

The Role and Importance of Standards for the Quality of Services in Educational Institutions in the Field of Mechanical Engineering

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Abstract- Besides higher education activities, there is a complex range of services provided by the educational institutions in Serbia in the field of mechanical engineering. In order to provide a balance between core activities related to higher education and additional activities, in accordance with the national Law on higher education, good organization and synchronization of these activities is crucial. There are many tools and techniques that could be used to make this process more effective and easier. This paper considers the role and importance of standards implementation in educational institutions, especially related to the establishment of quality and laboratory management systems. The similarities, complementarity and differences of standards SRPS ISO 9001:2015 and SRPS ISO/IEC 17025:2017 are examined, together with challenges for their implementation.

Keywords— ISO Standards, Educational institutions, Quality management system, Laboratory management system

I. INTRODUCTION

Education represents the acquisition and usage of knowledge and is aimed to facilitate learning at various levels of knowledge using different education methods. Although there are various stages of education, the subject of this paper is higher education, which leads to obtaining an academic degree. Higher education system is a complex, intentional system, involving a huge number of stakeholders. The exact structure of the educational system varies from one country to another, however, it is primary regulated by the national legislation, while the application of international or other guidelines and various directives depends of the country's determination to meet certain criteria or standards, or individual commitment of each educational institution/ faculty.

It is very difficult to provide a definition of quality in higher education, out of many attempts to establish a culture of quality in various education systems. Although the definition of quality in education is not unified, knowing its essence is of key importance to education quality assurance. Stakeholders in higher education, according to Srikanthan, could be grouped into four

categories, each providing its own perspective on quality: funding bodies (state authorities, including tax payers, private parties and all those who ensure the provision of faculty's services), employees of the education sector (professors and other academic and administration staff), students (users of services) and users of output (employers seeking for the well qualified employees) [1]. Quality assurance could be then considered as set of processes, policies and actions performed externally by the accreditation or certification bodies or internally, within the institution [2]. There are several methodologies to measure and guide quality assessment and improvement in various organizations. Some of methodologies that are internationally recognized and validated are ISO standards, mostly ISO 9000, Balanced Scorecard and EFQM Excellence Model [3]. This paper mainly concerns the role and importance of ISO standards implementation in faculties of mechanical engineering, especially related to the establishment of the quality and laboratory management systems.

II. ACTIVITIES OF THE HIGHER EDUCATION INSTITUTIONS IN THE FIELD OF MECHANICAL ENGINEERING

Higher education activities, their scope, framework and possibilities of commercialization in Serbia, are regulated by the Law on higher education [4], defining also the institution that are in charge for carrying out those activities in various scientific fields. The subject of this paper are educational institutions in the field of mechanical engineering, whose ranges of activities are wide and provide many opportunities for their commercialization.

In Serbia, the higher education activity in the field of mechanical engineering is covered by five state owned faculties, operating in the group of technical and technological sciences within three Universities: Faculty of Mechanical Engineering University of Belgrade, Technical Faculty in Bor University of Belgrade, Faculty of Technical Science University of Novi Sad, Faculty of Mechanical Engineering University of Nis, Faculty of Engineering University of Kragujevac and Faculty of

Mechanical and Civil Engineering in Kraljevo, University of Kragujevac.

Each of these educational institutions has its own foundation acts, statutes and other general acts, prepared in accordance with the statutes of the University of Belgrade, Novi Sad, Nis and Kragujevac, and general legislation in the field of higher education activities at the republic level and other acts prescribed by the Ministry in charge of higher education affairs.

Higher education in Serbia is aimed to transfer scientific and professional knowledge and skills and to develop science through the activities of scientific research, which support the expert and consultancy activities, publishing activities and other activities that can contribute to the commercializing the outcomes of scientific, artistic and research work. The statutes of each of the abovementioned faculties prescribed the exact scope and range of activities that can be performed in certain institutions. Some of them are related to the education while others are focused on the commercialized use of the obtained knowledge during scientific research activities, grouped in accordance with the national classification of activities [5].

