

SECTION 1 – PROFESSIONAL EDUCATION IN CUSTOMS DOMAIN

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HIGHER STANDARDS ON TEACHING STANDARDS

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Abstract

The article considers how knowledge of standards can help companies to compete at international markets; whether standards' competencies are required by the labour market; how education on standardization issues is organized in national educational institutions; on UNECE activities on promoting and teaching standards.

Key words: education on standardization, standards as a trade obstructing and trade facilitation factor, labour competences and qualifications relating to standards, promoting and teaching standards.

Introduction

Standards are one of the principal corner stones of trade and economic integration and of all dimensions of sustainable development, reducing trade costs, ensuring the safety and security of workers and consumers, protecting communities from hazards and facilitating the transition to a green economy. Better knowledge of standards and their wider application is beneficial to the society as the whole and is, evidently, essential for business.

Globalization processes demonstrate the ever-growing importance of standards as a new competition tool. To participate in the international trade and to take the full advantage of global supply chains companies shall be capable to manufacture a high quality product which meets specific rules of a national (or a foreign) market where it will be delivered. Often such requirements go much beyond only product characteristics and include, for example, also conformity assessment procedures (how a product shall be tested and by whom; what certificates are required; what are requirements for testing laboratories; labelling rules; etc.).

By using standards companies could improve compatibility and usability of their products and meet public health, environmental, protection of animal life and other legitimate concerns of the governments. At the same time regulatory measures can become a protective device by establishing much stricter requirements for foreign products or limiting their deliveries based on the unwarranted risks (without scientific justification), etc. Hence, the importance for policy makers and for business is to see and to understand both trade-facilitating and trade-distorting aspects of standards and to ensure that such “technical barriers to trade” (TBT) do not unnecessarily hamper international trade.

1. Role of standards in globalized world

Various types of research have been done to analyze the role of regulatory measures in trade. As an example, we can quote one of the studies on sanitary and phytosanitary (SPS) regulations and, in particular, regarding aflatoxin standards on groundnuts in European and African trade.¹ It shows that tightening such standards by 10% led to an 11% reduction in trade. Another study on measuring the SPS impact on developing countries' exports to developed market economies noted the different influence of SPS standards. They typically harm trade in agricultural goods (which are difficult to be adapted to a specific standard) while in case of manufactured products their impact was positive as information provided in standards improved a product's ability to be sold. It means that the same standard could be a barrier to trade or a means of facilitating trade.

It is not surprisingly that the WTO Trade Report 2012 noted with concern the increased application of technical barriers to trade as a major challenge for international trade and concluded that regulatory standards can have even more a significant impact on trade than tariffs.

The WTO report highlighted the increasing use of TBT/SPS measures since mid-1990-s with the total number of such measures reported to WTO exceeding 200 cases.² In 2010, half of the measures that were considered as "burdensome" by developing countries' exporters were accounted by TBT/SPS measures. Similar statistics is for the European Union (EC). When analyzed by the type, such "burdensome" measures can be divided by the following categories (as percent of all declared measures at WTO): conformity assessment – 31; export-related measures – 25; technical requirements – 17; rules of origin – 10; para-tariff measures – 6; pre-shipment inspection – 5; quality control – 4; etc.

Moreover, it shall be noted that the list of traditional regulatory requirements for a product (as shown above) is constantly expanding and now includes, for example, sustainability issues as well (such as environmental standards, rules on disposal, labour laws, including child labour, etc.) thus exposing a company to new obligations.

Besides international marketplace companies are facing standards every day on their domestic markets. For example, a complex link exists between standards and innovations. On the one hand, development of standards can facilitate introduction and implementation of innovations and their interoperability with the currently used devices and products. On the other, existing and already applied standards and technologies can block the new competing technical approaches.

This complexity can be illustrated by a recent (2014) study on the barriers to commercialization of innovative goods and services in 28 countries of the European Union (from which, for the purpose of our analysis, we will take only statistics relating to standards).³

When asked what obstacles they encounter in selling innovative products and services, more than two thirds of companies (68%) noted lack of financial resources, 64% - domination of the market by established competitors and 62% - cost or complexity meeting regulations and standards. Among other problems are: low demand (52% of respondents); lack of market expertise (48%); weak distribution channels (44%) and lack of market standards and regulations (43%). If we look into all identified barriers, they are primarily either financially or market-related and the only technical matter are standards and regulations. And interestingly companies see the problem both in the necessity to comply with standards and in their lack.

