used in IT projects evaluation creates a general view over a diversity of IT projects aspects, like resources consumption, costs, performance, and risks.

Starting from the system of indicators based on historical data regarding projects that have been run in the past there can be easily created a system that allows releasing information related to the chances that a running project can be successfully completed. There also can be determined the stage of the subject in relation to the projects that have been undertaken in similar conditions and thus action can be taken based on the records of these projects using the lessons learned from those projects.

The management of the IT projects evaluation from the perspective of the user is aiming to ensure the client's satisfaction through the maximization of the coverage of its needs.

The indicators allow for fundament the decisions and the marking of the structural elements. They should stand for a system which allows an overall appreciation of all the aspects concerning IT projects. This system should render an image of all the resources used and of all of them that will benefit

from in the future.

The extension of the system of indicators and the use of very large data series converge to a reference system used to make decisions with effect on the further social and economical development from the point of view of the very important sector of information technologies and communication.

The system of indicators is developed in steps and it is further to be improved with specific data from other projects in other fields, thus being consequent to the methodological rules required for a comprehensive knowledge of the elements related to the characteristics of the modern society.

3. Classification of Project Management Metrics

As defined in [5] a metric represents a mathematical model developed around an equation having the following form: $y = f(x)$.

A mathematical model consists of one or more equations, inequations, and objective functions and it has the role to describe the associated system state. The metrics measure the project or product characteristics based on the characteristic's influencing factors. Using project metrics is created a basis for projects hierarchies and classification.

The metrics have the following functions:

- Measurement;
- Comparison;
- Analysis;
- Synthesis;
- Estimation;
- Verification.

Defining the metrics for IT projects consists of building models and indicators that start from values measured with objectivity, such as the number of objectives, number of milestones, budget, number of modules, number of phases, number of activities etc.

Projects metrics and historical data are very important for project oriented organizations. Often happens these records are missing, incomplete, incorrect, or are not centralized and metrics are not computed

The factors that can be measured and used in IT project management metrics are classified in: personnel, process and project/project indicators [6], [7].

The *personnel* evaluation could take into account:

- education level;
- certification level;
- social abilities;
- experience;
- project team homogeneity degree;
- personnel productivity.

The evaluation of the *process* is focused on the maturity of the IT project management. The quality of the project deliverables cannot be obtained without a high quality process, but a quality process does not guarantee quality products. The quality of the process is certified through quality standards. Regarding the evaluation of the process, the following factors can be used:

- development techniques and methodologies used;
- company certification level;
- the degree of novelty for software and hardware;
- programming language used;
- degree of reuse.

Some factors derive from the *product/project* characteristics and its related environment. There are several factors related to the project/product evaluation, like:

- project complexity;
- number of users/stakeholders;
- the existence of similar product on the market;
- software application specific.

Some of the most important project management metrics related to costs and quality are described in the table 1.

Table 1 Some metrics used in IT Project Management [6]

Category	Metrics
Quality	Project complexity Portfolio complexity The degree of client or executive management satisfaction by completing the project objectives
Costs	Statistics regarding different costs categories Project portfolio value

These metrics have to be classified and grouped in systems of metrics and they have to be tested and validated after they will be used in practice.

4. The Pareto Principle in the Modern Economy

The name of the *Pareto Principle* (also known as the *80/20 rule* or *Pareto's Principle of Unequal Distribution*) was suggested by the Joseph Juran (1904-2008), an American management consultant that was born in Romania (Braila).

He revealed the work of the 19th century Italian professor of political economy *Vilfredo Pareto* that discovered that the top 20% of any country's population accounts for more or less 80% of its total income.

Initially, Pareto noticed the distribution for Italy but right after he extended the analysis on several other countries obtaining very similar results. Of course, the principle can be virtually applied in any area, like domestic behavior, for example – we can easily notice that we eat 20% of favorite food for 80% of time or, similarly, we spend 80% of time doing the most frequent 20% of activities.

Mathematically speaking, there is nothing special about the proportion of 80/20 but many real systems come across a ratio very closed by the Pareto's distribution.

In the modern economy, the principle was quickly extended to quality control [8], stating that most defects in production are the result of a small percentage of the causes of all defects. This is generally defined as "the vital few and the trivial many" or "the vital few and the useful many".

Starting from the Pareto Principle, Juran lately introduced the concept of CWQM (Company Wide Quality Management) [9] that was based on three pillars (also known as *Juran Trilogy*):

- quality planning – is focused on identifying the customers together with their needs that should be satisfied;
- quality control – follows the process of producing goods and services that meet the previously identified needs;
- quality improvement – the efforts performed to constantly improve the previous processes.

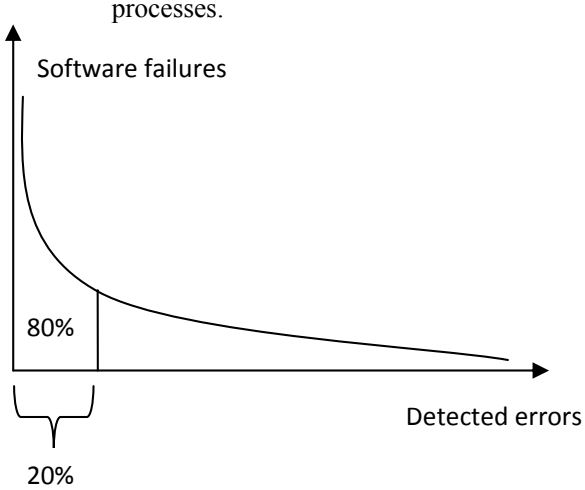

Fig. 2. Graphical Representation of the Pareto Principle

In our days, the principle is still very applied in a variety of areas, especially the quality control field. For example, in the IT industry it is considered that 80% of users are actually using only 20% of the features.

In the recent years, the principle was mostly applied on errors rather than features because it was observed that 80% of errors are generated by the 20% of the detected bugs, so a small proportion causes most of the errors (figure 2).

This is a winning strategy applied by the big software companies that are fighting with the bugs since the customer satisfaction can be quickly improved by fixing only a small amount of the reported errors.

5. Conclusions

The metrics used for projects evaluation create a general view over a diversity of project management aspects, like resources consumption, costs, performance, and risks. Based on historical data regarding projects that have been run in the past, there can be easily created a system that allows releasing information related to the chances that a running project can be successfully completed. There also can be determined the stage of the subject in relation to the projects that have been undertaken in similar conditions and thus action can be taken based on the records of these projects using the lessons learned from those projects. Also, the Pareto Principle is still a strong mechanism constantly used in quality control of projects from various areas, including the IT field.

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OPTIMIZING PROJECT TIME-COST-QUALITY BY USING GENETIC ALGORITHMS

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Project management causes the problem of efficient resource assignment, activity, time constraints and relationships between activities. Traditional scheduling methods like CPM and PERT are incomplete tools to use in practice because they do not consider constraints regarding resources and cannot be realistic as they consider infinite resources.
Optimization of project time-costs-quality is very complex and can be achieved by using meta-heuristic methods as Genetic Algorithms, Ant Algorithm, Tabu Search. In this article we study the state of the art in this domain, define the optimization problem we want to solve and propose some improvements for a genetic algorithm, starting from GENOCOP I (Genetic Algorithm for Numerical Optimizations of Constrained Problems) developed by Michalewicz and Janikow[12], later improved to GENOCOP V (Suzuki [9]).
***Index Term**: planning and scheduling, time-costs trade-off problem, genetic algorithms*

1. Optimizing project time-cost-quality problem

Project planning requires special attention for project mangers based on the fact that the quality of the plan is fundamental for good results.

There should be mentioned an important distinction between **planning and scheduling**. The plan defines *what* must be done and restrictions on *how* to do it, the schedule specifies both *how* and *when* it will be done. The plan refers to the estimates of time and resource for each activity, as well as the precedence relationships between activities and other constraints. The schedule refers to the temporal assignments of tasks and activities required for actual execution of the plan. The quality of planning and scheduling activities is measured through the objectives performance. This article studies the planning activity through multi-objective optimization.

The following picture illustrates the flow of implications from planning activity through the final results of a project:

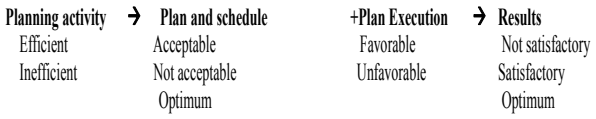

Figure 1.Project planning workflow

The mostly desired results, optimum results, are obtained through the following chain:

Efficient planning → Optimum plan and schedule + Favorable Plan Execution → Optimum Results

Therefore an Optimum Plan (OP) is an important requirement for Optimum Results, even if it is not a guarantee to achieve them. To obtain an Optimum Plan there should be solved a multi-objective problem of: minimizing costs, allocating and leveling resources and maximizing benefits.

In this study we try to solve a particular problem which contributes to an OP: the planning time-costs-quality, by using genetic algorithms (GA).Time-cost-quality optimization can be viewed as the time-cost trade-off problem extended with quality criteria.

The weaknesses of the actual heuristic and mathematical approaches to solve multi-objective problems like cost-time-quality are well known in scientific literature (Zheng at al. [3])

Improving the work of Kaveh at al. [6], we can present the following models to optimize project planning:

Table 1. Project optimization research history

YEAR	Minimize project time and/or improve resource utilization	Time –cost tradeoff for non repetitive construction	Minimize time and/or cost for repetitive construction	Minimizing time and/or cost while maximizing quality
1989	**Easa** – resource leveling approach-inconsistent with regard to the quality of results produced on project networks			

YEAR	Minimize project time and/or improve resource utilization	Time –cost tradeoff for non repetitive construction	Minimize time and/or cost for repetitive construction	Minimizing time and/or cost while maximizing quality
1996	**Chan at al**.- resource scheduling with genetic algorithms	**Burns at al**.- mathematical approach		**Babu and Suresh** – mathematical approach, linear programming models
1997		**Feng at al** – using genetic algorithms **Li and Love-** using improved genetic algorithm		
1998		**Maxwell at al.-** optimization of crew configuration using activity-based costing		
1999	**Hezagy-** optimization of resource allocation using genetic algorithms	**Li at al**.- using machine learning and genetic algorithms(MLGAS)		**Khang and Myint** –mathematical approach
2000		**Feng at al. (Burns and Liu) -** hybrid approach- genetic algorithms integrated with simulation techniques to sustain uncertainty situations		
2001			**El-Rayes and Moselhi** –resource optimization for repetitive construction projects **Hegazy and Ersahin-**using spreadsheets and genetic algorithm technique **Hegazy and Wassef-** cost optimization in projects with repetitive nonserial activities **Leu and Hwang-** optimal repetitive scheduling model with shareable resource constraint	
2002	**Gomar at al-** workforce assignment and allocation optimization			
2004		**Zheng-** multi-objective modified adaptive weighting approach (MAWA)		

YEAR	Minimize project time and/or improve resource utilization	Time –cost tradeoff for non repetitive construction	Minimize time and/or cost for repetitive construction	Minimizing time and/or cost while maximizing quality
2005		**Zheng at al-** improved MAWA using Pareto ranking and niche information		**El-Rayes and Kandil** –genetic algorithm and developed a system named: multi-objective automated construction resource optimization system (MACROS)
2007				**Afshar, Kaveh, Shoghli** – multi-objective ant colony algorithm optimization (MOACO)
2008		**Feng-** based on confidence interval estimates and fuzzy numbers **Afshar at al**.- based on fuzzy logic		

1.1. Classical approaches in generating project plan and schedule

Backtracking is an exhaustive method to generate all possible solutions, but it is a time-consuming method, and it does not provide search criteria to select the optimum solution.

Greedy Hill-Climbing is a heuristic method to generate local optimum based on a specific criterion, but it does not provide a guarantee of finding a global optimum.

CPM (Critical Path Method) analysis has the major objective to schedule a project assuming deterministic durations and available resources. Another important point is that different resource combinations have their own costs. Ultimately, the schedule needs to take account of the trade-off between project direct cost and project completion time. For example, using more productive equipment or hiring more workers may save time, but the project direct cost could increase. In CPM networks, activity duration is viewed either as a function of cost or as a function of resources committed to it. The well-known time-cost trade-off problem (TCTP) in CPM networks takes the former view. In the TCTP, the objective is to determine the duration of each activity in order to achieve the minimum total direct and indirect costs of the project. Studies on TCTP have been done using various kinds of cost functions such as linear (Fulkerson-1961, Kelly-1961),discrete (Herroelen, Emaghraby-1993),convex (Lamberson, Hocking-1970 and Berman-1964), and concave (Falk, Horowittz-1972).

PERT (Program Evaluation and Review Technique) appeared due to the existence of many uncertain variables dynamically affecting activity durations, and the costs also changing accordingly. Examples of these variables are weather, space congestion, productivity level, etc. To solve problems of this kind, PERT has been developed to deal with uncertainty in the project completion time.

In practice, basic PERT and CPM scheduling techniques have proven to be only helpful when the project deadline is not fixed and the resources are not constrained by either availability or time. To deal with project resources, two main types of techniques have been used: resource allocation and resource leveling.[5]

Most of the optimization techniques, namely time-cost trade-off analysis, resource leveling, resource allocation, and resource constraint scheduling, however, deal with distinct sub-problems and thus can only be applied to a project one after the other, rather simultaneously. [10]

1.2. Modern approaches in generating project plan and schedule

Recently, constraint satisfaction problems have been studied extensively in the operations research (OR) and artificial intelligence (AI) literature. In OR formulations constraints are quantitative, and the solver (such as the Simplex algorithm) optimizes (maximizes or minimizes) the value of a specified objective function subject to the constraints. In contrast, AI research has focused on inference-based approaches with mostly symbolic constraints.

Two of the best-known meta-heuristics are *Genetic Algorithms* and *Tabu Search*.

Genetic Algorithm (GA) procedures were developed by John Holland in the late 1960s and early 1970s (Holland 1975). Parallel to the development of GAs, Fred Glover established the principles and operational rules for Tabu Search (TS) and a related methodology know as *Scatter Search* (Glover 1977).

Scatter search has some interesting commonalties with GA ideas, although it also has a number of quite distinct features. Several of these features have come to be incorporated into GA approaches after an intervening period of

approximately a decade, while others remain largely unexplored in the GA context.

Scatter search is designed to operate on a set of points, called *reference points,* that constitute good solutions obtained from previous solution efforts. The approach systematically generates combinations of the reference points to create new points, each of which is mapped into an associated feasible point.

Tabu search is then superimposed to control the composition of reference points at each stage. The heart of tabu search lies in its use of adaptive memory, which provides the ability to take advantage of the search history in order to guide the solution process.

Ant Colony Optimization (ACO) technique has emerged recently [14] as a new meta-heuristic for hard combinatorial optimization problems The ACO algorithm is basically a multi-agent system where low level interactions between single agents (i.e., artificial ants) result in a complex behaviour of the whole ant colony. ACO algorithms have been inspired by colonies of real ants [14], which deposit a chemical substance (called *pheromone*) on the ground. This substance influences the choices they make: the larger amount of pheromone is on a particular path, the larger probability is that an ant selects the path. Artificial ants in ACO algorithms act in similar way.

The concept of **Fuzzy Programming (FP)** on a general level was first proposed by Tanaka et al. (1974) in the framework of fuzzy decision of Bellman and Zadeh (1970). Introducing fuzzy uncertainty and imprecision into the GP problems, Narasimhan (1980) initially proposed fuzzy goal programming (FGP), which gave rise to some related research (Rao, Tiwari, Mohanty, 1988; Rao, Sundararaju, Prakash 1992; Rubin, Narasimhan, 1984)

In the recent years, the researchers became more interested in solving more complex problem and for this used combinations of different methods, named **hybrid methods**. Fred Glover, James P. Kelly, Manuel Laguna elaborated a hybrid system called **OptQuest** which combines neural networks and Tabu Search, by this solving the optimization and simulation problem.[13].

Evolver (a trademark of Axcelis, Inc.) is a genetic algorithm (GA) implementation that is commercially available to run under the Windows operating system. Although it is possible to create customized systems based on the Evolver function library. When used as an add-in tool, the system assumes that the user has constructed a model using an Excel worksheet and related functions [15]

The method we want to analyze (GENOCOP algorithm) seems to fit between the OR and AI approaches. First, it uses the OR technique for problem representation, *i.e.* the formulation of constraints is quantitative. On the other hand, this method uses a genetic algorithm, which is considered as an AI based search method.

2. The GA approach for optimizing project plan

Genetic Algorithms (GA) are part of the evolutionary methods which try to extract mechanisms from the real world (like ADN composition, species evolution, neural activity) through a mathematical model, develop the model theoretically and then apply the results in practical areas (like biology, economy, robotics, mechanics, physics).

GA takes the species evolution as model by starting from an initial population of solutions (randomly or not generated) and tries to apply some operators (selection, mutation, cross-over) in order to get another population with a higher performance, until some requirements are achieved (like a maximum number of iterations are reached or the individuals from the actual population are not very different from each other).

Solution representation is a key issue in genetic algorithm work because the representation scheme can severely limit the window by which the system observes the world (Koza, [16])

There are two types of GA approaches: canonical algorithm (developed by Holland - 1975) and hybrid algorithms (the most recent approaches which combine the initial approach with new science results like neural networks, fuzzy logic).

The main advantage of a GA is that it provides a near solution (sub-optimal) in an acceptable execution time, which can be preferred to a time-consuming algorithm providing an optimal solution.

For project time-costs-quality problem, the **GA** has the following **advantages**:

- Should be parallelized for higher performance. Co-evolution approach signifies that multiple populations can run simultaneously on different threads of execution and can be combined later in order to improve the local optimums found by each of them.
- Can be applied to different cost functions (discrete, convex, concave)
- Have non linear execution and gives better solutions than the classical methods
- Can be used for multiple restriction problems
- Are easily implemented
- Run unsupervised
- Have a high degree of generalization

As representative GA types for the optimization problem we studied **Fast PGA** (Fast Pareto Parallel Genetic Algorithm) and **GENOCOP** (Genetic Algorithm for Numerical Optimizations of Constrained Problems).

The proved superiority of Fast PGA over other alternatives to use multi-objective problems is most likely due to:

- Employment of high intensity of elitism
- Utilization of a new ranking strategy
- Adaptive population sizing
- Conservative solution evaluation scheme

In this study we intend to analyze GENOCOP algorithm in order to find methods to improve it. From its beginning, this algorithm has been improved several times to respond better to a larger variety of optimization problems.

GENOCOP I (Z. Michalewicz and C. Jankow - 1991) is especially used to solve operation research problems as transportation problem. The initial population consists of identical copies of an initial point (generated or provided by the user) which represents a start for the feasible solution.

The main idea behind the GENOCOP system [12] consists of reformulating the problem in order to simplify its solution. Linear constraints are of two types: equalities and inequalities. Firstly should be eliminated all the equalities, reducing the number of variables and appropriately modifying the inequalities. Reducing the set of variables both decreases the length of the representation vector and reduces the search space. Since remains only linear inequalities, the search space is convex—which, in the presence of closed operators, could be searched efficiently.

Because GENOCOP I was created to handle only linear constraints, some improvements were necessary.

GENOCOP II (Z. Michalewicz and Attia -1994) distinguishes between linear and nonlinear constraints. The algorithm maintains feasibility of all linear constraints using a set of closed operators which convert a feasible solution into another feasible solution. The method has important features: it starts from a single point/individual and it also use dynamic penalties.

GENOCOP III (Z. Michalewicz and Nazhiyath - 1995) incorporates the original GENOCOP system and extends it by maintaining two separate populations where a development in one population influences evaluations of individuals in the other population. The first population consists of so-called search-points which satisfy linear constraints of the problem. The second population consists of so-called reference-points, which satisfy all constraints. The difficulty of this solution is that that of locating reference points in the initialization operation.

GENOCOP III introduces additional parameters: population size of reference points and probability of replacement (some reference points are moved into the population of search-points).The main advantage of this algorithm is that it always returns a feasible solution.

In this case of nonlinear optimization, a conventional solving method is the **Sequential Quadratic Programming (SQP)** (Chen, 1994). SQP is an iterative procedure, which solves a Quadratic Programming (QP) problem at each iteration. As a classical method for constrained nonlinear optimization, it is based on Kuhn-Tucker (KT) conditions.

Revised GENOCOP III (Masatoshi Sakawa and Katsuhiro Yauchi -2000) proposes a method of efficient location of initial reference point by solving the optimization problem where sum of squares of violated nonlinear constraints is used as the objective function. Moreover, the method of search of feasible solution by bisection is proposed.

GENOCOP V (Suzuki - 2004 ([9])) is viewed as an universal tool for nonlinear optimization problems with nonlinear constraints as it introduces fuzzy variables.

All GENOCOP versions are written in C and run without changes on most UNIX systems. The system, however, can also be compiled in DOS and Windows machines. The software is the property of Z. Michalewicz, but permission is granted to be copied and used for scientific, noncommercial purposes.

Methods used with GA

- **Penalty function approach**

The major issue in using penalty functions approach is assigning weights to the constraints: these weights play the role of penalties if a potential solution does not satisfy them.

The most common approach in the genetic algorithms community is that of penalizing infeasible individuals. The domain of the evaluation function (fitness function) is extended

Eval(i+1)(p)= Eval(i)(p) + Q(p)

Q(p) represents either a penalty for infeasible individual p, or a cost for repairing this individual.

The penalty should be kept as low as possible, just above the limit below which infeasible solutions are optimal.

The importance of penalty functions:

One way of dealing with candidates that violate the constraints is to generate potential solutions without considering the constraints and then penalizing them by decreasing the “goodness” of the evaluation function. In other words, a constrained problem is transformed to an unconstrained problem by associating a penalty with all constraint violations and the penalties are included in the function evaluation.

The paper by Richardson, Palmer, Liepins, and Hillard [11] examines the penalty approach discussing the strengths and weaknesses of various penalty function formulations and illustrate a technique for solving three dimensional constrained problem.

Z. Michalewicz and C. Janikow, [12], do not consider this to be a promising direction. For a heavily constrained problem, such as the transportation problem, the probability of generating an infeasible candidate is too great to be ignored. The technique based on penalty functions, at the best, seems to work reasonably well for narrow classes of problems and for few constraints.

- **Decoders**

Decoders methods offer an interesting option for all practitioners of evolutionary techniques. In these techniques a chromosome “gives instructions" on how to build a feasible solution. For example, a sequence

of items for the knapsack problem can be interpreted as: “take an item if possible", such interpretation would lead always to a feasible solution.Each decoder imposes a mapping T between a feasible solution and decoded solution. It is important that several conditions are satisfied: (1) for each solution s 2 F there is an encoded solution d, (2) each encoded solution d corresponds to a feasible solution s, and (3) all solutions in F should be represented by the same number of encodings d.3 Additionally, it is reasonable to request that (4) the transformation T is computationally fast and (5) it has locality feature in the sense that small changes in the coded solution result in small changes in the solution itself.

3. Problem Definition and Solution

3.1. Model Formulation

The problem we want to solve is formulated as a multi-objective optimal control problem that involves three conflicting objective functions. The objective functions are the total direct costs of the project (to be minimized), the mean of project completion time (min), the variance of project quality (min).

Input Data of the algorithm is represented by the initial population, a subset of activity vectors automatically generated by a procedure.

Ak, Aj, … Ap, where k,j,p=1,..,n

The general form of a chromosome is: A1, A2, A3, .., An, which is a vector of activities ordered by the time criteria (the start time for each activity is ordered ascending)

For each activity the following are known:

- Earliest time to start -ES
- Latest time to start-LS
- Earliest time to end-EE
- Latest time to end-LE
- Cost for ES- CE
- Cost for LS-CS
- Quality for ES-CE
- Quality for LS-CS

ES	EE	CE	QE
LS	LE	CS	QS

Between them we find the following relations:

ES< EE, ES<=LS

LS<LE, EE<=LE

EE-ES=LE-LS=activity duration

Disregarding the resource utilization and associated constraints, the total duration of a schedule , T, can be determined as:

[1] ESn=MAX{(EFp+Lag)}

[2] EFn=ESn+Dn

[3] LFn=MIN{(LSs-Lag)}

[4] LSn=LFn-Dn

[5] TFn=(LSn-ESn)=(LFn-EFn)

[6] Ti=MAX{EFn}, n=1,2,..,k

TFn=total float for activity n

Lag=the lag time between activities which are related to each other by precedence relationship

Problem constraints have several types:

- Time constraints regarding activity precedence, some activities are influenced by other activities start-end time
- Cost constraints
- Quality constraints, some activity sub-chains should have a minimum required quality in order to be validated

For the first version of the algorithm are accepted only linear constraints and no fuzzy variables, this meaning that the reference model is GENOCOP I algorithm. Also penalty functions and decoders are not used.

The representation scheme is the mapping between the problem and the multidimensional search space and has the following parameters:

- Alphabet size K=10 (decimal)
- For each chromosome results a 4 dimensional group: (X,Y,Z,U) meaning time-cost trade-off, where X=the vector activities, Y=total time, Y=total cost, U=total variance of quality. Therefore, the search space will be a 4 dimensional hypercube.

The purpose of the algorithm is to search the optimal (X,Y,Z,U) group which minimizes Y, Z and U.

To normalize the objectives, this approach proposes the modified adaptive approach (MAWA) as:

Fitness function:

[7] min f=Wd * (D-Dmin+x)/(Dmax-Dmin+x) +Wc * (C-Cmin+x)/(Cmax-Cmin+x) +Wq*(Q-Qmin+x)/(Qmax-Qmin+x)

Wd, Wc, Wq= the weights of time, cost and variance of quality

Dmax, Dmin, Cmax, Cmin, Qmax, Qmin=the maximal and minimal value of duration cost and variance of quality

x= very small positive number in order to prevent dividing by zero in objective function

3.2. Algorithm Implementation Principles

Genetic Operators

The operators used in GENOCOP system are quite different from the classical ones for the following reasons:

1 GENOCOP deals with a real valued space *Rq*, where a solution is coded as a vector with floating point type components. This characteristic will not be satisfied by the proposed algorithm, as it does not fit the optimization problem for project time-cost-quality, where all variables are discrete.

2. The genetic operators are dynamic, *i.e.* a value of a vector component depends on the remaining values of the vector. . This characteristic will be kept.

Some genetic operators are non-uniform, *i.e.* their action depends on the age of the population. They have "responsibilities" like fine tuning and prevention of premature convergence. This characteristic will be kept.

Besides these characteristics, the operators should be applied as following:

- **Selection operators**

Represent criteria to eliminate inefficient population. The individuals are kept within the next generation according to their efficiency calculated as fitness function value for each of them.

- **Mutation operators**

Acts like a background operator, occasionally changing values and allowing alternative alleles to be related, encouraging genetic diversity. It will be applied by using inversion in 1 and multiple points with associated probabilities. This operator is used when its result is appropriate, like increasing the value of the fitness function if it is chosen.

- **Cross-over operators**

The activity vectors should be combined by using 1 point cross-over and/or 2 point cross-over. The points of cross-over are found by searching the differences between vectors, and switch them where differences occur, maintaining the condition that the resulting vector should contain all the activities.

Initialization parameters, as population size, maximum number of iterations and probabilities for selection, mutation and cross-over are user provided through external files.

Algorithm Implementation is made from scratch in C#, according to the mentioned steps and following general structure of GA (see Figure 2)

procedure genetic_algorithm
begin
initialize parameters
initialize $P(t)$
evaluate $P(t)$
while (**not** termination-condition) **do**
begin
select $P(t)$ from $P(t2\ 1)$
mutate P(t)
recombine $P(t)$
evaluate $P(t)$
end
end

Figure 2. General pseudo-code for genetic algorithm

3.3. Case Example and Analysis of Findings

The GA Application is tested with real and generated project data. For simplicity are taken projects with less than twenty activities, few constraints and a given cost, duration limit and variance of quality.

Expected results of the algorithm are:

- The actual solutions generated, more efficiently than using classical approaches as CPM, PERT
- Good convergence of the algorithm, the genetic operators as described previously being able to avoid premature convergence of the algorithm

4. Conclusions and further research

Optimizing the project plan and schedule is a complex activity which should satisfy objective function (minimizing/maximizing) regarding time, cost or quality and several constraints on activities, resources or other project relevant data. This paper analyzes research history in the domain of project optimization methods, focusing on Genetic Algorithms (GA) approach.

As important research results we mention: applying GENOCOP (Genetic Algorithm for Numerical Optimizations of Constrained Problems) for optimizing time-costs-quality. This study proposes a problem model and modifications required for the mentioned genetic algorithm to solve it.

Future research plans include comparison of the proposed GA Time-Cost-Quality with GENOCOP versions previously elaborated (GENOCOP I, GENECOP III, GENOCOP V) and with other meta-heuristics as Tabu Search and Ant Colony algorithms. Furthermore, the actual proposed algorithm can be improved by using co-evolution and can be hybridized with Fast PGA (Fast Pareto Parallel Genetic Algorithm).

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THE QUALITY IMPORTANCE IN A PROJECT MANAGEMENT COMPLEXITY ENVIRONMENT

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A project is a temporary endeaver undertaken to creat a unique product, service or result. The temporary nature of project indicates a definite beginning and end. The end is reached when the project's objectives have been achieved or when the project is terminated becouse its objectives will not or cannot be met, when the need for the project no longer exist. Temporary does not necessarily mean short in duration. Temporary does not generally apply to the product, service, or result created by project; most projects are undertaken to create a lasting outcome. For example, a project build a national monument will create a result expected to last centuries. Projects can also have social, economic, and environmental impacts that far outlast the projects themselves.

An outgoing work effort is generally repetitive process because if follows an organization's existing procedures. In contrast, because of the unique nature of projects, there may be uncertainties about the product, services, or results that the project creates. Project tasks can be new to a project team, which necessitates more dedicated planning than other routine work. In addition, projects are undertaken at all organizational levels. A project can involve a single person, a single organizational unit, or multiple organizational units.

A project can create:

- A product that can be either a component of another item or an and item in itself,
- A capability to perform a service (e.g., a business function that supports production or distribution), or
- A result such as an outcome or document (e.g., a research project that develops knowledge than can be used to determine whether a trend is present oa a new process will benefit society).
- Exemple of projects include, but are not limited to:
- Developing a new product or service,
- Effecting a change in the structure, staffing, or style of an organization,
- Developing or acquiring a new or modified information system,
- Constructing a building or infrastructure, or
- Implementing a new business process or procedure.

Project management is the application of knowledge, skils, tools, and techniques to project activities to meet the project requirements. Project management is accomlplished throught the appropiate application and integration of the 42 logically grouped project management processes comprishing the 5 Process Groups.

These 5 Process Groups are:

- Initiating,
- Planning,
- Executing,
- Monitoring and Controlling, and
- Closing.
- Managing a project typically includes:
- Identifying requirements,
- Addressing the various needs, concerns, and expectations of the stakeholders as the project is planned and carried out.
- Balancing the competing project constraints including, but no limitied to:
  - Scope,
  - Quality,
  - Schedule,
  - Budget,
  - Resources, and
  - Risk.

Quality management is the process of ensuring that the quality expected by the customer is achieved. It encompasses all the project management activities that determine and
implement the Project Quality Plan. The various elements of an organisation's quality management interrelate and are as follows:

A quality system, which has an organisation structure, procedures and processes to implement quality management. Both the customer and the supplier may have quality systems. The project may have to use one of these systems or an agreed mixture of both.

Quality assurance, which creates and maintains the quality system and monitors its application to ensure that the quality system is operated and is effective in achieving an end product that meets quality and customer requirements. A quality assurance function should be separate from and independent of the organisation's project and operational activities to monitor use of the quality system across all projects within the corporate body. If such an independent body does not exist, the Project Assurance function will assume the quality assurance role within the project.

Quality planning, which establishes the objectives and requirements for quality and
lays out the activities for the application of the quality system. In the Project Initiation Document the quality

methods for the whole project are defined in the Project Quality Plan. It is important that the customer's quality expectations are understood and documented prior to project commencement. This is done in *Starting up a Project* (SU). Each Stage Plan specifies in detail the required quality activities and resources, with the detailed quality criteria shown in the Product Descriptions.

Quality control, which is the means of ensuring that products meet the quality criteria specified for them. Quality control is about examining products to determine that they meet requirements.

ISO ISO issues an international range of standards including those for quality management systems.There is a specific standard covering quality management system requirements in the design/development, production, installation and servicing of a product, including project management. It is a standard used by many organisations as the basis for their quality management system (QMS). A company can use the ISO quality standard when:

● Setting up a quality management function

● Examining the quality assurance system of a supplier. It therefore may have several impacts on the quality considerations for a project:

● The customer and/or the supplier when creating its quality management system may have used it as a checklist

- ✓ The supplier's development methods may be accredited under an ISO standard
- ✓ The customer may wish to match a supplier's quality methods against the requirements of an ISO standard or insist on a supplier who holds an ISO standard accreditation
- ✓ It may have been used as the basis for the corporate quality policy of the supplier.

Quality policy The customer and/or the supplier may have a quality policy, laying down the company's attitude towards the quality of anything that it makes or uses. It should direct and influence the supplier's attitude in construction, testing and reaction to any customer complaints about quality. If both customer and supplier have quality policies, it is sensible to check that they are in harmony. If not, there will need to be an agreed compromise, driven by the needs and best interests of the customer. Where the project is part of a programme, the programme should provide guidance or direction to the project.

