Chapter 7
Changes in the Engineering Competence Requirements in Educational Standards

Aleksandr Vasilyevich Berestov
Moscow Engineering Physics Institute, Russia

Gennady Konstantinovich Baryshev
Moscow Engineering Physics Institute, Russia

Aleksandr Pavlovich Biryukov
Moscow Engineering Physics Institute, Russia

Ilya Igorevich Rodko
Moscow Engineering Physics Institute, Russia

ABSTRACT

This chapter presents prognostic analysis results concerning the changes in the engineering competence requirements. It is noted that professional competences of future experts in this field are undergoing certain changes related to the need for operating complex systems and working in a team in uncertain contexts in order to support and ensure good management throughout the entire high-tech systems life-cycle. It has been established that certain technological areas of the National Technology Initiative (NTI), which is being implemented now, are not provided with the educational training programs by the adopted Federal National Educational Standards (FNES). This chapter also focuses on the role of Worldwide CDIO Initiative international engineering standards of education in the development of new engineering competence assessment tools to enhance the national system of educational standards and includes National Research Nuclear University MEPhI's own educational standards in higher education as an example.

DOI: 10.4018/978-1-5225-3395-5.ch007

INTRODUCTION

The research on the changes concerning professional engineering competence requirements is directly connected to the vision of the high-tech industry future, which will demand relevant competences for development, analysis of development strategies, foresights, road maps exploring promising areas of technological development, research focus and innovation implementation. For its implementation, this vision, shaped by the expert community, should be provided with the relevant methodological standards on the one hand and with enhanced staff training and the creation of a relevant system to form qualifications and competences on the other hand (IBIS, 2014).

First of all, it should be mentioned that the very term 'engineering' is understood quite broadly starting from its general meaning as a perfect synonym to the creation of promising and competitive engineering systems to the narrow and specific interpretation as 'business-consulting', i. e. monitoring projects which create engineering systems in order to raise their saleability and value. This makes the issues related to defining engineering and industrial design professional competence requirements multidimensional and multifold (Osmakov & Pastukhov, 2015).

BACKGROUND

The Financial Terms Dictionary (Financial Terms Dictionary, 2017) gives the following definition of engineering: engineering is a field of activities concerning the issues of the creation of industrial sites, infrastructure etc., primarily in the form of rendering of commercial engineering and consulting services.

In terms of pre-production, according to Construction Guidelines 80-12.2000: Methodological Recommendations on Working Out of the Investor's (Customer's) Conditions (Requirements) during the Preparation for Contract Tendering, engineering means engineering and consulting services related to pre-production and ensuring of normal production and sales (Construction Guidelines, 2000).

Several normative documents suggest the following definitions of engineering and related terms:

- **According to GOST R (Russian National Standard) 54147-2010:** Strategic and Innovation Management. Terms and Definitions - 3.1.14 Engineering: Research, design-and-engineering, computational and analytical activities, preparation of feasibility studies, working out organizational recommendations (GOST R 54147-2010, 2010);
- **According to GOST R (Russian National Standard) 54147-2010:** Strategic and Innovation Management. Terms and Definitions - 3.1.15 Innovation Engineering: the totality of works and services aimed at creating an innovation project including the conception, implementation, promotion and diffusion of innovations;
- **According to GOST R (Russian National Standard) ISO 15704-2008:** Industrial Automated Systems. Standard Architecture and Enterprise Methodology Requirements - 3.7. Enterprise Engineering: discipline used for any works related to the creation, change or reorganization of any enterprise (GOST R ISO 15704-2008, 2008);