¹ European review of agricultural economics, vol. 208 (2) 2001

² WTO Trade Report 2012

³ The role of public support to in the commercialization of innovations, European Commission, 2014

The above study allows to have an insight into similar responses from US and Swiss companies. Regarding standards, the complexity of meeting regulations and standards was noted by 18% respondents from USA and 55 % from Switzerland (to note: EU – 62%); as for the lack of market standards and regulations, the replies were the following (in %): USA – 14; Switzerland – 37 (EU – 43). The data for Switzerland is comparable with the low end of a scale at EU. As for significantly lower figure for USA, it might be explained by the fact that US government relies less (than European public administration) on prescriptive regulations and more - on companies' responsibility and legal liability.

When analyzed by a country, there are serious variations in responses to the two above questions. The complexity of meeting regulations and standards is a problem for at least three quarters of companies in Italy, Portugal and Spain. At the other end of the scale less than 40% of the surveyed businesses in Estonia, Denmark and Lithuania have the same concern.

Lack of market standards or regulations seems to be a serious problem for the majority of Portuguese companies (77%), as well as for Cyprus (68%), Romania (65%), Hungary, Greece and Italy (around 60%). In our opinion, this statistics demonstrates as well differences in existing regulatory regimes in individual countries.

From the point of company characteristics, the study shows that the larger company, the less likely it has standards-related problems (and other, as well). Also standards are more a headache for industry sector companies (than for services).

To sum up, this study once again shows the need for business to be fully aware of the complexity of regulatory mandatory and voluntary (when required by the market) measures which shall be addressed and met in its daily activities. It means that it is important to keep companies aware of the role of standards and also to promote relevant standardization knowledge and skills among specialists entering the labour market.

2. Market demand for standards' competences

The understanding of a need in standards related competencies and skills is growing and is reflected in relevant requirements from business. Thus, the International Federation of Standards Users (IFAN), which unites major industrial companies, prepared in 2014 a guide to show what aspects/knowledge of standards issues are required at different levels (departments) in a company (see a table below).

Knowledge Functions	Standardization role	Standards identification process	Integration of the content for relevant standards	Take into account sustainable development	Integration of management systems	Product compliance		Standardization lobbying		Business intelligence in standardization
						Issues	Methods	Issues	Methods	
CEO & senior management	•••			••	•••	•••		•••	•	
Human resources	•		•••							
Marketing	•••	•	•		•••	••		••	••	••
Sales	•••									
R&D and Innovation		•	••	••	••	•••		••	••	•
Laboratories			••		••	•••	•••	••	••	•
Purchasing		••		••	••					•
Production										
Quality, Environment, Safety Social responsibility			••	••	••	•••				•
Standardization	•••	•••	••	••	••	••	••	••	••	••
						•••	Substantial knowledge			
						••	Good knowledge			
						•	Some understanding			

It is clear from this table⁴ that almost every employee in a company from top management to marketing or sales agents shall have at least a certain understanding of standards. For example, according to IFAN, CEO and top management are expected to have: (a) “substantial knowledge” of: need to comply with standards and regulations; strategies for standardization work; role of business associations in developing standards; standards and company management systems; (b) “good knowledge” of: how standards can help sustainable development (in the context of company’s strategy at world market place); (c) “some understanding” of: how to influence the content of standards from the company’s strategic perspective; how to identify standards and regulations that products have to comply with.

Relevant skills for top management include: identification of risks and opportunities; global implementation process; influencing lobbying process.

Evidently much wider and deeper knowledge is required from other employees of a company, in particular, in standardization (evidently), production, sales and marketing departments. For example, marketing experts (in addition to similar knowledge of general issues as CEO) shall also understand the value of compliance with standards; know the methodology of obtaining information on development of standards. Their skills shall also be substantial to enable them to identify relevant regulations; to monitor them; to map standards into company’s operations; to understand how to participate in a standardization process; to relate sustainable development to marketing of products.

In our opinion, the only one important layer that is missing in the IFAN table is legal departments and justification why jurists shall be aware of standards. To recall that legally standards can be used in various ways. First of all, one could say that a standard is to a certain extent a technical problem vision in a form of a legal document. Plus a standard provides the most recent and agreed solution/best practice for a problem. In case of a court action, use of standards can demonstrate the seriousness of a company and that: (a) company satisfied safety or other mandatory governmental requirements (as set in a standard); (b) in case of a conflict over quality or other aspects of a delivered product, it can be solved on the basis of a standard referenced in a contract; (c) when court is deciding on a degree of a responsibility, a standard can provide a minimum level of a legal protection for a company.

An interesting study of relevance of standards qualifications for getting recruited was done in Germany in 2010-2012 through an analysis of around one thousand job offers from recruiting companies looking for professionals with the words “standards” and “engineers” in the job title.⁵ The analysis showed that responsibilities varied according to a company’s profile. However, all companies were looking for an engineer or an equivalent bachelor degree specialist with additional experience in standards (sometimes in a specific standard).