Quality Management System (QMS) Two things should support a quality policy; a quality management system and a quality organisation structure. The QMS is a set of standards covering all the normal work done by that company. Each standard will cover the techniques, tools, required expertise and steps to be used in the creation of a specific type of product. If the product is a document, the standard will also cover its format or appearance. If both the customer and supplier have quality management systems, there must be agreement on which QMS or what amalgamation of standards from both sets of standards will be used. The quality organisation structure indicates the responsibilities for quality − that is, who sets the quality policy, who sets the standards to meet the policy, any external body imposing quality constraints, who monitors use of the standards and any quality training group. Much of this work is often done by a central quality assurance function.

Quality assurance Site-wide responsibility for setting and monitoring quality standards is often given to a quality assurance group. The Project Quality Plan should indicate where this responsibility for setting the quality standards lies. It may be that the independent quality assurance group has a representative take a Project Assurance role in order to monitor the use and effectiveness of agreed standards. If so, this should be stated in the Project Quality Plan.

Project Approach How the project aims to meet the customer's quality expectations will be affected by the approach chosen for the provision of the end result. Typical approaches would include:

The product is built from scratch by the customer's staff

An external supplier builds the product from scratch

The product is built from scratch with contributions from many external organisations

An existing product is modified to meet new needs

An off-the-shelf product is bought.

Quality control methods and responsibilities will vary according to the approach chosen. The Project Approach is confirmed as part of *Starting up a Project* (SU).

Project Assurance Each time an external TeamManager plans work for the project, the Project Assurance role should review and approve the draft plan. The purpose is to identify products being developed in the plan that are of interest to the Project Assurance function. Project Assurance then verifies that quality checking arrangements for these products are satisfactory. This covers the method of inspection, the points in the products' development when inspections are to be held and the people to be involved in the inspection. Project Assurance should have the option to specify people to be included in inspections. This is particularly relevant and important for the customer's assurance of an external contractor's work. This requirement to inspect and modify the contractor's plans should be included in the contract.

Project Quality Plan This is created in *Initiating a Project* (IP). It forms part of the Project Initiation Document. It defines in general terms how the project will meet the customer's quality expectations. It will identify the techniques and standards to be used. If there is a QMS in existence, it is normally sufficient simply to reference the QMS manual that contains the standards. If necessary, the Project Quality Plan will identify any standards in the QMS that will not be used or any extra standards not in the QMS that will be used. The plan should also identify quality responsibilities for the project. For example, if the

customer or the supplier has a quality assurance function, the plan would explain how that function would play a part in the project. The Project Quality Plan should mention the quality responsibilities of the Project Manager and Configuration Librarian, and define how the assurance responsibilities of each Project Board member are to be handled.

Stage or team quality plan Stage Plans or team plans should contain a quality plan that will identify the method(s) and resources to be used to check the quality of each product. The Project Assurance roles have a key part to play here in identifying products of key interest to their role and in specifying who should be involved in quality checking these products. For example, for any quality reviews, the names of the chairperson and reviewers would be given.

Product Descriptions and quality criteria As part of a Stage Plan there should be a Product Description for each major product to be created during that stage. This indicates, among other things, the quality criteria that the product must meet and the method of checking that those criteria exist in the finished product. It is sensible, often essential, to involve the customer's staff in defining the Product Descriptions, including the quality criteria. Not only are they the people who should know best, but also the product needs to meet their quality expectations. An inherent quality criterion for every product is that the product should satisfy all the elements of the Product Description. For example, it should contain those elements mentioned under 'composition' and be capable of satisfying the defined purpose of the product.

Quality control The people involved should have been identified when creating the Stage Plan. The technique links with the configuration management part of the project organisation, which will be responsible for releasing copies of the document to be reviewed, freezing the original copy and updating the status of the product.

Quality Log The Quality Log is created during *Initiating a Project* (IP). It is the record of all the quality checking done in the project. Details of all quality checking activities are entered in the log as they are planned in either Stage or team plans. TheTeam Manageror individualteam member charged with the development and testing of a product subsequently updates the log with the results and dates of that quality checking. It forms an audit trail of the quality work done in the project.

Project Issues Project Issues have many potential impacts on quality. A Project Issue may be reporting a quality problem. Normally such problems would be found during quality control. But a quality problem may be found in a product that has already been approved or a review might discover a problem in a product that is not the one being inspected.

What is special about quality in the project environment?

It is very difficult, if not impossible, to achieve the business benefits of a product if that product does not meet the customer's quality expectations. By its nature, a project is a temporary environment created for a particular purpose. As such, any required quality management for the project may have to be created for that project if the organisation does not already have a quality system in place.

Making project quality work Project quality planning should cover the following aspects to ensure that the project delivers to an acceptable level of quality:

- ✓ How each product will be tested against its quality criteria
- ✓ When each product will be tested against its quality criteria
- ✓ By whom each product will be tested against its quality criteria
- ✓ How acceptance will be notified.
- ✓ The first aspect is actioned by *Planning Quality* at the outset of the project, during *Initiating a Project*. The next two aspects are actioned in the relevant Stage Plans, created in *Planning a Stage.* The final aspect is the process of using all the quality-checking techniques defined in the quality system. These split largely into two groups:
- ✓ Objective methods, where, after applying them, there is a largely definitive 'yes' or 'no' answer to whether the product is 'to quality'. Examples of these methods are the use of gauges and meters, testing and checklists.
- ✓ Subjective methods, where the criteria involve either judgement or opinion, such as user friendliness, conformance to business strategy and market acceptability. To control the process of checking conformance to quality in these areas, the quality review technique is available.

Hints and tips It is almost always possible to define objectively measurable criteria. But it is sometimes not worth it – that is, not cost or time effective. The Daily Log can be used by either the Project Manager or the Team Manager to note down a check that needs to be madeabout quality, such as finding out why a planned quality check has not been done (or not recorded in the Quality Log), why so many errors were discovered in a quality check and so on. Customers and Suppliers may have different Quality standards. It is important to ensure that appropriate measures are agreed with/between all parties.

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STATISTICAL MODELS USED IN PROJECT MANAGEMENT

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"Statistical Models used in Project Management" is approaching major interest issues within the actual research context, when research activities are grouped per project. An observer of the phenomena taking place today in the higher education and research can not fail to notice the importance of scientific research have achieved through programs or projects as part of European higher education and the need to establish closer links between Common European Higher Education Area and European Research Area in the context of both the organic substrate defining building a Europe of knowledge In this context we can define the major role they play research conducted by research programs and projects with national or international funding and training resources for scientific research, along with promoting interdisciplinary, in the process of maintaining and improving the quality of European higher education oriented performance and competitiveness.
Key words: *performance in scientific research, projects, performance indicators, statistical models based on indicators systems, performance evaluation.*

Currently, there tend to denote any activity with relatively complex character as the project. Elements that define a project must carry out those activities differentiate between current and common projects. Mainly any project must belong to a domain, should be defined by a goal achievable, measurable, quantifiable, can be broken down into intermediate objectives, phase, activities, to be associated with resources of time, cost, including financial resources, material, human, to be defined deliverables. Of course any project contains risks, has constraints, is a project manager and last but not least is unique.

Project management is the process of professional coordination of all available resources in order to achieve a target project in conditions of specific performance. This involves project management processes: start - which takes place award for design event of signing the contract, appointment of managers and project team, define the resources - time, cost, developing project documentation - project plans, financial estimates, estimates of time, defining milestones in the project - those events which confirm the achievement of a stage intermediate target, the exceeding of a critical point in the project, allocation of responsibilities, to followed by co-ordination of all resources in terms of design, control and monitoring of project execution, setting indicators to confirm progress in the project. In any project there is at least one discontinuity, which must be eliminated so that the project to continue without gaps in time or additional costs. Closing process is the formal completion of the project, preparation of documentation of completion, delivery of results, acknowledgement of the project.

Project management is based on eight principles: The Commitment Principle, The Success Principle, The Management Principle, The Single-Point Responsibility Principle, The Cultural Environment Principle, The Project Approach as a System Principle, The Strategy Principle and not least The Tetrad Trade-off Principle Purpose-Quality-Cost-Time. This principle is actually to achieve an objective in the conditions defined in performance cost conditions and well-defined time. All statistical variables to be defined so as to be accepted and become measurable and achievable. In terms of character measurable, quantifiable objectives, resources and results to tackle statistical methods to estimate the costs and times, the forecast of the evolution of project based on information available at a time.

Another method used is Cost Benefit Analysis and Business Case, which begins by describing the history of the project and its context, by confirming the alignment of these elements project to the overall strategies of the company, continuing to define the benefits to be achieved - value proposition, how to achieve the expected benefits, assessing options, justifying the choice and risk assessment, description of deliverables, influences (stakeholders) and working hypotheses, the phase detailing of their activities, planning and identification of critical activities, financial evaluation of investment and establish requirements resources.

Earned Value Analysis or method value added - indicates Project Manager's not only labor costs up to a point, but the amount of work already performed analysis using: BCWS (Budgeted Cost of the Work Scheduled) - budgeted cost of work planned, BCWP (Budgeted Cost of the Work Performed) - budgeted cost of works carried out, ACWP (Actual Cost of the Work Performed) – actual cost of work executed.

Background statistical models to assess performance in project management, starts from the general principles underlying the measurement in economics, process quantification is the connection between the theoretical and the empirical of knowledge in the field, generating and the quantities, namely by defining indicators. Before defining performance indicators is necessary to define the concept of successful project management and performance results. Following this definition can lead indicators to assess performance and the critical factors for success project-specific. Identify performance indicators and critical success factors, and use of management models that include methods, techniques and statistical tools such as Balanced Scorecard model, budgeting model, best practice models are needed in decision-making manager project or by the case of the project owner.

The level of performance in scientific research is determined by quantifying and centralize the university level and then measuring the results of projects carried out in a certain period of time. In order to obtain additional funding these results are reported annually to the authority which provides core funding for higher education in the form and structure quality indicators - IQ6. For the allocation of these funds to universities the procedures for evaluation, monitoring and financing developed by national authority. Research component is included in core funding, as expressed and reported by one of the indicators system of quality indicators that quality indicator IQ6 - The performance of scientific research. The score obtained by each university in this indicator is possible to achieve a hierarchy leading to the university access to this type of arrangement.

The values of quality indicators are calculated in two stages, the first step is to determine the absolute values of indicators and in the second stage relative values of quality indicators. The calculation of quality indicators (absolute) is distinct for each indicator separately and differ in terms of their complexity.

The formulas used to transform the quality indicators (absolute) is the relative quality indicators and calculation methods to quantify joint or separate methodologies such as the indicator of such complex IQ6 - The performance in scientific research, compared with other indicators of quality of the system.

The importance of the targeting of quality indicators is considered to be different. As it is expressed mathematically by assigning each indicator has a value expressed as a percentage, called the weight indicator (Pk). This ratio expresses the percentage of total funding base, which is distributed according to the indicator universities (IQk). Overall share of funding basic component whose distribution is influenced by the quality indicators is 30% of the total funding base (equal to the sum of the proportion of indicators. IQ6 indicator of quality - The performance had şiinţifică research by 2008 accounting for 3% of the IQ system of quality indicators.

Quality indicators are calculated for each university in part by mathematical formulas that contain a whole set of parameters. Most indicators of system quality indicators, calculated by simple mathematical formula (the ratio of two parameters and report the sum of two parameters). The remaining indicators of quality such as complex or require a distinct approach to the funding algorithm, is calculated by special formulas.

The calculation of quality indicators for each university is partly based on the parameter values entering the calculation formulas. For the universities sent to national authority data available at the time considered the reference, required the calculation of quality indicators. The procedures used do not exclude the possibility that during the year to update the value indicators are made from new data become available.

The quality system IQ6 - The performance in scientific research aimed at assessing the level of performance in academic scientific research, conducted by projects approved to finance, has a complex structure and a separate formula compared to other indicators of quality.

To assess the performance of research and development conducted in univeristăţi through research projects at the institutional level, 5 parameters generally monitored or indicators of the quality system - IQ6, established and applied by the NURC, based on a specific methodology: funding

1. Ability to attract research (25%)
2. Ability to develop human resources for research (10%)
3. The relevance and visibility of results (50%)
4. Ability to design / develop innovative products-technologies (10%)
5. Ability to organize and support research (5%)

Every general indicator of performance appraisal is a separate calculation method, according to the methodology approved national authority and therefore this is a complex statistical model. The methodology for calculating the indicator IQ6 - "The performance in scientific research, the procedure national authority is presented below:

1. Ability to attract funds for scientific research(25%)- n1

(sum of weighted average rate of funding)

$$\mathbf{n_1 = n_{1.1}*4\% + n_{1.2}*6\% + n_{1.3}*15\%}$$

1.1 Initiative in attracting research funds, nationally and internationally (4%)- n 1.1

(ratio of weighted number of projects submitted and the number of teachers and researchers)

$$\mathbf{n_{1.1} = n_{1.1}' * p_1 + n_{1.2}' * p_2}$$

$$n'_{1.1} = \frac{NPD_n}{N_{cd} + N_c}$$

$$n'_{1.2} = \frac{NPD_i}{N_{cd} + N_c}$$

$n_{1.1}'$=component of attracting research funds at national level (national competition)

$n_{1.2}'$=component to attract international research funds (competitions international)

NPDn = number of projects submitted in national competitions,

NPDcd = number of projects submitted in international competitions

NCD=total teachers

Nc = total number of researchers,

P1 = the share of national component, 0.30

P2 = share international component, 0.70

Submission of projects is essential to obtain funds and the sub-institution shows concern in this regard. At the national level are reported only for the university is coordinating projects and international projects related to university is the coordinator and partner.

1.2 Projects won in national and international competitions (6%) - n 1.2 (ratio of weighted number of projects won and the number of teachers and researchers)

$n_{1.2} = n_{1.1}'' * p_1 + n_{1.2}'' * p_2$

$$n_{1.1}'' = \frac{NPC_n}{N_{cd} + N_c}$$

$$n_{1.2}'' = \frac{NPC_i}{N_{cd} + N_c}$$

n1.1''=score obtained for the number of projects won in national competitions

n1.2''=score obtained for the number of projects won in international competitions

NPCn = number of projects won in national competitions,

NPCi = number of projects won in international competitions,

NCD = total teachers

Nc = total number of researchers,

P1 = proportion of national component, 0.30

P2 = proportion of international component 0.70

Proportion this sub-may increase the expense of the above as the initiative will be increased.

1.3 Funds attracted from national and international competitions, projects / contract research, consultancy / technical services and technology (national or international, including agreements directly with local and foreign companies) (15%) - n 1.3

(ratio of value of projects and research contracts, consultancy or services-expressed in the same currency unit and the number of teachers and researchers)

$$n_{1.3} = \frac{(VT_1 + VT_2 + VT_3)}{N_{cd} + N_c}$$

VT 1 = total contracts obtained in national competitions,

VT 2 = total contracts obtained in international competitions,

VT 3 = total contract research / consulting / technical services and technology agreements directly with the companies in the country and abroad,

N cd = total teachers

N c = total number of researchers,

Funds raised by a university have the same real value, regardless of source of origin. All values expressed in lei, the exchange rate prevailing at the date of conclusion. The score for financial resources has attracted 15,000 USD per person reference)

2. Ability to develop highly qualified human resource for scientific research (10%) - n 2 (sum of weighted average rate of funding)

$n_2 = n_{2.1} * 4\% + n_{2.2} * 6\%$

2.1 Degree of involvement in the preparation of highly qualified human resources for scientific research (4%) – **$n_{2.1}$**

(ratio of total number of doctoral leaders and the total number of teachers, owners and consultants from the university)

$n_{2.1} = N_{.doc.lead} / N_p$

$N_{.doc.lead}$ = Total number of doctoral leaders

N_p = total number of teachers (holders and consultants) of the university

2.2 Efficiency in training highly qualified human resources for scientific research (6%) - **$n_{2.2}$** (ratio of total number of theses completed and publicly and total number of doctoral students enrolled at the university)

$n_{2.2} = N_{.thesis} / N_{phD}$

N_{thesis} = total number of theses completed and publicly supported

N_{phD} = total number of doctoral students

3. The relevance and visibility of scientific research results (50%) - **n_3**

(sum of weighted average rate of funding)

$n_3 = n_{3.1} * 30\% + n_{3.2} * 10\% + n_{3.3} * 10\%$

3.1 Articles published in internationally recognized journals

(ratio of weighted number of articles published internationally and the number of teachers and researchers)

a) ISI Web of Science;

b) of mainstream publications without impact factor, indexed DBI;

c) published in international conferences ISI volumes and / or those organized by international professional societies (30%) – **$n_{3.1}$**

$n_{3.1} = n3.1' * p3 + n3.2' * p4 + n3.3 * p5$

$$n_{3.1}' = \frac{\sum_i N_i * \alpha_{fi}}{N_{cd} + N_c}$$ where i: magazine

$$\alpha_{fi} = \frac{FI_i}{FI_{\max}}$$

n3.2' =Np / Nt + Nr

n3.2' =Nw / Nt + Nr

p_3= proportion of articles published in international journals, ISI - 0.60

p_4 = proportion of articles published in international journals, unlisted ISI, but indexed DBI - 0.20

p_5 = proportion of articles published in volumes of international conferences, ISI, and those organized by international professional societies – 0.20

Ni = total number of articles published in the magazine and, α_{fi} = be calculated for the journal impact factor

Nt = total teachers

Nr = total number of researchers,

i = magazine that is published article and,

α_{fi} = impact factor of journal i

FImax = maximum impact factor of journals in the field of magazine

Np = total number of papers published in international journals unlisted ISI, but indexed DBI, Nw = total number of works (articles) published in volumes ISI and the international conferences organized by international professional societies

3.2 Articles published in journals recognized nationally by the national authority - category B +, B and C (10%) - $n_{3.2}$

(ratio of weighted number of articles published nationally and the number of teachers and researchers)

$n_{3.2}$ = Nart BB+ / (Nt + Nr)*1 / P6 + NartC / (Nt + Nr)*1 / P7

N art.BB= total number of articles published in journals recognized by the national authority - categories B and B +,

N art.C = total number of articles published in journals evaluated by national authority - category C

N t = total teachers

N r = total number of researchers

P 6 = share of the national component (categories B and B +) – 0.80

P 7 = share of the national component (category C) – 0.20

3.3 Books published in national and international publishing houses publishing (paper and / or electronic) (10%) - n 3.3

$n_{3.3}$ = Npag-in / N pr-in*(Nt+Nr)*1 / P1 + Npag-n / N pr-n*(Nt+Nr)*1 / P2

Npag-in = total number of pages published in international work,

Npag-N = total number of pages published in national papers,

N pr-in = number of pages in reference to international work (50),

N pr-n = number of pages of reference works nationally (100)

Nt = total teachers

Nr = total number of researchers,

P1 = the share of national component0.30,

P2 = share international component, 0.70

4. The ability of universities to design / develop products - innovative technologies for business (10%) - n 4 (weighted average rate of funding)

(ratio of total number of patents / products with intellectual property right and the number of teachers and researchers)

n 4 = n 4 '* 10%

n_4' = Npat. / (Nt+Nr)

Npat. = total number of patents / products with N patent-pi proprietary intellectual

N t = total teachers

N r = total number of researchers

5. The institutional capacity of universities to organize and support scientific research and transfer research results in the socio-economic (5%) - n 5 (weighted average rate of funding)

n 5 = n 5 '* 5%

$$n_5^{'} = \frac{n_{5.1} + n_{5.2}}{2}$$

n 5.1 = 0, if there is functional structures to support research

1, if there are functional structures to support research

n 5.2 = 0, if there are no functional to support transfer of research results

1, if there are functional structures to support transfer of research results.

From the data available for the period 2004-2008, the quality indicator IC6 – "The performance in scientific research, it analyzes the development level and structure of quality indicators for IC6 Academy of Economic Studies Bucharest. Evolution of financing the 17 indicators of quality indicators system in 2004 and in 2008, the year start and end of the period considered, is represented in the graph in figure 1. 1

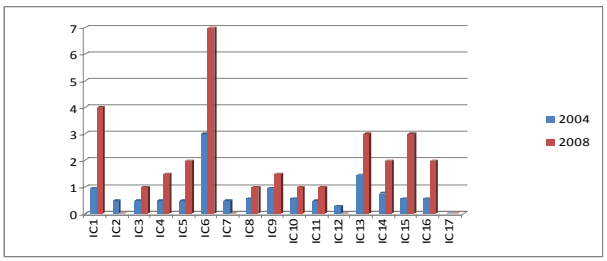

Fig. 1.1 Funding in 2004-2008 The quality system structure

From this graphic there is a significant increase in budgetary allocations to support performance in scientific research, from 3% in 2004 to 7% in 2008. Funding provided in 2008 reflects the obvious interest in obtaining relevant results for the Romanian Scientific Research.

Based on data requested from project managers in centralized databases and annual NURC, the Economic Research Department of Economic Studies

Bucharest was possible to apply scientific methodology to assess performance, described above. Such systems have been calculated subindicatorii of IC6:

$$n_1 = n_{1.1}*4\% + n_{1.2}*6\% + n1.3*15\%$$
$$n_2 = n_{2.1}*4\% + n_{2.2}*60\%$$
$$n_3 = n_{3.1}*30\% + n_{3.2}*10\% + n_{3.3}*10\%$$
$$n_4 = n_4'*10\%$$
$$n_5 = n_5'*5\%$$

Then it calculated the final indicator:

$$IC_6 = n_1 + n_2 + n_3 + n_4 + n_5$$

As can be seen as indicator of IC6 is actually a weighted average indicators $n_{1.1}$, $n_{1.2}$,..., $n_{5.}$ (weighted sum is equal to 100%).

Following the methodology of calculation, we present results obtained for the 5 sub-period analysis:

Table 1.1 - The quality indicators - IC6 calculated ASE Bucharest 2004-2008

Indicator name (weighted by the percentage of funding IC6)	**2004**	**2005**	**2006**	**2007**	**2008**	**Total punctaj**
1. Ability to attract funds for scientific research	0,004	0,030	0,070	0,166	0,292	**0,563**
2. Ability to develop highly qualified human resource for scientific research	0,035	0,034	0,035	0,033	0,026	**0,162**
3. The relevance and visibility of scientific research results	0,043	0,046	0,077	0,084	0,147	**0,397**
4. The ability of universities to design / develop products - innovative technologies for business enviroment	0,000	0,001	0,000	0,000	0,000	**0,001**
5. The ability of universities to organize and support scientific research and transfer research results in the socio-economic	0,025	0,025	0,025	0,025	0,025	**0,125**
Total -IC_6	**0,107**	**0,136**	**0,207**	**0,308**	**0,490**	**1,248**

Source: ASE Bucharest 2004-2008 data were collected from the departments, research centers and centralized database configured to NURC for assessing the performance of scientific research.

As can be seen in Table 1.1 include a progress indicator is sloping upward during the five years, with higher growth in 2007 and 2008. Compared to 2004, the indicator rose IC6 with 0.383 points, which means the percentage of 357.6%. On average, increasing from year to year was 0.095 points, or 46.8%. Evolution of financing is represented suggestive in figure 1.2.

We note increased ability to attract funds, revealed by the exponential development sub-indicatori 1 (increase of 73 times, explained the rise and especially the value of research projects over the past two years). Due to the growing number of papers published in international journals ISI and increased relevance and visibility of research results more than 3,4 .

We note that sub-indicators 2 and 4 show a relatively constant during the period under review, even a slight decline in 2007 and 2008 to prepare the human resource capacity at the expense of decreasing the number of doctoral theses completed and decrease the number of doctoral coordinators.

In Figures 1.2 plot changes in the quality of the five IC6 system.

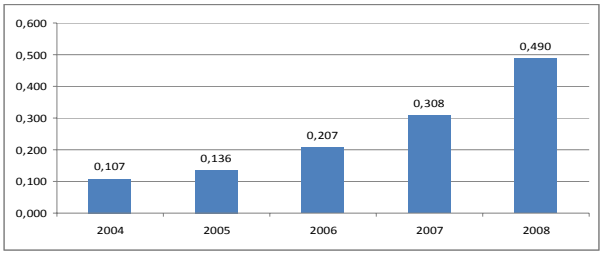

Fig. 1.2 Development of indicator IC6 2004-2008 for ASE Bucharest

Conclusions:

Performance research conducted by research projects should be assessed by indicators build on this work and feedback on how performance results are recovered. The problem of defining a financial indicator that can be made commensurate with the production following the completion of transfer of technology. In evaluating these new indicators should consider indicators by which to identify social and environmental effects that are relevant to the project, program or organization.

Since the transfer of technology in Romania at present is limited to the existence of centers created in addition to units, usually with activity of CD, the way technology transfer concerns mostly only the results of their units question. To extend this activity suggest some actions such as:

• developing a national computer platforms including indicators that reflect all transferable research results, as a single database, accessible to any natural or legal persons interested in technology transfer activities, as shall in the European area with results of research conducted on the basis of funds;

• develop a procedure to collect performance data from research (economic, social, environmental, etc..), By exploiting the results of the beneficiaries of technology and unlimited access to the data accumulated in databases for this purpose, the only way to assess the contribution each unit of CD in the innovation process the company, and that assessment of efficiency of each unit receiving public funds for research. It thus creates the possibility of sealing loop-research funding results-recovery-effects with return of funds from the state budget. The loop is now open, without the existence of feedback, the consequences when they felt the question to justify the efficiency of budgetary funds for research consumed or to justify the need for funds for this purpose.

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EX POST AND EX ANTE IMPACT ANALYSIS OF RESEARCH PROGRAMMES USING CMMI FRAMEWORK

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In this paper, we propose a new approach for evaluating research projects and programs. According our approach, the improvement might be achieved by adopting a results-based and a project portfolio approach, and assuring a research and technology development (RTD) indicators documentation through a standard and comprehensive indicator description, named indicator template. The results-based approach will assure a consistent indicators structure, according to the results chains and a strong connection between ex ante and ex post impact evaluation. The project portfolio approach will assure a tight integration of the research performance indicators, especially between policies goals and program results. And, finally defining a comprehensive indicator template it will be possible to understand better the indicators, develop a detailed analysis, based on the business intelligence techniques, such as OLAP (On-Line Analytical Processing), data mining and text mining. According our knowledge the usage of this kind of techniques on RTD metadata is an innovative process.

What we expect to find out is the indicators similarities and differentiations, the indicators clusters, the association between indicators, the most important input factors of indicators definition. According the results-based and project portfolio approach the discovered patterns will be evaluated

The approach will be developed and applied within a research project financed by the Romanian Ministry of Education and Research, in the framework of the National R&D and Innovation Plan for 2007-2013.

Categories and Subject Descriptors
*I.2.6 [**Artificial Intelligence**]: Learning – Induction, Knowledge acquisition.*
General Terms
Measurement, Documentation, Performance.
Keywords
RDT indicator, RDT statistics, indicator template, data mining, text mining.

INTRODUCTION

The evaluation of the research projects and programs is a data intensive endeavor and for this reason the reliable and comparable research and technology development (RTD) statistics and indicators are of crucial importance. Eurostat, Statistical Office of the European Communities, Unit F4: Education, Science and Culture statistics assures RTD data collection, integrity, and access by the public, quality and dissemination. RTD data are compiled in accordance to the guidelines laid down in [1].

The starting point of the European Commission's approach to evaluation of research and technological development (RTD) programs goes back more than twenty years. Before the 1980s, a series of experimental activities had established the peer review as the EU approach. Independent experts, constituted into panels met usually every 6-8 months to review the results of surveys and interviewed the key stockholders. The main evaluation criteria were scientific and technological quality of research, effectiveness of program management and contribution of results to the general progress of science and technology.

The institutionalization of the evaluation activities has started in early 1980s when a centralized evaluation unit was established by DGXII. This unit was in charged of the development of improved evaluation schemes and their implementation ever since. It had defined the first multi-annual plan of action for evaluation in 1983, which initiated the operational evaluation system setting up process. The second plan of action (1987-1991) consolidated this system. Each Specific Program within the Framework Programme (FP) was evaluated by external experts at least once during the implementation period. Not all the FP activities fell under the aegis of DGXII. For example, the programs related to Information and Communication Technologies (ICT) is administrated by DGXIII. The DGXIII had developed its own evaluation system and the first evaluation was a mid-term review of ESPRIT in 1985. A panel of experts had held face-to-face meetings with relevant organizations and conducted a questionnaire survey of participants. Other similar evaluations followed, focusing on the objectives and priorities reviews. DG Research has a long-established Evaluation Unit which has acted over the years both as a focus for methodological and strategic development of evaluation, with initiatives such as the SPEAR research program and as the node for a succession of networks of evaluators and responsible officials, and as the unit responsible for the practical implementation of the evaluation of the Framework Programme as a whole and for those sub-programs within the ambit of DG Research. External scrutiny of the evaluation approach for the Framework Programme is carried out by an Evaluation Sub-Committee of CRET (Committee for Scientific and Technical Research) the Commission and Council's advisory committee. The Sub-Committee consists of

representatives of the Member States and the Commission.

In 1994, the Commission introduced an evaluation scheme based on continuous monitoring reporting annually and five-year assessment carried out midway through program implementation. This evaluation time line assures two previous programs to be included (the ex post evaluation of the previous program and the mid-term appraisal of the current program) and produce results for the next FP proposal preparation. Figure 1 presents this time type for FP5, FP6 and FP7.

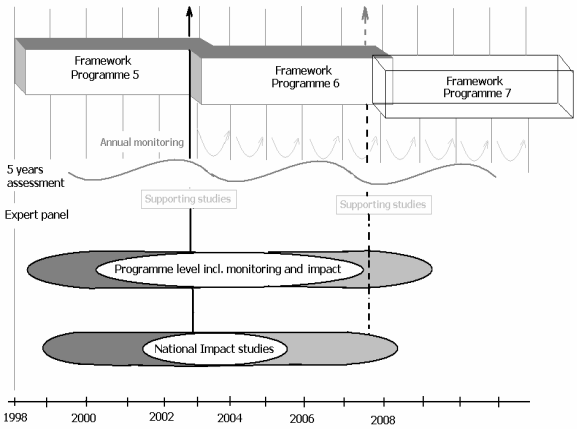

Figure 1. *Time cycle for RTD Evaluation (Source: [2])*

Using this five-year assessments model specific programs/key actions were assessed by panel supported by different tools. Two studies by overlapping teams of European experts ([2] and [3]) have focused in particular on new or more theoretically grounded approaches to evaluation.

The EPUB Toolbox ([3]) was compiled by a network of evaluation specialists in the European Union with financial support from the STRATA program within the EU Framework Programme. It had been observed that EU policy-making processes, and also those in many Member States, applied evaluation in a way that very much resembled what the EPUB authors understood as "monitoring". For other steps of the evaluation process, peer reviews and expert groups have mainly been used as described above. However, the EPUB Network argued that analysis of available evaluation techniques and experiences together with methodological advances showed that the evaluation process can offer more to decision-makers than currently is made use of.

To address this problem, the network analyzed the methodologies for evaluating the socio-economic impact of Research and Technological Development (RTD) policies over a two-year period. The resulting toolbox provides policy-makers, scientists and practitioners with an overview of the main evaluation concepts and methodologies, outlines their strengths and limitations, and sets them in relation to the policy context. Emphasis is set on a practice-oriented presentation.

Legal basis for present EU evaluation practices includes articles of the legal texts, financial regulation and rules for implementation of financial regulation; communication on evaluation standards and communication on better regulation.

A study by Technopolis France [4] has looked at the issue across all areas including some reference to RTD. Key findings included:

-Direct take up and use of results of evaluation occurs but is not the norm

-Evaluation use is more likely to become cumulative across evaluations

-Evaluation is more likely to be influential than sole cause of subsequent action

-The process of evaluation is seen as a useful opportunity fir reflection and clarification of frameworks

-There is no single model of good practice

-The nature and degree of use of evaluation appears more determined by overall organizational arguments for dissemination, cross-DG consultation and routine liaison between those in the evaluation function and operational policy colleagues

Many problems were identified with the current evaluation approach. It is considered to rely excessively upon questionnaires to participants and the questionnaires continue to be given more prominence in reporting than the simple filter role envisaged by the ETAN panel. The problem is exacerbated by a continuing decline in response rates which call into question the validity on the resulting data. Thinking is continuing on how to develop new approaches, particularly in the light of the broader range of instruments now being used in the Framework Programme.

REQUIREMENTS FOR EVALUATING RESERACH PROJECTS AND PROGRAMS

For research projects and programs evaluation process, according our opinion the following requirements has to be solved as soon as possible:

– more results oriented

– based on limited number of verifiable objectives with SMART indicators to monitor the achievement (build robust hierarchy of logically interdependent outcome objectives, and a limited number of realistic and appropriate indicators)

– well defined and integrated evaluation information system (a clear documentation of the indicators plan, using an indicator template)

– strengthening evidence base (a systematic data collection approach, monitoring based on common performance indicators, independent assessment of scientific and technical quality and progress mid and end of term)

– strong connection between ex ante and ex post evaluation and coordination between different member states

– new methods and tools

– coordinated evaluation studies (horizontal assessment and assessment of impact & achievement at portfolio, program and higher levels against strategic objectives & indicators set in clear program logic.