The analysis of the activities showed that the best classification of activities is presented in the Statute of the Faculty of Technical Science University of Novi Sad, where higher education activity is emphasized as core activity (field 85 educational activities in the national classification), while research and development are recognized as the separate set of activities (field 72 professional, scientific, innovation and technical activities in national classification). The overall scope of their activities is complemented by the classification set of activities named "others". It includes numerous activities that belong to the various fields of the national classification: publishing and multiplication of audio and video recordings, production, repair and installation of various machinery and equipment, retail of different goods, publishing activities, computer programming and related consulting activities, engineering activities and technical consulting, technical testing and analysis, information and internet services, management and related consulting services, market analysis, various legal, financial and business activities and activities of different kinds of associations. Other five faculties in the field of mechanical engineering provide only lists of activities with the corresponding codes from the classification, without grouping them in accordance with any other criteria. However, with minor differences, lists of faculties' activities are very close in their scope and range.

III. QUALITY OF THE HIGHER EDUCATION AND OTHER SERVICES IN THE EDUCATIONAL INSTITUTIONS

Taking into account a large number of faculties' activities, their synchronization and harmonization are necessary to provide the required quality of educational activities, which is a priority, together with the provision of good quality services other than educational, in order to position faculties as competent institutions at the local, regional or even global market [6].

Quality of education is primary regulated by the Law on higher education [4]. The National Council for Higher Education is in charge of activities that provide the development and enhancement of the quality of the higher education system through the alignment with European and international standards in education, the proposal of norms and standards for the works of faculties, as well as measures aimed to improve higher education systems. This Council also prescribes standards and procedures for both self-assessments and external appraisal of the quality of higher education system, which is additionally regulated by the Rulebook on standards for self-assessment and Rulebook on standards for external appraisal of the quality of higher education institutions, both published in National Gazette of the Republic of Serbia. The most important standards prescribe that the faculties establish their quality assurance strategy and determine the methods and procedures for ensuring the quality of their education systems. Based on this quality assurance strategy and complementary procedures for quality assurance, the inputs for the external appraisal are provided.

Standards for quality of higher education systems prescribed by the faculties and international standards for quality management systems prescribed by International Standard Organization (ISO) should not be confused. The quality of the higher education system is regulated by Serbian legislation, and acting in accordance with these acts is obligatory for every higher education institution in Serbia. In this case, standard means certain level of the quality of services that is agreed to be acceptable by the Serbian regulatory authorities. ISO standards are internationally agreed by experts in certain fields, and contain their concentrated knowledge formulated as guidelines with respect to well-defined, field specific objectives. Acting in accordance with standards created by ISO related to the quality management systems is voluntary and the precondition of their adoption is the commitment of the top management as well as the overall staff of the educational institution to fulfillment of those standards' requirements. Also, the exact scope of the standard application should be unambiguously defined for each educational institution that implements the certain standard, and its requirements are not limited to only higher education activities. To be more precise, their objective is the provision of good quality services in relation to the faculties' activities, no matter how many and how complex the institutional processes are.

IV. ISO STANDARDS APPLICABLE IN THE EDUCATIONAL INSTITUTIONS IN THE FIELD OF MECHANICAL ENGINEERING

The core activity in an educational institution – higher education activity, could be significantly improved by the quality management systems implementation. The focus is then shifted from the quality of individual engagement of various professors and lecturers to the overall performance of the faculty. This new approach provides the establishment of the quality assurance system and performance-related mechanisms [7]-[9]. However, the overall performance of the educational institution is also influenced by the realization of all other activities of this institution. Taking into account a large number of

institutions' activities there is a tendency to transfer models from the private sector and corporate governance to the educational institutions.

Quality management standards developed and created by ISO could be used by the educational institutions as support to develop and enhance the quality of all services that faculties provide in accordance with their core and other activities. As it was mentioned before, these standards are not obligatory, but their implementation can be useful as a tool for easier and more effective synchronization of all faculties' activities especially related to the establishment of the quality management systems and quality assurance of their services.

The set of standards Quality Management Systems – ISO 9000 was developed to enable organizations to improve customer satisfaction, continually improve their processes and maintain an efficient quality management system. This set of standards includes the following standards:

- ISO 9000:2015 – Quality Management Systems – Fundamentals and Vocabulary. This standard provides fundamental concepts, principles and vocabulary for quality management systems. It contains the terms and definitions that apply to all quality and quality management system standards.

- ISO 9001:2015 – Quality Management Systems – Requirements. This standard specifies requirements for a quality management system when an organization needs to demonstrate its ability to consistently provide services that meet customer requirements and expectations.

