INTELLIGENT COLLECTIVE NETWORKS – TOOLS IN DEVELOPING THE KNOWLEDGE BASED ECONOMY

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ABSTRACT

Modern day society is characterized both by the transition to the knowledge economy and growing need of gathering information. The development of the internet, the easier ways of accessing information and the expansion of social networks and e-learning solutions have influenced the way we see today the educational system.
The present paper begins with a review of the theoretical background of the knowledge economy, as described by different authors and specialists throughout the world.
We have chosen a simple, and yet relevant example for the knowledge transfer – the educational system, with its strengths and weaknesses and humans struggle in history in order to create and improve efficient alternatives to this system.
Based on the existing platforms, on their advantages and disadvantages, we have come up with a concept that will resolve most, if not all of the present e-learning systems flaws. Even though it is a theoretical concept, we strongly believe that this is a relevant and easy-to-use solution that will bring the e-learning environment to a new level.
Created as a composite between social networks and e-learning system, the objective of this new system is bringing together the people in need of information and knowledge with those who possess them, increasing the accessibility and the transfer of knowledge and information.
We believe that in the next 3 years we will come up with a practical solution to this concept, which will become the next step in social e-learning networks evolution.

KEYWORDS: *Knowledge economy, knowledge transfer, social networking, e-learning*

JEL CLASIFICATION: *M15, D83*

1. INTRODUCTION

The main characteristic of nowadays society is the continuous and rapid growth of change and innovations throughout all sectors of economy: industry, services. Based on this assessment the need of a change in the educational and learning systems is growing.
If the invention of the steam engine was the event that triggered the first Industrial Revolution and the automation of processes is known as the second Industrial Revolution, then I believe it is safe to say that we are witnessing the third Industrial Revolution.
Also known as the Knowledge Revolution, it is defined as the transition from the classic economy, the goods economy, to the knowledge economy.

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Digging inside the new type of economy, new kinds of activities and processes are brought out in front, such as generating, storage, transfer of the knowledge and using it in obtaining value, all of which are key and, yet again, critical processes, mostly because of the transiency of knowledge.
Basically, the knowledge transfer relies mostly on both the desire of sharing the knowledge and on the way chosen for that.
The most common example of knowledge and information transfer is the learning system, defined as the continuous interaction between a knowledge transmitter, such as a teacher, and one or more recipients, in this case the students.
I have chosen this example for my analysis because is the most common and the most easy to understand. Even with its simplicity, there is numerous cases and situation in which information transfer becomes difficult, mostly generated due to the way the transfer is made and, furthermore, of the individual uniqueness, which is a great factor in the way each and every one of us understands different concepts.
The main objectives of my analysis are creating an image of nowadays learning environment, with its own strengths and flaws and developing a new learning.
Due to the fact that today's society relies on the internet, I strongly believe that a combination between a social network, which was the potential of gathering people of different cultures, from different places of the world, but with the same common goal, and an e-learning platform, which provides the basic tools for gathering new information, should became an important step in the evolution of modern learning systems.
Throughout history, the development of new alternatives to classic learning systems has focused on the major technological and communicational breakthroughs, such as the radio waves and the television.
The expansion of the internet has coincided with splitting the virtual learning platforms in two main categories: synchronous learning and asynchronous learning.
The concept of the social e-learning network, as a composite of the two main categories, would become the next step in the evolution and development of the e-learning environment.
The complexity of the concept and the rather simple way of using it provides a unique and original characteristic to the platform.

2. THEORETICAL ASPECTS OF THE KNOWLEDGE ECONOMY

Starting with the post-industrial era and the transition from a goods economy to a services economy, the importance and the position of knowledge within the economy has grown with the evolution of our society. Knowledge has been the root of progress and innovations among all fields of sciences, innovations which later became themselves new fountains of knowledge.
Knowledge is not the primary resource of our society, but a result of an evolution chain.
The foundation of the informational society is the data. Known as a transcription of an event, a process or an activity, the objective of data is standardization and measuring the environment using the same metric system.
Moving on and acknowledging that there is a lot of everything that a human being does not know, the data turns into information. Basically, the main difference between data and information is that the later defines a concept to its user.
On the other hand, knowledge is the final step of this chain. Its main objecting is generating value from using information.
Alan Burton Jones, quoted by Nicolescu and Nicolescu (2011), defines knowledge as a sum of information and the abilities generated by the usage of them.

