

ABSTRACT

The concept of a university teacher implies a scientific competence validated through studies, publications, and scientific communications, corroborated with the need for perpetual professionalization. The development of a solid research base in the field of industrial engineering is a substantial advance in contemporary society. This goal can be achieved primarily through the professional and human experience of the teachers involved in the field.

This thesis reflects the abilities and the level of didactic and research performances accumulated by the candidate Dr. Ing. Dan Ovidiu Glăvan, who currently holds a teaching position as an associate professor in the state of functions of the Department of Automation, Industrial Engineering, Textiles and Transport (AIITT) at the Faculty of Engineering of the University "Aurel Vlaicu" in Arad, obtained after public support of the doctoral thesis "New structures in the conditions of copying and adaptive ordering for lathes" in 1999 and up to date.

The thesis includes and emphasizes, primarily, those achievements that attest to the author's ability to conduct scientific research in the field of Industrial Engineering as well as concerns to introduce novel university teaching methods, appealing to students, and in line with global trends; at the same time, it poses a challenge for students to integrate into larger international communities, including participants from several faculties in various countries who collaborate in hosting innovative activities, thus creating the emulation so necessary for higher education.

Having accumulated 31 years of continuous teaching activity within this department, the candidate has developed his teaching skills and performances, carrying out all types of activities: seminars, laboratories, projects, courses, mentorship in the development of diploma and dissertation projects, etc., climbing the hierarchical scale of teaching functions. He contributed to the development of didactic works, university textbooks and guides for applied works, book chapters published in various countries, to the establishment of new laboratories and their endowment, and to the introduction of new disciplines.

From a managerial activity standpoint, starting from 2012, the candidate held the position of dean of the Faculty of Engineering. In the more than nine years of coordination / management of the faculty, the candidate was concerned with the development of strategic management (mission, objectives, strategies, policies) and the management of human and material resources. The recorded results are appreciated at the level of the faculty and of the University.

The presentation of the candidates' abilities and accomplishments obtained in the research activity occupies the majority of the thesis content. Thus, in the introductory section, the author presents the topics addressed and the results obtained throughout the 22 years that have elapsed since the defense of the doctoral thesis.

This habilitation thesis is structured based on 3 important and current directions in industrial engineering and university teaching:

1. Studies on the precision of machining on lathes, including analysis of the causes of errors, comparisons of different types of load-bearing structures (classical, inclined, specific to small and medium-sized lathes) and the calculations from the perspective of the structure rigidity, of the assembly's elastic yields, etc.; study covering the structure creation process (cast or welded), experimental tests of the two methods in order to determine the type of absorption or propagation of the vibrations of the structure, thus attempting to identify the optimal field of use of each variant analyzed. In order to support the results of the computations, theoretical considerations were issued and experimental determinations of the pressure distribution on the guides were made. For this purpose an experimental method was validated, after which it was applied to the studied structure, control systems for compensating for deformations during the processing time, which led to the introduction of the concept of "active structure", an innovative source of corrective (compensating) micro-displacements of the cutting tool in real time, as well as a comprehensive theoretical study on "solid state" transformers for the reduction of the space occupied, increasing reliability and the degree of automation.

2. The use of water jet as a cutting technology - an emerging industrial process with significant advantages over alternative cutting technologies for certain industrial applications. The technological stages of the process were studied, thus stating that water jet cutting is done in two stages:

- (i) pressurization of pure water to several hundred MPa, thus generating potential energy
- (ii) Conduction of this water to a diamond nozzle, through which, in a 100% efficiency process, this potential energy is transformed into kinetic energy, resulting in a jet of water twice as fast as the speed of sound.

In order to better understand the characteristics, advantages, and possible limitations of the industrial use of the water jet, a brief review of the water jet cutting technology was presented, mainly for considering such a manufacturing technology with the purpose of replacing high-energy thermal cutting processes that have as their main disadvantage the high working temperatures reached inside the manufactured metal with the risk of changing the structure and properties of the base material. Using this technology, it is expected to achieve a significant improvement in the final characteristics of the manufactured surface, which are necessary for the current case study.

3. In the third part of the thesis, innovative teaching and learning solutions were presented in the engineering environment,

In order to understand the potential of Online Learning Environment tools and resources in Engineering Education, a project on the use of dedicated educational strategies has been carried-out in various European Schools of Engineering to improve students' engagement on different forms of participation and to enhance

their learning outcomes. This study focuses on the use of Web 2.0 tools while teaching Manufacturing Processes to Industrial Engineering students of a Higher Education Portuguese Polytechnic Institute during a full semester. Cumulatively to students' perceptions, data was collected and assessed to infer about two main research questions: "Are engineering students able to use efficiently online learning tools to enhance their autonomous learning process?" and "Can engineering students work collaboratively using online tools towards achieving common learning goals?". Preliminary findings showed that students managed to efficiently use the proposed online collaborative learning tools during the course. However, students preferred the individual learning tools and processes to working and learning collaboratively from and with each other.

Wikis being collaborative editing tools that support the creation of cohesive documents authorized successively by numerous people, which have four main features that improve such an experience: (i) the existence of a shareable online document, edited by each member of the group, (ii) a mechanism for tracking each change to the shared document, (iii) the integration of an alert and notification system to communicate any changes made to the entire group and (iv) complementary support that allows group members to communicate, discuss, and negotiate actions related to the finalization of the collaborative document. These tools were used in a group at an international level with the participation of three European countries together with Romania, Instituto Politecnico Castelo Branco Portugal, Lapland University of Applied Sciences Finland and University of La Rioja Spain.

The four partners initiated and developed in this group a re-engineering competition with the participation of students from each university and a jury of teachers from each participating country, the collaborative learning method being improved and developed during this international competition.

At the end of the thesis, the candidate presents the project for the development of his university career, noting the complex and complete approach, both vertically as university development as well as horizontally with respect to. visibility of University 'Aurel Vlaicu' Arad on a local, national, and international level considering medium-sized university partners, public authorities, or economic agents. It should be noted that for each activity the candidate graduated specialized courses to acquire the qualities of teaching, managerial, communication, economic, international relations, etc. in order to meet the increasingly difficult challenges that modern, high-quality education poses today.

