

NEW EUROPEAN QUALIFICATIONS FRAMEWORK FOR ENGINEERING EDUCATION**JĀUNO EIROPAS KVALIFIKĀCIJU IETVARŠ INŽENIERIZGLĪTĪBAI****Jolanta Janauska**

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Introduction

The *EC New Industry Policy*, which is based on *New Lisbon* “Partnership for Growth and Jobs” put knowledge and innovation at the heart of European growth, thus allowing industrial businesses to create more and better jobs with an intension to make Europe a more attractive place to invest and work.

Integrated European approach to higher education, industrial research and innovation will help to anticipate both the barriers and opportunities to improving research and innovation investment and the commercialization of new technologies in Europe.

European Single Market

The framework for the developed market – Knowledge Economy, is based on the following foundation corner stones:

- The *New Approach* (1985) to technical harmonization and standards
- The *Global Approach* (1990) to conformity assessment.

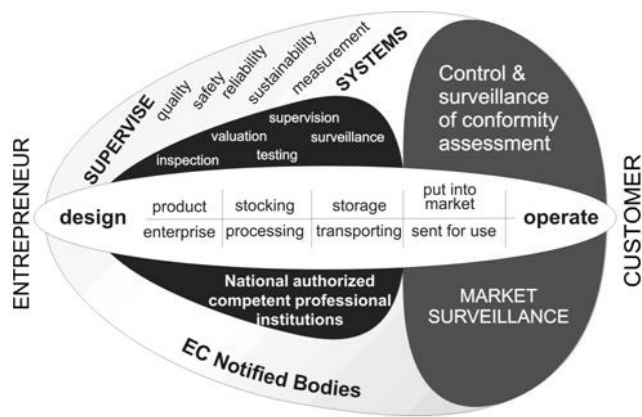


Fig.1. European Single Market

manufacturers and professional organizations. Government interference into pre-market processes is forbidden; its task is to form the national surveillance authority thus eliminating appearance of dangerous, hazardous and unsafe products and services on the market. Activities of manufacturers are supported by the professional organizations, facilitating design of the product, promoting its placement on the market, competitiveness and assisting to secure against possible sanctions in case of nonconformance, non-compliance, hazard and/or danger to mans' life, health, and environment. Conformity means that the regulatory and non-regulatory conformity assessment spheres are defined and separated; in the regulatory sphere to assure, certify and attest conformance of the product and production process to non-hazard and safety requirements is required.

The frame of conformity assessment comprises four independent systems:

- Implementation of conformity assurance
- Pre-market conformity assessment
- Market surveillance
- Conformity surveillance of the product in use.

The manufacturer should be obliged to make the product comply with the provisions and to remedy the infringement. The corrective action depends on the level of noncompliance which has to be established on the case by case basis and it has to be in accordance with the principle of proportionality. Non-conformity to essential requirements must usually be considered as a substantial noncompliance, because this may present a potential or actual risk to the health and safety. In such cases all appropriate measures shall be taken to restrict or prohibit the placing on the market and putting into service of the product in question, and to ensure that it is withdrawn from the market.

EC New Industry Policy [1]

New Lisbon "Partnership for Growth and Jobs" [2] is making Europe a more attractive place to invest and work. EC launched a new, more integrated industrial policy to create better framework conditions for manufacturing industries, including seven new cross-sectoral initiatives – on competitiveness, energy and the environment, on intellectual property rights, on better regulation, on industrial research and innovation, on market access, on skills, on managing structural change.

Competitiveness, energy and environmental policies are closely interrelated in their objectives and impacts. Given the need for consistency of policy and legislative initiatives in these areas and, in order to exploit fully the synergies between them, closer coordination and the development of an integrated approach is of the essence.

Competitiveness – reviewed existing strategy and instruments will be focused on those sectors and markets with greatest potential gains for competitiveness. *Market access* objectives will be regularly

The basic principles of functioning of the European Single Market include: (1) Economy without limitations, tariffs and limits; regulations are applicable to dangerous, hazardous products and services which can be a cause of danger to safety, development and morale. (2) It is a responsibility of the manufacturer – to place on the market safe, non-dangerous products and services; (3) Government's responsibility is to establish market surveillance and to facilitate cooperation with EEA/EU institutions.

Activities in the *Single Market* environment can be separated as activities of government and activities of

prioritized in combination with a more effective use of the *Trade Barriers Regulation* and supported by new *legislative simplification programme*.