On the other hand, Nick Milton (2005) sees knowledge as a combination of experience, theory and heuristics, which are developed by a community or an individual and which allows adopting decisions or initiating actions.

Understanding what knowledge is what how it is formed brings us to the utility and the importance of it. As mentioned before, we are witnessing knowledge revolution, which Alan Burton Jones, quoted by Nicolescu and Nicolescu (2011), describes to be the fundamental change from the goods economy to the knowledge economy.

The Organisation for Economic Co-operation and Development considers knowledge economy to be the type of economy based on the production, the transfer and the use of knowledge. (OECD, 1996)

Moving on, the European Commission (2004) states that the main characteristics of knowledge economy are a great connectivity between the economic agents and a widely usage of knowledge in all economic activities and domains.

As Bucharest University of Economics professors Ovidiu Nicolescu and Ciprian Nicolescu (2011) state, the knowledge economy represents the transformation of knowledge in primary resource, assets, products and factors of production and economic processes among which generating, learning, storage, development, transfer and protection of knowledge become prevailing and are the primary elements of obtaining and insuring the sustainability of the economy.

Looking back at the formation and evolution of knowledge, it is safe to admit that the main characteristic and yet again, the trickiest aspect of it is the transience. Since knowledge does not have a material shape, one of the biggest issues in using it is developing a solution which would insure a proper storage and transfer between users.

Transfer of knowledge assumes the transmission of knowledge between users, by the means of communicating channels. (Ursăcescu, 2009)

Knowledge transfer needs to consider avoiding the occurrences of informational malfunctions. For this reason, the usage of a knowledge management system is important. The knowledge management system consists out of a sum of techniques and methods which insure the functioning of knowledge management processes. (Radu et al, 2007)

William Glasser, quoted by Brut (2006), proved that human nature has a great influence in ones capacity of memorizing and understating information and that, usually, the percentage of information retain is influenced by the source its obtained from.

Furthermore, all learning systems have a series of flaws, such as time, space or the interaction between the teacher and the students, which influences the quality of the knowledge and information transfer.

The last two aspects are probably the main reasons which determined the need of searching and developing new solutions in order to increase the quality of the transfer between the teacher and his students or, more general, between the transmitter and the recipient.

Another important aspect regarding the knowledge transfer consists in the nature and the degree of transferability. Based on these criteria, knowledge can be classified into:

- Tacit knowledge, which are obtained from one's own experience and are extremely difficult to code and reproduce.
- Explicit knowledge, wide spread knowledge, which have a great potential of coding and distribution.

Under these circumstances, a lot of knowledge transfer models have been developed, one of them being the spiral of knowledge. Created by Japanese specialists Nonaka and Takeuchi (1995), this model codifies ones knowledge through socialization, insuring the transformation of tacit knowledge into explicit knowledge.

There is lot of examples regarding knowledge transfer, but, in our opinion, the best and the most common example of them all is the learning process, the lecture of a professor in front of a group of students.
Despite the number of students, which is not always the same, the professor will try to follow the same lesson plan in order to transmit a predetermined quantity of information. But since each individual is unique in his own way, there is a great possibility of information not reaching the recipient in its intended form and meaning.
The classical learning process, also known as educational process, consists out of 3 activities:

- Teaching, or the distribution by a professor of information and knowledge;
- Learning, or the reading and retaining of the information transmitted by the professor by the students;
- Evaluation or the measuring of the students results. (Rosca et al, 2002)

Throughout the evolution of the learning process, three main dimensions have been brought out in front:

- Pedagogy, based on the teacher, who is the main character and the sole responsible in the distribution of information and knowledge.
- Andragogy, based on the student, who has freedom in choosing the subject, the learning manner and rhythm.
- Sinergogy, defined as an innovative approach, which blends the pedagogy and the andragogy and focuses on information transfer and assimilating knowledge through teamwork (Chivu et al. 2011)

