

LEASECON 2021  
Conference on Land Economy and Rural Studies Essentials**SPECIALISTS TRAINING QUALITY ASSESMENT IN THE  
COOPERATION OF TECHNICAL UNIVERSITY WITH  
STAKEHOLDERS**

Elena S. Mishchenko (a), Nikolay G. Chernyshov (a), Mansur F. Galikhanov (b),  
Yana V. Denisova (c), Rustam R. Mirzaev (c)\*  
\*Corresponding author

(a) Tambov State Technical University, Russia  
(b) Kazan National Research Technological University, Russia  
(c) Moscow Automobile and Road Construction State Technical University (MADI), 64 Leningradsky prospect,  
Moscow, Russia, mirzaev@madi.ru

**Abstract**

The relevance of the article is due to the increasing requirements for the quality of engineering education in modern conditions, characterized by the dynamic development of science, engineering and technology. The purpose of the article is to form a comprehensive system of criteria for assessing the quality of specialists training in the context of network interaction of a technical university with industrial partners based on the requirements of European standards and guidelines for quality assurance of higher education ESG. The authors considered the main directions of cooperation between the university and the industrial partner, formulated the key criteria for assessing this cooperation. The proposed criteria are based on the recommendations of leading accreditation agencies, taking into account complex factors starting from general structural requirements for the organization of a network partnership of a higher educational institution and an enterprise and ending with the release of trained specialists with the necessary set of mastered competencies.

2357-1330 © 2022 Published by European Publisher.

*Keywords:* Industrial partner, network, quality assessment criteria, Technical University



## 1. Introduction

Engineering education is becoming an advanced intellectual factor in the development of the state, in this regard, the priority of state policy in the field of higher technical education is the quality of training of future engineers, their ability to actively innovate, and this, in turn, is one of the decisive factors in the market success of enterprises, industries, regions and the country's economy as a whole.

The dynamics of the development of the world's leading economies is aimed at the technological domination, the introduction of fundamental scientific achievements in the shortest possible time. This allows the state to take the position of a leader, and, consequently, to achieve economic success, to form a renewed socio-economic structure of a society. This explains the significant role of the quality of engineering education, as well as its growing influence on the development of a society (Dvoretzkaya et al., 2005; Melecinek, 1998).

## 2. Problem Statement

The interaction of a university with industrial partners in the real sector of the economy is a requirement of the times. The scale of training of engineering personnel in developed and developing countries of the world shows its significant increase. This is confirmed by the growth of interest on the part of applicants to engineering professions, which has been especially noticeable in recent years. This trend is due to the growing need of modern production for specialists in science-intensive professions, as well as the need for closer interaction with universities, not only in the field of training and employment, but also in joint applied and fundamental scientific research. The result of the multilateral interaction of universities with specialized enterprises is the integration of educational and research activities, the direct participation of technical universities in the development of new progressive technologies with their subsequent introduction into production (Prihod'ko & Sazonova, 2007, 2014; Quadrado et al., 2020; Standards and guidelines for quality assurance in the European higher education area, n.d.).

## 3. Research Questions

Let's consider the main points regarding the network cooperation agreement with an industrial partner. The university and the industrial partner implement an educational program for students, adopted in accordance with the procedure established by law. Parts of the educational program, implemented with the use of resources, time, place of their implementation, are determined by an additional agreement to the agreement on network interaction. The industrial partner determines the person responsible for interacting with the university to provide its resources. An educational program implemented in a network form can be implemented using e-learning or using distance learning technology. The university has the right to check the progress and quality of the implementation of a part of the educational program by the industrial partner, and the industrial partner can also come up with proposals for the modernization of the educational program. The agreement is valid for the period of mastering the basic educational program. The contract conditions can be changed by agreement between the university and the industrial partner.

An important point in the process of network interaction of the parties is that, if necessary, the parties can conclude additional agreements to the network cooperation agreement, providing detailed

conditions and procedures for the interaction of the parties. Typically, these additional agreements are related to educational and research activities.

In connection with the increasing number of connections in a wide variety of areas between the university and its partner enterprises, it seems important to formulate a methodology for a comprehensive assessment of the quality of this interaction. Both the partner companies and the university are expressing their interest in that. Also, this monitoring can be useful to carry out directly at the stage of forming an agreement on network cooperation between the university and the enterprise, in order to increase the effectiveness of this cooperation. This will allow one to determine the most important points of contact of interests when concluding additional agreements in the future.