Our approach will address these requirements and will have an important contribution to go beyond the state-of-art.

A RESULTS-BASED APPROACH FOR EVALUATING RESEARCH PROJECTS AND PROGRAMS

Our concept is mainly based on the results-based approach. The results-based management is a life-cycle approach to management that integrates strategy, people, resources, processes and measurements to improve decision-making, transparency, and accountability ([5]). The approach focuses on achieving outcomes, implementing performance measurement, learning and changing, and reporting performance.

We consider the results-based research evaluation as very important for the evaluation of research projects and programs, assuring management improvement (focusing interventions to achieve results), marketing success (showing general program progress and demonstrating results, you can win public support), and increased accountability (demonstrate results against money spent). A good integration of ex ante with ex post impact analysis is possible.

Principles of results-based management are: focusing on results in all the management phases, aligning projects and programs according to the results, keeping measurement & reporting simple and cost effective, managing for, not by, results and using results information for learning and decision making. The planning and implementation processes are integrated by the following results chains (figure 2):

a) planned results chain (developing causal chain, defining appropriate program objectives and outcomes to be achieved, developing the results indicator plans);

b) actual results chain (reporting on outputs and outcomes, adjusting the program to achieve outcomes, review and validate the causal chain, reporting on the program outcomes)

The main results-based evaluation approach requirements are:

– Identification of the program objective and intermediate outcomes which are critical to achieved it

– Development the entire hierarchy of objectives showing the causal linkages (objectives -> sub-objectives)

– Clarifying the evaluation purpose

– Identification of evaluation question

– Select appropriate methods based on the questions to answer

– Defining the performance indicators

– Prepare data collection and analysis plan

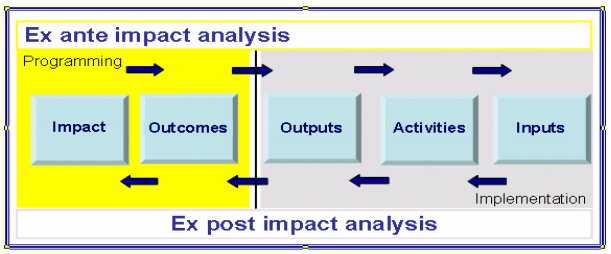

Figure 2. The results chains

The improvement of the projects and programs ex post evaluation and ex ante impact assessment will be possible by developing:

– An improved set of RDT performance indicators, structured according to the results chains;

– An indicator template, basis for the standardization of the indicators management process;

– Datasets and databases for policies and program evaluation

– Results oriented program evaluation techniques, based on database and machine learning technologies

The central concept of the results-based approach is the key performance indicator. The Key Performance Indicators (KPI) are financial and non-financial metrics used to quantify objectives to reflect strategic performance of the project or the program. For example, key performance indicators for evaluating the university international collaboration (research internationalization) might be selected from the following: research mobility, externally funded programs, (total international/bilateral project number, total project value, incoming funds, co-funding, geographic coverage of partners, number of project coordinated, success rate, number of patents, etc), effective participation in European Research Area (number of created research posts, number of other posts created, n umber of outgoing researchers, number of returning researchers, number of spin off companies, number of centre of excellence, number of publications in international scientific journals etc).

Performance indicators should be SMART (specific, measurable, attributable, realistic, and targeted). Each indicator must be properly defined and used. This is meant we should define an indicator template, specifying: definition, baseline & targets, data acquisition method; data analysis & reporting method and critical assumptions. It is difficult to decide the performance indicators to be used, because it is used a wrong question ("What indicators should I use?"), instead of: "What decision do I want to make"? Other questions of interest for the policies makers are: "How will I know if I have achieved the goal?" and "How I know if I am making progress toward the goal?"

Using the results-based approach and a set of research performance indicators, structured according to the results chains it will is possible to estimate the

impacts of research efforts and programs on high-level policy goals.

The alignment of the research projects and programs to the policy goals can be assessed by applying project portfolio approach to develop measures and associated indicators to measure the effectiveness, efficiency, costs and benefits, and economic and sustainability impacts of research activities. We propose to apply for RTD evaluation the following related methods:

- Investment portfolio score card
- Project portfolio score card
- Portfolio matrix models
- Project portfolio dynamics reports
- Networks of projects - methods for networking of projects
- Chains of projects – project chains management methods

RDT METADATA AND THE ANALYSIS FRAMEWORK

In order to describe the content of the RDT datasets and databases an indicator template will be used. As starting point we consider the indicator template developed by SEI, *Carnegie Mellon University* [6].

The main metadata are the following:

- Indicator name/Title
- Objective
- Questions
- Visual display
- Perspective
- Input/s (data elements, definitions)
- Data collection (how, when/how often, by whom, forms)
- Data Reporting (responsibility for reporting, by/to whom, how often
- Data Storage (where , how security)
- Algorithm
- Assumptions
- Interpretation
- Probing questions
- Analysis
- Evolution
- Feedback Guidelines

The methodological framework for RTD indicators analysis will be based on analytical methods, coming from business intelligence, especially data mining. Data mining involves the use of sophisticated data analysis tools to discover previously unknown, valid patterns and relationships in large data sets. These tools can include statistical models, mathematical algorithms, and machine learning methods (algorithms that improve their performance automatically through experience, such as neural networks or decision trees). Consequently, data mining consists of more than collecting and managing data, it also includes analysis and prediction.

Data mining can be performed on data represented in quantitative, textual, or multimedia forms. Data mining applications can use a variety of parameters to examine the data. They include association (patterns where one event is connected to another event), sequence or path analysis (patterns where one event leads to another event, such as the birth of a child and purchasing diapers), classification (identification of new patterns), clustering (finding and visually documenting groups of previously unknown facts, such as geographic location and brand preferences), and forecasting (discovering patterns from which one can make reasonable predictions regarding future activities.

As an application, compared to other data analysis applications, such as structured queries (used in many databases) or statistical analysis software, data mining represents a *difference of kind rather than degree.* Many simpler analytical tools utilize a verification-based approach, where the user develops a hypothesis and then tests the data to prove or disprove the hypothesis. In contrast, data mining utilizes a discovery approach, in which algorithms can be used to examine several multidimensional data relationships simultaneously, identifying those that are unique or frequently represented.

According our knowledge the usage of this kind of techniques on RTD metadata is an innovative process. Usually these techniques are applied on data in order to discover hidden patterns.

What we expect to find out is the indicators similarities and differentiations, the indicators clusters, the association between indicators, the most important input factors of indicators definition. According the results-based and project portfolio approach we will evaluate the discovered patterns.

Based on the conclusions of this extended analysis the RTD indicator set for projects and programs evaluation will be improved.

CONCLUSIONS

Developing this innovative approach for research projects and programs evaluation some relevant achievements will result. The main achievement is the conceptual framework based on the results-based research evaluation, project portfolio management and business intelligence techniques. A relevant result is the RTD performance indicators set and the methods for the research projects and program evaluation based on the analytical methods, especially data mining.

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E-LEARNING – A SOLUTION FOR PROJECT MANAGEMENT EXCELLENCE

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The paper presents an e-Learning platform in project management centred on the learner and based on advanced technologies, such as: ontology, competence standards, IMS Standards.
Key-Words: e-Learning, ontology, project management, competency management, ICB.

1 Introduction

The e-learning platform, named SinPers, is based on two new fundamental concepts: Learning object – LO and learner's model. These assume the structuring of the course content (knowledge) on several abstracting levels: domain ontology (concepts and relation between concepts), learning objects (support of the concepts), and metadata (objects attributes). Applying this for the project management domain imposes the adopting of a standard for the domain concepts and project managers competencies. This standard is ICB – International Competence Baseline of the IPMA – International Project Management Association.

The training material is structured on indexed learning objects (LO). For the specification of the relations and interdependencies between the elements, SinPers platform uses ontology; these allow the abstracting, definition and inter-correlation of the training domain concepts by relations like is_part_of, requires, and suggested order, for the link with LO. Learner models are created and maintained in SinPers. These models contain, mainly, the learner cognitive state and preferences (knowledge level, cognitive and perceptive abilities, relations with the actors of the learning process etc.).

In SinPers a course will be composed from a selected set of goals of the training (key concepts that the learner must learn) and from a learning path (a sequence of LOs that will be used for a learner in order to reach the goals). Once established these elements, begins the complete cycle of the learning-training process.

2 The educational content management – an ontology-based learning approach

2.1 Definitions

A learning ontology is an explicit formal specification of how to represent the learning objects, learning concepts (classes) and other entities and the relationships among them ([5]). It describes the learning terms and the relationships between them and provides a clear definition of each term used. Ontologies are created using ontology editors, such as Protégé 2000 ([10]). Protégé is a Java-based ontology editor which allows ontology implementation as an applet. Protégé provides the framework for a multiple usage of the ontology. An interesting guide to develop a learning ontology is given in [5]. The proposed methodology for developing learning ontology include the following steps: identifying the purpose (why is the ontology being built), ontology capture mechanism (identifying all the key concepts and relationships), coding (representing the ontology in a formal language, using a suitable editor), refinement, testing and maintenance of the ontology.

A precise and formal description of the course content will be made by explicit references to the learning ontology, using semantic annotations. The modelling of an ontology-based course can be accomplished on two levels of knowledge organization (figure 1):

- the upper level: the concepts set of the course topic selected form the ontological domain concepts;
- the lower level: learning resources (books, web presentations, movies) associated with the upper level concepts; the ontology may be used as a semantic index for accessing the resources.

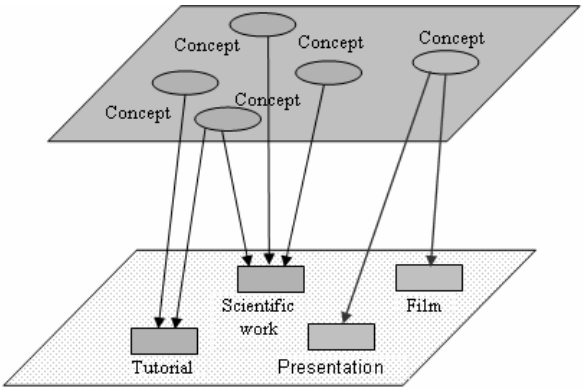
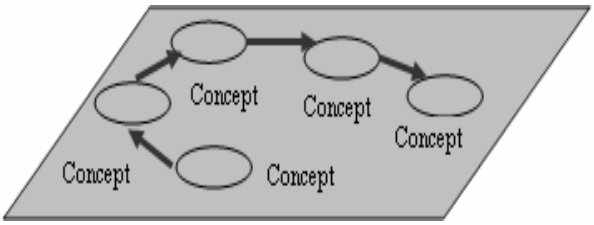


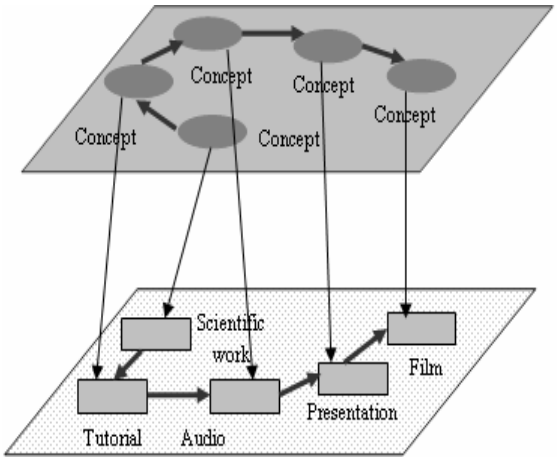
Fig. 1: The content semantic annotation

In the course development phase, learning paths can be created at the conceptual level based on semantic relations between the concepts (figure 2). In this phase, it is considered:

- a sequence of concepts obtained by browsing of the domain ontology, which give the access order to the learning objects
- the corresponding learning objects sequence, which is associated to the ontology concepts and which constitute the personalized course.



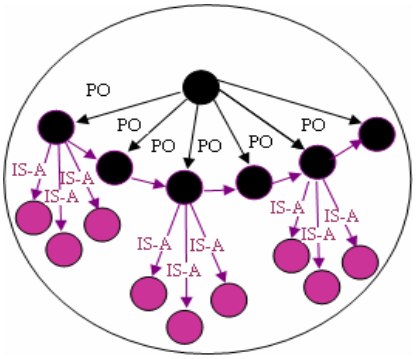
a) The learning path at the conceptual level



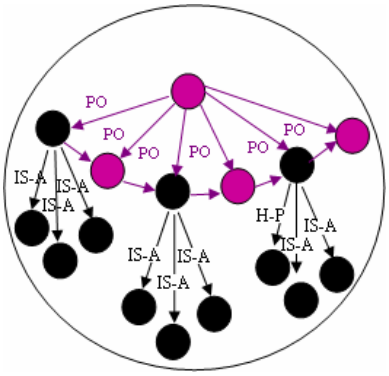
b) A learning path with LO

Fig. 2. The learning path

At the conceptual level, the learning paths can be developed based on semantic relations between the concepts, on two dimensions: the horizontal dimension and the vertical dimension (figure 3).



a) Horizontal dimension



b) Vertical dimension

Fig. 3. The learning path development

On the horizontal dimension, the learning sequence is established by moving from a given concept (the main subject), the ontology is browsed by following the decomposition relations (PO – Part Of relation). On the vertical dimension, the ontology is browsed on the specialized connections (the IS-A relationship) with different results base on the direction: from down to up (synthesis and topic completion) and from up to down (topics development).

2.2 Ontology-based learning systems - some examples

The following systems are based on ontologies and standards that have an important role in the representation of learning objects and repositories ([5]):

- *CIPHER* (http://www.cipherweb.org): The system supports the exploration of national and regional heritage resources.
- *Connexions* (http://cnx.rice.edu): It is an open source project that provides learning objects, a repository, a markup language and a set of tools for authoring, composing modules into courses and navigating through these courses.
- *Conzilla* (http: www.conzilla.org/): Conzilla is being developed as part of the PADLR project as a means of accessing and annotating learning objects. It is a concept browser that allows the user to navigate through a space of context maps to access associated content. While the context maps are not reffered to as ontologies, they may be regarded as equivalent.
- *Edutella* (http://edutella.jxta.org): This project provides an infrastructure for Peer-to-Peer systems for exchanging educational resources. Edutella uses metadata based on standards such as IEEE LOM to decsribe resources.
- *EML (Educational Modelling Language)* (http://eml.ou.nl/introduction/explanation.htm): It is a notational system developed at the Open University of the Netherlands as a means of representing the content of a study unit and the students and teachers roles, relations, interactions and activities. It now forms the basis for the IMS

Learning Design Specification. As with many XML based approaches ontologies are not mentioned. However, the study units, domain and learning theory models can be contructed as a set of ontologies.

2.3 Integrating the ontology-based learning with an ontology-based project management competency management

The competency ontology, known as *competency catalogue* ([1], [7]) defines the *employee competency profiles* (the actual competencies of the employees) and the *reference position competency profiles* (the list of competencies that are needed to fulfil the working requirements of the individual positions). The competency ontology should be in line with the ICB competence standard. These two types of profiles allow afterwards a matching process to be done for the identification of a possible gap between the reference and the actual competency profiles and identification of the project management training requirements. An ontology-based project management learning approach allows to find the most suitable courses when there a similarity but do not an exact match between training offers and the competency gap.

The usage of competency ontologies have several benefits like:

- Competency groups or clusters can easily be defined since the competency ontologies are taxonomies. An hierachy can be easily exploited to aggregate competencies to a more abstract level and build up competency groups.
- An ontology component can be integrated from another information source (e.g. the domain ontology) using ontology mapping techniques.
- Similarity measures can easily be calculated to define the gap between the reference and the actual competency profiles.
- A similarity-based search of the most suitable trainings is possible. This can be used to recommend trainings that are similar but do not exactly close to the competency gap.

3. The SinPers Project Management Ontology

Applying the ontology learning approach for the project management domain requires adopting a standard for the domain concepts and project managers' competencies. This standard is ICB – International Competence Baseline of the IPMA – International Project Management Association.

The training material is structured on indexed learning objects (LO). For the specification of the relations and interdependencies between the elements, SinPers system uses ontology ([1], [3], [6]); these allow the abstracting, definition and inter-correlation of the training domain concepts by relations like is_part_of, requires, and suggested order, for the link with LO. Learner models are created and maintained in SinPers. These models contain, mainly, the learner cognitive state and preferences (knowledge level, cognitive and perceptive abilities, relations with the actors of the learning process etc.).

In SinPers a learning unit will be composed from a selected set of goals of the training (key concepts that the learner must learn) and from a learning path (a sequence of LOs that will be used for a learner in order to reach the goals). Once established these elements, begins the complete cycle of the learning-training process.

The ontology of the project management course contains 201 concepts and 3 types of relationship between concepts.

The following table presents concepts of ontology, in connection with ICB competence elements ([4]):

ICB competence elements	SinPers concepts	ICB competence elements	SinPers concepts
Project management success	INT, PRJ, SCS, DSC, FSP, SUC	Assertiveness	CO4
Interested parties	MSP, MSE, PIN, RMS, ACO, QAD, AAN, SRP	Relaxation	CO5
Project requirements and objectives	ENT, ASI, STO, RST, OBV, OOB, DOB, OBP, OSA, NOB	Openness	CO6
Risk & opportunities	MRO, IER, ACA, MOC, PMM	Creativity	CO7
Quality	MCP, PCP, PPR, PCR, PCM, ASC, ADP, CON, COA	Results orientation	CO8
Project organisations	SOP, ORG, OPR, RPR, PRP, MGP, CMP, STP, ASO, CER, FDP, CAM, MEP, COL, EPR	Efficiency	CO9
Teamwork	FEP, CEP	Consultation	C10
Problem resolution	MPR, CRD, PSO	Negotiation	C11
Project structures	GRP, CXP, STR, SPR	Conflict & crisis	C12
Scope & deliverables	SFC, REZ, WBS, WBI, SPA, CPA, RPA, IPA	Reliability	C13
Time & project phases	DIT, FPP, CVP, FZP, MTP, PLC, PJA, JAL, DGT, ADC, DRA, DEP, RDD, DRC, ALG	Value appreciation	C14
Resources	RES, NOR, ESR, ALR, MLR, OAR	Ethics	C15
Cost & finance	MCF, COS, TCO, CEN, PCO, ECO, BPR, MFP, SFP, PFI	Project orientation	OPP
Procurements & contract	ACC, NAP, SFR, NCO, DCA	Programme orientation	MPG, PGR, OPG
Changes	MSH, MSC, MSR, MSF	Portfolio orientation	MMP, GRU, LAN, CLP, MPP, POP, SPP, OPO, GPP, TPP
Control & reports	CCT, RPT, ACP, CRE, RCR, DUR, CCO, RPC, AEV, CFN, RAF, TMC, CTR	Project, programme & portfolio implementation (PPP implementation)	TIP, DIM, DSP
Information & documentation	IDP, SMD, SMP, SIP, BDP	Permanent organisation	ICO, DMP, MOP, COO, MMO, EMP
Communication	COP, STC, TIC, SWP	Business	IPR, INV, IDE, CRV, SPZ, ACB, AEC, ASZ, ARC, SWO
Start-up	DDI, DIP, PRO, CPR, DDP, EEP, ATP	Systems, products & technology	PTH
Close-out	TPR, DOF, APR, LIN	Personnel management	MGF, MGE, MGR
Leadership	CO1	Health, security, safety & environment	SSS
Engagement	CO2	Finance	AFC
Self-control	CO3	Legal	AJD

The following table describes the type of the relationship between concepts:

ID	Relationship type	Symbol
1	Has-Part	
2	Is-required-by	
3	Suggested-Order	

Figure 4 presents an overall view of the ontology and figure 5 presents detailed views of the following parts of the ontology: project (5a), project management (5b) and project oriented organizations (5c).

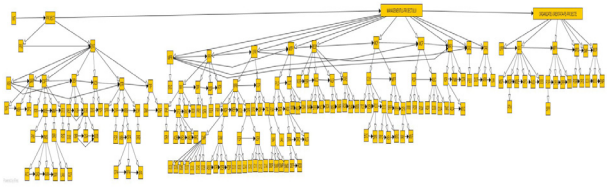
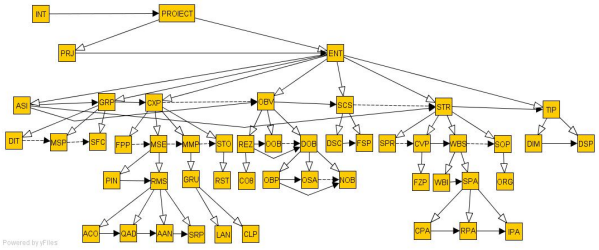
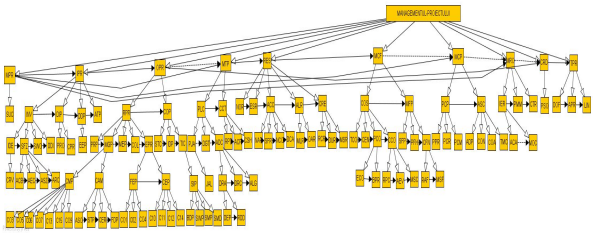


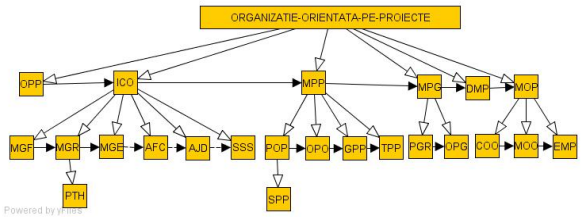
Fig. 4. The ontology of the project management course – a general view



a) The detailed view of the *Project* part



b) The detailed view of the *Project management* part



c) The detailed view of the *Project oriented organizations* part

Fig. 5. The ontology of the project management course – detailed views

Figure 6 shows the Protégé description of the project management course ontology and the figure 7 presents a fragment from the OWL code.