3. EVOLUTION AND INTERNATIONAL BREAK-THROUGH OF ALTERNATIVES TO LEARNING PROCESS

As time passed and the need of the society as a whole and, also, of the individuals have changed, it could be observed a series of flaws of the learning system that required the research and implementation of new solutions. But, in order to improve the learning process and to provide new alternatives, there was the need of conquering the distance between the teachers and his students.
This was the main reason that determined the alternatives to the learning and educational systems should follow the technological highs in matter of communication.
In the 19th century, the expansion of Great Britain's Postal Service Company gave the possibility of increasing the number of people who could use a system on communication. Based on this opportunity, Isaac Pitman starts in 1840 a distance shorthand teaching class by using the services of the Postal Company.
In 1874, the Wesleyan University from Illinois, USA, invented an educational system which allowed students the possibility of passing the baccalaureate exam with the need of attending classes. (http://en.wikipedia.org/wiki/History_of_virtual_learning_environments)
Even though the postal service brought a solution to the distance between the teacher and the students and, furthermore, it created a communicating channel which encouraged interaction, it was not an efficient method, mostly because of the time needed for a letter to reach its recipient.
1920 was the year of a new step in developing a viable alternative to the classic educational system, with the first class which used radio.
In 1953, the University of Houston and the public television station KUHT invented the television classes. Held between 1 p.m. and 3 p.m., they covered about 38% of the weekly schedule. (http://en.wikipedia.org/wiki/History_of_virtual_learning_environments)
Using radio waves and television infrastructure as the means on which new alternatives to the classical learning system have developed. Compared to the postal services, the new infrastructure had a great advantage in regards both with the time needed for the information to reach its recipient

and the number of users that could access the simultaneous. On the other hand, the biggest weakness was that users could not interact in real time with the transmitter.
This was the next challenge, the development of an integrated solution which would provide a small time for knowledge and information transfer, a wide range of users and last, but not least, a proper and efficient interaction between the transmitter and the recipients.
In theory, the solution was simple and consisted in creating the background for al user to be connected between them, at every moment. This is what today is known as a network.
In the 1960s, the University of Illinois launches the Programmed Logic for Automated Teaching Operations, or PLATO. Developed by a research team, the system was capable of fulfilling multiples roles, including the possibility for students to access multiple courses, the interactions of them with the professors and, also, permitted the instructors to follow up with their students' progress.
Plato was the first ever computer based learning system which blended all the previous attempts advantages in a user-friendly informational solution. PLATO was very similar to what is now the intranet.
Furthermore, with the development and expansion of the internet, all PLATO-like systems invented a new kind of accessibility both for teachers and students. A more fast interaction between users became possible, while the speed information transfer grew. (http://en.wikipedia.org/wiki/PLATO_(computer_system))
In 1969, the United States Defense Department launches its very own computer network, called ARPANET. Even though it had very, if not none influence over the existing systems at that time, it is widely consider the ancestor of modern day internet. (http://en.wikipedia.org/wiki/ARPANET)
The year 1989 is considered to be a breakthrough year, as the internet saw light for the first time. In the years to follow the internet expanded and became widely used, mostly because of its wide accessibility and easy-to-use interface.
Due to increased accessibility and the great capacity of information transfer, the internet gave the possibility of the expansion of the e-learning. The e-learning is defined as the usage of IT & C in the learning process (Cross, 2004).
As the internet developed and expanded, so have the e-learning networks. Throughout history, there were a lot of popular and important networks, such as:

- iEARN – International Education and Resource Network;
- Microsoft Class Project;
- myUnisa;
- BlackBoard;
- OLAT – Online Learning and Training.

As the telecommunications technologies expanded and new alternatives to the learning process appeared, new approaches of the teaching and learning system have appeared, by moving the spot light from the supplier of knowledge to the user of knowledge. Therefore, the pedagogy is replaced by the synchronous learning, while the andragogy is replaced by the asynchronous learning. (Hratinski, 2008)
The modern trends of on-line communities, most of which based on the social networks could become in the near future a relevant solution to the two flaws mentioned above.
Created on spontaneous collaborations, an on-line community is composed out of individuals who gather around to create a service or a good and to share the final result (Tapscott & Williams, 2010).