#### **4. Purpose of the Study**

Figure 1 shows a generalized structure of educational, scientific and social interaction between a partner enterprise and a university.

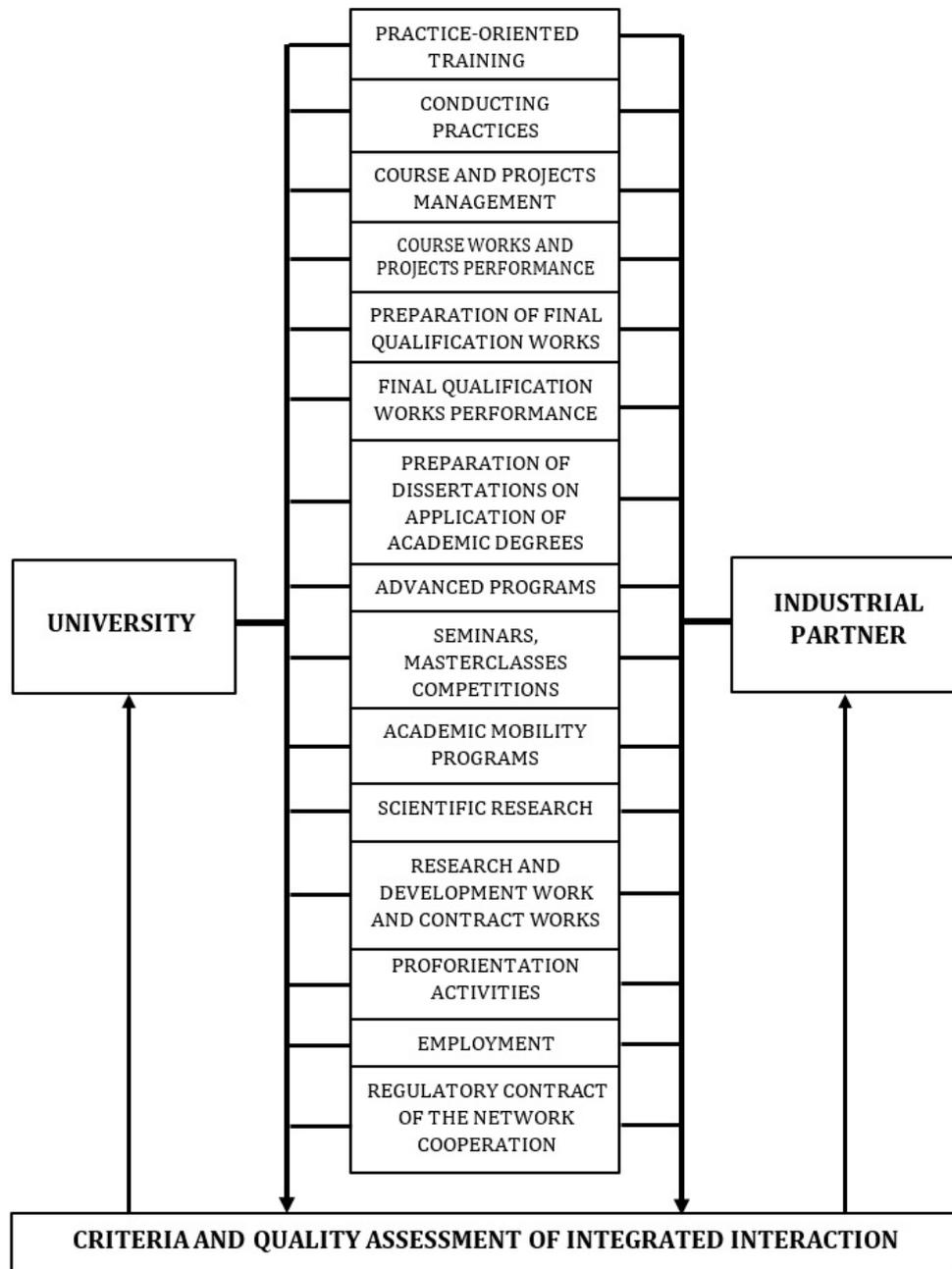
The directions of this interaction are formed on the basis of a regulatory agreement on network cooperation.