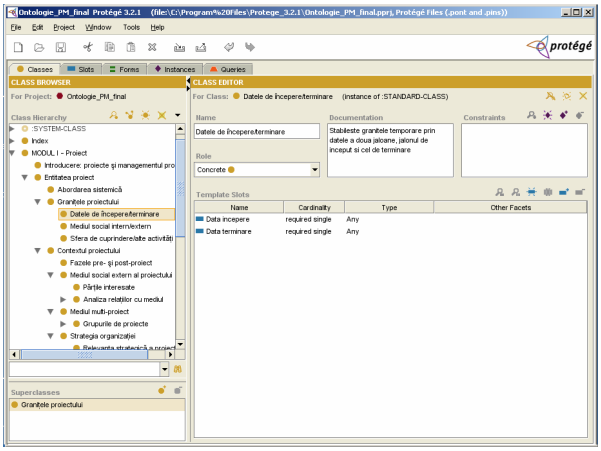


Fig. 6. Protégé description of the project management course ontology – an extract

```
<?xml version="1.0"?>
<rdf:RDF
  xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:xsd="http://www.w3.org/2001/XMLSchema#"
  xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
  xmlns:owl="http://www.w3.org/2002/07/owl#"
  xmlns="http://www.owl-ontologies.com/unnamed.owl#"
 xml:base="http://www.owl-ontologies.com/unnamed.owl">
 <owl:Ontology rdf:about="">/>
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Fig. 7. OWL description of the project management course ontology – an extract

4. Conclusions

The research project brings new conceptual approaches and technical solutions for three basic elements: the teaching-learning process (e.g. learning and support activities flow, delivery conditions, triggers - notifications or timed events), the learning content (e.g. domain ontology, learning object and metadata) and the actors-roles. The learning platform development process use state of the art IT technologies (metadata and ontology for knowledge manipulation, web services, learner model, and intelligent tutoring systems). The research project concentrates both market demands in e-learning for adults (mainly project managers from different industries), and the emerging concepts and technologies regarding Internet usage, man-computer interaction, multimedia technologies, knowledge management, according to the IST / FP6 and FP7 - Technology enhanced learning objectives

The reaserch project team developed the first comprehensive project management course ontology based on ICB 3.0. The integration of the ontology-based learning with the competency management is proposed. The competency ontology should be in line with the ICB competence standard. The competency ontology allows the identification of a possible gap between the reference and the actual competency profiles and

the identification of the project management training requirements. An ontology-based project management learning approach allows to find the most suitable training when there a similarity but do not an exact match between training offers and the competency gap.

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FROM KNOWLEDGE MANAGEMENT TO BUSINESS EXCELLENCE IN PROJECT MANAGEMENT

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Romanian Project Excellence Award competition has already four years as history. The paper presents the main results of this awards, the theoretical basis of the excellence model used for the assessement and the practicies in the model implementation in Romania.
Key words: project excellence, project results, project management

1. The history of Romanian Project Excellence Award

Romanian Project Excellence Award competition has already four years as history. In 2005, PM Romania started the organization of the first competition under the high patronage of the IPMA VP Otto Zieglmeier. One training workshop held in May 2006 trained the first Romanian Assessors. In 2006, five projects reached the finalist status. The first Romanian Jury, represented by Otto Zieglmeier, Stanislaw Sroka, Constanta Bodea, Cornelia Manole and Dan Colesniuc (Romanian Award Project manager) decided that the winner of the Romanian Award is the SEI Project, *Siveco Romania SA*.

In 2007 has been organized in Romania for the second time, the **Romanian Project Excellence Award 2007.** The competition had finished on 2 November with the Award Gala in National University of Defence, in Bucharest. The evaluation of the projects which has been submitted was assessed by Teams of specially Trained Award Assessors based on the "IPMA Model for Project Excellence" (a derivative based on the highly acclaimed EFQM Model). The PM Romania National Project Excellence Award 2007 supports professional project management in achieving high performance in projects and identifies projects as examples of excellent project management. For a good understanding of the "IPMA Model for Project Excellence", PMR organized a second training course for Romanian assessors, in the period 4-6 May 2007 that was held in Bucharest, by International Award Assessor Lead-Trainer. Mr. Otto Zieglmeier and Co-Trainer Colesniuc Dan, project manager of the Romanian Project Excellence Award 2007. Twenty-three Romanian experts participated successfully in the Training-Workshop and conducted the assessment process for the PM Romania National Project Excellence Award 2007. The members of the assessors' teams were affiliated to the different governmental and non-governmental organizations. The complete evaluation process respected the IPMA Model for Project Excellence in correspondence with the schedule that is presented below. Different milestones of the entire assessment process were evaluated by the international jury board that validated subsequently the next steps.

The entire assessment process of the *Romanian Project Excellence Award 2007* has supervised by an international jury. The composition of the international jury team was: Krzysztof Witkowski (Polish Project Management Association), Andreja Kriznic (Slovenian Project Management Association), Constanta Bodea (Romania, President of Romanian Project Management Association), Cornelia Manole (Romania, Ministry of Defense, Armament Department) and Dan Colesniuc (Romania, Project Manager of the PM Romania National Project Excellence Award 2007). The involvement of Krzysztof Witkowski and Andreja Kriznic was to ensure with their experience from the IPMA International Jury a calibrated Jury process between the International Jury and the National Romanian Award Jury. The Award Gala was final highlight of the International Conference, "Knowledge is Power – KIP 2007", focused on the „best practice in project management" conducted by the PMR Project Management Romania, National University of Defence and Academy of Economic Studies.

Romanian Project Excellence Award 2008 attended its final moment on October 24th when the winner of the Romanian Award was announced. The project honored as the award winner in 2008 is *Well Modernization Project*, carried out by *Petrom Exploration and Production Division*. The project is aimed at reducing the frequency of intervention on 5.000 oil wells, with an expected positive impact on production – that is supposed to rise, and on production costs, that will go down.

The well modernisation program is carried out by Petrom's Exploration and production Division and encompasses 5.000 oil wells. The program is aimed at reducting the frequency of intervetion on oil wells, with an expected positive impact on production – that is supposed to rise, and on production costs, that will go down. Petrom's well modernisation program kicked off in 2006, with a testing stage, the results of the pilot test were remarkable, with the frequevency of intervention on oil wells being slashed from 20 to 2 per year and well. Therefore, the program's large-scale implementation began in 2007, with 4,339 wells already upgraded by end-September 2008. „As a result of the implementation of modernisation and re-engineering programs, the well-upgrading program

included, Petrom succeeded in 2007 in stopping the decline in oil production and stabilizing it at 89,000 burrels per day, against the backdrop of a global fall in oil production that has been going on for 30 years now. In the last three years, and a half, Petrom invested about seven bln lei in exploration and production activities," reads the cited release.

Petrom is Romania's largest oil and gas company, running business on the exploration and Production, Refining and Marketing, Gas and Power segments. Petrom exploits proven estimated oil and gas reserves of 0,9 bln barrels of oil equivalent, its annual refining capacity is 8 milion tons of oil. Petrom operates 550 filling stations in Romania plus and international network of 257 stations in the Republic of Moldova, Bulgaria and Serbia.OMV, Central Europe's leading oil and gas group, holds 51.011 pct of Petrom's stake, the State Assess Capitalization Authority holds 20,64 pct. the „Proprietatea" Fund – 20,11 pct. The European Bank for Reconstruction and Development – 2.026 pct and minor shareholders hold 6.214 pct.

The entire assessment process of the "Romanian Project Management National Project Excellence Award 2008" has supervised by an international jury. The composition of the international jury team was: Andreja Kriznic (Slovenia Project Management Association), Krzysztof Witkowski (Polish Project Management Association), Constanta Bodea (Romania, President of Romanian Project Management Association), Cornelia Manole (Romania, Ministry of Defense, Armament Department) and Dan Colesniuc (Romania, Project Manager of the PM Romania National Project Excellence Award 2008). The participation of Krzysztof Witkowski and Andreja Kriznic ensured a calibrated process taking into account the international assessment practices. Petrom's Well Upgrading Project won the Project Management Excellence Award bestowed by Project Management Romania reads a company release. „Winning this award is a honor, the more so as the well modernisation program is one of our major undertakings with impact on two E&P strategic goals: stabilizing oil and gas production in Romania and cutting productions costs." Said Johann Pleininger, Petrom Board member in charge of Exploration and Production activities.

Figure 1. Romanian Project Excellence Awards history in pictures

2. The Project Excellence - theory and practice

Project management is been used to increase efficiency and effectiveness in metallurgical industry since the 80's. In the 1980, large metallurgical companies as in South Africa had the necessary infrastructure both to develop metallurgical flow sheets and to undertake the construction and project management of metallurgical plants. Effectively, the sole contribution by contracting companies was the supply, and possibly the installation, of specific items of equipment, presents Johhens in the history of project management for South Africa.

Following IPMA members – national Project Management associations in Germany and Austria, for the first time Polish PM association – SPMP, organizes the Polish national award: Project Excellence Award Polska. Award Polska is to popularize the highest project management's standards in Poland and to promote Polish projects not only in Poland but also worldwide. Mittal Steel Poland won the price for Implementation of SAP system. Mittal Steel Poland is a part of ArcelorMittal which is the world's number one steel company, with 320,000 employees in more than 60 countries. ArcelorMittal brings together the world's number one and number two steel companies, Mittal Steel and Arcelor. The main goal of the project was the implementation of

SAP IT System into business management of Mittal Steel Poland in order to unify IT system with another Mittal branches in Europe and to improve business and financial processes. This system was developed under the umbrella of strategic investment of Arcelor Mittal in Europe.

A model to achieve excellence in project management was proposed by IPMA International Project Management Association which annually awards project management prizes to project teams that achieve, and can prove, great results in project management, making the winner the most successful representative of project management. The model can be successfully applied in metallurgical industry, as a possible solution to overhaul crisis problems because it is based on results. The model proposed to achieve excellence in project management. In order to achieve excellence, a company according to International Project Award organization, has to achieve excellence in the followings areas: results, processes, social responsibility, leadership, partnership with suppliers, employees'career development, and customer satisfaction.

The model offers a management tool for the management team in order to continuously improve the quality of the metallurgic facility activity.

- **Results**. To obtain sustainable and lasting results the company has to balance the expectations and demand of all parties involved: suppliers, environmental organizations, local and central administration, clients
- **Processes.** Activities within the project should be viewed and conducted as processes. Processes are actions or operations conducted within the project and characterized by INPUTS, OUTPUTS, tools and techniques to obtain results. Actions are time and other resources consuming, representing the elementary unit in the planning and monitoring activity of the project.
- **Social responsibility.** The main characteristic and concern of the metallurgical company should be about its relation with the environment and with unemployment offices, according to European regulations and standards.
- **Leadership.** Leaders, better than managers, can form steering committees and build the organizational culture and vision needed to achieve excellence
- **Partnership with suppliers.** It is important to develop a collaboration relation with suppliers, as complementary actors, based on cooperation, trust and reliability
- **Employees' career development.** Paths for career development in metallurgical facilities are easy to be developed in Romania mainly due to the tradition in the metallurgical families.
- **Customer satisfaction**. Customer total satisfaction should be the purpose of all metallurgical activity as the purpose of any private business. Quality has to be evaluated only by client. Clients have to asses if their needs, wishes, demands and objectives have been fulfilled.

A system of appraisal is been developed in order to asses each part of the model based on assigning evaluation points out of a total of 1000 per project. Project description follows if Figure 2, splitting the overall appraisal into two main groups: project management and project results.

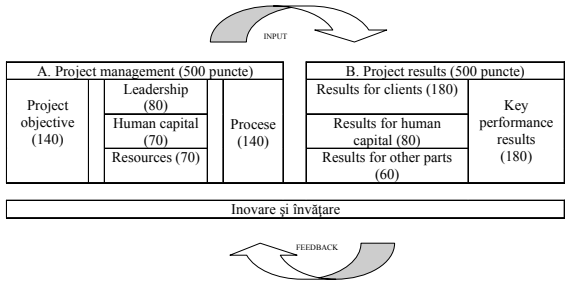

Figure 2. Excellence in project management assessment description

Applying the model assumes that in both parts we have nine criteria of assessment. Project Management (500 points) comprises project objectives, leadership, human resources management and the other resources evaluation. Project results appraisal comprises evaluating the level of achievements for client, for human resources development, for other parts, like environmental organizations, and also evaluating the key performance indicators and project results. The parts, project management and project results are evaluating taking into account the training feedback. An example of appraisal self - conducted before the IPMA team visit and the appraisal team results are compared for a metallurgical company in Eastern Europe in Figure 3.

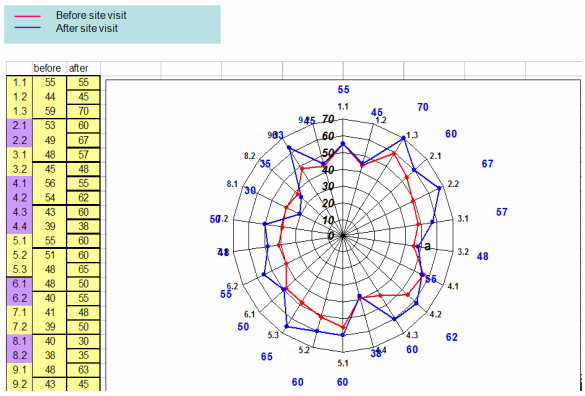

Figure 3. Performance indicator appraisal before and after IPMA evaluation

Conclusions

Project management model is and open and very adaptable management concept, allowing different project management approaches to be used, in order to use experience for gaining profits from new projects.

The model elements are based on the fundamental ground, concepts and experiences of Total Quality Management.

Focusing the results of the management team on achieving excellence in project management it will allow to identify opportunities and make us of them in this period of financial resources crisis. The Project Excellence model offers an useful support for the management team to reach potential improvement areas and achieve the best results. It also help the management to asses their criteria and the overall result of the project.

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COMPARATIVE STUDY BETWEEN NATIONAL LEGISLATION OF EUROPEAN UNION MEMBER STATES, REGARDING EUROPEAN GROUPING FOR TERRITORIAL COOPERATION

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The legislative package for Structural Funds (2007-2013) introduced Regulation 1082/2006 establishing a new legal instrument for territorial cooperation: the European Grouping of Territorial Cooperation (EGTC). EGTC is a European instrument enabling regional and local authorities from different Member States to set up cooperation structures with a legal personality. EGTCs can facilitate and promote cross-border, trans-national and interregional cooperation, with or without a financial contribution from the EU, and can offer a new approach for multi-level governance.

For this analysis the adopted national provisions available in English and French have been compared. The national provisions of Bulgaria, Hungary, United Kingdom, Portugal, Greece, Romania and France were then analysed.

The study took into account several key aspects related to European Grouping for Territorial. Comparing the national legislation adopted by the Member states the following conclusions can be made:

1. Composition of the membership

According to **art. 3** from Regulation 1082/2006:

"1. An EGTC shall be made up of members, within the limits of their competences under national law, belonging to one or more of the following categories: (a) Member States; (b) regional authorities; (c) local authorities; (d) bodies governed by public law within the meaning of the second subparagraph of Article 1(9) of Directive 2004/18/EC of the European Parliament and of the Council of 31 March 2004 on the coordination of procedures for the award of public works contracts, public supply contracts and public service contracts (1).(...)"

Most national provisions stay in close relation to the EC Regulation regarding the composition of the membership.

But, some provisions (United Kingdom and Hungary) do not further specify the categories of prospective members. In Hungary, although not excluded, the participation of local governments is subject to a number of specific conditions and requires the consent of superior authorities. Similar conditions apply to budgetary organisations of national or local minority governments. Other countries introduced new categories of prospective members: inter-municipal authorities (Portugal); Metropolitan areas (Portugal), Communities (Greece); Prefecture Self-governments (Greece).

Greece has a rather unusual provision concerning "Existing unions of institutions, city networks and other forms of cooperation regardless of any legal personality they are operating under, that are seeking aims similar to those of EGTC and have their statutory seat in Greece, can be transformed into EGTC, after the decision of their managing body and the approval of the Minister of Interior according to the above-mentioned provisions, if they adjust their statutes to the provisions of the Regulation 1082/2006 of the European Parliament and of the Council of 5 July 2006 and of the present article."

2. Participation of entities from third countries

According to **point (16) from Preamble** of Regulation 1082/2006:

"The third subparagraph of Article 159 of the Treaty does not allow the inclusion of entities from third countries in legislation based on that provision. The adoption of a Community measure allowing the creation of an EGTC should not, however, exclude the possibility of entities from third countries participating in an EGTC formed in accordance with this Regulation where the legislation of a third country or agreements between Member States and third countries so allow"

So, the participation of entities from Third countries (bordering countries outside the EU territory) is neither mentioned nor explicitly excluded in the overall majority of national provisions.

The Romanian national provisions explicitly mention that third countries shall have the right to join the EGTC, providing that their national legislation so allows. The French provisions allow the participation of Council of Europe countries.

3. Acquisition and nature of legal personality

According to **art. 5** from Regulation 1082/2006:

"The statutes referred to in Article 9 and any subsequent amendments thereto shall be registered

and/or published in accordance with the applicable national law in the Member State where the EGTC concerned has its registered office.(...)"

Most national provisions (like those from Hungary, United Kingdom and Greece) describe in detail the process for the acquisition of legal personality. The provisions in Bulgaria, Greece, Romania mention that the EGTC has the character of a non-profit legal entity. (wording Portugal: public collective associational body; Bulgaria: Non-Profit Legal Entity, Hungary: not-for-profit business organisation, Greece: company of non-profit making character, Romania: non-profit legal entity).

In the provisions of Hungary and Romania it is mentioned that these non-profit legal entities are governed by private law.

4. Budgets and procedures for the supervision of public funds

According to **art. 6** from Regulation 1082/2006:

"1. Supervision of an EGTC's management of public funds shall be exercised by the competent authorities of the Member State where the EGTC has its registered office. The Member State where the EGTC has its registered office shall designate the competent authority for this task before giving its approval to participation in the EGTC under Article 4.

2. Where required under the national legislation of the other Member States concerned, the authorities of the Member State where an EGTC has its registered office shall make arrangements for the appropriate authorities in the other Member States concerned to carry out checks within their territory on those acts of the EGTC which are performed in those Member States and to exchange all appropriate information(...)"

Most national provisions describe their respective supervision procedures in detail. Supervision procedures are generally centralised.

But, in the UK, the EGTC members appoint an appropriate eligible auditor in accordance with the decision-making procedures contained in the statutes of that EGTC.

Hungary has a rather complicated control system: the State Audit Office is authorised to supervise the financial management of a European grouping as a legal entity. The Government Audit Office controls the utilisation of funds provided by the European Community in line with separate legislation. Should a grouping receive central budgetary funds in the course of its operation, the organisations authorised under separate legislation (State Audit Office, Government Audit Office, organisation providing the support) are allowed to supervise the utilisation of such funds. Other audit organisations (Tax and Financial Audit Office, National Headquarters of the Customs Guard, etc.) supervise the operation and activities of the European grouping in line with relevant legislation.

Greece and Romania do not further specify their supervision procedures.

5. Overall objectives and tasks

According to **art. 7** from Regulation 1082/2006:

"1. An EGTC shall carry out the tasks given to it by its members in accordance with this Regulation. Its tasks shall be defined by the convention agreed by its members, in conformity with Articles 4 and 8.

2. An EGTC shall act within the confines of the tasks given to it, which shall be limited to the facilitation and promotion of territorial cooperation to strengthen economic and social cohesion and be determined by its members on the basis that they all fall within the competence of every member under its national law.

3. Specifically, the tasks of an EGTC shall be limited primarily to the implementation of territorial cooperation programmes or projects co-financed by the Community through the European Regional Development Fund, the European Social Fund and/or the Cohesion Fund. An EGTC may carry out other specific actions of territorial cooperation between its members in pursuit of the objective referred to in Article 1(2), with or without a financial contribution from the Community. Member States may limit the tasks that EGTCs may carry out without a financial contribution from the EU. However, those tasks shall include at least the cooperation actions listed under Article 6 of Regulation (EC) No 1080/2006.(...)"

Most Member States do not further specify the overall objectives and tasks (Bulgaria, UK, Greece) or stay very close to the objectives and tasks as listed in the EC Regulation (Romania). The overall aim "promotion of cross-border, trans-national and/or interregional cooperation" is reflected by most national provisions.

Hungary gives a negative definition of the tasks in so far as it specifies that a grouping may not be established with the primary aim of pursuing business activities and may not perform public authority activities.

Portugal gives the most detailed definition of specific actions: to promote studies, plans, programmes and projects, to establish other types of relationships between agents, structures and public entities, to manage infrastructure and equipment, to provide services that are in the public interest.

6. Convention and Statues

According to **art. 8** from Regulation 1082/2006:

"1. An EGTC shall be governed by a convention concluded unanimously by its members in accordance with Article 4.(...)"

According to **art. 9** from Regulation 1082/2006:

"1. The statutes of an EGTC shall be adopted on the basis of the convention by its members acting unanimously.(...)"

Conventions and statutes are either not explicitly mentioned (France, Hungary, UK, Portugal, Greece) or remain similar to the specifications of the EC Regulation 1082/2006 (Bulgaria). The hierarchy of applicable rules (in particular convention and statutes versus national law) is not explicitly addressed in the national provisions.

The Romanian provisions provide in greater detail for the necessary steps in case of amendments to the EGTC convention and statutes, which shall both be adopted unanimously and sent to the Notification Authority for authorisation.

7. Organisation of an EGTC

According to **art. 10** from Regulation 1082/2006:

"1. An EGTC shall have at least the following organs:
(a) an assembly, which is made up of representatives of its members;
(b) a director, who represents the EGTC and acts on its behalf.
2. The statutes may provide for additional organs with clearly defined powers.
3. An EGTC shall be liable for the acts of its organs as regards third parties, even where such acts do not fall within the tasks of the EGTC."

Most national provisions (Hungary, UK, Greece, Romania) do not further specify the organs defined in the EC Regulation.

Bulgaria additionally introduces a "managing board" made up of at least three people. Portugal introduces an additional "fiscal council" which is not further defined in the text.

8. Regime of responsibility

According to **art. 12** from Regulation 1082/2006:

"(...)2. An EGTC shall be liable for its debts whatever their nature. To the extent that the assets of an EGTC are insufficient to meet its liabilities, its members shall be liable for the EGTC's debts whatever their nature, each member's share being fixed in proportion to its contribution, unless the national law under which a member is formed excludes or limits the liability of that member. The arrangements for contributions shall be fixed in the statutes. If the liability of at least one member of an EGTC is limited as a result of the national law under which it is formed, the other members may also limit their liability in the statutes. The members may provide in the statutes that they will be liable, after they have ceased to be members of an EGTC, for obligations arising out of activities of the EGTC during their membership. The name of an EGTC whose members have limited liability shall include the word 'limited'. Publication of the convention, statutes and accounts of an EGTC whose members have limited liability shall be at least equal to that required for other kinds of legal entity whose members have limited liability, formed under the laws of the Member State where that EGTC has its registered office. A Member State may prohibit the registration on its territory of an EGTC whose members have limited liability.(...)"

In the provisions of Bulgaria, Portugal and Romania and the United Kingdom it is mentioned that the liability of an EGTC is unlimited. Due to the fact that third country participation is generally not mentioned in the national provision (excepting Romania and France), liability in case of third country participation is not mentioned either.

In Hungary, local government partnership and local government budgetary organisations have limited liability. Some Member States explicitly prohibit an EGTC registering in their country with a member with limited liability (UK, Bulgaria).

9. Public interest definition

According to **art. 13** from Regulation 1082/2006:

"Where an EGTC carries out any activity in contravention of a Member State's provisions on public policy, public security, public health or public morality, or in contravention of the public interest of a Member State, a competent body of that Member State may prohibit that activity on its territory or require those members which have been formed under its law to withdraw from the EGTC unless the EGTC ceases the activity in question. Such prohibitions shall not constitute a means of arbitrary restriction on territorial cooperation between the EGTC's members. Review of the competent body's decision by a judicial authority shall be possible."

Most national provisions (Portugal, Romania, UK) explicitly mention that the Member State may prohibit the EGTC's activity on its territory if it is against the "public interest". Most provisions refer to activities concerning public policy, public security, public health or public morality, or in contravention of the public interest. Most provisions (Portugal, Romania, UK), also do not further specify control procedures to protect public interest but nominate the competent court.

10. Jurisdiction

According to **art. 15** from Regulation 1082/2006:

"1. Third parties who consider themselves wronged by the acts or omissions of an EGTC shall be entitled to pursue their claims by judicial process.
2. Except where otherwise provided for in this Regulation, Community legislation on jurisdiction shall apply to disputes involving an EGTC. In any case which is not provided for in such Community legislation, the competent courts for the resolution of disputes shall be the courts of the Member State where the EGTC has its registered office. (...)
3. Nothing in this Regulation shall deprive citizens from exercising their national constitutional rights of

appeal against public bodies which are members of an EGTC in respect of: (a) administrative decisions in respect of activities which are being carried out by the EGTC; (b) access to services in their own language; and (c) access to information. In these cases the competent courts shall be those of the Member State under whose constitution the rights of appeal arise."

Most provisions do not further specify the jurisdictions in their national provisions.

Hungary and Portugal explicitly mention the competent court under the heading of jurisdiction. Hungary further specifies the general rules which apply in case of litigation (rules of civil proceedings).

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CAREER MANAGEMENT. NEW PERSPECTIVE.

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The article has started from the necessity of reconsideration the connections of double - determination which are established between the academic institutions (as main system of professional formation) and requirements of market's labor (which is developing upon the personal and qualified human scale - adjusted academic curricula to changes and current needs). The article's utility was proved, one more time, in social dynamics bred by the development of the new technologies and equilibrium incidence's between the approaches from our country and the principles and the European practices in area. Thus, if there is a positive balance between the academic preparation and the requirements of labor market the process of career management will accelerate the professional integration of graduates.

The management of the career. Patterns, methods and strategies

The Dictionary of Psychology published in 1997 (coordinated by Ursula Schiopu) defines the career as a "succession of the statutes and the roles manage by a person during his lifetime". Career is defined by an influential large spectrum of factors: personal needs, social and economic context, interests, other

We are distinguishing only four such models, starting from one of the Gardner's model (which has an obvious, educational influence, but it represents link for other model of the career management, in the same time,):

1. Theory of multiple intelligences is relied on the undertaken studies of Dr. Howard Gardner, teacher in the education area to Harvard's University. The author had initially identified 7(seven) types of intelligences, the large spectrum of those having to be developed through specific techniques and methods; the traditional school exacerbates, through programs and the current practices, the role of the intelligences of linguistics and mathematical type, minimizing the importance of the others.

The result is a double error: first, we can notice the development of an unreal hierarchy between students and, the other hand, it is noticed that some of them cannot register the performance in even reductionism program suggested by the school, what drives, inevitably, to diminution the self esteem and the motivation in the instructive – educative process.

Relying on large casting of intelligences, Gardner (1993) defines the intelligence as three area of act: (1) The ability to solve problems wherewith meets us in alive; (2) The ability to generate new problems that we must solve and (3) the ability to do something or to develop a thing which it is valued from own view.

Thus, Gardner observes 7 forms of intelligences: *Linguistic intelligence* consists in the ability to think using words and to utilize the idiom in order to express and appreciate the complex meanings; *Logic mathematical intelligence* does feasibly the computation, the quantification, the taking in considers the sentences and hypotheses and adjourns to good exhaust the mathematical complex operations; *Spatial intelligence* insufflates ability to think in the tridimensional manner of the sailors, the pilots, the sculptors, the painters and the architects; *Corporal-kinesthetically intelligence* is the form which offers the ability to handle the objects right to the level of proper physical abilities; *Musical intelligence* is obvious to the individuals who own sensibility to perceive the essence, musical harmony, the rhythm and the tone; *Interpersonal intelligence* is the ability to apprehend on (them) and to interact to an efficient level with others; *Intrapersonal intelligence* is referring to the ability to "build" and to perceive with accuracy their own person as well as to utilize such knowledge in the planning and guiding their own life.

In obvious way, as notice at Gardner otherwise, this list represents a structure for a system of all the intelligences which can be tint and expanded. The author himself had tried to undertake such demarche through introduction of others types.

2. The model of competences. The development of the career gets a practical support in the evaluation and the optimization of the competences to the employees' level. This view departs from the model of competences, the model which is constituted as an answer to the changes which appear to the organizations' level, of jobs or average conditions of work. For example, Harry Schroder (apud Davies, Ellison, 1999) identifies a list of managerial competences for getting at high performances. Some of these competences represents: the seeking of information; the conceptual flexibility; the management of the interactions; the impact and influence upon the employees; the orientation toward the results; the orientation toward the own development and the others; the confidence in own forces; the proactive and efficient orientation whereat another studies added competences of communication (vocally and written); tolerance / stress endurance / resistance etc.

Otherwise, it noticed that an important number of researches concerning the identification of the criteria

which guide us to the conception system of competences.

Thus, taking over Dreyfus'model(apud Davies, Ellison, 1999), distinguishes five stages: novice, beginner – advanced, competent, specialist and expert.

In the stage of novice, a person executes activity in a relative rigid manner, using the facts and the rules that learned before, situational perception is minimum, novice's actions being little connected with the unicity of the former conditions that brought about the problem wherewith confronted.

In the stage beginner - advanced, the person's performance is improved by the experience of many situations in which he (she) worked. The understanding of the phenomenon begin to be found out outside of the facts and the learned rules, but situational perception is still limited - each condition of work is treated as having an equal importance.

The third stage is represented by *the competence's assurance*. The employee appreciates the horizon and the level of the tasks that receives them, he recognizes many aspects and he can select and concentrate what it is else important in comparison with the elements with important of low maul; likewise, he can discern long-term objective. Person begins to use routine and standard procedures in ordinary activities.

The specialist's level represents the fourth stage. The employee sees the situations wherewith is confronted rather a system, a whole than isolated aspects; it is noticed, likewise, what it's important in the situations and he can deviate from the norms and rules if this thing is necessary.

Last level it is represented by the quality touch of *expert*. The employee demonstrates an agreement of depth situations wherewith are confronted and it utilize an intuitive way of doing this thing. In this stage, the person owns and uses a large repertory of plans and stratagems to solve the situations which change and own a vision about the possibilities in which it can solve with success the majority of situations of work.

He is obvious that the management of the career must to follow the development of the employees through ensuring following from the stage of novice toward the stage of expert, to the level of some multiple competences. Wherefore it is useful in the careers' management, the model of the competences.

3. Theory of anchors was defined and developed by Edgar Schein (1975). The author considers as, simultaneously with the appearance of an occupational identity, we also consign, an appearance of a distinct print of aims, values and own needs from the viewpoint of the career. Schein remarked, based on the researches he made it, that it might spoken about five such patterns: functional competence, managerial competence, safety (security), autonomy, the creativeness (there were completed by the author with the anchor of the life style, the challenge to the competition and attaining to a cause in '80).

- *Functional competence (technique).* Persons included in this in category choose the place of labor in order to assume and practice the responsibilities for which they developed the theoretical and practical abilities. For these, the professional development supposes the improvement and the expanding of the capacities and skills, considering less important the managerial functions and "political" games. The major interest of individuals defined by this type guide themselves specially toward the performing of the tasks that they know; also they are the persons that accomplish the roles of expert - persons of whom any organization need a lot of their assistance (especially in period of his maxim expansionist or market change).

These members of organizations prove a high level of commitment and desire to assist in the settlement of the aims' organization; simultaneously, they try the autonomy in getting them, from the moment in which they defined explicitly what must do. Challenges represent an important feature, appreciated of these members in regard of their own labor. For these reason, for them, the promotion into an organization don't mean just a hierarchical development, but it defines through the procurement of the bigger "scientific" benefits, a more interesting labor or extensive budget for what they do.

- *Managerial competence.* According to Schein, the employees that can be included in this category have as real aim: the management - desire to manage, the promotion on higher managerial position and they see the competence relate to three areas:

a) Analytic – based on analysis, synthesis and problem solving which many times have needed the integrated solution, involving many areas of activity, which are ambiguous;

b) Interpersonal – based on influence, on management and check of those around them, efficient motivation in order to determine these persons who act for goal's achievement;

c) Emotional - defining the responsible actions to exercise the power (power to punish, to dismiss somebody, to take long term decisions, the advantages and approval to these, the valuable members of the team can be temporally disadvantaged) and not to be leaded in a lack of motivation when appear the interpersonal and organizational crisis.

Here is, therefore, that the individuals which develop a managerial competence, considers, as opposed to first (which they have as anchor - the functional competence), that the specialization is a trap; they are dynamic persons, eager person to have control either of situation or about persons from all around them;

- *Safety* .For those with such of central view, the dominant value is given by secure and reliable contract, on long term, by an predictable activity, in "safe" organization, financial stable organization; the development of competences is important in great measure in which it support them to maintain this

stability and certain secure benefits, as much for the professional life and in personal plan. Person characterized by this anchor adopts easy the values and norms of the organization, they accept to tell them what to do and how to do, knowing as, thus, is assured into a certain degree the safety they wanted.

- *Independence.* The employees motivated of autonomy tackle with opening view the jobs which don't enclose their freedom of the motion and of action; governed by situation in which other don't establish their program, the way of behavior, the compliant rules which are unfolding the labor; find (out) us to the antipode of those persons from the previous segment (which they had valorized the discovering of a long-term view); at this present category, the mobility can be much more, because the aim represent the valorization of the opportunities which appear. Category of the persons with anchor's careers in this area contains the intuitive persons, with adaptive labor, own rhythm of action, depending on the personal criteria that create themselves, with a big confidence in his person, in the individual capacities; they are recommended for the management of different organizational project.
- *The creativeness (entrepreneurial).* The employees which have this anchor at high level can possess also the needs and the values which were outlined previously, but understand to exercise them in creative way. We have to deal with persons which persons who want to develop their projects and personal products, enterprising persons which develop his own business or become the inventors many times (of his businesses or products); being focus on product, it is possible not to develop, in many cases, at a high level, the managerial capacities; in return, they are early following of the creative interest, these being doubled by talent and a strong motivation many times.

In years '80, E. Schein developed his theory, adding three another types of anchors: the style of the life, challenge to the competition and service (with dedication) of a cause.

4. The theory of Holland. In 1973 J. Holland found distinctly six occupational orientations that each of us may have them, what means that, expressing a certain orientation, the individual is else approached to take hold of certain jobs, with specific responsibility.

1. The realistic type prefers the explicit, ordered activities, in this category including the persons who they find themselves as demonstrating the mechanic abilities more than social abilities. The reality is seen in the simple, traditional terms.
2. The artistic type prefers the unsystematic activities, ambiguously, without restriction (of the activities). Thus, it prefers the artistic products; either it is a matter of the manipulation of the words, the influence of the peoples and physical form of creation. In this category we find expressive, eccentric, recusant, independent persons. They see the world in a flexible, non-conventional manner.
3. Social type will make one's choice for profession as well as the doctor, medical assistance, teacher, adviser, because prefer "manipulation" (positive of) others, assuming the informing, the instruction, his development or their cure. The ones whom belong to this category develop, with predilection, the social abilities (communication, empathy, the control of the conflicts etc.) seeing the world in a flexible manner.
4. The enterprising type prefers, likewise, to work with peoples, nevertheless, exercising the control and leaderships to the success of the activity. As demonstrate the name of this category, the enterprising types will be involve the activities which suppose the initiative, therefore any kind of activity which suppose the sale – buying - the management of a business of any size.
5. The conventional type prefers the organized, explicit activities, but, as opposed to the lively type which makes one's choice with predilection toward the manipulation of the objects, the one of conventional type work mostly with the verbal or digital information, in consequence of an algorithmic strategy.
6. The investigative type is characterized by the observant style and by the analysis, caused in his actions by the aim of cognition-knowledge things. For them, world is original, complex, abstract.

Starting from this model, knowing and reflecting to the orientation which is fitted, those who choose the career, can be convenient to a profession which brings them satisfaction.

The experimental demarche

Hypothesis from which we started our project, it was that, as if between academic preparation(s) and the requirements of the labor market, exist a positive balance, therefore the process of management of career will accelerate the professional integration of the graduates.

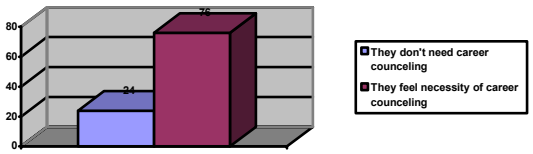
To check up this hypothesis, we have considered necessary to investigate a double area of evolution of a image about career: on aside, we determined the constants of the image about career at students (both of those from the first year and those of terminal year in the academic process, which they are convenient to the moment of beginning of socio-professional insertions); of another side, we developed counter-weight with investigation of the opinions of the graduates, persons which they have, already, developed a career and they can deliver us a critical look about the areas of the negative and also of the strong points existing in relation among academic preparation and the integration on the labor market.