4. PRESENT DAY ENVIRONMENT OF LEARNING ALTERNATIVES.

The e-learning environment has developed continuously for the past 10 years and currently expanding, as of a result of both the transition to knowledge economy and the great accessibility to internet.
The main characteristic of this environment is the differentiation of the existing platforms resulting from the two main categories:
Synchronous learning – focused on the user, based on the classroom model and on the interaction between the teacher and his students.
Asynchronous learning – focused on the computer, following each user's individual learning rhythm by the means of modern communications methods.
The main weakness of the existing alternatives to the learning system is the lack of proper, real time interaction between the transmitter and the recipient. This happens because most e-learning platforms function using the asynchronous learning model, emphasizing the user's individual learning rhythm. This way there is no need of setting up a class schedule, as all books and materials are available the users at any moment. The only object the users need, however, is a computer with an internet connection.
The main characteristic of this learning model is the great responsibility placed on the user's shoulders, as they set up their own learning schedule, in order to learn and acquire new concepts and information
However, when talking about certain domains, the sole reading of different materials is not enough for the user to understand and acquire the described concepts.
Another important aspect regarding the existing e-learning platforms is the absence of a 'usage instruction manual' for the information and knowledge described. I believe this to be a result of low to non-existing interaction between the transmitter and the recipient. In my opinion, a proper interaction between the two main characters of any learning process would provide a good transfer of knowledge and, also, the best way of acquiring the information.
Most e-learning platforms use the open-source learning platform MOODLE (Modular object-Oriented Dynamic Learning Environment). The main two strengths of this platform are the ease of use of the new platform, both for the creator and the users, and the fact that creating a new platform using the base code is free.
However, the high degree of similarity of all MOODLE based versions makes the interactions between the participants to be reduces to simple forum chats.
Beside the MOODLE based versions, other world-wide popular e-learning platforms are:

- Udemy.com;
- Campusbug.com;
- Academica.edu;
- Wepapers.com;
- Livemocha.com;
- Researchgate.net;
- Pronetos.com.

Udemy.com is an online learning platform which gives the possibility for teachers and professors to lecture on different subjects. The services provided by the website enables the professors to choose their own subject to build their class around, to upload any type of file needed for the course and to maintain an online connection to their students.
Another popular e-learning platform is Campusbug.com. Its main objective is bringing together online learning, socialization and e-commerce. The working principle looks alike to a forum, where users have the possibility of posting questions and getting answers to them. Furthermore, this gives users the opportunity of earning money from the provided answers.

Academica.edu is an online platform, devoted mainly to research, with the help of which users can share research articles, case studies and papers. Launched in 2008, it works on the basis of academic genealogy, which allows it to differentiate from other platforms.
An online tool for learning foreign languages is livemocha.com. Developed as an online community, its main objective is building a world in which every person is fluent in more than one language. The network gives the possibility to users to learn up to 38 different languages, with the help of audio-video courses, vocabulary testes and, also, assisted by an on-line live tutor.

5. NERDBOARD AS A NEW STEP IN SOCIAL NETWORKING AND E-LEARNING PLATFORMS

NerdBoard defines a concept, an alternative to today's e-learning systems and one of the first social e-learning networks, which main objective is improvement of knowledge transfer and reducing the distances and barriers between users, individuals who seek information and solutions regarding different problems and those who are able to provide that information.
The principle of the network is that for each problem there is at least a solution. Moving on, there is at least one person who can provide the solution to another person problem. The only flaw to this concept is finding and linking the two persons.
The best example to the principle described above is the educational system, in which, to
NerdBoard creates the possibility of linking the users in search for new information with those who poses and intend to distribute them. This concept is based on a real time communicating channel, in order for solving any type of problem in a fast an efficient way.
Furthermore, the network provides the possibility of linking the users with specialists from different domains.
The main characteristic of the network is combining the synchronous learning with the asynchronous learning; by creating a real time communicating channel which would allow fast and efficient solving to a number of problems and issues from a variety of subjects and domains. Moving forward, all solved problems would become part of a library, in order for other users to check them if in need.