Improving *sectoral skills*. Skill shortages were identified as a key challenge in a wide range of different industries. Relocation of industrial activity is in some cases motivated more by skill shortages than by cost factors. EC has address skill shortage issues through number of policies - *Education and Training 2010* work programme, including the *European Qualifications Framework*.

Assessments of the nature of the skill problems would include the identification of current sectoral skill requirements and skill gaps, and would examine likely developments in sector-specific competencies, including where possible effects on SMEs.

Structural change in manufacturing. EC intends to ensure that better anticipation of economic restructuring is included in the new Structural Funds programmes, supporting aims at modernization of Labour markets and enhancing the cooperation across regions.

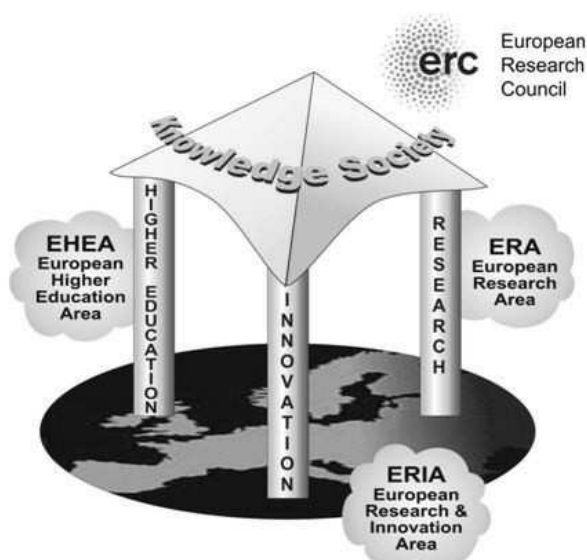
With an intention to foster achievement of strategic goals for growth and development of Latvia's economy, the improvement of training, vocational and life-long education system is defined as one of the main priorities. Development of knowledgeable, creative, skillful and proactive professionals capable to add value to production and creative industries at local and international levels, to promote productive cooperation throughout Europe and increased competitiveness throughout the world is exceptionally significant for Latvia.

Higher Education, Research and Innovation

Bologna Process: *Realizing the European Higher Education Area for making Europe the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion.*

It is intended to create in Europe a targeted environment encouraging and motivating higher education, research and innovation, and promoting a wide-range cooperation of higher education and research institutions and facilitating creation of quality assurance systems at both institutional and national levels, as well as in the region as a whole.

Higher Education Institution – autonomy, authority transparency. Industry, education and research strengthens, improves and enhances collaboration and cooperation. Professors/professionals' group activities should be oriented towards modular programme development for diversity of individual, academic and labour market needs, curriculum development and continual improvement, and qualifications diversification for rapidly changing labor market.



Strategic management group activities should support benchmarking, innovation management and technology transfer, change management “from administration to governance” – to breakthrough and anticipation.

Study/research personnel, management group activities should be focused to study/ training course design and redesigning, technology transfer – “from teaching to learning”, development of cyber-studies and e-study network.

Higher education is an important factor in further enhancing research and the importance of research in underpinning higher education for the economic and

Fig.2. EHEA, ERA, ERIA – the Pillars of Knowledge Society

cultural development of our societies and for social cohesion. Efforts to introduce structural change and improve the quality of teaching should not detract from the effort to strengthen research and innovation.

Research, research training is an important and integral part of higher education; it is necessary to increase the role and relevance of research to technological, social and cultural evolution and to the needs of society.

Students should be considered as full partners in higher education governance, they need appropriate studying and living conditions so that they can successfully complete their studies within an appropriate period of time without obstacles related to their social and economical background.

Lifelong learning should be an integral part of higher education activity. HEI and all concerned are urged to enhance possibilities for lifelong learning in higher education level including the recognition of prior learning. EHEA encompasses a wide range of flexible learning paths, opportunities and techniques to make appropriate use of ECTS credits.

European Qualifications Framework

EU member states elaborate a framework of comparable and compatible qualifications for their higher education systems, which should seek to describe qualifications in terms of workload, level, learning outcomes, competencies and profile.

EHEA elaborate an overarching framework of qualifications, comprising three cycles (including with national contexts, the possibility of intermediate qualifications), generic descriptions for each cycle based on learning outcomes and competences, and credit ranges in the first and second cycles.