We have worked with a sample of 363 of students in the I, II, III or IV year from the four different faculties of the University of Bucharest. The proportion of the investigated graduates reported to a number of 148 persons whom they have two specializations. Likewise, is deserved to empathize that we work an

investigation as much in a continuity (in the sense as we analyzed the options of the students and graduates from the same faculties) and in discontinuity (a multilayer analysis on students from certain faculties and graduates from another faculties). The subordinate hypothesis whereat we have started (a) such demarche (otherwise, it was confirmed by the research) was that the report among the opinions of the students and graduates is one of the constant's variability, regardless of faculties that the investigated persons attend or finalized them.
The acquired perspective from our research is valid at the level of some determinants of the connection between the higher education in the whole sense and this relation with the labor market and it is not an effect of a certain academic specializations. As methods of investigations, it has used the following methods: questionnaire, focus – groups, observation and conversation as investigation method.

The results of the investigation

The necessity of a counseling process in career among the students: a proportion of 24 % among subjects assert that they don't feel the necessity of counseling regarding to the career that must plough to a trace. We can say as in this category, we meet two types of persons: person that don't feel the necessity of a counseling because they have a strong decision of career, already taken fro their point of view and the persons which don't realize that they have this necessity (they don't become aware of the importance of the process of guiding in the career, but, in fact, they have this need). The remaining of 76 % among subjects assert only that they feel such a necessity - counseling in career, an important fact of underlines being that as the proportion among first year in the university and terminal year is kept constant. An explanation occurrence of a such situation is reported on actually by the "wagon" respondents who own a strong decision of what they will follow in life, represents an equivalent proportion during the academic preparation; those who are framed, only, in the interest of 76 % making ones choice for the necessity of a guidance in career are those whom from first academic years until the last year demand a certain a support but they didn't find it.



That is why the importance of a centre of counseling of the career to the level of each faculty becomes such obvious. A such center can be the interface between academic preparation and the labor market on aside and the centers of scholar and professional counseling wherewith it will manage scholastic evolution and, then, in career build-in persons included in the process of academic development.

The cognitive-attitudinal axis in the development of the students through academic instruction

In the frame of initial academic preparation, we looked about for the development of two dominants: attitudinal dimension and informational aspect of a cognitive – formative structure from the viewing of the management of the career. These two perspectives have been analyzed either by students and graduates in the aim of noticing the dynamic of the evolution of the views in question.
Thus, considering the options of the populations of the investigated students, sharing the development to the attitudinal level is placed at general level as follows:
Very big / highest in measure: 19%; Outside / higher in measure: 40%; In average measure: 30%; Little / lower in measure: 9%; Very little / lowest in measure: 2%.
It is interesting that the maxim grades of general weights (outside in measure and in average measure) maintained in the options from terminal years with ones from the first years of academic preparation, the single major change being related to the interests / percents granted to the categories "very big in measure" and "little in measure":
Measure in which students (the terminal years) consider that the faculty developed them to attitudinal level:
Very big in measure: 25%; Outside in measure: 37%; In average measure: 30%; Little in measure: 6%; Very little in measure: 2%.
Measure in which students (from the first years) consider that the faculty developed them to attitudinal level:
Very big in measure: 13%; Outside in measure: 43%; In average measure: 30%; Little in measure: 12%; Very little in measure: 2%.

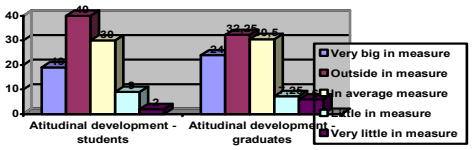
Therefore, it is noticed as the investigated population makes predominant choices upon the "outside in measure" and "average measure", with accent toward "the outside in measure".
Because, by the method of conversations, population "target" doesn't considers as the faculty whereat they study, is involved sufficient in the personal development of his students, hereby we can appreciate as these issues are granted by the single interventions of the subjects, existing habits at the level of educational organizational or at the level of didactic staff wherewith they interact.

In this way, we can emphasize that the main motivation of this option represents an absence of the comparative criterion of scholastic climates with an another element of attitudinal development with the similar magnitude (many times, the books of the scholastically development, for example, but and other external source of the school, if subjects have income in the contact with these during the scholarship, these

have this tendency to include them all in influence's area of the school, to think the own development, in unitary way, as much to formal level as much in the non-formal and informal level). Either, such a view can be seen as a bonus for the optimization and increase the role of the scholastic programs of intervention to the level attitudinal development.
The school has to assume the role of leader of all these influences, being delegated in this aim (structures, programs, specialized personnel and mission).

Only that in the present, we can register the fact that such a demarches are - just as have, already, showed – rather the appanage of a lonely, particular papers than the results of a generalized system.
In this moment, it is useful a comparison between the ways in which investigated students have considered that academic preparation developed them to attitudinal level and the percents allocated by the graduates, upon the same item.
Thus, regarding to the populations options of investigated graduates, share of the development to attitudinal level (offered by the graduates of the two investigated specialization - psychology and pedagogy) is placed to the general level, thus:

The "average" on faculty graduates of Pedagogy and Psychology: Very big in measure: 24 %; Outside in measure: 32,25%; In average measure: 30, 5%; Little in measure: 7, 25%; Very little in measure: 6%.



We notice that the registered differences are not very big; that demonstrates as - in spite of many, real and pointed out deficiencies - the Romanian education in university offers the sufficient reasons for considering the attitudinal development of the students and the graduates.
It is obvious as such a view must be, only, double by program of increase these shares in direction variants of "very big in measure" because, in opposite way, I could register in the future the important rebounds in this category.

As we underline in a subordinate hypothesis of the research, students - both one's from terminal year and those being for the first time in the academic preparation, appreciated that the informational side is consistent on the level of their development inside the institutions of higher education. Thus, it emphasizes once again the fact as the Romanian school is focusing the demarche upon the informational infusion of the populations of students.

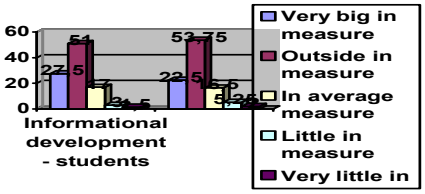
Nevertheless, if the general percent of 40% which have characterized the degree of attitudinal developmental to the level of school for the variant "outside in measure" is some important, the degree share of development to informational level is holding by the variable "outside in measure" (51%). The change is given by the assimilated direction for the second place (ascendant) whereat, in this rearward case, we find out "very big in measure" (with 27, 5%) while, in situation of the attitudinal development, the direction is descending toward the variant "in average measure" (with 30% of percent). Another explanation that we can offer about this discrepancy is the fact as the subjects have the tendency not to differ between received information versus attitudinal development (what is artificially, the two of those interweaving permanently, an information owning namely a degree of formative extension through his oneself structure).

In a concrete manner, at the general level, the contribution of higher education was seen with following share from informational angle: Very big in measure: 27, 5%; Outside in measure: 51%; In average measure: 17%; Little in measure: 3%; Very little in measure: 1,5%.

In what look of the equilibrium / balance of the allocated shares upon the first year of the academic preparation and the terminal years, the situation was the following:
Measure in which students (terminal years) consider that the faculty developed them to informational level: Very big in measure: 29, 4%; Outside in measure: 53%; In average measure: 12%; Little in measure: 4%; Very little in measure: 1,5%.
Measure in which students (the first years) consider that the faculty developed them to informational level: Very big in measure: 25, 5%; Outside in measure: 49%; In average measure: 22%; Little in measure: 2%; Very little in measure: 1,5%.

We notice as the big changes have appeared at the variant "in average measure". We remark, likewise, as much in respect of informational development and in respect of that attitudinal, the percent of those whom have selected the variant "very little in measure" were closed (1,5% in first case and 2% in second case and it didn't exist the variations between the first years and terminal years).

We will compare one more time the registered percents in the analysis of the student's opinions with the percents offered by the graduates from the two selected specializations toward analysis.
In a concrete way, at general level, the contribution of higher education was seen by the graduates of Psychology's and Pedagogy's sections with the following shares from informational angle:



The "media" on faculty - graduates of the Psychology and Pedagogy: Very big in measure: 22, 5%; Outside in measure: 53, 75%; In average measure: 16, 5%; Little in measure: 5, 25%; Very little in measure: 2%.

The career value determinants

In order to define the starting point of career identity structure on its beginning we made a profound research activity on this identity base on the examined subjects. Thus, I appealed to an introspective method related with group debates and then with the concentrate dimension of focus groups. In this way I have completed the image offered by the reasons they selected in choosing their currently career. I have asked them to imagine that the profession they are training in wouldn't exist and to choose other three careers explaining therewith the reasons of the choices. This activity, as and one of the analyzing the own values table followed a double aims: on the one side a demarche of investigating the subjects' options, and on another part we did not neglect the formative demarche of career management in action, showing the fact that the reasons of choosing the other three careers represents the intrinsic dimensions of satisfaction which is able to be obtained from a job and we asked them to identify a way to experiment this thing in the career they are still preparing in present.

The main reasons of the different chosen careers were framed in several fundamental categories. Thus the alternative careers they opted to, should have offered to the subjects: (1) Creativeness, the novelty of some situations; (2) The contact with others, the possibility of help other people; (3)Freedom, the travel possibility; (4) Stimulating passion for knowledge, the possibility to analyze new phenomenon, to discover; (5) Social recognition, the possibility to do something important, outstanding; (6) The possibility of value a talent (especially on artists' area).

If it is to include all these characteristics in the determinants of the job record file for career, probably we would obtain the ingredients of an ideal job from the point of view of majority who are building their own career.

On the other hand, such elements are (separate or together) a vital appearance for an efficient career management: even if one career doesn't suppose at first sight on one of these as others (for example, the doctor profession, teaching, etc. there were those who plenary pointed "the contact with others, the possibility of help peoples"), a judicious career management can be regarded in the direction of a development on some broads less visible of few professions in such way that the perception of those who fulfills them to be able to register them and to be able to speak about an increase of the employee' work satisfaction.

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All these demarches might be achieved through the development of nets of centers which offers a career management to the level of each institution of higher education in this way, achieving the connection between the systems of the scholastic and professional orientation from the pre-university education and socio-professional insertion of the graduates. That is why the institutions of higher education have to offer the flexible programs, adjusted to the students' needs of formation that must be seen in their double quality: both as the beneficiaries of the process of education and as the funds for a better development of the future programs of formation. The university has to reconsolidate its status and to develop the role of social actor of maxim importance; the partner of the employers – those whom, in fact, utilizes the product of her instructive-educational activities.

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ISSUES RELATED TO THE PRESENT ECONOMIC CRISIS

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What began as a global financial crisis has truly become a virulent global economic crisis. The credit crunch that has clogged the arteries of the world financial system has now caused an economic meltdown of global proportions.
Several financial experts and economists have warned that the world confronts a mega-economic crisis. This may lead government economic compulsive policies to extensive social unrest at international, regional and national levels, should the earnings of citizens decrease and unemployment rise in the near future.
***Key words**: economic crisis; recession; depression; contraction of consumption; economic stagnation; economic recovery.*

Conceptual delineations

Generally speaking crises can be defined as situations with a well-marked instability, characterized by growing volatility and uncertainty. When a crisis occurs, no matter the form it takes, we find ourselves in permanent anxiety and restlessness about the future, fear or even panic.

A crisis is defined as a manifestation of economic, political and social difficulties, as a period of tension and disorder, of endeavors which are often decisive and manifested within a society, related to the current lack of goods, time, work force, etc.

Human protection and conservation instinct sometimes urge the individual to have an irrational behavior, thing that stresses this volatility even more, as- given one's cognitive skill- he filters the information and understands the phenomenon in his way, translating it into a certain attitude related to market.

Some specialists classify these crises as being: social (growing inflation, unemployment, poverty), financial (marked volatility on capital market, spectacular fall and rise of the share market), political (which can lead to wars); then there are the local and international ones, natural disaster-induced crises and general economic crises.

It is not the first time when the world economy faces depression. Hence, we are currently facing a crisis that covers not only the developing countries but also the developed ones, as predicted, after so many years since the Big interwar Crash in 1929, or the fall of the Bretton Woods System in 1971.

Crises have major implications in people's life and activity, with often unpleasant consequences. That is why maybe most of the scientific fields have developed their own concept on crisis.

Politologists focus on the negative aspects of political involvement, considering that the causes of crises are phenomena related to failures in political leadership, ungovernability aspects, political system's inconsistency and lack of coherence, political parties' lack of ability to manage social conflicts.

On the background of rapid changes it is difficult to appreciate when a financial crisis turns into an economic one or if an economic crisis sets forth a financial one, or the other way round. Basically, we always refer to an economic crisis generated by financial, political, or social crises. A financial crisis is a form that the economic crisis takes to manifest itself, reflecting a high lack of trust in the financial system, a significant fall of the stock exchange transactions, a malfunction of the market mechanisms.

An economy that goes through an economic crisis will surely experience a fall in the gross domestic product (GDP), an evaporation of liquidities and a rise/ fall of prices due to inflation / deflation. The economic crises can reach the form of stagflation, a recession or economic depression which sometimes can lead to economic collapse [1, p.52; 3]

Considering the economic crisis, one obviously should appreciate how big the volatility or the market rise should be in order to label such a move. Consequently, there comes the question of how big the inflation, unemployment or GDP fall in a country should be to appreciate that country goes through an economic crisis.

Recession and depression- severe forms of economic crisis

Economy experts define recession as a severe form of economic crisis, a general decline of the economic activity and economic growth, characterized by unemployment, depreciation, inflation, fall of the living standard. The National Bureau of Economic Research (NBER) defines recession as a significant fall of the economic activity within the whole society, lasting for more than one month, a visible fall by a decrease in the GDP, of the population's real income, of the unemployment number within economy, industrial output, of the wholesale and retail. [3]

Conventionally, it has been established that we speak of recession when we have a decrease of the GDP in a country or region after two consecutive quarters. In other words, there is a significant decline of the economic activity level within the whole society, visible by recording a negative growth average of the GDP. Likewise, negative growth

quarter rates can be seen if related to similar periods of the previous year, for all fields of activity. A decline of the industrial output, of the production volume in buildings, trade and services can be traced. Socially, recession manifests itself through a rise in the inflation rate and unemployment and through a decline of the population's real income. A longer recession leads to economic depression.

Economic depression is considered to be an extreme form of recession, being characterized mainly by a major fall of the industrial output, investment and commercial exchange, an unusual rise of the unemployment rate and of the price of goods, of the prices of services (hyperinflation) and consequently, the presence of a significant negative rate of the GDP for at least two quarters.

When the market (estates, oil, labor) gets malfunctions or important corrections, these will be seen in the profitability of the businesses on the stock exchange and in the financial assets (shares or bonds) implicitly with a direct influence on the investors' expectations.

The economy-related panic does nothing but stress the amplitude of these corrections and induce new uncertainties in economy. It is only a step away from reducing the eagerness for savings and investments and then from a raise in the interest on the market.

Forms world economic crisis takes

World economy is facing the worst economic and financial crisis since the Great depression, 80 years ago, and governments have been striving hard to support the markets since world great economies underwent recession.

Torments on world financial markets started in the summer of 2007 when securities of two investment funds of the French Bank BNP Paribas were suspended from transactions due to accumulation of bad loans. The problematic loans were part of the so-called "sub-prime" products by means of which banks agreed to grant credits for minimum guarantees. American banks had taken massive loans before under these terms, and gradually people were not able to return the money anymore.

The problem of liquidities lack that some banks started to face, unfortunately turned into a liquidity crisis when more and more banks started to decline the request of loaning money to other banks for fear they should not get their liquidities back. The liquidity crisis extended from America to Europe and gradually it went on all big financial markets, to sooner than later strike hard on the real economy globally speaking [1, p.128].

The evolution of this situation was gradually marked by bankruptcies and nationalizations. This way, the British bank Northern Rock was nationalized on February,17, 2008, then in March, 16, the JP Morgan Chase&Co bought the investment bank Bear Sterns for a very low price, with some help from the central American bank. Meanwhile, on March, 11, world central banks made new massive injection with liquidities on credit markets.

The effects of the crisis yet started to be felt more and more acutely after the first half of 2008. Thus, on September,7th, the greatest mortgage credit banks in the US, Freddie Mac and Fannie Mae, were placed under federal observation.

On the 15th of September the investment bank Lehman Brothers, the 4th bank in the world, went bankrupt and one of the greatest American banks, Bank of America, announce to take over Merril Lynch, the third world investment bank.

Similarly, ten international banks created a liquidity fund of 70 billion $ to be able to face urgent necessities while central banks relaxed crediting. These measures could not yet prevent from significant falls on international capital markets.

On the 16th of September the central American bank, Federal Reserve and the American government nationalized the biggest insurance group in the world, American International Group (AIG), threatened to go bankrupt, by granting a support of 85 billion $ in exchange of 79.9% from its shares; however, the international capital market continued depreciation the next day, while the central banks started getting more and more measures to revive liquidities on the financial market [5].

In their turn, governments have initiated more and more actions to save financial markets. Thus, on October 3rd, the American Congress adopted a 700 billion euro plan to save the banking system and a mini-summit of the most important four European states took place the next day in Paris, trying to find new solutions for the ongoing crisis.

In this context, the British government adopted a salvation plan of the banking system on the 8th of October, while the great central world banks took decisions on relaxing monetary policy. Nevertheless, most of the world stock exchange faced significant decline on October 10th.

On October 12th the Euro-group representatives reached an action agreement which prescribed guarantees of the inter-banking loans, banks recapitalizations; consequently, the next day Paris, Berlin, Madrid, and Vienna among other European capitals presented their banking system salvation plan.

The European Commission (EC) published the first recession estimates on November 3rd, 2008, and stagnation ones in 2009 as well as a rise in the number of unemployment up to 2 million, from 2008 to 2010.

In its turn, Germany published a plan meant to support economy on November 5, and it was on November 6 that the International Monetary Fund (IMF) anticipated that the developed countries would get into recession in 2009, the first one after the second World War, and that the world economic growth level will be no more than 2.2 %.

Meanwhile, unemployment reached 6.5 % in the US in November, as the highest peak for the last 14 years, and Washington announced it would not buy toxic assets of the bank anymore but it would invest directly in their capital.

In its turn, China announced an economic boost plan on November 12. Germany, Italy and Hong Kong started recession while the Euro zone announced its recession on November 14 for the first time since its settlement.

On November 17 Japan also announced its recession and two days later Iceland, on the verge of collapse, gets support from the IMF and Nordic countries. On November 24, the Great Britain, which had already got into recession, announced an economic boost plan wand then the next day gave details on the plans to support consumption and estate market.

The EU finally appeared on the stage of state support at the end of November when it made public a plan of 200 billion euro to stimulate economy, after endless controversial debates among the great European economies.

On December 1st the US announced that they had been into recession for 1 year already, as if to add something more to the already bleak background.

At a later date, the Central European Bank (CEB) reached the most important decision to relax the monetary policy since its settlement , lowering it with 0.75%, reaching thus 2.50%. This way, both Great Britain central bank and the Sweden one significantly lowered, in their turn, the key interests.

A strong relaxation of the monetary policy was settled in the US as well, where the central American bank designed measures to relax the monetary policy beginning with September 2007, with an aim to stimulate economic growth.

The most affected segments were the car industry, siderurgical and flight industries, while unemployment grew with the number of factories reducing production and restricting activities.

The Organization for Cooperation and Economic Development (OCED) predicted an economic growth of 0.3% for 2009 and a significant raise in unemployment especially in Europe. Consequently, the secretary general of OCED predicted that 8 to 10 million work places would be lost by the end of this year in the OCED area, referring mainly to the developed countries, and 20 to 25 million all around the world, by 2010.

Recent data shows that the rate of global economy contraction slows down and we are getting closer to the end of the most severe global recession of the last decades. According to IMF estimates the costs of the world financial crisis have reached about 11900 billion $, representing about 1779 $ for each inhabitant on the planet [16].

The huge amount represents the equivalent of 20% of the world GDP and it includes capital infusion made to save banks from going bankrupt, costs related to the so-called "cleaning" of the toxic assets using public money, guarantees for debts and measures taken by central banks to increase liquidities on the market.

The calculus made by the IMF underlines the constant growth of these costs. Therefore, most of the money was spent by the developed countries which used up so far costs of about 10200 billion $ while the emerging economies contributed with about 1700 billion $. States from the G20 group of the most developed and emerging economies of the world will have a combined budget deficit of about 10.2% of the GDP in 2009, the biggest since the end of WW II [16].

The well-known economist Nouriel Roubini, also known as "The Apocalipse doctor" appreciates that the recent optimistic trend generated by speculations that economy would reach a possible minimum half-way this year and it would spectacularly revive in 2010 seems to be incongruent with the current situation. Roubini supports his opinion with 3 arguments, as follows [6].

First, it is mentioned that it is a fact already that the current deep recession in the US as well as the one for other developed economies will continue all year long in 2009. In other words, those who were optimistic were wrong when stated that we would have economic growth in the middle of this year.

It has been two years already (as there will be 24 months in the last quarter of 2009) since the US started the U-type recession (longer and more severe), a sort of V-type recession, with a spectacular fall and a recovery that was abrupt and rapid in the same time.

For the period 2010-2011, a continuous contraction of consumption and its weak recovery on a medium term would have a more toxic influence, similar to the need to refill the deposits that have been spent meanwhile, which would be quite a serious burden for all the states on a longer term.

Secondly, instead of a quick recovery, the economic growth will be slow and it will not get any faster in 2010 or 2011. However, a period of growth is not to be excluded, to the end of the year or at the beginning of next year, when companies restore their stock-sheet and they evaluate the effects of the fiscal and monetary salvation plans. The structural weakness of the American and global economy will yet determine a raise that will not meet the expectations.
Thirdly, a W-type recession cannot be entirely excluded, and then the chances of a recovery plan for 2010 are failed, at the end of the year or in 2011.

This situation can be created by those major economic malfunctions determined by the raise in oil price, raise in taxes and public debt interest rate in many advanced economies, simultaneous to the growing fear about the fiscal sustainability on medium term and the risk related to the fact that by monetizing fiscal deficit we will get inflationist pressure in 2 years after the deflationist pressure. [2, p. 182]

Roubini does not exclude yet the possibility for the situation data to improve in the coming

months, while aggressive policies to stimulate economy will be perceived effectively.

According to estimates, it is possible for the recession to get to its minimum at the end of this year or the beginning of 2010.The widely spread opinion that economy cannot fall anymore and that it will start growing is wrong [2, p.182].

Aspects related to the economic crisis in Romania

For a correct understanding of the way the economic crisis manifests itself in Romania- i.e. recession and economic depression- an analysis of the economic and social situations is necessary, starting 1990 and going up to present, in the way they are reflected by official statistics. Therefore, in order to reveal such phenomena one considers analyzing " main macroeconomics indicators, as follows: GDP, industrial production, real income and yearly average inflation rate.

According to official statistical data Romania recorded a severe form of recession called economic depression, between 1991- 1992 and 1997- 1999. For the first interval in focus, the four indicators recorded negative major growth rate, both in 1991 and 1992. The industrial physical production recorded the greatest decline in the 90's, i.e. -23.0% in 1991 and -25.3% in 1992, the accumulated loss (for both years) related to 1990 being 42.5%.

The negative influences of production decline over the GDP were significant, these having important declines in both years, that is -12.9 % in 1991 and – 8.8% in 1992, the cumulated decline of both years being 20.6% compared to 1990.

The yearly average inflation marked the existence of the phenomenon of hyperinflation, its levels being + 170.2% in 1991 and + 210.4% in 1992. As a result, the real income decreased with 18.5% in 1991 and 13.1% in 1992, while the purchasing power decline was 29.2% related to 1990.

After 4 years of economic recovery with annual improvement starting 1993 and going up to 1996 inclusively, economic depression was recorded for the second time in Romania. Between 1997 and 1999 the physical industrial production recorded negative growth rates annually, an accumulated decline being 22.0% at the end of 1999 compared to 1996. The GDP went down annually , the negative growth rate reaching 11.7% in 1999 compared to 1996. Hyperinflation was installed again, the inflation average rate per year going from +38.8% in 1996 to 154.8% in 1997. The real income decreased very much in those three years, the cumulated decline being 27.7% compared to 1996 [1, p. 78].

Economy experts consider that Romania would still have had the current crisis due to the productive structure national economy still has after the strong disindustrialization, by applying the shock therapy in 1997 and creating a number of 3.7 million of unemployment cases in the first 13 years after 1989, even if the economical-financial crisis had not taken place in the fall of 2008 in the US to later get to all the developed countries in the world rapidly [1, p. 102].

The international financial crisis was just the click to push-start the internal economic crisis, because it affected the financial sources. There generally was a consumption on debt and now loans are much more expensive or they are not at all. This situation is valid for the government as well, for companies, for people. The vulnerabilities of an unbalanced economy, with many postponed structural reforms are now obvious. People loose their jobs and this is just the beginning, since we won't have economic growth, budget collections will be smaller and collections will be made in difficulty due to lack of liquidities. Simultaneously, it won't be enough for the Romanian National bank to stimulate credits by reducing interest and minimum mandatory stocks.

Economy analysts consider that the solution to get out of a super-consumption crisis is not an undifferentiated stimulus for the consumption. At its best, this way the peak of the crisis is just postponed for a couple of quarters.

According to analysts, the crisis in Romania does not have the same causes like the ones in the US or EU; consequently, it cannot be dealt with in the same way. First of all it is an internal crisis, a crisis of a development pattern. We have a super-consumption crisis out of which we can get by eliminating dissipation, by investing in infrastructure based on multi-annual budgeting schedule, by fiscal reform and by implementing structural reforms. Obviously, the poor have to be supported throughout this kind of periods [7].

We must start by eliminating dissipation and we can do so by cutting down on administrative budget spending. The cheapest money is the money one already has and can be saved. From the savings done this way, an infrastructure investment plan can be considered, as this brings jobs and it has an important effect on drawing flows in economy. Infrastructure investment yet must be achieved within a multi-annual budget scheduling, which is the only solution to cutting down on extra costs and eliminate public money misplacement [1, p. 148].

Also, economy experts consider that a plan to adopt euro currency must be assumed, to have a clear target; such a plan will increase our credibility abroad and the external financing cost will be lowered.

On the economic crisis evolution background , the state has borrowed from banks over 40 billion lei so far, more than 10 billion euro, that is three times more than everything done last year altogether. After the IMF and EC agreement has been announced related to the 20 billion euro loan, interests requested by the Romanian state banks started to go down to now having an ascending trend again [8; 9].

Negative data regarding local economy evolution such as the possibility of an economic decline like 8% - 8.5% from the GDP this year and not

4% as expected in the IMF agreement, made the investors raise the price in loans granted to the state, both locally and internationally.

In March this year the Romanian state reached an agreement for a total financing of 19.95 billion euros for a period of 2 years, out of which 12.95 billion euros from the IMF, 5 billion from the EC, 1 billion from the World Bank and 1 billion euro from the European Bank for Reconstruction and Development (EBRD), European Investment Bank (EIB) and International Finance Corporation (IFC) [10].

To support the currency stock, the IMF money goes to NRB (National Romanian Bank), that from the EC and World Bank is destined to cover the budget deficit and the remaining 1 billion euro is destined for the banks, to support crediting. The first part from the IMF, an amount of 5 billion euro was transferred on May 6th.

According to the provisions of the signed agreement, the IMF should transfer the second part of about 1-9 billion euro from the loan granted to Romania on September 15, depending on the results of the first analysis in August, and on the country's performances in the first part of the year, as the intention letter published on June,10th states.

The last part of the funds allotted for 2009 from the IMF should get by December,15th, and we are talking about 1.56 billion euro.

The third part is also dependent on the results of the second analysis to be done by the IMF based on the performance criteria at the end of September 2009.

On March 15, 2010, Romania should get about 847 million euro and on June 15, the same year- about 849 million euro, according to the country's performances at the end of 2009 and the third IMF analysis [10].

Also, on September,15, 2010, the fifth part of the loan should get to 850 million euro, an amount that is similar to the sixth part, which should get here on December 15, 2010, according to the IMF agreement.

Also, another thing shown in the agreement states that he last part of the loan, 966 million euro from the IMF must be sent to Romania on March 15,2011, after the last analysis of the Fund and performance criteria at the end of December 2010.

According to the schedule, the IMF will also grant Romania another 145.1 million SDR (special drawing right) in September 2009, the equivalent of 226.2 million $, the full amount getting thus to 908.8 million SDR (approximately 1.4 billion $) [12].

Considering all the above mentioned, we underline that the IMF granted Romania 763.7 million SDR in August 28 this year, the equivalent of 1.19 billion $, part of an extensive program by means of which the Fund supplements the liquidities of the member states [11].

With a view to the monitoring over the accomplishment of the established performances, the IMF will come back to Bucharest at the end of October or the beginning of November this year, for a second evaluation of the stand-by agreement signed with Romania. The previous evaluation of the international financial institutions took place at the beginning of August, this year, the conclusions of the expert team being positive. At the time, the two parties agreed upon changing some indicators since the prognosis related to the economic evolution had gone bad, considering a decline of the GDP with 8 -8.5% by the end of this year [13].

Related to the European Commission, the first part of the contracted loan was received on July 24, 2009, and it reached 1.5 billion euro [14]. .

On the other hand, the irredeemable structural funds allotted to Romania by the EU for 2007, 2008 and 2009 and not spent by the end of March 2009 reached 5.5 billion euro. Altogether there is an amount of 9 billion euro out of which we could possibly spend 3-4 billion this year, and should a minimum economic growth occur, new work places could be created.[15].

According to specialists, the main lesson learned for the economic crisis is to have an appropriate set of rules and principles for markets, in order to get the best results, related to development, work place and fight against poverty.

Without adequate rules malfunctions will still be on the market. Without a proper, timely implementation of the rules, failures of the public policies will continue to come up. Consequently, the economic crisis is, according to economy experts, the result of a double failure: both markets and public policies.

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THE EUROPEAN HUMAN RESOURCES MANAGEMENT MODEL

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The Europeanization process has a direct influence on the management carried out by European companies, producing new concepts: euromanagement, euromanagers and eurocompetencies, notions that lay under the distinctions between European countries from the cultural point of view as well as the impact they have at both economic and social levels.

Introduction

Within the framework of the globalization of competition and the accelerate development of information technologies, organizations must identify alternative competitive advantages. The studies have highlighted the fact that the human resources field stands as an important resource that is, unfortunately, poorly researched. Therefore, most organizations are aware of the need for a change in the role that the human resource function plays.

Human resources management has constantly improved, gaining, lately, an international dimension. Specialists mention, and we support this, an international human resources management. This international human resources management has emerged as a consequence of the international evolution and growth of the globalization process. The importance of this new perspective in human resources management is justifiable, especially within the European space, by means of the intensification of the European Union enlargement process.

Internationally, but mostly at a European level, human resources management has to deal with new problems concerning the existence of human resources characterized by multiplicity. This situation requires for the adaptation of management practices in the field, according to the heterogeneousness of personnel within an organization, depending on their different cultural backgrounds. Organizations will have to develop new practices that fructify human resources diversity in European countries.

European Human Resources Management Characteristics

European management stands as the concept of problem-solving and decision-making processes at organizational level, which distinguishes the European identity in terms of strategies, planning, implementing and evaluating change[7].

The arguments laying at the base of the European management model, stated by E. Burduş[8], are as follows: *the necessity to develop new solutions to the cultural, economic, political and social diversity problems and opportunities specific to the European space; the drafting of a systematic development strategy of all resources, as only a European economic strategy can efficiently deal with the challenges of the global competitive environment; the reforming of the European organization management, so that national models be able to surpass economic, social and cultural existing barriers; the enlargement of the European Union, introducing the European single currency and setting up an institutional, juridical and legislative background to govern the European Union space, to standardize relations between states; the development of trans-European companies, as a result of the internationalization of businesses, whose organizational culture offers increased economic power and a superior competitive advantage on the global market; developing common educational strategies on trans-cultural learning as well as the work force allotment according to a European vision; the transition from the concept of competition between European countries to that of competition between European companies; the hiring of European managers by multinational corporations in order to ensure a unitary managerial approach across all subsidiaries; the setting up of similar management models across European countries in terms of decision-making and problem-solving processes.*

The pluralism of the European space can be summed up in a European identity reflected upon the organizations' management by means of strategy drafting, organization structure, the way that management processes are exerted, the human resources evolution from the mobility point of view, the learning and communication processes.

Table 1 - European Management Characteristics

CHARACTERISTICS	DESCRIPTION
The cultural, economic and political complexity and diversity	European managers, unlike those in the USA or Japan, must have special training in order to cope with these conditions, to have the ability to think within a trans-European vision.
Company strategies	By means of their content, objectives and means, the resources involved and anticipated effects, they must surpass the borders of a

[7] E. Burduş, *International Compared Management*, Economic Publishing House, Bucharest, 2006, p. 300.
[8] Ibidem, p. 287.

CHARACTERISTICS	DESCRIPTION
	European country.
The organizational formula	A decentralized, horizontally-coordination based organization, which diminishes both hierarchization and centralized management.
The European identity	Made up of economic and social specific values, highlighted by means of promoting communication and trans-cultural exchanges.
The human resource mobility	With focus on human resources international mobility, thus creating the premises for European careers in management, based on flexible intercultural training.

Table 1 deals with European management characteristics[9], seen by human resources field specialists.

European management characteristics highlight the importance that the human resources have within the new management model. The focus is on the ability to understand European diversity, in general, and cultural diversity exploitation in particular.

The European space is characterized by a high degree of work force mobility; hence work force circulation is of utmost importance. The globalization and internationalization of markets are factors that trigger work force migration, an increased fluidity in circulation. Moreover, temporary migratory phenomena acquire a specific significance. In addition, work force mobility allows the intercultural transfer within the European space.

The European management model can be characterized by a high degree of organizations' adaptability in the various fields of activity to the dynamics of the environment they act within.

Another characteristic of the European management model is the existence of sets of values and behaviors specific to the European space, that allow political, social, economic and cultural integration. Among these: the common struggle against poverty, environment awareness, democratic governments within member countries etc.

Another characteristic of European management is given by organizations. No matter the activity, organizations are part of society and have a long term vision in terms of the decision-making processes and investment policies. In European vision, *profit stands as one of the main objectives of companies, and not as the very reason for their existence*[10].