The main areas of complex interaction between the university and the partner enterprise include the following:

- the implementation of enterprise-oriented training, practice, joint leadership with the company's employees of coursework and course projects,
- the performance of a coursework and projects with the involvement of heads of departments, workshops as members of the commission, other engineering personnel,
- preparation of final qualification works in the interests of the enterprise, focused on specific implementation, data protection of final qualification works,
- preparation of dissertations for scientific degrees, joint implementation of advanced training programs, organization of seminars for students and university teachers, as well as other partners, master-classes, competitions, implementation of academic mobility programs, joint research, research and development, contractual work, including those aimed at the realization of production diversification programs at the enterprises of the military-industrial complex,
- the conduct of career guidance events both at the university site and at the enterprise, assistance in the employment of university graduates at regional enterprises, which are also the main employers of university graduates.

Let us consider some of these areas of cooperation with industrial partners in more detail using the example of the Department of Radioelectronic Profile "Designing of Radioelectronic and Microprocessor Systems" of Tambov State Technical University. For many years, the department has been actively cooperating with regional enterprises in training personnel. Regional enterprises are part of the cluster of enterprises of the military-industrial complex of Russia. The subdepartments of TSTU have been functioning at these enterprises for several decades. Also, in recent years, cooperation with large Russian telecommunication companies has been actively developing – PJSC Rostelecom and PJSC MTS. As an

important positive factor of this cooperation, we noted the creation of specialized laboratories of these telecommunication companies at the department.



**Figure 1.** The structure of interaction between the university and the industrial partner

Enterprise-oriented training is an effective mechanism for learners to master the educational program in order to form their practical skills by performing real practical tasks. Enterprise-oriented learning is based on the optimal combination of obtaining fundamental education within the walls of the university and applied training at a partner enterprise. Students work in departments, workshops and subdivisions of the enterprise directly and receive knowledge related to the competencies acquired after graduation from the university. At the same time, the real production situation facilitates the subsequent

integration of the university graduate into the enterprise team after graduation from the university, and early acquaintance with labor functions increases the quality and efficiency of the young specialist's work.

Enterprising in all courses, from introductory to pre-graduation, provides a standard amount of familiarity with the university's partner enterprises in a specific field of study, which, in combination with enterprise-oriented training, makes it possible to get to know the chosen direction more fully and determine the topic of the final qualifying work.

Joint leadership with the company's employees on coursework and course projects, makes it possible to solve specific production problems, makes this work not formal, but solving a specific, possibly even innovative problem. The defense of term papers and projects with the involvement of the heads of enterprises, departments, and other engineering personnel as members of the commission, allows us to make a preliminary selection of the most talented and prepared students, including them in the future personnel reserve. This is facilitated by competitions of term papers and projects regularly held by enterprises. The most prepared students who have shown the best knowledge are awarded personal scholarships. Experience shows that these students are subsequently quite successful in this enterprise and are dynamically moving up the career ladder.

As a rule, most of the final qualification papers performed by students are carried out in the interests of the enterprise and are also consulted by representatives of the enterprise. The papers are focused on a specific implementation and fully correspond to the subject matter of the enterprise. The performance of these final qualification papers is carried out with the participation of the management of these enterprises among the members of the state examination commission.

For several years, the university has been participating in the public competition "Development of an integrated system for providing highly qualified personnel to organizations of the military-industrial complex of the Russian Federation" organizations of the military-industrial complex.

It should also be noted that the university and enterprises jointly organize thematic seminars, round tables and master classes for students and teachers, as well as other stakeholders. In the framework of the implementation of academic mobility programs, students visited the State University "Dubna", where they underwent training and got acquainted with the enterprises of the radio-electronic profile of the military-industrial complex.

An important place in the interaction of the university and partner enterprises is occupied by the scientific component – preparation of dissertations for scientific degrees, joint fundamental and applied scientific research, implementation of research and development projects, contractual work. These include those aimed at implementing production diversification programs for enterprises of the military-industrial complex. It is worth noting that a number of senior managers of the department's partner enterprises were engaged in research work together with the department's staff and subsequently successfully defended their dissertations.

## **5. Research Methods**

One of the effective tools for improving the quality of engineering education is advanced training in the implementation of educational programs at enterprises, at the university, including within the

framework of international projects in engineering pedagogy. At the moment, the university, together with representatives of partner enterprises involved in the educational process, are taking part in an international project ERASMUS+ “EngineeriNg educoTors pEdagogical tRaining”/ENTER (598506-EPP-1-2018-1-PT-EPPKA2-CBHE-JP).