EHEA ensures complementarities between the overarching *Framework for Qualifications* of the EHEA and the proposed broader framework for qualifications for lifelong learning [3] encompassing general education as well as vocational education and training as now being developed within the EU.

Development of national and European frameworks for qualifications is an opportunity to further embed lifelong learning in higher education.

Elaboration comprises improvement recognition of prior learning including, where possible, non-formal learning for access to, and as elements in, higher education programmes.

European Qualification

Descriptors of *European Qualifications Framework* (EQF) determine extent to which qualifications – knowledge, skills and abilities in education, labor market, social and cultural environments are assessed/leveled out. Qualification is understood as a level of professionalism, confirmed by the competent/authorized institution by assessing of the achievements, performance, and gains in the corresponding sphere of professional activity, study/learning.

Qualifications descriptors allow individually assess/compare value of qualifications, determine prerequisites and conditions for qualifications transfer and accumulation, in lifelong learning they provide opportunities for individual design, acquisition and diversification of qualifications, required in different formations, systems and countries. Descriptors also broaden employers' options to evaluate the profiles, content and significance of qualifications, demanded in the labor market, enables educators to compare profiles and contents of the education/learning programs with other offers, which is a relevant requirement for quality assurance in education and learning.

EQF appropriately comprises general, adult and further education, vocational education and training, as well as, professional higher education and their continual improvement activities. EQF qualifications descriptors in education should be considered as the study markers, describing possible/expected learning outcomes; they are arranged at eight successive levels according to the extent of significance of the learning outcomes – knowledge, skills and competence.

According to definitions given in [3], “knowledge” means the outcome of the assimilation of information through learning. Knowledge is the body of facts, principles, theories and practices that is related to a field of work or study. In the context of the *European Qualifications Framework*, knowledge is described as theoretical and/or factual. “Skills” means the ability to apply knowledge and use know-how to complete tasks and solve problems. In the context of the *European Qualifications Framework*, skills are described as cognitive (involving the use of logical, intuitive and creative thinking) or practical (involving manual dexterity and the use of methods, materials, tools and instruments). The term “competence” means the proven ability to use knowledge, skills and personal, social and/ or methodological abilities, in work or study situations and in professional and personal development. In the context of the European Qualifications Framework, competence is described in terms of responsibility and autonomy.

Creation of knowledgeable, creative, skillful and entrepreneurial society rooted in the fool-fledged lifelong and lifewide education and successive chain of education/learning comprises all-inclusive forms of education/learning: formal, non-formal and informal, facilitating growth in economic, social and cultural environments.

The New Professionalism

Engineering/managerial high schools/colleges/universities are facilitating improvement of higher education in all study cycles, thus promoting increase in innovation proficiency level and effectiveness of the higher professional education in Europe, and creation of new, proficient professionalism, which can be characterized by common skillful research and innovation competencies

To make the EHEA truly effective it is necessary to place the Bologna process fully within major challenges expressed in the Lisbon goals, to make strong exploratory focus on innovation – to enhance new professionalism and consequently to deploy *European Research and Innovation Area*.

Higher education institutions equipped to increase • access & participation • reiterative innovation process • social cohesion – to respond to the new expectations of society. Access & participation is needed in order to create continuous learning paths, to stress the importance of professional degrees as fully equal to traditional degrees and to enable transfer from professional to research-oriented cycles. Reiterative innovation process ensures opportunities to invest in the cooperation between professional higher education institutions and industry, in the quality of teaching staff according to the new demands and in the building up of a satisfactory infrastructure for practically oriented research. Social cohesion is characterized by setting up talent programs.

Professional programs are fully equal to other degree programs and enabling easy transfer to research oriented programs. Integration of the *European Higher Education Area* with the *European Research Area* (Bologna) and *European Research and Innovation Area* (Lisbon) strengthen innovation activities of higher education institutions and are encompassing development of new professionalism.

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Industrial research projects in higher education institutions are implemented in cooperation with industry or separate production units, determining the most significant areas of research, promoting

creation of networks with working environment and stimulating implementation of the “talent programs”.

Success of the Bologna program takes its roots in improvement of higher education quality, its receptiveness, harmonization, accessibility and appropriateness to increasing interests of the society: needs, requirements and still unrecognized interests and desires.

Quality Education and Education Quality

The quality of higher education has proven to be at the heart of the setting up of the EHEA, Quality assurance additionally includes quality evaluation, accreditation and audit. A national quality assurance system should include:

- Definition of the responsibilities of the bodies and institutions involved
- Evaluation of programs or institutions, including internal assessment, external review, participation of students and the publication of results
- System of accreditation, certification or comparable procedures
- International participation, co-operation and networking.