European management is human resources oriented. In European managers' opinion, the human resource is the one that ensures progress and is, therefore, considered to be a strategic investment for any company. Such orientation is supported by company care for employee quality of life, ensuring proper working conditions, developing and motivating the human resource. The main coordinate in European Union politics is employee work safety and health.

Should progress continue at the same pace, the European management model will further develop and grow stronger as a result of the *Europeanization* process[11].

American specialist, Chris Brewster, defines European human resources management as follows: *European human resources management is very complex. There is no other region in the world that encompasses so many historic, cultural and linguistic differences, such as the European space. Every country in Europe has its own employment system, laws and institutions, its own educational system and highly individualized management cultures. In some states, differences occur at an internal level as well. One must also mention that all these differences are governed and regulated by the European Union legislation* (figure 1)[12].

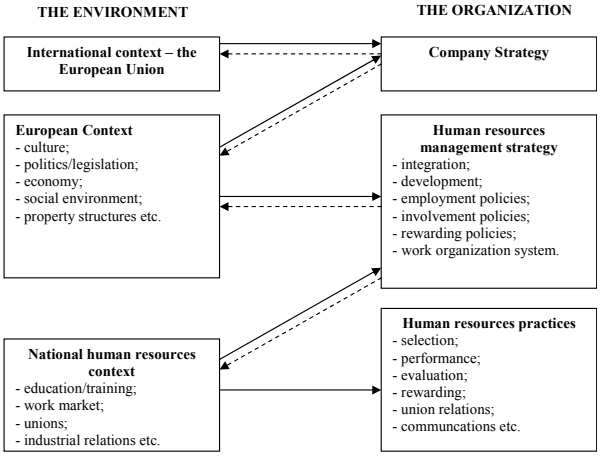

Figure 1 - The European human resources management model[13] as seen by American specialist Chris Brewster

[9] D.A.Constantinescu, A. Rotaru, C. Savu, *Compared Management – Articles and Case Studies,* The National Collection, Bucharest, 2002, p. 83.

[10] Bloom H., Calori R., Woot P. - *Euromanagement. A new style for the global market,* Kogan Page, 1997, p. 18

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[13] Ibidem, p. 45.

The European human resources management model is characterized by the influence of factors such as culture, legislation, property forms, union activity and advisory agreements, employee participation and is based on the hypothesis that organizations have a limited autonomy:

- *International* - highlighted by European Union regulations;
- *National* - European organizations must abide national legislations as well;
- *Organizational* - organizational initiatives must respect employee interests, as they are discussed with unions;
- *Property* - organizational activity must ensure that stakeholders' interests and needs be met.

As far as the culture and legislation are concerned - national culture specificity is reflected upon the human resources practices, as well.

From the legislative point of view, the European human resources management model is limited by a series of legislative constraints, specific both to the European Union and to each European country. Another limitation derives from the high degree of state intervention in establishing national level human resources strategies and policies.

From the cultural and legislative point of view, one can characterize the European human resources management model as follows: *legislative regulations on employment, firing and labor contracts closure; legislative regulations on salary levels; norms on the certification of educational and human resources training programs; allotment of important public funds to the initiation and development of workforce programs: professional formation and reconverting, career counseling, creating work places and increasing the degree of workforce employment; social protection measures; the European Social Charter regulations, enforceable especially at the European Union level.*

Consequently, the European human resources management model must give organizations the possibility to act within an environment characterized by a degree of complexity and diversity from an economic, social, political and cultural point of view.

Cultural Differences among European Countries

Cultural differences among European countries reflect upon human resources practices, leading to the emergence of regional country groups, within the European human resources management model. The way countries are included in one or another group of countries depends on the authors of the several classifications.

Field theoreticians, Ingatovic M. and Svetlik I. identify four distinct human resources management models, as follows:

- *the organizational management oriented model*, specific to Easter European countries;
- *the human resources management oriented model,* specific to North-European countries;
- *the professional human resources management model,* specific to Western-European countries;
- *the participative management model*, specific to Central and South-European countries.

Authors like Bloom H., Calori R. and Woot P.[14], identify, at European level, four groups of countries: northern countries (Sweden, Norway, Denmark, Finland, Holland), Anglo-Saxon countries (Great Britain and Ireland), German countries (Germany, Switzerland, Austria) and Latin countries (France, Spain, Italy, Belgium, Portugal). These authors' point of view, the one that we support as well, is that Anglo-Saxon countries present a series of characteristics specific to the American human resources management model, thus being different from the other European countries.

Countries in Northern Europe are dominated by a series of values like: liberalism and a low degree of state intervention, very good organization and participative management. As opposed to the general situation at European level, the public sector in northern European countries is predominant. From this point of view, the northern countries' management model is different from that of the Germanic countries, as it is less based on performance. The northern countries management model is dominated by the orientation towards quality of life and eliminating status differences between people.

Southern European countries are characterised by: *a high degree of state intervention in the economy, laws that are meant to protect and strongly classify.*

Eastern European countries like Poland and the Czech Republic have adopted the German management model, especially because the developed economic relations between the two countries and Germany.

Geographically speaking, France lays at the border of the northern and southern regions of Europe. Therefore, this country is different from any other southern European country due to its management system specificity, which incorporates, on the one side, intuition and analytical skills, and on the other, a high level of hierarchization and authority.

The management model used by countries like Belgium, Holland and Luxemburg incorporates characteristics of the German, Latin, Anglo-Saxon and northern models. Hence, at this group of countries' level, elements of differentiation appear. Belgium's

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[14] Bloom H., Calori R., Woot P. - *Euromanagement. A New Style for the Global Market*, Kogan Page, 1997, p. 18.

management style is influenced by the French model, whereas the Dutch management model is influenced by the British one.

We can draw the conclusion that the European space incorporates so many historic, cultural and linguistic differences, and that each European country has its own laws and institutions, its own educational system and a strongly individualized managerial culture.

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THE NEW LEADER

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This paper is based on reflections resulted from articles presenting aspects of the American concept revised for the theatre in Afghanistan. Among them, the most important is that of Julian Barnes published in "Los Angeles Times" Magazine with the title "A New US Approach Expected In Afghanistan"[1]. Here, the author presented his opinions on the aspects of Lieutenant General Stanley McChrystal's appointment as the commander of the American forces deployed in Afghanistan. This paper presents several reasons why the General's aggressive leading style is considered more adequate to the actions specific to contemporary warfare in this conflict environment in Afghanistan. Supporting this, Robert M. Gates stated that revising the command was imposed by the lessons learnt during the military operations in Afghanistan. The author's conclusions speak about the inefficiency of the American war efforts due to old ideas and inadequate innovations intensely criticized by some American military circles. They consider that General David D. McKiernan's failure is due, on one hand to the lack of visibility of the new operational plans and on the other hand, to his well-known reluctance to adapt the US strategies used in Iraq to the characteristics of the theatre in Afghanistan.

General lieutenant Stanley McChrystal is considered to represent a flexible and sharp leader. In other words, he is the commander who can bring about a change of the American force's image and a substantial improvement of the Afghan forces' training. That is why, General McKiernan's replacement is both a rapid solution to revise the information system and also the change of the organizational architecture of the American and NATO forces. McChrystal's aggressiveness is well-known due to the big number of complaints sent to Washington by several American officers, regarding his way of leading, especially during the armed forces' missions in Afghanistan. Thus there are numerous articles with the titles: In the conflict in Afghanistan, the Pentagon considers structural changes [2]; Afghan villagers receive money for actions to kill civilians [3] etc.

Another factor in favour of this decision was the Secretary of Defence Robert Gates' wish for changes which should interrupt the inheritance habits of high appointments. For this, Gates, motivating the terrorist activities in Afghanistan, managed to get the US president's approval for sending 21,000 troops to Afghanistan and approved the resignations forwarded by important defence commanders and also the former commanders of the American forces in the Middle East.

Another factor leading to the generals' replacement was generated by the strategy of "searching new military leaders" supported by the US president Barack Obama as Robert Gibbs, the White House spokesman stated[4]. A change of the military operations concept was quite predictable due to president Obama's pacifist attitude.

Faced with these challenges, some important US Defence officials were against the changes. These supporters of McKiernan understood that the major reason for his change was the slow reaction in designing and applying a plan of operations based on the new American political strategy. General McKiernan is known to command the US military forces for only 11 months out of the initial 2 years. In spite of the positive opinions towards McKiernan and the military operations in Iraq, Robert Gates stated that the General's replacement was due to his age – he was 58. During a press conference at the Pentagon, Gated stated: "Our mission requires new ways of thinking and new approaches of our military leaders"… "Today we have a new politics established by our new president, a new mission and a new ambassador. I believe we also need a new leadership."

One of the leadership characteristics adopted by General McKiernan's during his command of NATO force in Afghanistan was the separation of the American military structures from those of their NATO allies, by changing the command's organizational architecture and failure to adapt the operational plans to the strategies used during the mission of reconstruction of the Iraqi military force. The US forces' operational objectives were to protect Baghdad against the insurgents' attacks and to create US-Iraqi common militias throughout the country. The General's statement "we must ensure the population's security and help them help themselves and we must make them believe that the future is in their hands" represents the essence of his politics.

In Afghanistan, even if McKiernan's plan supported the US concept that "we need to apply what we know it works", it was considered old and ineffective. They also disregarded the fact that, during McKiernan's command, the Afghan national army increased its troops from 60,000 to almost 83,000, compared to Iraqi army which in 2007 had almost 100,000 men. Thus, a former Defence official stated that: "The growth rate of the Afghan national security forces was much too slow."

General lieutenant Stanley McChrystal, the new commander, is considered to be an expert in dealing with the insurgents and an "architect" of several missions of the US army in Iraq. We state here the

General's preference to use special forces during the actions of neutralizing both Sunni insurgents and Shiite militias. The most famous strategy was in June 2006 when the US forces neutralized an Al Qaeda group and killed its leader, Abu Musab Zarqawi.

We could assume that the new leader is more aggressive and tough in achieving his planned objectives. In other words, we could state that the new leader could achieve his objectives using any methods, even immoral ones. For instance, the way to collect information from the Afghan population using "bribe" or giving gifts or granting favours to local leaders or by physical constraint used by local structures. Can this be a characteristic of the new leader? It is a very difficult question.

A leader must have the capability to lead, that is to channel the effort of a group of people to achieve his vision. A major quality of the global informational environment is determined by the "rapid reaction" in planning or reorganize an action, even if, in some situations, this implies tougher measures. The leader's role is that to achieve and maintain the creativity climate [5]. According to the general theory of management, this job implies interpersonal relationships, good communication and collaboration of all the architectural elements of the respective organization, all facilitated by common motivation and good teamwork. In an ideal organization, all its members' aptitudes, talent and energies should be used. That is why, one of the leader's tasks is finding the most adequate communication methods in order to avoid conflicts and solve all the problems. The way to solve these problems can determine the quality of leadership. It's well-known that leadership implies achieving the objectives planned by the best action of an organization or group.

Often used in the military practice, the leadership based on the leaders' heroic image can achieve a fracture between the elite and the rest of the troops [6]. Based on this, there can be competitive advantages even if temporary. Generally, to compensate this aspect, the rhythm and action concepts must change, which can lead to a premature exhaustion of the available resources. That is why, in order to ensure the stability and continuity of an organization, the leaders must create a culture in which ordinary individuals can be very good for a long time. We could assimilate the leader's image to that of a puppeteer who knows how to pull the strings in a way that his puppet's moves amaze the audience even though they know it's nothing but a cliché. Therefore, continuity and not change is the main characteristic of certain evolution to an objective. Lack of continuity is a problem generating natural reactions against the new conditions. The solutions are to adapt in time or establish a new team which should acknowledge the leader's authority. Moreover, a successful action depends on an adequate organizational behaviour where the architectural elements are in accordance with the factors of personality, teamwork, individual behaviour and other variables determined by the way the tasks are organized. A too authoritative style increases the stress within an organization and thus, prevents an optimum organization.

These analyses may not show any differences for "the new leader". That is why, the changed characteristics of the environment have caused changes in contemporary leadership. Thus, the extra-organizational relationships have become more and more important against the leader's native quality.

We have to mention that the young people are very well trained today due to easy access to any kind of information which determines new challenges for the leaders, especially if his age is close to the medium age of the organization. New satisfactors must be identified for the members of an organization, given the fact that the classical values have changed following the globalization of informational systems. Today, young people with only one click can communicate and satisfy almost any informational curiosity especially if they speak a foreign language. Furthermore, they can improve their training in their own area of interest. On the Internet they can always find bibliography (graphics, scanned papers, opinions published on bloggs etc) or consultancy (general or specialized forums, chat rooms etc). That is why, one of the greatest challenges for the leader would be adopting a relationship of optimism, respect and safety determining the young people to accept teamwork instead of the individual activity in front of a computer.

Starting from these premises, we can state that the modern leader must acknowledge the limits of his own authority. It's very clear that the model of authority given by knowledge has become obsolete as nobody can know everything. This can be considered a new effect of globalization.

And then we ask ourselves: For the current military environment, can we cultivate the image of the all-knowing leader or the consecrated model of the commander who makes decisions by himself in front of the map when there are a lot of experts in different sectors of the commandment?

In the past, the leader was considered to be the person who knew everything about the respective organization. History is full of examples of leaders consecrated due to their outstanding knowledge. The model of the commander who sits at his desk and communicates a balanced solution for a conflict, still represents the symbol of the armies where only the commander makes decisions, the subordinated troops representing just the elements who transform his decisions into actions. We don't state that this image is obsolete but at present, anybody can appreciate the ethics of the received order, can judge it and be against it if this isn't in accordance with his moral opinions.

Therefore, can a person's native qualities represent an important factor in establishing a leader's performance?

Due to the extremely visible possibilities for the identification and classification of the leader's general portrait, we will analyze a hypothetic model specific to the military system. Thus, if we study carefully the generic framework of the military service we can see the large number of very good leaders, leaders who graduated at least one educational program against the model of native leader who knew how to lead. Moreover, even if "in-extremis" we could identify now a native leader corresponding to the model of great leader from the past (Spartacus, Mihai the Brave, Iancu Jianu, Che Guevara), he couldn't impose in front of his subordinates if he didn't have an adequate training in his specific field. That is why, we consider that the general model of contemporary leader is formed not native. A military leader increases his qualitative value by undergoing a progressive series of training in the field of military sciences. These training series depend on the evolution in time of the individual and are established through programs and personnel policies. They are based on educational programs corroborated with the experience acquired during various time consuming events (in the theatre, different cultural and educational environments etc). Thus, a young man cannot be the commander of a large organization (300 people - battalion) if he doesn't undergo a range of training series through which he will gain experience.

Moreover, contemporary military leaders are concerned with maintaining a high level of responsibility and authority towards their subordinates through managerial less informational methods. A high quality leader has an outgoing managerial spirit and an operational background against the large number of diplomas confirming his multidisciplinary training. A sine-qua-non condition for any leaders is that an individual can justify his authority not only through his job but also through his managerial experience, an important element which enhances his position within the respective system.

Another characteristic of contemporary leadership represent the interpersonal relationships the leader's influence is based on. These relationships develop in time, with the efforts to respect one's duty towards the military organization, job requirements and self-sacrifice capability, all of these being consecrated through the military oath. For any military structure, the job obligations result from the moral responsibilities of the respective hierarchic position. Generally, they establish the acting framework and define the leadership relationships placing the general requirements of the military organization (platoon, company, battalion, brigade etc) before individual requirements. That is why, in some modern armies, establishing inter-familiar relationships and maintaining the concern about the subordinates' families is not seen as an abuse. These new functions of the leader can be observed in the events when a military man must part with his family to leave for an operational mission, participate at a tactical exercise or any other long training program.

During any of the above situations, an accident may occur causing the participant's injury or death. All the military men know the risks and that is why the methods to stimulate or compensate their efforts represent only psychological stimuli not real rewards for the dangers during the military service. This can affect his physical or psychological health influencing thus his whole life (amputations, improper feeding, stress etc).

Without being biased, we ask those who know military life just from movies and who consider these impositions normal to answer these questions:

- in the conditions established by the general theory of management, should the persons who are about to die be still recompensed?
- which would be the effect of a punishment when the action presents risks of injuries or even death?
- What could motivate the military men to give their own lives for an ideal, given the fact that nobody on earth does so?

Therefore, the army men have their own rules where patriotism has different meanings in a wide variety, from defending the country (city, village etc) to helping their comrades. In such situations, do you believe that a leader succeeds only if he can find that method of leading which inspires ideals to his subordinates and not to claim the blind observance of rules? The answer is yes. In other words, the new leader, regardless of his activity, should pay more attention to his subordinates. Moreover, if the respective leader is charismatic, we can talk about a successful leadership, all his subordinates can be volunteers. The leadership theory considers this style of leadership a transformational leadership or the dominant style of military leaders.

This style is spreading to civilian organizations as well. Unfortunately, the discrepancy between the way to remunerate the leaders of any kind of organizations (military, administrative or political) means that the message to the latter be similar to that of "buying their leader's silence". Furthermore, within military structures, a too big remuneration would generate lack of trust in his relationship with his colleagues. On the other hand, the lack of awards discourages both the leader and his subordinates.

While the organizational environment is characterized by relationships determining destabilizing factors, the leader's effort to maintain his position would be extremely big. Let's consider the effort a leader must make in a civilian business environment when his subordinates are desperate about losing their jobs, capital or about the necessity to change their style or way of living.

We agree that the current global environment, characterized by a deep economic crisis, imposes fewer expenses, crises budgets, educational programs and other drastic fund saving measures. Therefore, we can explain military leadership and way of life

methods adopted by civilian leaders. In many civilian organizational environments, it's difficult for the staff to understand the necessity of adopting such values and to support the public leaders with a military style. On the other hand, the leaders with military skills tend to have public activities with an increased risk to their position and especially activities affecting their public image and can misunderstand the adopted directions, generally unsuccessful actions which can lead to discrediting the respective leader.

In conclusion, we consider that the new leadership represents a reflection of the military leadership on the civilian leader's activities. The adaptive capabilities, innovation and flexibility required in dangerous situations, represent a new leadership style more and more present in the private sector.

In our opinion, the new leader will always value his subordinates' activity. This will increase the organizational competitive style in order to obtain positive results, often, the leader's quality being obvious in his absence. The new leader will influence his subordinates by stimulating their dominant characteristics. In other words, the new leader will know to render them efficient and orientate them towards a certain type of activity, often left out or unattractive.

That is why, we consider that the new leader will have a vast experience and will be very well trained and a fine psychologist who will know how to use a vast series of methods for an effective activity. In other words, the new leader will be an orientation leader or a tutor who will end his mission when his subordinates change their jobs or when a certain degree of safety is reached.

We can state that we have just understood the American way of changing the generals in the theatre in Afghanistan. In other words, new rules for new situations.

The military principle called "taking the initiative" represents the only alternative to withdrawing from the competitive environment. Regardless of his activity, a new leader must reinvent his organization's development before somebody else forces him to do it. Depending on his position in the hierarchy, in a society characterized by a rapid change of relationship between its elements, the new leader must permanently keep the rhythm of the development. That is why, the leader will help his subordinates to adopt the change both outside and inside the organization.

For those who want to be new leaders, we cite Colin Powell's advice to the readers of his memoirs: "be ready to change your opinions based on events and don't attach to a certain way of action if this is not essential to your mission." [7]

We end this paper by paraphrasing a well-known military saying: Considering the things presented, you can decide.

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AUXILIARIES FOR THE TEXTILE INDUSTRY AND ENVIRONMENTAL PROTECTION

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The textile industry is an industrial field that affects the environment, from the plant growth until the production process. The obtaining of environmental licence for Romanian companies that produce textile products is related to elaboration and implementation of a modern system for an environmental management, that consist in utilization of ecological technologies for finishing, in diminution the water and energy consumption, cleaning of waste waters, reutilization of cleaned waters, sustenable management of wastes. In this study, the surfactant categories used in the textile industry that fulfil the conditions of environment protection, are presented. Some exemplifications were made involving the existing surfactants in Romanian textile industry, obtained from both domestic and external production. Also, some recommendation are suggested regarding the utilization of surfactants manufactured from either vegetal oils or chemical/petrochemical wastes, with similar properties as those from import having decreased prices an that affect as small as possible the environment.
Keywords: *textile industrie, surfactant, pollution, environmental protection*

1. Introduction

The textile industry is an industrial field having serious problems referring to the environment pollution. In the world the annual production of 2 million solid wastes, 3 million of carbon dioxide as well as 7 million cubic meters of waste waters was recorded [1]. The polluants proceeded from many sources. Besides the industry, a first pollution source is agriculture field, where immense amounts resources are produced that generally are not entirely recycled. Additionaly, the frequent changes of tendencies in the fashion determine a growing production that is useless many times, together with an excessive pollution. The pesticids used for protection of plant cultures destined to textile industry are harmful for fauna, also contaminate other products and reach to the food. Thus, the cotton growing requires 25% of total amount of pesticides used in the world, these chemical substances being recognized as carcinogens [2].

The used chemical substances for dye and discolour textile materials contain chlorine, chrome and other polluants that affect the environment, being dangerous for the life of farmers, process workers, and also of those who wear the closes [3]. Moreover, during the dyeing process of materials huge amounts of water are used which remain concentrated with polluants and, therefore, require cleaning. As an example [4], some alkaline and coloured waters result from the fibre preparation and textile manufacturing. These waste waters have a value of OBC index (oxygen biological consumption) of 60-1380 mg/L, 30-900 mg/L suspension of solid particles, 5 mg/L nitrogen compounds, 1.5 mg/L phosphorur compounds as well as a rised temperature. The waste waters may also contain free chlorine, sulfides, mineral acids, hydroxides, starch, greases, oils, hydrogen peroxide, heavy metals (zinc, copper). Consequently, the treatment of waters consists in more complex processing such as neutralization, chemical precipitation and conventional biological cleaning.

It is well known that in the textile industry, beside of natural fibres the synthetic fibres are commonly used; these fibres consume the potential exausting resources of the world regarding oil and natural gas. In this respect, the ecofashion intends both the environment protection and consumers health together with the workers health by improvement of their working conditions. The ecological clothes are made from organic natural textiles, as the cotton cultivated without pesticides or the silk obtained from silk worm grown in organic medium. In France, the ecological products are special labelled indicating the steps within the corresponding plant convert into cloth product and the benefits of using such kind of product. Also, the applied label indicates the toxic indices from product composition in order to eliminate some health risks. Such indices can be, for instance: the formaldehyde content of product that led to irritations, neck ulcerations, oesophagus, stomach, nose, eyes and skin deases; the content of heavy metals which lead to serious diseas, dermatitis, destraction of kidneys, anaemia and brittleness of bones; the hexavalent chrome may provoke skin ulcerations, irritations of nose mucous and sometimes the modification of enzyme activity.

Recently, regarding the textile products group the RO-Flowe ecological label was introduced in Romania, which is similar as European label; this is an important measure of National Commission for Awarding the Ecological Label belonging to the Environment Ministry. It is expected from the eco-labelling the increase of opportunities for export, by conformation with international legislation, assurance of human health of consumers, financial savings by optimization of processes and remove the toxic and dangerous substances from the production process.

During a technological process the environment preservation may be accomplished by the following measures [5,6]: the ecological technologies of finishing able to reduce the values of pollution indices; modern technological solutions for waste water cleaning; diminution of water and energy consumption; reuse of cleaned water; sustenable management of wastes; elaboration and application of a performant system of environment management by new concepts of environment protection and by obeying the stipulations of European Community Acquis for environment. Since 1990 year, a reason for the removal from activity of many companies involved in textile production (spinning mills, weaving mills, knitwear and ready-made clothes factories) was also related to nonconformity with environment requirements and, hence, to unfulfil the conditions necessary to obtain the environment licence as a consequence of financial impossibility for re-technologization [5].

2. Surfactants based chemical reagents for textile industry

The surfactants (also *called surface-active reagents*) are chemical compounds that can decrease the surface tension of water even their concentration has low values [5]. The diminution of water surface tension is explained by adsorption at either gas-liquid or liquid-liquid interfaces. Typical molecular structure of a surfactant indicates both hydrophobic and hydrophilic part. The hydrophobic part contains usually a hydrocarbon chain with 8-18 carbon atoms and can be in its nature: aliphatic, aromatic or a mixture of both. The sources are natural greases, oils, petrochemical fractions, synthetic polymers with relatively low molecular weight, or synthetic alcholols with high molecular weight.

According to the nature of hydrophilic groups, surfactants may be classified into: anionic, cationic, non-ionic and amphoteric. Thus, the corresponding groups in anionic surfactants consist in carboxilic groups (as in soaps, for instance), sulphates, sulphonates or phosphates. The cationic groups are forms proceeded from amines. A non-ionic part is represented by the oxygen from ethers and polyethylene glycol, organic compounds that all are associated with water. In every case, the final hydrophilic group is strongly attracted by water molecules, whereas the attraction of hydrophobic groups is very weak.

The surfactants play an important role in a lot of practical applications, being utilized in various forms [6]: detergents, emulsifiers, dispersants, dies, adhesives, inks, humectants, wacs, foams, a lot of pesticides (herbicides, insecticides, biocides), some cosmetics, lubricants and others.

Depending on their origin and structure, before weaved, the majority of textile fibres are processed in spinning mills. During the technological processes, in spinning mills and in weaving mills a series of chemical products are utilized as surfactants (separation agents, tensides). A classification takes into account the applied operations; thus:

1. Products in preparation for spinning, which is used in order to prepare and pretreatment of fibers. These are divided, in turn, into three classes:
- product training, pretreatment, ungluing, mercerization;
- whitening products;
- softening products.

2. Products in the processes of dyeing and printing, which are divided as follows:
- products produced by dissolution or dispersion;
- antifoaming products, antimigration, antifold and protecting fibers;
- products for equalization and for mordanting;
- fastening products after washing;
- products for printing.

3. Final dressing products:
- products avoiding influence of touch (emollients);
- hydrophobic starch products, antistatic agents, oleofobe agents, fireproof agents;
- polymeric dispersions, catalysts, reticulated resins;
- special products, as antibacterial, antimicrobial, UV absorbers.

4. The surfactants and the environment

An adequate choosing of the surfactant takes into account the properties, price, its effects on human health (people working in the manufacturing process or consumers of textile products) and the impact on the environment. The properties required in various applications of surfactants can be known from product guides published by various producing companies.

In general, there are followed the properties which lead to a certain effect in the production process, or for consumers. Other issues are related to energy consumptionthat must be reduced more, and the mutual influences of various substances in the mixture. In recent years, it is much considered the impact of some products (and hence of surfactant) existing in the remaining water, or products that affect the environment.

Biodegradability of surfactants is one of important properties related to their impact on the environment; the process can take place in two stages:
- primary biodegradation when lowering the foaming properties of surfactants;
- final biodegradation that is complete, up to carbon dioxide and water.

The main factors affecting biodegradation are physical size of the surfactant molecule and the degree of ramification. Knowing surfactant structures can provide which types of molecules are more easily biodegradable and which are harder.

Other properties that make surfactants may become friendly for environment are:

- application by exhaustion; - degradation of peroxides (for surfactants in combination with enzymes); - obtaining from plant products that facilitate biodegradability; - their use at temperatures close to ambient, and so on.

5. **Types of ecological effects of surfactants used in the textile industry in Romania**

Romanian textile industry uses a variety of auxilliary substances provided from domestic production and import; for instance, they are purchased from various companies such as CLARIANT, DAIT-STAR, B-ZEMA, CIBA, ROTA, BASF and others.

In the following we present several types of surfactants produced by the company CLARIANT (Switzerland) [7].

1.Produse of enzymatic ungluing:

Bactosol TK contains enzymes based amylase; its effect shows a strong degradation of starch, being applied by exhaustion. Bactosol FB contains enzymes amylase and cellulose, used for unglutingungluting, for special effects, the wearing (Wash and Wear) "type articles on jean, cellulose fiber and mixtures with synthetic fibers. It is stable in water strong acids (optimum pH = 5,0-6,0), optimum temperature being 50-60 ° C; it is recommended for continuous and discontinuous processes.

2. Enzymatic products for special treatment

Bactosol AP containing enzyme catalase-based liquid that is applied by exhaustion to remove traces of hydrogen peroxide after bleaching. It is applied to a temperature of 20-40 °C, pH 6-

Bactosol SAP contains enzymes based on selected catalase, which are used for cellulose fibers and their blends, and is stable in the presence of detergents and wetting agents; it decomposes traces of hydrogen peroxide after bleaching, without attacking fiber colors and is presented as organic product.

3. Products for cleaning, cooking, washing

Imerol XN is an ether as recommended polyglycolic posted very effective for all kinds of stains; - used for all types of fiber, alkali-stable at up to 19 ° Be NaOH; - strong wetting agent; - shall apply by all processes of exhaustion, continue processes.

Sandoclean PCJ - synergistic mixture of alkyl-ethoxylates and fatty alcohols, which are used for all types of fibers and blends them into operationsof ungluting, preparation, cooking, washing, bleaching, etc.; - it is biodegradable; - it is applied by exhaustion.

Sandoclean JSF - alcoxilat fatty alcohol used to remove traces of mineral oils; - stable in hard water, acid and alkali to 6 ° Be NaOH; - organic biodegradable product.

Sandoclean TiO - fatty alcohol-ether-aryl sulfonate poliglicolic used as universal auxilliary in bleaching with hydrogen peroxide and a cotton mixtures, acting as softening, detergent and stabilizer, with significant economic efficiency; it - is environmentally biodegradable.

Sirrix ATO- glucozidic derivate, is used to ungluting, preventing the formation of oxicelluloze in alkaline environments, items used in processing jeans, partially or totally replacing treatment with pumice, being environmentally biodegradable.

Sirrix CRC - alkyl sulfate salts organic and inorganic - stable alkaline fleets up to 30 ° Be NaOH; it acts as a wetting agent in reductive alkaline fleets and is applied by exhaustion and continuous process.

4. Products mercerization

Sandoflex A – a solution of sulfur esters of fatty acids: - stable in alkaline fleet to 34 ° Be NaOH; - effect of high penetration and mercerization; - apply by continuous process.

6. **Products for final dressing. Hydrophobic dressings and antistatic fireproof oleofobe**

Nuva CSF fluid – a dispersion cationic fluoro-carbon is used for all types of fibers; - it gives very good impermeability to water and oils, with effect permanently; - through exhaustion applies in acid medium.

There is some possibility of summary auxiliarii textile using indigenous raw materials. For example company S.C. SIN SA-made products OLEOCHEMICAL distilled **acids from vegetable oils** (sunflower oil, soybean oil) to obtain alkyd resins industry plastifianţilor lakes and electrical, textile auxiliaries production of fatty esters and other chemical intermediates [8].

It is used in the country and produced some of the Romanian companies such as octa-CHIM-COLOR, which produces textile auxiliary groups presented in Table 1 [9].

Table 1. The produced textile auxiliary groups from OCTA-CHIM-COLOR company

Name	Action
Altexim	Agent ancient properties of emoliere, good equalization, a colourant, penetration capacity and dispersal
Alvirol	Sequester agent for alkaline-earth salts
Alviron	Painting and auxilliary agents dezarerare for all types of fiber
Lavan	Washing agent for all types of fiber, agent for improving resistance soap painting
Losin	Agent dissolution of fat and deployment wet stain washing and dry cleaning for all types of fiber
Sevalin	Auxilliary boiling and blanching
Seventin	Agents to protect the fibers
Sevofast	Slip agents for all types of fiber
Sevofin	Paraffin emulsions
Sevofix	Agents to improve the final treatment resistances and cellulose fibers Polyacryle
Sevofixan	Auxilliary dimensional setting for the wool
Sevolase	Deglutination agent with enzimes
Sevophob	Agent to oleo-hydrophobization for all types of fiber
Sevoprint	Products for dyeing and printing
Sevosoft	Systems for obtaining special effects finishing
Sevosoftal	Antifold agents for all types of fiber and finishing

Name	Action
Softycon	Emollient agents for all types of fiber and textile contextures
Stabilthern	Stabilization agent of fall colors
TC Antistatikum	Antistatic agents, lubricants for spinning
TC Binder	Binders for dyeing and printing with pigments
TC Carrier	Accelerator for dyeing fiber polyesters
TC Dispergator	Universal agents of dispersal
TC	Emulsifiers agents for removal of spinning oils
TC Entschaumer	Antifoam agents for all the finishing
TC Fix si Wash	Agents and soap for fixing reactive dyes
TC Fixierer	Agents fixing dyes
TC - Maschinenreiniger	Special products for cleaning machines
TC Okostabil	Plugging system for maintaining pH countries Oko-specified standards
TC Puffer	Plugging systems for various processes of finishing
TC Reaktant	Reactant resins for finishing higher cellulose fiber
TC Retard	Retardation for painting poliacrilonitril with cationic dyes
TC Schnellnetze	Moistening agents very effective for all types of fiber, textile materials and processes
TC Stabil	Permanent finishing agents without formaldehyde for easy finishing
TC Stabilisator	Agents for the stabilization process of the peroxide bleaching
Tecoredukt	Reducing agents
Tecovin	Finishing agents for sewing thread and wet waxing agents

In the current economic context, the trading prices of textile auxilliaries have the following values shown in Table

Table 2. The trading prices of textile auxiliaries

Name	Price (euro/kg)
Bactosol CA	10
Bactosol MTN	8
Bactosol JA	7
Bactosol CD	9
Bactosol PHC	3,5
Sandopan BFN lichid	6
Sandopan DTC pastă	5
Sandopan KD	2
Sandozin NAN	2,3
Nuva TC	11
Nuva FBN	13
Nuva K	10
Nuva CSF	13
Mercerol QW lichid	1,80
Mercerol QWLF lichid	2,50

The value of imports of textile auxiliaries in Romania is of 10-12 million / year, of which the products of the company CLARIANT is two million euro per year.

5. Conclusions

Textile industry is an industry that affects the environment from plant growth to the production process. Textile products may affect the health of consumers and, after their wear and tear, increased amounts of solid waste result. Applying a modern system of environmental management consists in the use of ecological technologies of production, reduction of both water and energy consumption, waste water purification, purified water reuse, sustainable management of waste. In the paper, a category of textile auxiliaries – surfactants was presented, which contribute along with other chemical and technological agents to impact on the environment. The surfactants are substances are absolutely necessary for textile industry in various technological operations, since they facilitate processes and enhance quality and resistance of textile products. In Romania annually are imported large amounts of textile auxiliaries, including the surfactants with good technological properties; among them, some act at relatively low temperatures, some are biodegradable, others destroy peroxides, so being more friendly to the environment. A part of imported textile auxiliaries can be manufactured into the country using indigenous raw materials such as fatty acids, distilled from vegetable oils. In this way some raw materials in Romania may be used, such as a series of chemical or petrochemical wastes from industry, achieving the finished product type surfactants with similar characteristics to those of imports, but cheaper, while reducing environmental pollution

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KNOWLEDGE TRANSFER ON COLLABORATIVE PLATFORMS

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This paper discusses the emergence of assisted instruction platforms as a result of the development of informational society and IT&C. The development of assisted instruction platforms is analyzed through the perspective of using collaborative systems for transferring knowledge to the students. The three approaches of knowledge transfer are also analyzed: hierarchical, centralized and anarchical.
Keywords: assisted instruction, informational society, collaborative platforms, knowledge transfer

Introduction

Both informational society and information technology contributed to the development of courses for high education with campus presence and supported the development of courses for distance and on-line education. The quality standards provided by each type of education must be as high as possible from the points of view of both students and universities.

One of the methods to ensure the quality of the education is to diversify the educational resources and the means to access them by providing complementary approaches for preparing didactic materials, transferring knowledge and for evaluating the progresses done by the students. In order to encourage the interaction between the instructor and the student, as a result of increase of the physical distance between the actors of the system, there must be used a series of communication means which are as more attractive as possible: electronic correspondence, video and audio materials, computer networks, virtual spaces designed for discussions between instructors and students or between students. This way, the approach of learning by verifying the assimilated knowledge was replaced by the active formation of knowledge, in order to develop the reflection and to simulate the intellectual activity of the students.