Out of all advertised positions with “engineer” in the title, standardization activities were mentioned in 30% of job descriptions (plus 0.1% of offers were specifically recruiting “standards engineers”).

The positions with “standard” in title included the following main areas of duties (in %): managers – 39; engineers – 29; analysis – 16; developers – 12; compliance – 6; trainers – 2. In our opinion, these figures show that it might be a certain confusion with regard to using (understanding) term “standard” when companies are preparing job descriptions.

⁴ IFAN guide “education and training about standardization: different needs for different roles”, 2014

⁵ Workshop on standardization management, 20-21 March 2012, Valencia, Spain

When considering the job offers by industry sector, out of all offers of standards professionals manufacturing accounted for 34% followed by healthcare and hospitality (25%) and information technology (15%). For standards engineers the data was: manufacturing – 55%, information technology – 25%; healthcare and hospitality – 7%, etc.

From the point of the size of a company, 16% of job offers did not contain company's name (so it was impossible to identify them). Out of the remaining data, 95% job offers were posted by large companies, 55% - by medium and 0.1% - by small companies (it confirms that small business needs an additional assistance/training to better understand/use standards).

Summarizing a portfolio of standards-related competencies and skills that are expected by business, one can conclude that standards can be an educational asset and are often relevant for getting recruited.

3. Education on standards

In its area of competence, UNECE has been promoting for years the importance of understanding standards as technical and political tools.

Thus, one of the areas of UNECE work is a permanent group of experts dealing with policies relating to standardization, conformity assessment, technical regulations, market surveillance, metrology. This group has been active since 1970 and today it is called UNECE Working Party on Regulatory Cooperation and Standardization Policies (Working Party 6: WP.6; the author of this article has been the secretary to WP.6 for more than 10 years). Already in 1970-s the Working Party noted the importance of teaching standardization in high school and this proposal was reflected in a recommendation "I" to governments (voluntary recommendations are one of the forms of elaborating best practices at UNECE).

Intensified discussions in WTO and at other fora on technical barriers to trade in the 90-s brought education issues once again to the UNECE agenda in the context of what knowledge and skills relating to standards are required today by the market.

Standards have always been (and continue to be) on the curricula of engineers in all countries (and the above-mentioned study in Germany confirms it). The major standards-setting bodies (like ISO, IEC, ITU) have been promoting the importance of their own standards but UNECE experts felt that there was also a need for horizontal general awareness training/education among students of non-technical specialization to demonstrate them the multi-disciplinary character of standards in a modern world. To discuss this issue in detail an international workshop was organized by UNECE in Geneva in 2012.

To understand the context of the UNECE work on teaching standards, an overview of the situation in various countries is provided herewith. A significant interest in education on standards was noted in Asia as the result of the discussions on this issue at APEC (it included also preparations of training materials on this subject). In Asia, the most significant developments took place in Korea, Japan, Indonesia and China which from the mid 2000-s started a number of projects and programmes on university education on standards.⁶

For example, in Japan 51 course was introduced in 32 educational establishments with textbooks published and with a number of trained students reaching 2100 in 2012.

In Korea, in 2011 there were 81 programme offered at 41 university (with the total number of students around 3880). What is also important is that the number of lecturers on standardization

⁶ discussion paper on standardization in higher education, Helmut Schmidt University, 2014

matters increased in this country from 50 in 2005 to 294 in 2011.

In Indonesia, the national standards body (BSN) signed a memorandum of understanding with 30 high education establishments and currently standardization is taught as a permanent subject in 10 universities. The number of courses relating to standards rose from 2 in 2007 to 22 in 2012 and the number of participating students (for the same period) from 17 to 450. The total number of students trained on standardization curricula in Indonesia for the period 2007-2012 period totalled 1036.

In China, courses on standardization have been introduced in more than 200 educational institutions.

Surprisingly, in North America only few educational institutions are starting to teach standards (we believe that it has to do with a low importance of standards at the US regulatory system).

In Europe, according to the survey made by the Helmut Schmidt University, the situation in 2008 in high education establishments was the following: very limited academic infrastructure in the field of standardization; no curriculum with defined core content; no recognized textbooks. The emphasis of courses varied considerably from university to university and was ranging from standardization governance, strategic aspects of standardization to development of IT standards and e-business applications. In 2008, the estimated number of students in Western Europe was approximately 500.