Consistently with the principle of institutional autonomy, the primary responsibility for quality assurance in higher education lies with each institution itself. This provides a basis for real accountability of the academic system within the national quality framework.

Higher education institutions are urged to continue their efforts to enhance the quality of their activities through the systematic introduction of internal activities and their direct correlation to external quality assurance. *European Higher Education Area* adapts standards and guidelines for quality assurance and model for peer review of quality assurance agencies on a national basis, while respecting the commonly accepted guidelines and criteria. Cooperation between nationally recognized agencies with a view to enhancing a mutual recognition of accreditation of quality assurance decisions should be enhanced.

Quality Assurance and Improvement. Quality assurance is based on effective management system which stimulates development and improvement of the higher education – the excellence of acquired knowledge and skills. Development of a successful quality management system is ensured by institutional independence of the organization and management. The students are valuable partners involved in the implementation and management activities; a favorable economical, social and cultural environment should be provided to them, participation and involvement of students in further improvement of activities and processes should be encouraged.

Quality of higher education comprises:

- Full-fledged, useful study programs
- Productive study activities, actions and processes
- Effective management – leadership, governance and operations management.

Quality assurance includes:

- Quality management of programs, activities and actions – assurance, improvement, excellence
- Conformity assessment – audit, self-assessment, peer assessment, certification, registration, accreditation
- Quality improvement – TQM, excellence.

Elements of *Quality Management in higher education*:

- Institutional management – strategic and operational
- Implementation of programs – studies and research – management of content and actions
- Implementation of thematic modules, study courses – improvement of subject matter and activities.

Effective *Management systems*:

- Conformity assessment system: IWA 2 [5]; ISO 9001
- Quality improvement system: ISO 9004, TQM

- Excellence in education: EFQM, MBNQA, Breakthrough/Anticipation

Higher Education & Research. Higher education has a substantial role in further deployment of research and inclusion of useful research and practical research topics into study programs; the latest, in turn, will intensively facilitate the development of economical, social and cultural environment.

Aspirations of higher education development are closely related to research and innovation promotional activities. Research and practical research will facilitate quality assurance and improvement of the European higher education system and increase in its added value, attractiveness and compatibility.

Applied Research & Innovation. Innovative excellence takes its roots in professionals having wide and deep knowledge, outstanding creative and innovation skills, careful practical implementation abilities, purposeful initiative and efforts of continual personal development. Innovation proficiency is developing through successive process of studies, qualifications and practical training activities and in accordance with everybody's personal and professional wishes and needs and societal interests.

Engineering / Managerial Education. The growth of professionally well educated professionals is facilitated by development and implementation of comprehensive training and lifelong learning professional education programs where high importance has study/learning methodology – processes and activities, as well as study guides, supporting informative materials and appropriate infrastructure. Economic growth is stimulated by practical research and innovation activities – the practical accomplishments of researchers we consider to be more important component of this process than the findings of scientists working in narrow fundamental research areas.

Doctoral studies, Qualification. Widespread development of the practical research and growth of the practical value of professional education has close internal and mutual relationship. Significant importance has their joint and extensive development in interdisciplinary/trans-disciplinary fields; this development in turn is a cause of accelerated economic growth and flourishing of social and cultural environment. Efforts on education quality improvement should be carried out in close connection with practical research and innovation development intentions.

Doctoral qualification descriptors should be carried out consistently with the *European Qualifications Framework* aiming at expediency of the final result. The main goal of doctoral studies – creativity and innovation of focused research activities, development of improvement skills during research training at its initial and subsequent stages.

Descriptors of doctoral qualifications comprise equal provisions for educational/learning results to be achieved and knowledge, skills and competences required in professional activities – academic and research work at corresponding qualifications level.

For example, the qualifications descriptors at level number eight for creative/production industries are characterized [4] as follows:

Knowledge. Outstanding knowledge at the edge of known and achieved accomplishments at the most advanced frontier of a field of work or study and at the interface between fields.

Skills. The most advanced and specialized skills and techniques, including synthesis and evaluation, required to solve critical problems in research and/or innovation and to extend and redefine existing knowledge or professional practice.

Competence. Demonstrated substantial authority, innovation, autonomy, scholarly and professional integrity and sustained commitment to the development of new ideas or processes at the forefront of work or study contexts including research.