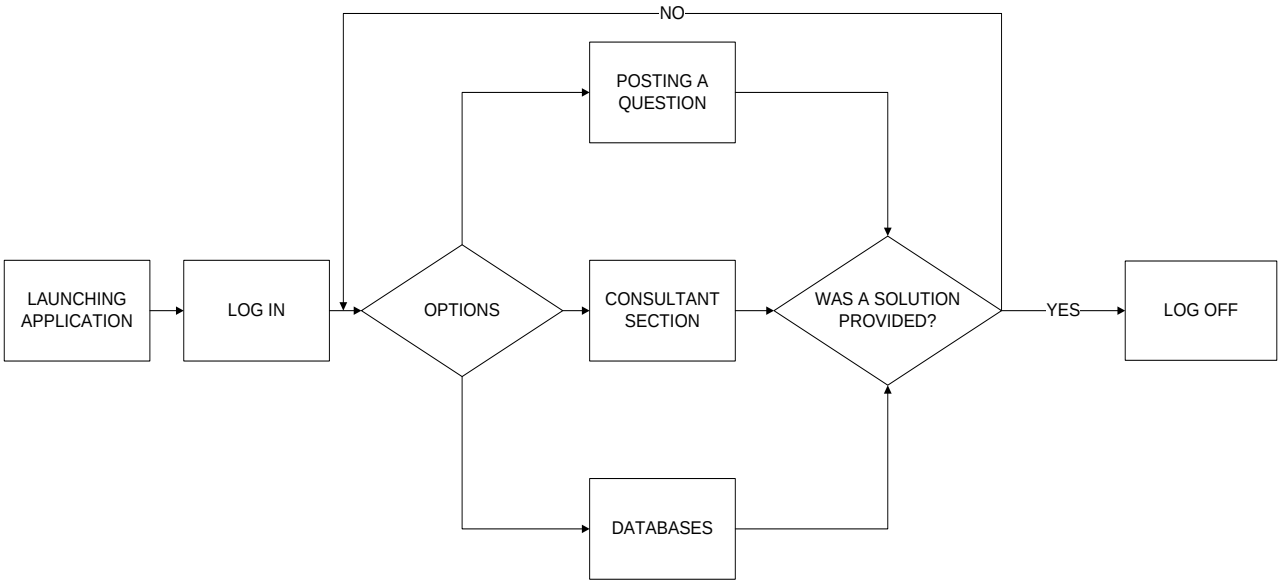

Figure 1. Scheme of the network working principle
Source: made by authors

Among the solved problems library, a library composed out of scientific articles, case-studies, dictionaries will be available to every user, in order to increase the comprehension and understanding of the information.
From the perspective of the perspective of the transition from the goods economy to the knowledge economy, the network can be use as a tool in transfer of knowledge, in an original and unique way of transmitting information and knowledge.
If a person needs or wants to access NerdBoard, he will need to create an account, by providing some personal details – full name, date of birth, location, e-mail address – and by choosing a nickname and a password. Once the account is created, he will be granted access and he will need to log in on each visit on the platform. Once connected, he will be able to use the network services and resources, thus becoming a user.
The working principle of the NerdBoard is simple and efficient. Each user in need of a piece of information, disguised as a solution to problem or an answer of a question, will have the possibility of posting a question.