To assess the quality of interaction between the university and the industrial partner in the above areas, within the framework of the ENTER project, a system of key criteria is being developed, which can also serve as criteria in the accreditation of individual educational programs. The world agencies for assessing the quality of education have determined the parameters characterizing the professional training of engineering specialists, the main emphasis of which is on the final result – the result of in-depth practical training, the professional development of a specialist and the level of his professional competence. The most common recognized system of quality assessment criteria is the European Standards and Guidelines for Quality Assurance in Higher Education (ESG).

The standard includes three key sections:

Part 1. Standards and guidelines for internal quality assurance.

Part 2. Standards and guidelines for external quality assurance.

Part 3. Standards and guidelines for external quality assurance agencies.

We consider the generalized and most important criteria for a comprehensive assessment of the quality of interaction between a university and an industrial partner, based on the ESG recommendations:

- general assessment of the educational program in the field of which the cooperation between the university and the industrial partner is implemented;
- financial, material and technical and information resources of the university and the industrial partner, providing complex network interaction;
- representatives of the industrial partner and the teaching staff of the university involved in the process of interaction between the parties;
- methods of educational activities;
- teaching materials used for classroom and independent work of students;
- joint research activities, including grants and federal programs;
- the degree of participation of the partner enterprise in the implementation of the educational program;
- the level of competence formation and satisfaction with the learning outcomes in the format of network cooperation with an industrial partner of a university graduate;
- demand for university graduates and analysis of the dynamics of their professional and career growth.

It should be noted that experts included in the EQUAR register (European Register of Quality Assurance Agencies) also pay special attention to the participation of representatives of specialized enterprises in the formation of curricula in the assessment of the quality of educational programs in higher educational institutions, the degree of activity of the university's partnership with enterprises in the region.

## 6. Findings

1. The importance of close and multilateral cooperation of the university with industrial partners is obvious and is a requirement of the time. Modern production needs specialists in science-intensive professions, and this is impossible without the development of comprehensive interaction with universities, especially in joint research, development and implementation of new innovative technologies.

2. Taking into account the integration of Russia into the international educational, scientific and industrial space, it is important to comprehensively assess the quality of interaction between the university and the industrial partner, based on modern European and world standards for quality assurance and allowing one not to radically change control activities during the international accreditation of educational programs.

## 7. Conclusion

The level of competence formation and satisfaction with the learning outcomes in the format of network cooperation with the industrial partner of the university graduate ensures further promotion of the graduate up the career ladder of the industrial partner, strengthening further ties between the university and the industrial partner. The most effective results of this cooperation are when a university graduate, in the course of a successful career, occupies high positions in the management of the enterprise, and subsequently creates at the university from which he graduated, specialized educational and scientific laboratories for joint educational and scientific activities. Although this seems like an idealized example, but there is such a practice.

## Acknowledgments

The study has been conducted in MADI as an activity under the project “Effective training model of technical discipline lecturers for the purpose of obtaining “International Educator of Engineering University” certificate - “ING-PAED IGIP”. MADI is recognized as a Federal Innovative Platform according to Order № 1580 from 25.12.2020 (registered on 03.02.2021).

## References

- Dvoretzkaya, E., Dvoretzky, D., & Chernyshov, N. (2005) *Introduction of bilingual educational programs in Tambov State Technical University, Russia. Bi- and multilingual universities, Challenges and future prospects*. University of Helsinki.
- Melecinek, A. (1998). *Engineering Pedagogy*. MADI (TU).
- Prihod'ko, V. M., & Sazonova, Z. S. (2007). Engineering pedagogy: formation, development, prospects. *Higher education in Russia, 1*, 10–25.
- Prihod'ko, V. M., & Sazonova, Z. S. (2014). Engineering pedagogy - the fundamental for the professional training of engineers and scientific and pedagogical personnel. *Higher education in Russia, 4*, 6–12.
- Quadrado, J. C., Galikhanov, M. F., & Zaitseva, K. K. (2020). Sustainable development principles for engineering educator, *Higher education in Russia, 29*(6), 75-82.
- Standards and guidelines for quality assurance in the European higher education area* (n.d.). Retrieved from: <https://enqa.eu/index.php/home/esg/>