- ISO 9004:2009 – Managing for the Sustained Success of an Organization – A Quality Management Approach. This standard is focused on effectiveness and efficiency of quality management system.

- ISO 19011:2011 – Guidelines for Auditing Management Systems. This standard provides principles of auditing, managing an audit program and conducting management system audits, as well as guidance on the evaluation of competence of individuals involved in the audit process [10],[11].

Out of the entire set of quality standards, only ISO 90001:2015 is envisaged for certification purposes, and represents one of the generic standards. It distinguishes between the mandatory and non-mandatory elements. Mandatory requirements include five sections of this standard, where general quality management system requirements are related to the organizational context and its understanding, internal and external issues related to its purposes, leadership or top management responsibilities (commitment) focused on stakeholders, quality management system planning, resource management, including infrastructure, work environment and human resources and continuous measurement, monitoring and improvement of the existing quality management system.

The institutional commitment is also important for standard ISO/IEC 17025:2017 – General requirements for the competence of testing and calibration laboratories, especially in cases when laboratory previously established quality management system [12]. This standard is applicable to all institutions that are in charge of laboratory testing and calibration activities, regardless of the size and

number of staff. It is aimed to promote confidence in the work of laboratories both nationally and around the world. Serbia is one of the countries where it is necessary to obtain accreditation by an independent, internationally recognized authority (Accreditation Body of Serbia) in order to provide proven quality testing and calibration services and to be deemed as technically competent. Usually, holding the accreditation is the only way for the test or calibration results of the laboratories to be accepted by other laboratories, suppliers and regulatory authorities. This facilitates cooperation between all stakeholders, while the test and calibration reports can be accepted from one country to another, without the need for additional testing.

There are many challenges of the application of these two ISO standards in educational institutions. The main difference is their applicability. While ISO 9001 fits to all types of institutions in all sectors, ISO 17025 is limited to the testing and calibration laboratories [13]. The similarity can be observed through the management system requirements of the standard ISO/IEC 17025, where two options to address these requirements were given: within the existing ISO 9001 quality management system, if any or within another quality standard, fulfilling the minimum management requirements.

Another very important issue related to the implementation of ISO 9001:2015 is the process approach proposed by this standard. The process approach is recognized as one of the important benefits of its implementation. This is especially true in the case of educational institutions, since their core and other activities are not characterized by well developed and established interconnections. Usually, some overlapping among activities appears, since they are more people than process-oriented. Implementation of the process-oriented approach for the quality improvement in educational institutions can contribute to the integration of various activities in order to meet common objectives, to improve the effectiveness of the processes, to use all available knowledge in certain institutions, therefore to improve quality of the services.

V. CONCLUSIONS

This paper considers the activities of higher education institutions in the context of quality management system establishment and ways to improve faculty's services provided to all stakeholders. ISO created standards that can be used as the tool for the establishment of management systems including quality and laboratory management systems: standards ISO 90001 and ISO/IEC 17025. Taking into account many advantages of ISO certification, it is very important that educational institutions recognize their significance for all their stakeholders, as well as the advantages of their implementation. Both standards ISO 90001 and ISO/IEC 17025 could benefit from the implementation of another one, although sometimes, in the case of testing laboratories in educational institutions, only fulfillment of minimum quality management requirements, besides certification against SRPS ISO/IEC 17025 could be fair enough solution. However, certification against SRPS ISO 90001 provides the wider framework for

ISO/IEC 17025 implementation through a better understanding of risks, organizational context and risk and process-based thinking that lead to the long-term benefits for the institution, as well as improvements and advances in many aspects of its activities.

Also, the process approach proposed by standard ISO 9001:2015 can be used for the development, application and effectiveness improvements of the quality management systems. Educational institutions can take many advantages of this approach, which is not customary in this type of institution. Besides making easier implementation of the quality management system, application of the process-based approach can facilitate the implementation of any other management system in the educational institution. This is especially true given the growing need to apply other non-quality standards, for example, information system security management system, business continuity management system, energy management system, etc. Finally, ISO recently developed a completely new standard ISO 21001:2018 Educational organizations – Management system for educational organizations – Requirements with guidance for use, which represents a new challenge for educational institutions that need to enhance the satisfaction of learners, other beneficiaries and staff, improve their educational systems and demonstrate the ability to support the acquisition and development of competence through teaching, learning and research.

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