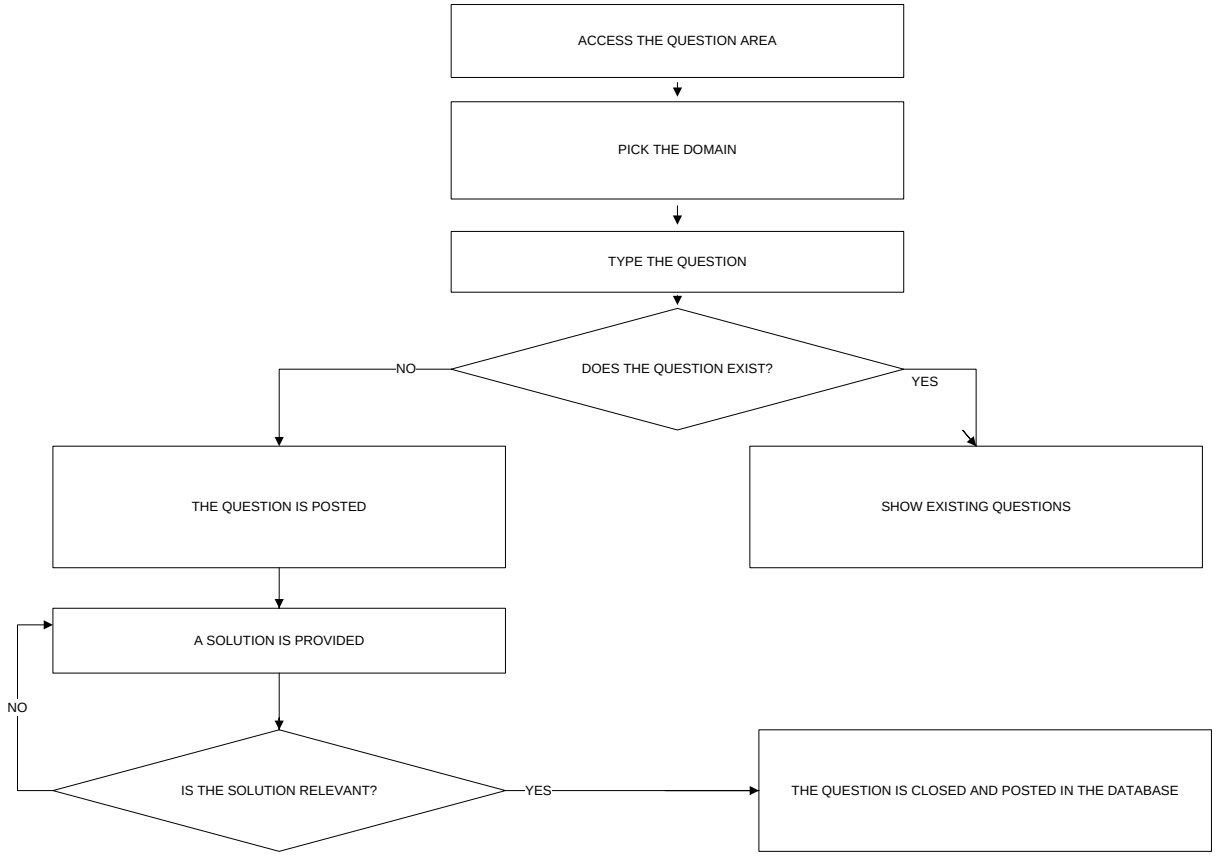

Figure 2. How to post a question
Source: made by authors

When posting a question, the user will have to follow the next steps. The first step is choosing the domain to which the question is related (for example math).
Following that, he will be requested to type the body of the question. In that moment, a search engine will be activated and it will start looking for existing question which are similar to the one typed. If it finds similar questions, the user will be notified regarding this and will be unable to post

the new question unless he checks the existing ones. If none of the existing questions is similar or it does not cover the subject, the user will have the possibility of posting the question.
Is this case, creating a functional search engine becomes a challenge as it is extremely difficult to compare two texts, as the structure and the words entered tend to be different.
While entering the questions, equations, diagrams, pictures or tables can be included in the body of the question. Once the text is typed in, the user will choose the option to post the question.
The post will be available to all online users at that moment and each and every one of them can provide an answer, by clicking on it. Once done, a communication window will appear that will link the two users.
If there is not any online user that can provide a solution, the initiator will be given the possibility of transforming the post in an offline question, similar to a forum topic.
Once a relevant solution to the problem is provided, the topic will be considered to be closed and saved on a dedicated database, in order to be checked and reviewed by other users in need of a similar solution.
The concept is based on a composite learning system synchronous – asynchronous, which creates the premises of a new virtual learning environment and, also, brings a note of originality.
The asynchronous part of the network will consists out of two kinds of data bases.
The first database will be composing from scientific papers, articles, monographs and research project.
The second one will contain all the public questions and problems raised by every user that have been solved. The existence of this database will prevent redundancy and will insure a note of uniqueness to the network.
On the other hand, the synchronous part will consist out of the interaction between users. This is made in real time, with the help of an instant messenger look-a-like program, which will provide means of fast and efficient communications. Each user will have three possibilities of interacting: either by writing messages, with the help of the audio-video tools or combining the first two options.
When accessing the communications icon, a new window will pop-up, signaling that the system is ready to start to sustain a discussion. The user will be given the possibility of choosing his conversation partner from the other online users and, also, from the online consultants with whom he has a learning agreement.
After choosing the interlocutor and based on the identified hardware on both users' terminals, the system who give the possibility of picking the interactions channel out of the three available ones.
Depending on the chosen option, the communication window will be divided into 5 zones:

- Two zones for each web-cam of the users;
- A writing zone, for entering messages;
- The discussion pane, which will save the discussion for further reviewing;
- A 'technical' zone, for accessing extra options, such as fonts, attaching and sending files, or creating diagrams, tables and equations.