Doctoral programs should be rooted in deep studies of interdisciplinary/transdisciplinary knowledge and abilities enhancing successful accommodation of knowledge, competences and skills to varying

needs of labor market. The number of graduates at each study cycle (bachelor's, master's and doctoral) should be well balanced in each national system. Appropriate proportions between them are determined by the size of economy and level of its development, as well as on the field of professional activity. In the field of technical and organizational management the ratio between graduates with bachelor's, master's and doctoral qualifications degrees has been as 62:33:5 forming in total 80 percent of the personnel having higher qualifications level. The rest of personnel (e.g. 20 percent) have obtained their qualifications through non-formal education and practical training. In countries with smaller amounts of GDP the proportion of professionals with higher qualifications is diminishing. Doctoral level qualifications need to be fully aligned with the *European Higher Education Area* overarching framework for qualifications using the outcomes-based approach. The case component of doctoral training is the advancement of knowledge through original research. Universities are urged to ensure that their doctoral programs promote interdisciplinary training and the development of transferable skills, thus satisfying needs of wider employment market. EHEA developed basic principles for doctoral programs linked to the overarching qualifications framework, supporting experience on development of innovative doctoral programs linked to the overarching qualifications framework, supporting experience on development of innovative doctoral programs. One of the principles to be ensured while developing and carrying out the doctoral programs should be elimination of overregulation by administrative and regulatory structures.

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Janauska J., Mazais J., Salenieks N. Jauno Eiropas kvalifikāciju ietvars inženierizglītībai.

Aplūkotas Eiropas Vienotā tirgus aktivitātes un noskaidrota atbilstības novērtēšanas un tās sistēmu loma un nozīme Vienotā tirgū. Atsaucoties uz Jauno Lisabonas „Sadarbība izaugsmei un nodarbinātībai” dokumentu, kā arī ES „Jauno rūpniecības politiku”, aplūkota zinošu, radošu un aktīvu profesionāļu izaugsmes nozīmība Latvijai. Analizēta augstākās izglītības institūciju orientācijas nozīme autonomijas, pilnvarojuma un atklātības virzienā un to iekļaušanās Eiropas Augstākās izglītības telpā saskaņā ar Boloņas procesa nostādņām, lai panāktu, ka Eiropa kļūst par konkurētspējīgāko un dināmiskāko, uz zināšanām balstīto saimniekošanas vidi pasaulē. Doti Eiropas Kvalifikāciju ietvara raksturotāji, kvalifikāciju līmeņi un formālās, neformālās un informālās mācīšanās loma, augstākās izglītības kvalitātes pilnveidē, it īpaši inženierizglītības / vadības izglītības jomās.

Janauska J., Mazais J., Salenieks N. New European Qualifications Framework for Engineering Education.

The characteristics of the European Single Market environment are given and the frame of conformity assessment and its systems in the Single Market are explained. With a reference to the New Lisbon “Partnership for Growth and Jobs” and the EC New Industry Policy a significance to develop knowledgeable, creative, skillful and proactive professionals for Latvia is discussed. An orientation of higher education institutions towards autonomy, authority and transparency and their inclusion into the European Higher Education Area in accordance with the Bologna process for making Europe the most competitive and dynamic knowledge-based

economy in the world is analyzed. The descriptors of European Qualifications Frameworks and the role of formal, non-formal and informal learning, quality of higher education with emphasis on engineering / managerial education and levels of qualification are outlined.

Янауска И., Я.Мазайс Я., Салениекс Н. Новая Европейская система квалификаций для инженерного образования.

Рассмотрены характеристики Европейского общего рынка, выяснено значение оценки соответствия и ее роль в общем рынке. На основе положений документов Нового Лисбонского «Содействие для роста и занятости» и «Новая индустриальная политика» ЕС рассмотрено значение знающих, могущих, творческих и активных профессионалов для роста экономики Латвии. Приведен анализ ориентации учреждений высшего образования по направлениям автономии, полномочия и открытости и их включения в пространство Европейского высшего образования в соответствии с основными положениями Болонского процесса с целью выдвижения Европы на ведущее место в мире по конкурентоспособности и динамичности развития экономики. Приведены характеристики и квалификационные уровни Новой Европейской системы квалификаций, охарактеризована роль формального, неформального и информального учения в усовершенствовании качества высшего образования, особенно в области инженерного образования.