APPLYING AND IMPROVING KNOWLEDGE-BASED MANAGEMENT IN THE TRAINING OF FUTURE ENGINEERS

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ABSTRACT: This paper aims to demonstrate that the application and improvement of knowledge-based management in the training of future engineers can represent the solution to some of the problems faced by Romanian technical faculties, in the context of an extremely unstable socio-economic environment. Therefore, we first made a distinction between what knowledge management and knowledge-based management mean for a university, in a short study of the specialized bibliography. This study was completed by presenting a potential scheme for applying knowledge-based management in the academic training of future engineers. The second part of the paper is based on a focus group conducted with seven students from different engineering specializations within the faculty where the author teaches. One of the conclusions is that the training of future engineers must take place within the coordinates of knowledge-based management, such as creativity, relationships, continuous learning and sustainability, but the first creators of these coordinates are the teaching staff, then the university's administrative staff and only finally the students.

KEY WORDS: management, knowledge, engineering, student, university.

1. INTRODUCTION

Even though knowledge-based management (KBM) has been a system known for many decades, numerous organizations and educational institutions in Romania have either not yet implemented it or can still improve it substantially.

Some specialists state that academia is a treasure trove of knowledge, but it is not properly and, therefore, some of its activities are useless or repetitive [3]. We believe that this can happen in any country on the globe.

2. METHODOLOGY

The first part of this paper consists of a bibliographical study, which makes a selection of the main aspects related to the implementation of KBM in modern organizations and then proposes a particularization of the implementation of this management system in universities in general and in the training of future engineers in particular.

The second part of the paper summarizes the results of a focus group conducted with seven students from different engineering specializations at the "Lucian Blaga" University in Sibiu, Romania, regarding the possibility of improving KBM for their professional training.

3. BIBLIOGRAPHIC STUDY

It should be noted first that the application of KBM in universities is different from the management of knowledge, as a resource for sustainable development, carried out by universities. Elements such as trust, culture, leadership, structure, and learning can affect knowledge sharing in an organization [5]. There are several factors mentioned in the specialized literature as essential for knowledge

management in universities: "knowledge perception, knowledge sharing, knowledge creation, knowledge diffusion, knowledge gathering and knowledge retention" [4]. But KBM involves more than these factors. The use of KBM in the university involves a systematic integration of people, academic processes and technology in the university, with the aim to develop, capture and share knowledge, and to improve educational, research/innovation and administrative activities.

Another element taken from the specialized literature regarding the implementation of KBM in organizations is the design and application of a new system for motivating teachers and students, "by rewarding them based on performance and merit, but also rewarding them through access to knowledge and the multiplication of knowledge" [2].

The author's opinion has always been that the intervention of creativity will support any modern management system. Therefore, the implementation of KBM in the training of future engineers should take into account the advice generally offered by specialists for stimulating creativity and innovation in higher education [1]:

- High technologies could be used in teaching and learning without hesitation, in order to achieve several goals such as Just in Time Teaching and Real-Time Online Teaching;
- Students' creativity can be stimulated through many mobile software technologies, like mobile chatbot software, data analytics and artificial intelligence algorithms;
- If educational models such as experiential education, competency-based education, open education and lifelong learning address creativity, they could solve higher education problems such as accessibility (including price), relevance of vocational training and skills shortages;
- Moreover, stimulating "disruptive" innovation - a fundamental change in the traditional structure, system and mentality in education - will lead to profound changes in higher education, with positive effects in the industry;
- Instruments like visual thinking (including videos made by students), flowchart thinking, live case analysis and metaphors are intended to stimulate students' creativity;