All written interaction will be stored automatically stored on both users profile, with the possibility of making it available to all users, in the solved problems database, if in need.
The online consultants section, mentioned above, is an original part of the network. Composed out of professors and researchers from around the world, this section will give the possibilities to address questions regarding different subject, from a wide range of domains.
The users will be given the option of signing a learning agreement with one or more consultants, but no more than three at one moment in time. On the hand, each consultant will not be able to sign more than 25 users on the same time. All learning agreements will be valid for 30 days.

After ending each learning agreement, the users will be asked to give a feedback regarding the consultant's activity. Based on the combined feedback, the learning agreement fee will be calculated.
Based on its complexity and originality, NerdBoard will become the leader of the new generation of social networking and e-learning solution. Due to its unique concept, created on the asynchronous-synchronous composite and with a user-friendly interface, the platform has all the needed elements in order to change the e-learning environment.
Furthermore, the interaction in real time between users and the consultant section influence will give rise to specific online communities and encourage information and knowledge distribution. Going further, online communities have the potential of developing new ideas and testing existing theories, as it will bring together wide groups of people, from different countries and experts in different domains. In one word, it will feed a real fountain of knowledge.
The greatest advantage of an internet based instant communication system is that it reduces the geographic and time barriers. Also, the network-like concept will give the possibility of contacting any other user.
The consultant section can be seen as an opportunity for researchers and professor to publish their work, to aid other users in need and, nonetheless, to earn money from their activity on the platform. As ones biggest business card is ones work, the network provides visibility and proper advertising to each domain.
Last, but not least, the concept flexibility will give the chance of existing the e-learning area and become an solid solution for other domains, such as management and business consulting for small and medium-sized enterprises.

6. CONCLUSIONS

From an economic and technological point of view, it is safe to say that we are witnessing the third industrial revolution, which marks the transition from the classic economy, based on goods to the services and knowledge based economy. Moving further, the prime materials and the resources used in generating the final products are substituted with knowledge.
Furthermore, there is a greater interest in using knowledge in generating value and profits. Therefore the attention shown to simple and, yet again, vital activities regarding knowledge, such as generating, storage, transferring and distributing them has grown exponentially with the use in nowadays actions.
As the priorities have changed, a new struggle for developing efficient tools for storage and transfer of knowledge began. Since all knowledge is transience, the struggle becomes even more difficult, as an immaterial object is extremely hard, if not impossible to store and to distribute.
Since all knowledge does not have a material form and shape, I believe that the needed solution in regards with an efficient knowledge transfer should not focus on the subject itself, but rather on those person who have developed them.
The concept presented above is designed to attract and bring together the people in need of information with those who possessed them. In this way, all misunderstanding and misinterpreting will vanish and the information will be transmitted in an original way, taking in consideration the existing e-learning networks.
The main goal of the projected network is providing a suitable solution that will ensure codification of tacit knowledge and transforming it into explicit knowledge.
As Japanese professors Nonaka and Takeuchi presented in the spiral of knowledge model, a solution to this transformation process is socialization, in the form of discussing the matter with other people. Also, as William Glasser showed, one will better understand an idea if one would discuss and would try to make another understand.

However, since the network is designed to link people, therefore it will function only if it will have enough users; there are a series of risks that need to be considered.
The first and most important risk is the marketing and promoting risk. It is known that one needs to be attracted by the idea, but is not necessarily for him to fully understand the concept and the working model. I believe that the network advertising should focus more on the advantages provided, rather than on the scientific and theoretical aspects.
Furthermore, due to concept described complexity, a step-by-step launch would be preferred to a single one.

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