Collaborative platforms

The optimal deployment of the teaching-learning-evaluating process is based on the higher education and preparation of the instructor in his competence domain, combined with his pedagogical skills. The answers that the instructor provides to his students, his communication skills, the clarity of his exposure, the dynamics of the course, the ability to raise the interest of the students, all of these determine the desire of the students to deepen the discipline and, consequently, the domain it belongs to. The evaluation of the students must be correct and transparent. The students should know from the very first course the tasks they have to accomplish in order to promote. Also, the methods for evaluating the students must be adequate and according to the discipline profile [3]

Based on the results of the students, the instructor may evaluate his course and the interest manifested by the students and may take possible decisions for improving his course or for changing his approach. As a result of their diversified prior education, the students use different approaches for studying and deepening their knowledge. To support them, e-learning and assisted instruction platforms were developed as a consequence of the emergency of informational society. A natural evolution of assisted instruction led to the development of collaborative platforms used in the educational process and beyond.

The development of assisted instruction processes through collaborative platforms provides the possibility of focusing on content or on activities by using collaborative instruments, educational objects and collaborative authoring. Collaborative systems may be used by institutions with different domains of activity as a method for complementary instruction, in parallel with the classical instruction process used.

The quality of the interaction with the user represents one of the most important features of an assisted instruction system. Instruction systems are either oriented on the student, including the tasks they have to perform during the instruction process, or on the instructor, with the accent on the content of didactical materials [1]

The unique features of personal computers like interactivity, making precise operations, the possibility to provide multiple and dynamic representations of phenomena; facilitate the transmission of information and knowledge, the personalized interaction with each student and the collaborative interaction at the group level

Knowledge transfer

Unlike pieces of information which can be assimilated in a very short time like seconds or minutes, knowledge represents packets of information which are assimilated in days or weeks by lecturing, documenting, learning, experimenting or by performing individual or group tasks. The development of knowledge represents the accumulation of new knowledge in order to innovate or to adapt and achieve proposed objectives [5]

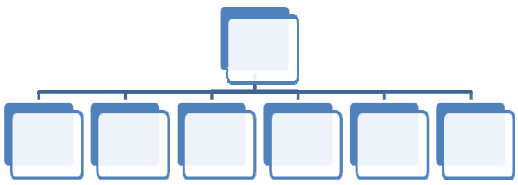

Figure 6 - Hierarchical approach

The hierarchical transfer of knowledge, Figure 6, is accomplished through teaching and involves a one-to-many communication in a single direction, from the instructor towards the students. All the students benefit from the same information, no matter the geographical area they are situated in, either at the same time ore at later dates by recording the course in a video format.

This method is applied especially when the students come for the first time in contact with the discipline presented in the course. The courses presented through this approach have a more general character and their objective is to present the theoretical notions that constitute the base of the discipline. Once they have been in contact with the theoretical notions, the students may search supplementary information about the studied domain.

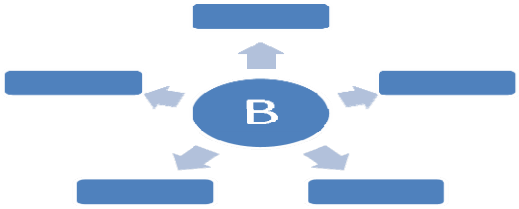

Figure 7 - Centralized approach

The centralized transfer of knowledge, Figure 7, is accomplished by using bibliographical electronic and printed resources (**B**) which are provided by the instruction system and which help the students understand better the notions taught at the course. This way, it favors the formation of a knowledge base particular for each student which consists in the knowledge learned at the course and the knowledge gained through individual study.

The collaborative dimension of the instruction system is enhanced by the anarchical transfer of knowledge between the students, Figure 8. After assimilating the notions taught at the course, according to the hierarchical approach, and the knowledge learned from individual study, the students may communicate one with each other through the assisted instruction platform, developing this way a collaborative activity.

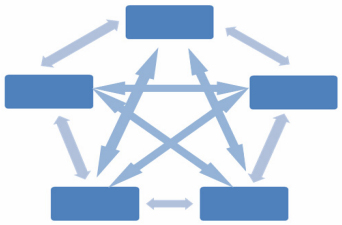

Figure 8 - Anarchical approach

This collaborative activity leads to the increase of the knowledge base as a result of communication between students. Possible questions a student has may be answered and clarified by the collaboration with one or more colleagues. This way, the scope of each student's knowledge base increases significantly.

The instructor may interfere with this collaborative activity. His interventions will clarify and answer the questions of the students regarding the discipline they study. Also, this way the instructor may evaluate his activity, may conduct the study of the students and may decide to restructure his course or his way of teaching and of collaboration.

The knowledge acquired by each student has different characteristics as a consequence of student's abilities to learn and understand. There are students who gain most of their knowledge from the course taught by the teacher, students who understand better the notions taught at the course by studying individually and students who learn better through collaborative study, by interacting with the other students.

The assisted instruction process must also pay attention on how to structure the schedule of the students. Although the students use a collaborative platform for instruction, their schedule must not tend to either of the two extremes: a *too busy* schedule will encourage the abandonment as the students cannot face the demands; a *too loose* schedule may result in a loss of interest towards the study.[2]

This way, the assisted instruction process requires a schedule which stimulates the creativity of the students. If students are allowed to put their ideas and knowledge in practice, if they benefit from the support of the instructors and if they are provided with the necessary means of communication with the other students, then the quality of the instruction process will be increased and innovative solutions might be discovered in the studied domain. Otherwise, beside the risk of abandonment increase, the instruction program will be limited only to train students at a mediocre level.

Conclusions

The collaborative activities which are carried out on an assisted instruction platform facilitate the enlargement of the knowledge scope for each student separately. The students who took part at the collaborative activities may group according to the interest they have on different domains, and a common knowledge base is created this way at the level of each group.

A benefit of using collaborative platforms is represented by a knowledge base with a broader scope resulted from the reunion of the knowledge of all student groups. This knowledge will be particular to only the group formed by the students of that promotion. Depending on the capabilities of the students and on the abilities of the instructor to transmit information, the dimension of such a knowledge base may be different from one promotion to another.

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THE DIAGNOSIS ANALYSIS OF REGIONAL INNOVATION-APPROACHES

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The communitary strategic orientations that the European institutions promoted since October 2006 have at their base the fact that research and innovation have a direct contribution at the prosperity and the welfare of the individual and of the community. The main objective of the research and technological development policy promoted by the European Union is that in the following years this regional group to become the most competitive economy based on knowledge in the world. The studies have shown that the density of the local networks of knowledge and their degree of involvement in the making of a plus of wealth in the region could have a decisive contribution at the dynamism and the competivity of the enterprises, of the business enviromenent, in general.

The promotion of the innovation policy at a regional level imposes a permanent diagnosis of the mechanisms of carrying out the system of regional innovation in such a manner that the efforts are focused on the incontestable priorities, that are the makers of added value and that we should give up the effort to decypher the meaningless details that lead to no future effects.

In the European programms of rising the competivity at a regional level and of occupying the work force the regions are often the managers of a global subvention for whose use the European Comission recommends the making of diagnosises that emphasises the strong and the weak points of the territories through the perspective of the innovation so that the consolidation of some effective innovative strategies is reached in connection to the European stakes.

Romanian projects regarding the regional innovation through the scientific approach that they have in mind try to give the local managers and to the specialists from research, education, a robust methodology of territorial diagnosis and the instruments necessary for steering and innovative management.

The systemic approach, creative concept of innovation

In literature it is shown that *knowledge networks* represent a collective factor of economic performance and one of the most important axes of the modern politics of innovation. The notion of "society based on knowledge" has become in the last years a concept that is common to all the states that are members of the European Union. Each economic agent, manager, researcher or employee comes into contact with numerous entities in the spehere of his own unit or in other units that are situated in the same geographical area or in other regions/ countries. From the experience of the developed countries it was noticed that the efficacity and the productivity of each economic agent depends largely on the number and intensity of these connections that become more efficient when the geographical proxemity is higher; because of this one of the main objectives of the European communitary politics is the development of innovation at a regional level. Frequently, the utility and the clarity of the scientific information is lost when their transmission is not made directly, through dialog, but by using informatic techniques of communication, because either the message or its content is altered. For this reason, in the making and following the putting into practice of some innovative projects the meetings "face to face" are preffered. Innovation is an interactive process. For this purpose, the production of knowledge is necessary, but not sufficient for innovation, it creates potential that has meaning only if it exists as final demand. The production of knowledge must be capitalized through the constant interaction between producers, enterpreneurs, users or intermediaries of knowledge and the public institutions.

The fundamental role of knowledge when we talk about societies, institutions of higher education and research can be described through the image of "triple helix" (science – industry, industry – state, state – science) that is perceived as being the DNA of the economic tissue and of innovation. According to the circumstances, the universities, the industries and the public organisms can play different roles in the innovation process, around the three great actors, science – state – industry, gravitates a large variety of institutional networks. The collective decisions are the result of the complex institutional arrangements between local and national partners, in which the public collectivities play a dominant influence.

A frequent phenomenon that we can find in the modern democracies is the plurality of actors in making the politics of regional innovation. Many times they are situated on rival positions. This is why a correct institutional government of the innovation process means the creation of an equilibrium between the autonomy, cooperation and rivalry of the actors involved. In order to assure the development on the long run of the economical regions, the institutional government has to set the "rules of the game" in the so-called institutional "coopetion" (cooperation-competition); one must make the difference between the subjects that are the object of codecisions and that mean the coordination in activity, and the ones that assure the territorial dynamic through a form of rival politics. The rules of the game indicate the directions on which one can act as to obtain the maximum of effect. French literature and the literature of other

European states recommends a demarcation of the action fields of the regional actors as it follows:

- Common fields: diagnosis, vision, the big axis of politics, the management of difficult priorities;
- Coordinated fields: financial and fiscal aid, incubators, the public scientific parks, the transfer organisms of technology that is financed by public fundings;
- Rival fields: the duties of the factories, the counseling in innovation and technique, the financing of the factories, the private incubators, and other actions that have effects through private efforts.

The defining of the regional policies of innovation means the deep knowing of how the regional economy works and the economical evaluation of the existing public strategies.

Regional systems of innovation, strategic diagnostic field

The role of the diagnostic analysis at a regional level is to identify the strong and weak points that are specific to the innovation process; it has to be methodical and to go beyond the mere enumeration of the statistical general elements (research staff, added value, investments, research expenses, number of patents) or of the list of universities, research centres, incubators, without being accompanied by argumented and scientific based commentaries.

The conclusions drawn from the analysis of a region must be completed by the diagnosis of the global stakes that are specific to the region, through the examination of the microeconomic dynamism of the actors of the innovation systems, by the appreciation of their capacity to generate knowledge and to turn it into new products and services or in "business models" (innovative) through the evaluation of the acces to capital.

The diagnosis analysis in the field of innovation at regional level is a must and it has to have three main dimensions:

-The analysis of the global components based on the indicators of economic activity and of the innovation potential;

- The analysis of the actors and of the networks of the regional system of innovation;
- The description of the functioning of the innovation government process and of the establishing the strategic priorities.

The deep description of the importance and of the dynamics of the main groups of activities allows the positioning of the specialization of the region as a strong or weak point and the making of the strategic activity clusters on which studies will be made afterwards and action programs will be implemented. The diagnosis analysis will aim at the "macroeconomic" elements of the regional system of innovation, that will be classified in the following categories: general indicators of the economic activity, human resources, financial resourses, data about the innovation environement, "innovation" outputs, the dynamics of innovation.

The diagnosis is the systematic analysis of the regional activity, under different aspects, through the identification of the main indicators that can offer information about the degree of innovation of the region and by the making of comparisons between regions or the European environements, of other countries etc. The diagnosis analysis imposes the putting into practice of an ensemble of quantitative and qualitative methods among which a high degre of use will have:

- Statistical methods: indices, concentration coeficient Gini, growth rates, specific weight, medium rythms etc;
- The score functions;-
- The evaluation ratings;
- Profiles technique;
- Decomposing, grouping and comparing;
- Swot analysis;
- Pareto method;
- Questionaries and surveys.

As general lines the diagnosis means the going through the following stages:

- the identification of the purpose of the innovation analysis at a regional level;
- the determination of the influence factors, of the chance relations betwwen these and of the methods – quantitative and qualitative – that can be applied;
- the analysis of the results and their interpretation according to region;
- proposing an action plan at a regional level;
- establishing the regional innovation strategy.
- presenting an informatic model about the evaluation of the innovation degree at a regional level.

The diagnosis will end by emphasasing the strong and weak points in a synthesis and the conclusions will lead to the making of innovation strategies of the region.

Comparison, as a qualitative method of diagnosis analysis, is best to be made by connecting the results of the region with the data of other regions and European countries. No indicator has scientific value if it is not compared in time and/or in space.

The regions used as a compariosn base in interpreting can be Romanian (them among themselves) because the purpose of this comparison is not to classify te regions, as European Inovation Scoreboard does, not to suggest to the region managers the reproduction of a model that is considered to be the best, but it only invites to reflection strating from the data presented. The major difficulty in analysing the innovation process on a national and regional level comes mainly from the limits of the statistic aparatus and from the fact that weft of the innovation is not really well localized and thus we do not have enough data for innovation.

European Inovation Scoreboard limited the analysis to a set of 7 indicators that describe the main characteristics of innovation in the European regions: the number of the staff hired in science and technology, the degree of participation to the

continuous formation of the persons with ages between 25 and 64 years old, the share of the Research-Public Development (C-D) in the region PIB, the share of Research-Private Development in the region's PIB, the existing jobs in the manufacturing fields of low, medium and high technology (% of the total occupation), the existing jobs in the fields of high techonology of services (% of the total occupation) and the number of patents at the million of inhabitants.

The present scientific paper wants to be a synthesis of the research made by the author with the ocasion of the first stage of the project INNOREG – MODEL AND INFORMATIC PROGRAMME FOR THE DETERMINATION OF THE INNOVATION DEGREE AT THE LEVEL OF DEVELOPMENT REGIONS (INNOREG) – 2008-2011 (see explanations in the paper "Innovation – the cornerstone of the economic succes at an international and regional level"), in which the ASE partner had as a responsability the study of the diagnostic analysis in the field of innovation at a regional level.

The selection of the indicators used in the diagnosis of the region

Although the attention of the authors in the project INNOREG is to identify an important number of indicators that can provide useful information regarding the degree of innovation in Romania – at a regional level – the experience of the European states that have tried the same procedure have shown that the analysis will limit itself only to a part of them, for reasons that have to do with the finality of the diagnosis, that has as a purpose the offering of a framework, common and simple, in an operational purpose, in the terms of public policies. The proposed elements that are a part of the diagnosis are available in general in the main informational sources (Eurostat, general indicators that are identified in every region).

The obtaining of information, that allows the making of the innovation indicators, faces an obstacle: the uncertain character of the innovation process. Tradition priviledges the patents (in connection to their number and their quoting) on the one hand and the input of the research on the other hand (expenses for Research-Development, number of researchers, research staff) as being relevant landmarks in the evaluation of the innovation process. In the last years progress was recorded regarding the way of reviewing the inventions that are effectively marketed but their importance is still limited because the obtaining of information is very slow.

The diagnosis of each region imposes the complementary analysis according to necessities, the research project that has to be eleborated only offers a common minimum frame of analysis and presentation, that is called to evolve in the same time with the amelioration of the statistical aparatus.

Innovation is a multiform phenomenon that can be analysed as a transformation process of the resources and that is in the same time the manifestation and the result of a certain dynamics. The French literature regarding this subject describes the different dimensions of innovation through an ensamble of components that can be analysed, each, through a set of indicators, that we enumerated above:

- General indicators of the economic activity performance: refers to the description, with the help of this subensamble of indicators of the demographic and economic global data of the region that appear more as a data base and as results of the innovation process.
- The structure of the economic activity: the structures of the activity are an "entrance" and a result; a strong orientation of the region towards "high tech" emphasises a positive performance of innovation and in the same time a favourable factor of development of new productive capacities.
- Human resources of innovation: in all the studies on innovation and teritories, the degree of preparation of the human resources is one of the most direct elements in the making of the innovation process.
- Financial resources of innovation is also an important factor in all its forms.
- Data regarding the environement – the innovation enviromenent: cultural and technical capacity of dispersing the innovations into the economy is an essential dimension that can be apreciated today through the perspective of some partial and often fragile elements.
- "Output innovation": the dynamic of the exits appears as a particular component of the regional system of innovation because the evolution of the ensamble can manifest itself under very different forms.

These subensambles create among them a system which means that each represents on the one hand the casuality elements for other subensambles and on the other hand they are the results of other components. This synergy is known and from the diagnosis analysis made at a factory level where the same indicator can represent the cause and the effect of other economic phenomena. Mutual interactions are created that generate a favorable dynamics or on the contrary there is the risc that they lose the collective competivity. For example, the "innovation" performance and dynamic of the region depends equally on the human and financial resources; but at the level of international rivalry regarding the human talents/aptitudes and the financing, the growth of the resources is connected to the attractivity of the region, thus to its performances. It is only one of the examples that shows that the economical structures are connected on the long term with other dimensions of the inovation system.

Each dimension is involved in diagnosis through an ensamble of statistics available: *diagnosis is strictly conditioned by the possibilities of the statistical aparatus.* In the majority of cases the relevancy of each of the indicators that reflect the component that we are talking about, respectively innovation, would become a debate topic vaste and sterile; one must make a selection and a determination of the measure in which they are combined and they have a common

result; the main goal is to apply the innovation's components in an unitary manner for the region's ensamble.

The different categories of indicators proposed by the authors have as a main goal the facilitation of analysis through the framing of the results, as strong/ weak points of the region according to a very strict description (swot analysis). For each subensamble a type of synthesis will be made under the form of an apreciation of the potential of the region, that is rated on a quantitative scale, from 1 to 5, mainly through comparisons with reference European regions; the interpretations will allow the emphasis of the possible and prioritary actions in connection to the findings made.

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THE USE OF NEURAL NETWORKS IN THE OPERATIONAL RISK DATA MODELING

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In this article it is presented a proposal of improving the data analysis process of Operational Risk (OpRisk) assessment in the financial institutions, for the Loss Distribution Approach (LDA) method, using the Artificial Intelligence (AI).
In the first part of the paper a substitute tool of the traditional model-based Autoregressive Moving Average (ARMA) is described, for analyzing and representing stochastic processes. An Artificial Neural Network (ANN) is particularly suitable for this challenge, especially when dealing with limited data sets. In this case, an ANN is able to operate model-free by extracting the pattern of the training data set and by learning from the data observed during the generalized delta rule back-propagation training. The proposed ANN is a time lagged Feed-Forward Network (FFN) with log-sigmoid activation function.
KEYWORDS Operational Risk, Advanced Measurement Approach, Loss Distribution Approach, Artificial Neural Networks, Genetic Algorithms

1. Introduction

Most of the financial institutions across the world have to overcome this issue: *the shortage of the loss data history*. When it comes to Romania, the reality is even worst. Given the fact that the new Basel II – capital adequacy framework become effectively with the beginning of 2007, together with the EU membership, the mission of building loss event database faced a critical constraint: the lack of the loss events in such a short period of time, especially for the majority of the banks activating in Romania.

LDA is based on data set which, ideally, will comprise, only the internal loss events for each business entity of the financial institution. Each of this entity has its own OpRisk profile. This profile is based on:

1. inherited risks like the product type or the complexity and the legal frame constrains;
2. internal controls like control culture, the systems and policies

In other words, inherited risk decreased by the existing controls results in the net risk.

The minimum capital requirement for the operational risk exposure is, mainly, influenced by the distribution tail of the loss events data set. This tail is made of loss events with low frequency rate and high severity. Appearing occasionally, this kind of events is, typically, not found in the historical database of financial institutions. For this reason, external data (i.e. Algo Opdata – Fitch Risk) could be used to complete the data set.

However, the extensive use of external data alters the risk profile of the financial institution. In order to overcome this inconvenient, a moderate use of external data combined with a data prediction is advisable.

And here comes in the idea of this article: to predict new realizations of the data set based on the observed data pattern. For that, an artificial data network is the preferable solution because of its model-free prediction capability.

2. A New Approach in Operational Risk Data Modeling

The solution for overcoming the lack of internal data collection appears to be one of utmost interest for the banking industry. In this context, using ANN for generating realizations for the insufficient loss data set becomes a realistic solution. The procedures based on neural networks could provide a powerful tool for analyzing stochastic processes in the difficult case of limited information, such as: short data set and lack of knowledge regarding the process.

The neural network proposed is a Neural networks do not need a model and learn from the data analyzed, generating realization of an incomplete data set based on perception only[15]. That is,

One of the most important features of the multilayer perceptrons of an ANN is that the Universal Function Approximation Theorem (UFAT) for non-linear input-output mapping is directly applicable, if certain conditions are fulfilled. This theorem states that *a single hidden layer it's sufficient (but may be not optimum in terms of learning time, ease of implementation and generalization) for a multilayer perceptron to compute a uniform* ε *approximation(where* $\varepsilon>0$*) to a given training set of inputs* $x_1, \ldots, x_m$ *and target output* $f(x_1,\ldots,x_m)$.[16] In other words, ANN is able of uniformly approximating, to any degree of accuracy, any kind of nonlinear functions defined on a compact domain (Eq.1)

$$\left|F(x_1,\ldots,x_m)-f(x_1,\ldots,x_m)\right|<\varepsilon \qquad (1)$$

where $F(x_1,\ldots,x_m)$ is an approximate realization of $f(x_1,\ldots,x_m)$ and $\varepsilon>0$.

The yields of the continuous function f will be understood as the stochastic process realizations and the function will be approximated by the ANN.

The network proposed is a multilayer feed-forward network. The dimensionality of the problem will determine the number of the output neurons. A k denoted neuron may receive input signals x_j, only from the previous layer, which are multiplied by the assigned synaptic weights w_{kj} with a bias value b_k and then are introduced into a summing junction. The summing junction becomes the argument of the

[15] Beer, Spanos (2005)
[16] Haykin (2008)

activation function $\varphi()$ which yields the output signal y_k. (Eq.2)

$$y_k = \varphi\left(\sum_{j=1}^{m} w_{kj} \cdot x_j + b_k\right) \qquad (2)$$

The activation function $\varphi(x)$ is a log-sigmoid function (Eq.3). This is a nonlinear and monotone-increasing function and has been chosen for the simplicity of its derivatives $\varphi'(x)$ which has to be repeatedly computed during training process (Eq.4).[17]

$$\varphi(x) = \frac{1}{1+e^{-x}} \qquad (3)$$

$$\frac{\partial \varphi(x)}{\partial x} = \varphi(x)(1-\varphi(x)) \qquad (4)$$

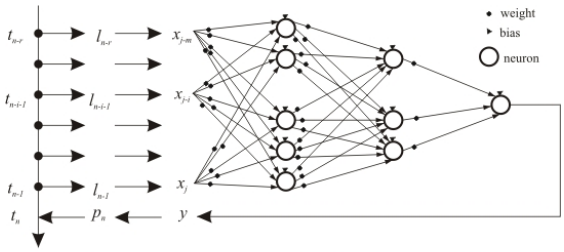

Fig1. Prediction process with a feed-forward ANN

As it is presented in the symbolic representation in Fig.1, below, the neural network will generate the prediction p_n at the n-th iteration and based on the real observations $l_j \div l_{j-m.i}$. The p_{n+1} prediction are not available unless the previous realization has not been provided.

3. A Numeric Example

The network is a multi-layer ANN, with standard error back-propagation and two hidden layers, one with 18 neurons and one with 8 neurons. The training scope is to adjust the weights and the biases of the neurons in order to reproduce the training data with an acceptable precision.

The training data consists of 10 randomly generated data series of 40 entries.

The target function is made up of the observed loss events of a small size local bank occurred between March 2005 and July 2008. All the date has been transformed in order to have the majority of the date in the effective interval of the logistic-sigmoid activation function [-4.595, +4.595]. This has been done using the function below:

$$x_j = (z_j - \bar{z}) \cdot \sigma_Z^{-1} \qquad (5)$$

Where z_j represents the raw data, $\bar{z}$ is the mean value and σ_Z is the standard deviation.

The network is trained rapidly with the Levenberg-Marquartdt function and in just 3 iterations the network is validated as shown in the figure no. 2.

The network gradient, mean and validation checks are shown in the 3rd figure while the regressions are plotted in the figure no. 4.

Simulated data are: 0.79291 1.1333 2.7221 0.14449 2.9127 1.7497 0.74304 0.39796 1.7172 0.64758 0.50214 2.4476 2.6575 1.0742 3.6415 2.5566 2.4414 3.5748 1.7416 0.30855 3.7531 3.3185 1.3811 1.744 3.2367 1.1426 0.43388 3.8541 1.3123 0.26635 3.0625 2.7031 2.5919 2.7221 0.42103 0.58613 0.59529 0.097576 1.1222 1.066.

These data will be transformed back to the raw data and will be part of the new data set.

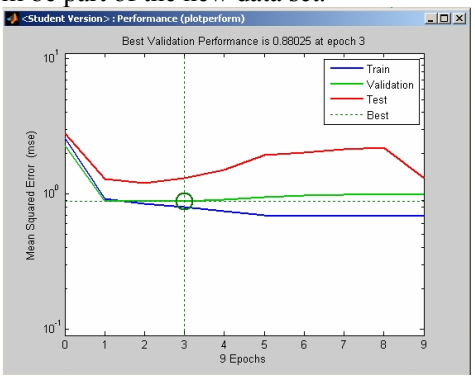

Fig.2 Network performance

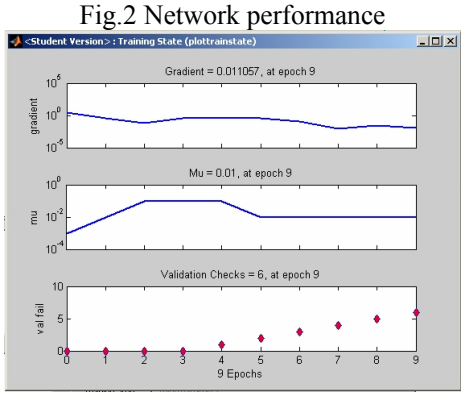

Fig.3 Network training

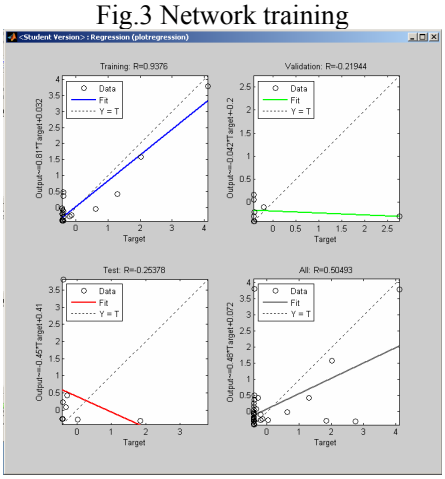

Fig.4 Network Regressions states

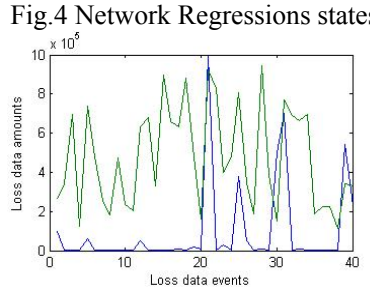

Fig.5 Observed raw data vs. predicted raw dataThe predicted and the observed row data are presented in the figure no. 5.

[17] Bodea (2002)

Conclusion

ANN represents a good alternative to the ARMA prediction especially because they are operating model-free. This is particularly effective in the case of OpRisk assessment with LDA, applied on an insufficient populated data set. Apart from higher inherent complexity, ANN predictions based on data pattern recognition will help the risks assessors to input as little as possible external loss events data. This is helping the OpRisk assessment process to keep the risk profile as close as possible to its business particularities.

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QUALITY OF THE ACADEMIC PROGRAMMES

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The main issue addressed by this paper refers to the quality of training and education on project management – is it different than the perception of quality of training and education in other fields, if so, where, in what aspects, who should be responsible for it, should it only be addressed as input based – provider, trainer, curriculum, or also output based – trainee, etc. A survey was made and the main results are presented.
***Key words**: Quality, Project management training and education*

1. INTRODUCTION

Worldwide, project management has become widely known and utilized in almost any activity which could be project-based. Project management isn't about quick fixes - the key to success here, as everywhere else, lies in preparation. Sometimes it's better to throw out the manuals and checklists and start a fresh, focusing on the basics that have stood the test of time. Everyone looks for a quick fix, an easy to-do guide, a no-brainer shortcut to getting the job done. And where does that leave project managers?

A good project manager knows the project management principles, methods and techniques and applies them, always looking for the best outcome of a situation. Some don't even need training to do that, it's in their blood to "get by". Some, on the other hand, need tons of training and never really quite figure out what's the deal about this project management thing.

While training is important for developing a number of competences, the practice makes perfect in all fields, not necessarily in project management alone. However, in project management, every little thing we do, or don't do, has an effect, which cannot always be measured and quantified, if the person is only acting on instinct. Project managers make decisions which affect not only a project, but a carefully built network of contacts and a carefully promoted image. There is also a great responsibility in terms of managing people and connections, communicating, and sometimes manipulating situations so that the project benefits from their outcomes.

Which leads us to the following questions: Where does the quality of project management education and training lie? How can we define project management training and education quality? Where should we establish boundaries so as to achieve effective and efficient and fit-for-purpose project management training? What should we teach, in order to get a ready-to-go project manager?

2. APPROACH FRAMEWORK

The main issue addressed by this paper refers to the quality of training and education on project management – is it different than the perception of quality of training and education in other fields, if so, where, in what aspects, who should be responsible for it, should it only be addressed as input based – provider, trainer, curriculum, or also output based – trainee, etc.

3. QUALITY OF EDUCATION AND TRAINING ON PROJECT MANAGEMENT – RATIONALE

3.1 Training the Project Manager - The roles of training providers and trainers

A training session could aim at developing or improving one of the project manager competences. By developing, we mean that the competence is at its basics or is not there at all. By improving, we mean that from the documentation received from a candidate, we can assume that some competence exists and we can build on that.

A training session could refer to one of the topics above, to any number of them combined, or to all of them, thus leading us to a corresponding duration of the training. Although it may seem that we are only approaching technical competences, a balanced percentage of theoretical and practical training, backed up by modern teaching methods, could lead to the improvement of behavioural competences, as well.

3.2 The Questionnaire Development

The methodology for the development of the questionnaire was based on the following aims:

1. Development of a questionnaire for assessing the general and specific traits of quality in training on project management
2. A focus on the practical aspects of organization and logistics, as part of the training organization
3. Stress on candidate accession / enrolment in a training course / programme
4. Inputs and resources ensured by the training providers
5. Trainers' profiles
6. Minimum requirements of curriculum

7. The training result

While starting backwards sometimes has advantages, such as establishing ground rules on accession to training and setting up a common language, it is quite disadvantageous to the training provider, as the selection process takes time, human resources and money.

The final aim of the questionnaire is to show whether there is any way to establish a combination of traditional and modern teaching for the project managers-to-be, who do not have the physical time to attend project management traditional courses / programmes, that will be practical enough to offer them a ready-to-go information and that will enable them to provide quality project management to their Clients and that, in the end, will provide them with a certification or a diploma, which is mutually accepted and valuable.

The questionnaire is structured into 2 main parts, split into questions about general aspects of education and training and particular questions related to project management education and training.

This is why we should also establish, as a result of the above-mentioned analysis, the key requirements for candidates' admission for project management courses, as well as the curriculum for each level and the trainers' competence requirements for each course / group of candidates. These aspects need to be universally accepted and agreed upon, so as to ensure consistency of any project management course, in each country that has a National Association affiliated to the IPMA.

This selection should assure quality to the training delivery, as everybody speaks the same language and the information exchange will be more focused, although the disadvantages are quite obvious: a lengthy selection process, of both candidates and trainers and customized project management curriculum. However, if this process also includes information on the candidates' wish to become certified, then the selection process leads to an intermediate result – training admission and to a final result – certified candidate. In this case, a procedure of communication between the Education & Training Board of IPMA and the relevant counterpart dealing with Certification (possibly in each National Association affiliated to the IPMA) should be established.

Bearing these in mind, developing a general project management curriculum, customized for each level of certification, covering achievement of competences from the list above, and applicable to all types of candidates, can be developed and disseminated to the IPMA and affiliated National Associations for final agreement. It will them become the "minimal requirements" for training providers and trainers, who want to provide education and training services accredited by the IPMA and National Associations and whose graduates can apply for any of the 4 levels of certification provided by the IPMA.

The respondent distribution (figure 1)**: *by nationality -*** 81 % of the responses came from China. The rest were received in Romania, from a number of professionals of different EU nationalities; ***by profession:*** The percentage of Project Managers who answered the questions is rather low – 8%. In the "Others" category, we have a software developer and a financial manager. 3 trainers replied the questions, providing insight on the questionnaire shape and content, as well as on project management training quality. The rest are professors, who are involved in both training on PM, but also as team members or team managers in research and other types of projects, thus ensuring a balanced overview of both theory and practical issues

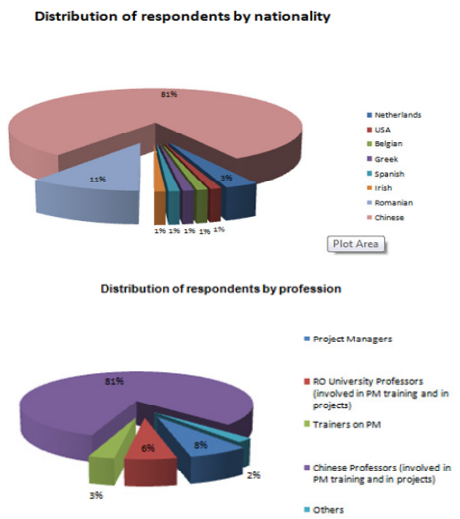

Figure 1

4. SURVEY RESULTS

The following figures present the main findings.

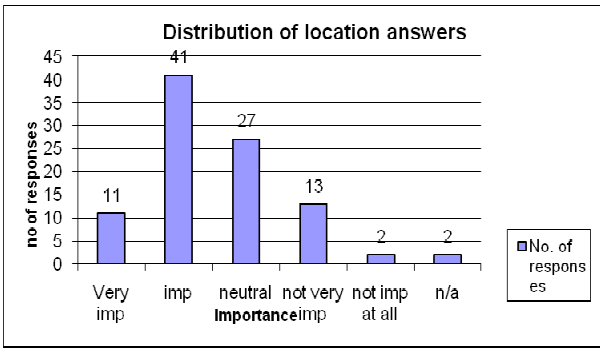

Figure 2

Location selected for training on PM is considered important by most respondents – 41 out of the 96. Only 11 say that location is very important, same goes for two who cannot decide. 13 people stated location is not very important, while 27

consider location is neither important, nor un-important.

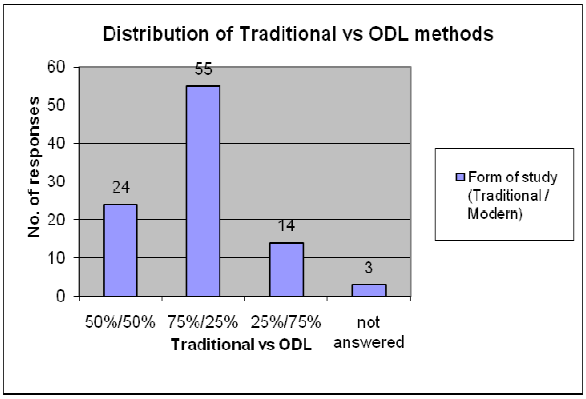

Figure 3

55 respondents opt for the higher percentage of face-to-face, traditional training. At the extreme, only 14 people consider that modern online teaching is more useful than traditional methods. 24 think an equal split of modern and traditional is useful

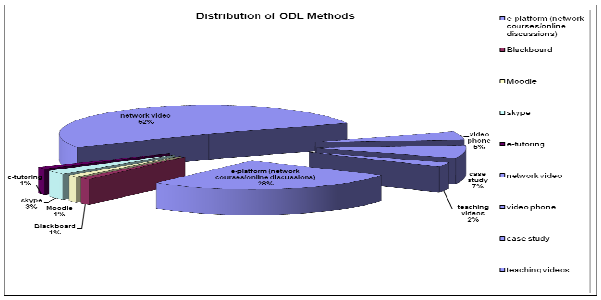

Figure 4

Most respondents opt for the network video (52%) and e-platform – 28%. 7% recommend case studies, while only 1% opt for e-tutoring, during and after course delivery.

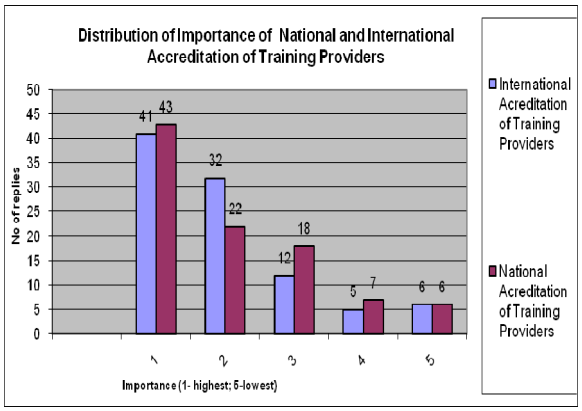

Figure 5

The majority of respondents opt for the outmost importance of accreditation of training providers (national or international). At the other end, 6 respondents do not care at all about this issue. National accreditation is seen as very important by 43 respondents, when compared to international – only 41.

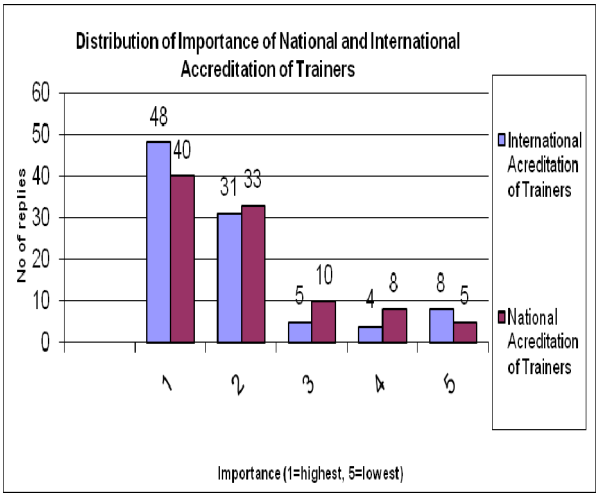

Figure 6

The same trend as above is kept when talking about trainers' accreditation. The analysis of the questionnaire shows that the importance of accreditation is mostly stressed for the institution, not for the person, but those who opted for 1 in the above questions, also opted for 1 or 2, in the trainers' answers, as well.

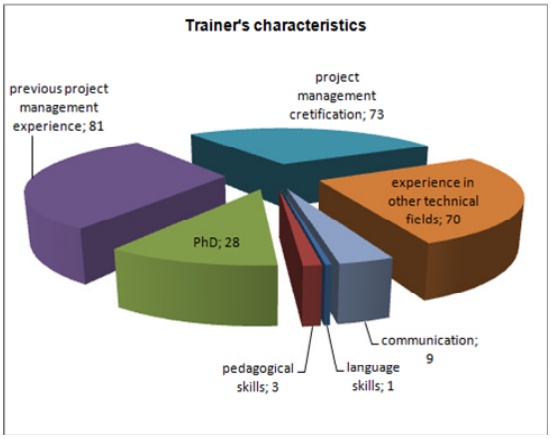

Figure 7

With regard to the characteristics of trainers, 1 person stated language skills, as being important, while 3 others stated pedagogical skills. 81 state that it is important for trainers to speak from experience, while 70 consider that some technical expertise is also required. 73 say that it would be important that the trainer is certified as Project Manager. PhD is considered important by 28 people.

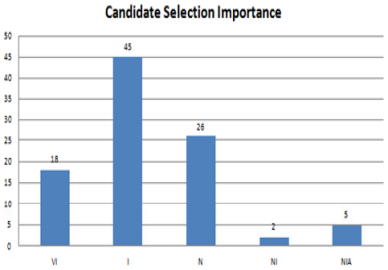

Figure 8

Candidate selection is very important for 18 people, and important for 45. This leads to a majority of 63 respondents who think that selection of candidates is an aspect of quality assurance. 25 are neutral about this aspect, while 5 feel that candidate selection is not important for training quality.

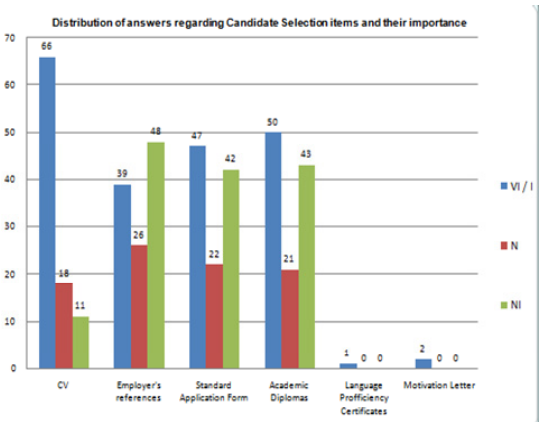

Figure 9

Most of the respondents declare themselves in favour of candidate selection. Most important documents required in the candidate file are: CV (very important for 66 respondents), Diplomas, Employer's references (very important for 39, but completely unimportant for 48), as well as an Application Form.

5. CONCLUSIONS

Quality in project management education and training depends on:

- Organization and logistics – a good organization and combination of teaching methods adds value to training (assessed through Session Feedback Forms)
- The training need addressed – practical solutions, exercises, case studies (assessed through Session Feedback Forms)
- Trainer's skills – pedagogy, languages, knowledge of the field, experience in the field
- Trainee's commitment and motivation

Training providers should promote a coaching service for a limited period after the training sessions. Alumni's databases and forums are desirable solutions. Training providers are not responsible for the performance of the graduate at the work place.

Training impact should be assessed through feedback forms, after a reasonable period from session graduation. Education and training on project management should aim at achieving a profile as close as possible to the one in ICB 3.0.

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DATA MINING LANGUAGES STANDARDS

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The increasing of the database dimension creates many problems, especially when we need to access, use and analyze data. The data overflow phenomenon in database environments imposes the application of different data mining methods, in order to find relevant information from large databases. A lot of data mining tools emerged in the last years. The standardization of data mining languages become in the last years a very important topic. The paper presents Predictive Model Markup Language (PMML) standards from the Data Mining Group. PMML, a standard language for defining data mining models, which allows users to develop models within one vendor's application, and use other vendors' applications to visualize, analyze, evaluate or otherwise use the models.

1. Introduction

PMML provides a vendor-independent method of defining models so that proprietary issues and incompatibilities are no longer a barrier to the exchange of models between applications. It allows users to develop models within one vendor's application, and use other vendors' applications to visualize, analyze, evaluate or otherwise use the models. Previously, this was virtually impossible, but with PMML, the exchange of models between compliant applications now will be seamless. Predictive Model Markup Language (PMML) is an XML-based language, that means PMML uses XML to represent mining models. The structure of the models is described by a DTD which is called the PMML DTD. One or more mining models can be contained in a PMML document.

2. The general structure of a PMML document

A PMML document is an XML document with a root element of type PMML. The general structure of a PMML document is:

```
<?xml version="1.0"?>
  <!DOCTYPE PMML
        PUBLIC "PMML 1.1"
        "http://www.dmg.org/PMML1.1/pmml-1-
1.dtd"  >
  <PMML  version="1.1">
  ...
  </PMML>
```

A PMML document is not required to have a DOCTYPE declaration. If there is one then a PMML document must not depend on external parameters, that is we assume the default attribute standalone="yes" in the <?xml?> statement. Although a PMML document must be valid with respect to the PMML DTD, a document must not require a validating parser, which would load external entities. In addition to being a valid XML document, a valid PMML document must obey a number of further rules which are described at various places in the PMML specification. See also the conformance rules for valid PMML documents, producers, and consumers.

The root element of a PMML document must have type PMML

```
<!ENTITY % A-PMML-MODEL '(TreeModel |
                  NeuralNetwork |
                  ClusteringModel |
                  RegressionModel |
                  GeneralRegressionModel |
                  AssociationModel )' >

  <!ELEMENT PMML ( Header,
            DataDictionary,
            (%A-PMML-MODEL;)+,
            Extension* )>
  <!ATTLIST PMML
     version CDATA #REQUIRED>
```

A PMML document can contain more than one model. If the application system provides a means of selecting models by name and if the PMML consumer specifies a model name, then that model is used; otherwise the first model is used. A PMML 1.1 compliant system is not required to provide model selection by name.

For PMML version 1.1 the attribute version must have the value 1.1 .

For all PMML models the structure of the top-level model element is similar to

```
<!ELEMENT XModel (Extension*, MiningSchema,
                  ModelStats? ....) >
  <!ATTLIST XModel
    modelName  CDATA    #IMPLIED >
  <!ELEMENT MiningSchema   (MiningField+) >
  <!ELEMENT ModelStats     (UnivariateStats+) >
```

The non-empty list of mining fields define a so-called mining schema. The univariate statistics contain global statistics on (a subset of the) mining fields. Other model specific elements follow after ModelStats in the content of XModel. For a list of models that

have been defined in PMML 1.1 see the entity A-PMML-MODEL above.

3. Example: DTD of Association Rules Model

The Association Rule model represents rules where some set of items is associated to another set of items. For example a rule can express that a certain product is often bought in combination with a certain set of other products. The attribute definitions of the association rule model uses the entity ELEMENT-ID in order to express a semantic constraint that a value must be unique in a set of elements (contained in the same XML document) of the same type.

```
<!ENTITY % ELEMENT-ID   "CDATA">
```

An Association Rule model consists of four major parts:

```
<!ELEMENT AssociationModel (Extension*, AssocInputStats,
                AssocItem+, AssocItemset+, AssocRule+)>
<!ATTLIST AssociationModel
    modelName  CDATA    #IMPLIED>
```

Basic information of the input data:

```
<!ELEMENT AssocInputStats EMPTY>
   <!ATTLIST AssocInputStats
        numberOfTransactions      %INT-NUMBER; #REQUIRED
       maxNumberOfItemsPerTA   %INT-NUMBER; #IMPLIED
      avgNumberOfItemsPerTA  %REAL-NUMBER; #IMPLIED
        minimumSupport          %PROB-NUMBER; #REQUIRED
       minimumConfidence       %PROB-NUMBER; #REQUIRED
     lengthLimit        %INT-NUMBER;  #IMPLIED
         numberOfItems             %INT-NUMBER; #REQUIRED
         numberOfItemsets          %INT-NUMBER; #REQUIRED
         numberOfRules             %INT-NUMBER; #REQUIRED>
```

Attribute description:

numberOfTransactions : The number of transactions (baskets of items) contained in the input data maxNumberOfItemsPerTA : The number of items contained in the largest transaction avgNumberOfItemsPerTA : The average number of items contained in a transaction minimumSupport : The minimum relative support value (#supporting transactions / #total transactions) satisfied by all rules minimumConfidence : The minimum confidence value satisfied by all rules. Confidence is calculated as (support (rule) / support(antecedent)) lengthLimit : The maximum number of items contained in a rule which was used to limit the number of rules numberOfItems : The number of different items contained in the input data numberOfItemsets : The number of itemsets contained in the model numberOfRules : The number of rules contained in the model

Itemsets which are contained in rules:

```
<!ELEMENT AssocItemset (Extension*, AssocItemRef+)>
<!ATTLIST AssocItemset
  id              %ELEMENT-ID;  #REQUIRED
  support         %PROB-NUMBER; #REQUIRED
       numberOfItems             %INT-NUMBER; #REQUIRED>
```

Attribute description:

id : An identification to uniquely identify an itemset support : The relative support of the itemset numberOfItems : The number of items contained in this itemset

Subelements: Item references to point to elements of type item.

```
<!ELEMENT AssocItemRef EMPTY>
<!ATTLIST AssocItemRef
  itemRef    %ELEMENT-ID;  #REQUIRED>
```

Attribute description:

itemRef : The id value of an item element

Rules: Elements of the form <antecedent itemset> => <consequent itemset>

```
<!ELEMENT AssocRule ( Extension* )>
<!ATTLIST AssocRule
  support         %PROB-NUMBER; #REQUIRED
       confidence                %PROB-NUMBER; #REQUIRED
  antecedent        %ELEMENT-ID;  #REQUIRED
  consequent        %ELEMENT-ID;  #REQUIRED>
```

Attribute definitions:

support : The relative support of the rule confidence : The confidence of the rule antecedent : The id value of the itemset which is the antecedent of the rule consequent : The id value of the itemset which is the consequent of the rule

4. Microsoft OLE DM

Microsoft released the OLE DB for Data Mining specification, a protocol based on the SQL language, that provides software vendors and application developers with an open interface to more efficiently integrate data mining tools and capabilities into line-of-business and e-commerce applications.

OLE DB for Data Mining incorporates PMML standards from the Data Mining Group. By incorporating the PMML standard, Microsoft has further strengthened an open specification for bringing data mining into analytical applications," said Jack Noonan, president and CEO of SPSS. "This means that a much broader group will now have a simple and

accessible way to incorporate data mining models into the applications they build, increasing analytical power without increasing complexity."

OLE DB for Data Mining extends the SQL language syntax to make data mining capabilities available to any business analyst or developer, without the need for specialized data mining skills. This natural integration into the relational database world enables faster integration of data mining into high-payoff e-commerce application areas, such as site personalization and shopping-cart analysis.

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EMOTIONAL KNOWLEDGE DYNAMICS

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The purpose of this paper is to present the place and role of emotional knowledge in the structure of the organizational intellectual capital. Western culture put the emphasis on the rational, cognitive knowledge and ignored almost completely emotional knowledge from science and decision making. According to Descartes, Cogito ergo sum! That means the preeminence of mind over the body, and the acceptance of the dualism of mind and body. By contrast, the Eastern culture put the emphasis on the oneness of body and mind, and thus the emotional knowledge became at least as important as the cognitive one. Emotional knowledge can be transformed into cognitive knowledge based on relation we do not know at this moment. Emotional knowledge is not the same with emotional intelligence. While emotional knowledge reflects a field of existing emotions and feelings, emotional intelligence reflects the capacity of processing both emotional and cognitive knowledge.

Introduction

One of the most important challenges knowledge management faces today is to explain organizational knowledge dynamics, and to find valid correlations between transforming knowledge forms, and then integrating them by means of different organizational integrators (Bratianu et al., 2007). Knowledge has been conceived in many ways, since the early philosophical works. However, in time there were different perspectives for Western and Eastern cultures to conceive knowledge creation and knowledge as a product of this process (Andriessen, 2006; Andriessen and Van den Boom, 2007). Nonaka and Takeuchi (1995) identified two streams of semantic evolution: the Cartesian dualism of body and mind, and the Japanese oneness of the body and mind. In the first case, mind creates knowledge, and thus, knowledge is rational. According to this stream of thought, "*It follows that we cannot know things through the senses alone, since through the senses alone we cannot know that things exist. Therefore knowledge consists in reflection, not in impression, and perception is not knowledge, because it has no part in apprehending truth, since it has more in apprehending existence*" (Russell, 1972: p.153). In conclusion, according to the Western culture there is only cognitive knowledge.

In the Japanese tradition, there is a strong emphasis on the oneness of body and mind. They are integrated into one entity and knowledge can be acquired through direct experience of the body. According to this tradition samurai had to develop their wisdom through physical education. Physical exercises contributed not only to the building and strengthening samurai bodies but also to the formation of their character, which included a certain way of thinking. In his famous *Book of five rings*, the legendary Miyamoto Musashi emphasis the importance of developing understanding and strategy in martial arts through direct experience: "*In order to be able to determine the possible outcomes of combat situations you must constantly maintain the proper attitude by practicing diligently. You can only fight the way you practice. By maintaining the proper attitude, you will always practice diligently with the proper spirit and ensure your ability to become that much stronger*" (Kaufman, 1994: p.13). In conclusion, according to Japanese philosophy there are two co-existing forms of knowledge: emotional and cognitive.

The first idea of this introduction is that knowledge in Western culture is considered to be cognitive in nature. We have to think in order to create and understand knowledge. Knowledge is associated with a virtual space of meanings. The second idea is that knowledge in Eastern culture is considered to be both cognitive and emotional in nature. Knowledge is associated with a virtual space of meanings and feelings. The third idea we would like to put forward in this introduction is that knowledge can be considered as *a field of meanings and feelings* in a continuous dynamic (Bratianu and Andriessen, 2007). The knowledge field is strongly nonlinear, nonuniform and nonhomogeneous, and contains different forms of knowledge which can transform themselves one into another. Thus, tacit knowledge can be transformed into explicit knowledge, and explicit knowledge into tacit knowledge, respectively. Cognitive knowledge can be transformed into emotional knowledge and emotional knowledge into cognitive knowledge, respectively.

Cognitive knowledge

For the Western culture knowledge is cognitive in nature. Plato was one of the first to suggest that knowledge is not perception. He pointed out that we perceive through eyes and ears, rather than with them, and he showed that some of our knowledge is not connected with any sense-organ (Russel, 1972). We perceive hard and soft through touch, but it is the mind that judges that they exist and that they are contraries. Only the mind can reach existence, and we can not reach truth if we do not reach existence. According to the Descartes dualism, mind is more certain than matter, and our existence is a direct result of the fact that we think. "*If I ceased to think, there would be no evidence of my existence. I am a thing that thinks, a*

substance of which the whole nature or essence consists in thinking, and which needs no place or material think for its existence. The soul, therefore, is wholly distinct from the body and easier to know than the body; it would be what it is even if there were no body" (Russel, 1972: p.565).

Cognitive knowledge is made up of *tacit* and *explicit* knowledge. This dyad tacit knowledge-explicit knowledge has been introduced by Polanyi (1983). He defined the knowledge obtained through a direct experience of life as tacit knowledge. The other type is defined as being explicit knowledge. Tacit knowledge means experience gained through direct interaction with other people and environment, and from this point of view is valuable. We don't know how much we know since tacit knowledge is a very fuzzy concept and limitless from the consciousness point of view. Tacit knowledge can be transformed into explicit knowledge through a process called *externalization* (Nonaka and Takeuchi, 1995). However, there is no correlation between how much tacit knowledge can be transformed into explicit knowledge. Conversely, explicit knowledge can be transformed into tacit knowledge through a process called *internalization* (Nonaka and Takeuchi, 1995). Same situation from quantitative point of view. Bratianu and Andriessen (2007) suggested a metaphor of knowledge with energy, and in this analysis the tacit-explicit knowledge dynamics can be better understood considering the parallel with the potential energy-kinetic energy dynamics. Thus, tacit knowledge is a potential for explicit knowledge, and explicit knowledge is related to the decision making process, which means also action.

Emotional knowledge

Emotional knowledge and *emotional intelligence* are relatively new expressions, although their importance in management has been recognized from the beginning of the last century through the works of industrial psychologists. Emotions are states of our body and mind which are characterized by the following generic constituents (Hill, 2008: p.78):

- a feeling component – physical sensations, including chemical changes in the brain;
- a thinking component – conscious or intuitive 'thought' appraisals;
- an action component – expressive reactions (like smiles or scowls), as well as coping behaviors (think fight or flight).
- a sensory component – sights, sounds, etc., which intrude and serve to trigger the emotional response.

According to Hill (2008: p.79) "*Emotionality is distinguished from rationality because the latter only involves one of these four components: thinking. Unlike an emotion, thinking may, but is less likely to, have a sensory component"*. However, emotionality does not contain rationality. Rational thought involves conscious, deliberate, evaluative assessments. Emotions, on the other hand, are existential states of body and mind generated by feelings. Due to their direct short-cuts to the mind, emotions are always faster than thoughts in the decision making process, and thus they are able to mobilize the body in case of emergency. Emotions work very well with the adaptive unconscious, and they are able to yield a snap judgment based on so called "thin-slicing". This mechanism refers to the power of our unconscious to discover patterns in situations and behavior based on very narrow slices of experience (Gladwell, 2005). According to author of *Blink* we should acknowledge the fact that there can be as much value in the blink of an eye as in hundreds of days of thorough rational analysis. Leaders have developed this competence of using successfully thin-slicing in judging people and their actions in time of seconds.

Emotional knowledge has two dimensions: time of existence, and intensity of manifestation. The first dimension is a quantitative one and it can be measured easily in a psychology laboratory. The second dimension is qualitative in nature and it can be measured more difficult. By contrast, cognitive knowledge has only one dimension which is closely related to a metrics. Thus, the quantity of cognitive knowledge should be evaluated in a different way than the quantity of emotional knowledge. However, at this moment knowledge evaluation is in its early trial and error phases, without any workable method and metrics.

Psychology research revealed the fact that our facial muscles may express seven core emotions, regardless of race, ethnicity, age or gender. One is essentially neutral – surprise. Five emotions are negative – fear, anger, sadness, disgust and contempt. The remaining emotion is positive – happiness. Sometimes, contempt is incorporated into disgust, and thus there remain only six basic emotions. Those six fundamental emotions can be combined in the real life and get a larger spectrum of emotions, carrying with them a larger spectrum of emotional knowledge. Also, the basic emotions can be extended by taking into account higher and lower intensities. For instance, for happiness the higher intensity generates joy, and the lower intensity generates satisfaction. For surprise we have high – amazement, and low – curiosity. For anger, we have high – rage, and low – annoyance. For disgust, we have high – loathing, and low – boredom. For sadness, we have high – grief, and low – pensiveness. For fear, we have high – terror, and low – worry (Hill, 2005). Knowing all of this spectrum we can use emotional knowledge in management and marketing decisions with very interesting results.

Knowledge dynamics

Our assumption is that there is a continuous transformation of one form of knowledge into another one, until the level of decision making is attained and used. Our decisions are clearly influenced by the quality and quantity of emotional knowledge we have,

although we are not able at this moment to explain how. However, just recognizing this dynamics it is a first condition to advance our research. Many people consider this idea impossible, being unable to imagine how emotional knowledge can be transformed into cognitive knowledge and then into a decision, leading to direct action. It is like in physics where potential energy is transformed into kinetic energy, which means mechanical work. For instance, when we are happy we tend to take a risk even if the reward is low, which means that the emotional knowledge transforms into cognitive knowledge, and then into a decision.

Using the metaphor *knowledge as energy* we may approach knowledge dynamics using as a source domain thermodynamics (Bratianu, 2008a, 2008b). Thus, the transformation of heat into mechanical energy, and mechanical work, respectively, we may consider transformation of emotional knowledge into cognitive knowledge by using cognitive work. In this dynamics we should remember the fact that emotional knowledge has two dimensions like heat, and cognitive knowledge only one dimension like mechanical energy. Since we do not have yet specific concepts to describe these dimensions we may use the concept of *temperature* to define different levels of emotional knowledge intensity. Thus, we get a larger quantity of knowledge if the emotional temperature is higher and the lasting time is higher. Although this analogy is purely qualitative at this very moment, it is useful to accept and then to perform further research.

Conclusions

Emotional knowledge does exist, although the Western culture ignored it systematically. Eastern culture developed a different perspective, of integrating both cognitive knowledge and emotional knowledge into oneness of body and mind concept. Emotional knowledge is associated to our emotions and feelings, and most of it goes to the adaptive unconscious of our mind. Thus, although we may not be fully aware of its content, we have to admit its power especially in decision making. Research demonstrated in many fields of activity that emotional knowledge and emotional intelligence act much faster than any cognitive analysis in making decisions. Our supposition is that emotional knowledge can be transformed into cognitive knowledge and vice versa, although we have no data to prove it. We have just used in our research the analogy with energy transformations and basic ideas from thermodynamics.

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IMPROVING PERCEPTUAL DIMENSION OF KNOWLEDGE QUALITY BY AUDIT TECHNIQUES

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This paper present the problems linked to the knowledge quality concept, taking into account the logical, the structural and the perceptual dimensions of knowledge quality. The logical dimension is based on data and software applications quality and can be improved by technical and computerized environment control audit. The structural dimension is discussed in connection with modularity, data base object model and redundancy check. To improve the perceptual dimension of knowledge quality we analyze the possibility of using the performance audit techniques. Thus way it can be offered to the managers the perception that data and knowledge have been well evaluated, in according with clear hypothesis, operational risks and with no missing analytical data. Two indicators, GPS - Quantitative Precision of the Supplier and TSD Total Stock Duration, are presented as examples of how the perceptual dimension can be improved by the performance audit.
Keywords: *Knowledge Quality, Quality Dimensions, Perceptual Dimension, IT Audit*

1. Knowledge Quality

Knowledge management, especially at the company level, should pay attention to the quality of knowledge that supports the operational and strategic decision making process. By taking a pragmatic view over the knowledge management processes, we can observe the complexity of knowledge quality over the processing process, from requirement identification, user needs, the acquisition, storage steps, and to the protections and use phase. The methodological framework for evaluating the knowledge quality requires a process of refining, starting from the 8 traits of quality defined by Garvin [MILL01], found generic also in international standards of quality. This process of refining, uses proposed filters for service quality, considering that providing knowledge is an IT service. This means that the quality must be assessed according to knowledge usability (average time of use and perception) and performance. To these criteria we can add: opportunity, form and format in which the knowledge are provided.

By passing for the general framework of quality to the detailed level, specific to knowledge as services offered by IT&C systems, the experts agree that quality assurance finds its solution at the intersection of three IT areas: [MILL01]

- software engineering;
- data base;
- artificial intelligence.

Corresponding to this approach the quality characteristics of knowledge are dependent on software and data quality, in terms of integrity and consistency, and also on the quality of the AI technologies implementation.

2. Knowledge Quality Dimensions

Given the different nature of these features from the intersection of the areas mentioned above, the quality of knowledge is analyzed in terms of the following three dimensions:

- logic dimension;
- structural dimension;
- perceptual dimension.

Each of these three dimensions collects criteria of the knowledge quality, taken either from the software segment, the quality of the data stored in databases, either from the indicators that evaluates the knowledge quality, orthogonality, completeness and consistency of the vocabulary. [SAND09].

The Logical Dimension of knowledge quality is based primarily on data quality and software application. The quality of data stored in databases and then used as sources in the data warehouse, is ensured through internal audit controls, included in the audit procedures, which should be integrated in the IT systems. This includes technical controls and environment controls. [TSFA08]

Technical controls first takes into consideration *data accuracy*, which is secured through validation of data entry (format, confidence limits, control check sum), compliance with database integrity constraints, validation of the output indicators (logical correlations, check keys and interval limits) but also algorithms that verifies the sequence of processing logic.

Computerized environment controls are considering the procedures that verifies the correlation between the informatics system and the information system of the organization. Through these control procedures it is reinforced the confidence in the semantic value of the data, information and knowledge on completeness, logical consistency and logical differences elimination.

The Structural Dimension of knowledge quality brings into discussion whether those criteria are met, ensures operations and proper functioning of knowledge management system, in the condition of developing new functionalities for the system. The criteria to be considered refers to system modularity, minimum and controlled redundancy of data, high cohesion of individual units, in parallel with minimum connections between modules.

The structural dimension of quality is linked, as suggested by the above criteria, with the quality of software design and the database object model. We must also prevent gaps or lack of data which will contribute to inconsistency in database. This inconsistency can be reached through errors in the

analysis phase or through excess in redundancy elimination.

Redundant database finds its solution through respecting the design requirements of normal forms, transitivity dependency rules and functional dependencies.

Compliance with minimum and controlled redundancy criteria protects us from replication of identical information, errors during actualizations, errors which would distort the final information quality and the process of knowledge generation and recovery.

The Perceptual Dimension on knowledge quality is related to how the human factor perceives and considers the knowledge provided by the IT system. What the manager or the user expects and what he actually receives.

The ability to design an efficient knowledge management is reflected in the approach to the issue of predictability, repeatability of requests. The design of data warehouses must provide mapping of the user demand with the knowledge matrix. The subjective nature of the perception can not be ignored, because each user has its own understanding about the utility of knowledge provided by the IT system, that he operates in the foundation of the decision making process.

How the user appreciates and supports the transformation of the tacit knowledge into explicit knowledge, followed by assimilation and utilization, depends on the experience and professional culture of each user. Several criteria can help to ensure access to this perceptual dimension of the quality: opportunity, concision, accessibility, availability, ease of use, intelligibility, interoperability, relevance and verifiability. We do not exclude the esthetics of form and format in which the information are presented, by making use of the best graphical user interface software and multimedia features, combined with text-to-speech playback if necessary.

The easy of navigation, the switch from synthetic to analytical, rollback and drilldown features are also criteria that must be pursued to increase the quality and reduce the distortion in the perception of the knowledge that is disseminated n the knowledge management systems.

3. Using Performance Audit for Improving the Perceptual Dimension

Performance audit refers to an examination of a program, function, operation or the management systems and procedures of a governmental, non-profit entity and organizations, to assess whether the entity is achieving economy, efficiency and effectiveness in the employment of available resources. The examination is objective and systematic, generally using structured and professionally adopted methodologies.

The scope of performance audits may include the detection of fraud, waste and abuse, although often these are not included in the scope. Prior to engaging in a performance audit, the auditor must have a scope and plan defined which will be used to guide the audit process.

As defined by INTOSAI [INTO04], performance auditing is concerned with the audit of economy, efficiency and effectiveness and embraces:

(a) audit of the economy of administrative activities in accordance with sound administrative principles and practices, and management policies;
(b) audit of the efficiency of utilization of human, financial and other resources, including examination of information systems, performance measures and monitoring arrangements, and procedures followed by audited entities for remedying identified deficiencies;
(c) audit of the effectiveness of performance in relation to achievement of the objectiveness of the audited entity, and audit of the actual impact of activities compared with the intended impact.

Performance auditing is investigatory work that requires flexibility, imagination and analytical skill.

The performance audit cycle involves strategic planning, preparation work, main study and follow-up activities. Strategic planning is the basis for the selection of audit topics or audits themes to be executed. Planning usually is carried out in these steps: determining potential audit areas, establishing the selection criteria, and identifying the main sources of information for the potential audits.

During strategic planning and preparation of work, the audits criteria have to be defined in order have clear methods for the evaluation of audit work.

Audit criteria are reasonable and attainable standards of performance against which the economy, efficiency, and effectiveness of activities can be assessed. They reflect a normative (i.e. ideal) model for the subject matter under review.

There is a need for implementation of performance audit in organization, in order to have a clear image on the results obtained especially when we are refering to the operational activities.

Top management should not have the perception that everything has been measured according to clear criteria without having a performance audit performed on those areas.

The most common problems encountered, due to the perception on the knowledge extracted from the systems, are:

- missing clarifications of the hypotheses that are taken into consideration when evaluating operations;
- lack of knowledge to support advanced technical terms;
- lack of knowledge in operational risks that have not been taken into consideration through the evaluation methods used;

- missing data analytics evaluations on the data set that is being used for computing indicators.

For example we will take into consideration the following 2 indicators that are being use to evaluate the logistic operations [AMAN09]:

3.1. Quantitative precision of the supplier – the percent of products delivered by the supplier that is not according with the quantity order, comparred with the total order. This is used to monitor the delivery performance of the supplier, from the quantity poin of view. This metric should be computed monthly for each supplier.

$$QPS_k = \frac{\sum_{i=1}^{N}(QO_{ik} - QR_{ik}) * P_{ik}}{\sum_{i=1}^{N} QO_{ik} * P_{ik}} * 100\%$$

Where: QPS_k – quantitative precision of the k supplier; QR_{ik} – quantity received of i product from the k supplier; QO_{ik} – quantity ordered of i product from the k supplier; P_{ik} – price of i product for the k supplier; N – total number of products.

The problems encountered when computing this indicator are:

- without taking into consideration the price, it will be difficult to compare the precision of the water supplier with the precision of the computers supplier, just in terms of volumes;
- data errors, from correlation errors, by taking into consideration quantities in sets (set of five pieces) and prices per piece.

The general perception about this indicator is that, it is very easy to compute and no problems could appear in comparing the results between suppliers.

3.1.1* Total stock duration – *number of sales days covered by the current stock, without taking into consideration products with stock 0 from the last X days.

$$TSD = \sum_{k=1}^{N} \frac{(\sum_{j=0}^{-X} ES_{jk}) / X}{(\sum_{i=0}^{-Nd} Sd_{ik}) / Nd}$$

Where: TSD – total stock duration; ES_{jk} – stock at the end of the day for k product; Sd_{ik} – sales from one day for k product (current and previous days); Nd – number of days during the week when the store is open; X – number of days taken into consideration in order to compute the average stock from warehouse; N – total number of products taken into consideration.

The problems encountered when computing this indicator are:

- aggregate values should be computed only for products from the same category (i.e. soft drinks, beer, wine), and even at the subcategory level (i.e. natural juice);
- the moment when the data is extracted from the system is very important in order to have accuracy and completion for the reference interval;
- data errors are encountered by not matching correctly the quantities added (set of six pieces with set of two pieces in the case of soft drinks).

The general perception about this indicator is that, it is very easy to compute and no problems could appear in comparing the results between different products.

Through these examples we presented some of the common perception errors that have been observed.

Conclusions

By taking into consideration our perception about the activity accuracy and completeness of the data that are presented, just because these data is extracted from a system, is a common error encountered in practice. Usually big errors have to be discovered before a performance audit is taken into consideration.

In the current difficult economic situation great attention must be given to these types of problems because there is a high pressure at the management level to reflect results that satisfies the stakeholders and the company top management.

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