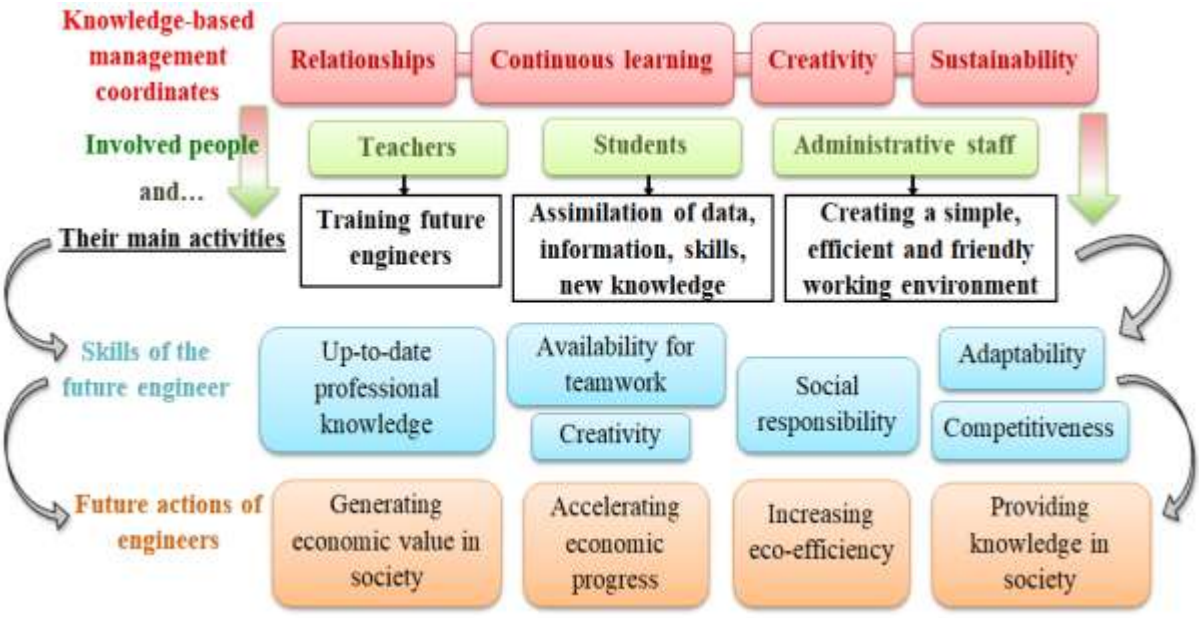

Figure 1. Applying knowledge-based management in the training of future engineer

- Universities have to implement "innovative models to facilitate students' access to higher education, support their success, transform their experiences, and prepare them for the increasingly complex economy and society".

Creativity supports the structure, functionality and results of the knowledge-based university in the dynamic environment of the present and the future, providing solutions to problems, responding to challenges and channeling organizational changes on the optimal path. Directly or indirectly, similar to what happens in a modern organization, creativity influences the other three key features of the knowledge-based university – sustainability, continuous learning and networking [2] – leading to an increase in their quality (Fig. 1).

Applying KBM in training future engineers will help university to achieve three of the most important goals of KBM in any organization (adapted from [2]):

- Maintaining the functionality of the university, even in an extremely unstable environment;
- Contributing to the creation of social, economic and ecological values for the entire community;
- Achieving educational performance.

4. FOCUS GROUP RESULTS

We conducted a focus group with seven students from different engineering specializations at the "Lucian Blaga" University in Sibiu, Romania, namely: Economic Engineering in Mechanical Field, Industrial Economic Engineering, Computer Science and Computer Engineering, Information Technology, Mechatronics, Robotics, Transport, Storage and Distribution of Hydrocarbons.

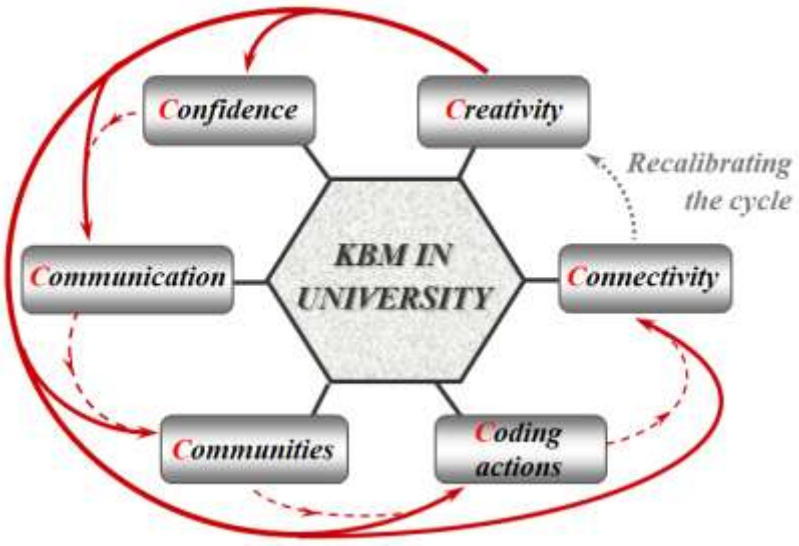

Figure 2. Improving knowledge-based management in the university

After a reminder of the main theoretical notions related to KBM, which all students have encountered in various previously taught subjects, the discussions focused on the usual KBM improvement cycle, which runs through six synthetic characteristics, presented in Figure 2, adopted from specialized literature with the abbreviated name of "the 6 Cs" [2].

Among the most important proposals of the focus group participants, related to the improvement of KBM in the university in general, with immediate effects on their own training, we mention:

- Development, by university professors, of a list of indicators to help each organization in the community decide, based on technological evolution, which of its own activities need to be improved, which are good to outsource, which need to be replaced with others;
- Based on this list, another one can be drawn up, which will include the essential elements of the future engineer's training;
- Analysis of the possibilities of stopping negative creativity in the university and reducing bureaucracy, with the involvement of administrative staff;
- Greater openness of university management to the change brought by technological waves;
- Finding ways to eradicate poverty in society, starting from the support that the educational environment, especially the university environment, can offer to students, organizations and community by putting into practice the latest technological discoveries.

5. CONCLUSIONS

In training future engineers, it is not only important to manage the knowledge that will be instilled in them by teachers, but also the idea that they will feel engaged or not in a knowledge-based management system. On one hand, engineering students must learn that every person employed in an organization has professional knowledge specific to the job they perform. But the future engineer must understand that the value that each employee brings to the organization's results depends on the training they have, but also on the professional effort they put in. On the other hand, university faculty and administrative staff should not expect only from students efforts to implement and improve KBM in universities, under the pretext that students represent the future and should show their gratitude many years after graduation, helping the university from the positions they hold in the industrial environment.

The training of future engineers must take place within the coordinates of knowledge-based management, such as creativity, relationships, continuous learning and sustainability, but the first creators of these coordinates are the teachers, then the university's administrative staff and only finally the students.

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