The follow-up survey done in 2013 (based on a limited number replies from European countries) confirmed the above-mentioned tendencies with certain positive exceptions. Thus, in Bulgaria 9 courses were taught with 285 students. The School of Economics (Erasmus University, Rotterdam) offered 6 courses attended by 134 students.

An interesting and successful approach was used in Denmark where individual lectures with a focus on standards-related issues (including patents, social responsibility, IT security) were introduced into various high education programmes. In 2010, the total of 86 courses with 1290 students that attended them were delivered (in 2012 – 177 courses and 1760 students respectively).

If the results of this analysis are restricted only to specialized standardization programmes, then the total number of students trained in this area in Europe could be currently estimated at around 1000 per year.

4. Educational programmes and standardization

In 2011-2012, the UNECE secretariat studied how standardization issues are being taught in various countries in bachelor and master programmes at non-technical faculties. The collected information showed, for instance, an active interest in standards in Asia, as it was noted above.

In Europe, as it turned out (and it confirms the results of the Helmut Schmidt University's study above) there were very few universities where students could learn standards. A couple of universities offered specialized master programmes (like in Switzerland – Geneva University or in Portugal – School of Management and Technology of Porto Polytechnic Institute). A number of institutions also provide selected training courses on various aspects of standards (some examples: at Netherlands – Delf University, Rotterdam, and Erasmus University; Rotterdam; in Germany – Helmut Schmidt University, Hamburg, and University of Technology, Berlin; in Bulgaria – Technical University of Sofia; in Japan – Chubu University, etc.). Some training was also provided by national standards bodies; thus, DIN (German Standardization body) offers a distance

learning facility on standards.

The insignificant attention to standardization, need for wider education both of business and of high school graduates, as well as for more coordination were among conclusions of the first European conference on education about standardization held in Brussels in June 2012 (it was organized by the European standardization bodies: CEN, CENELEC and ETSI in cooperation with the European Commission (EC)).

Substantial work on raising awareness and sharing experiences is done by academia and researchers on a regional level – by EURAS (European Academy for Standardization) and on international level – by ICES (International Cooperation for Education about Standardization); as well as in the EU context - by a joint CEN/CENELEC working group in this area.

As it was noted above, the situation with teaching standards differs substantially through the countries. Paradoxically, the better knowledge exists in the countries of the Central, Eastern and South Europe (due to a mandatory character of standards in the former socialist economies). For instance, teaching standardization experts was well established in the Soviet Union where existed a special state-backed system of education on standards (under the state agency responsible for setting and implementing standards). After dissolution of the Soviet Union these educational institutions which existed practically in all ex-USSR states continue to provide vocational training. The largest of such schools is in Moscow – Academy of Standardization, Certification and Metrology (ASCM) has 12 branches throughout Russia and provides various post-graduate courses (ranging from a week for top managers to 2 years for experts on metrology). The total number of experts who receive at ASCM various forms of training is around 1.5-2 thousand every year.

It shall be noted that ASCM is specializing on teaching on standardization for experts as an additional education with a relevant diploma (similar training institution exists in Belarus – Belarusian State Institute for Qualification Improvement and Retraining of Staff on Standardization, Metrology and Quality Management, Minsk).

There are also other educational institutions (primarily in engineering areas) in Russia and CIS that teach separate standardization courses (for example, Mendeleev University of Chemical Technology, Moscow).

5. Educational programmes analysis

Besides quantitative data on the number of students learning standards in various countries, UNECE secretariat also collected and compared existing educational programmes. The analysis of such information showed that programmes differ significantly both from the point of content and duration which makes difficult their comparison. If we look into the content, in Western Europe, for example, standardization is dealt with primarily from the point of interest of companies, whereas in countries of Eastern Europe, Caucasus and Central Asia it is dealt with from the point of view of regulatory authorities. Almost none of the existing programmes dealt with flanking issues such as metrology and market surveillance.

To address this issue of different educational approaches, secretariat in consultations with academia, prepared a proposal for a “model programme on education on standardization” which covers the minimum set of issues that a graduate shall master to have a general understanding of the topic from business or governmental perspective (it includes major standardization, regulatory and related issues relevant to the activities of business and of regulatory and administrative

authorities). The programme is intended for general university level academic programmes rather than to provide specialized in-depth training on standardization.

These agreed essential issues are grouped into 15 modules and the programme can be used as a self-standing full pledge course or its separate modules can be used for training on specific subjects. The same approach concerns teaching time recommended for each module which may vary depending on the purpose of training and on the level of knowledge of students.

The UNECE programme (see document ECE/TRADE/C/WP.6/2012/6) includes the following modules:

1. Standardization basics
2. Benefits of standardization for society
3. Standardization and companies
4. National legal and institutional framework
5. Regulatory policies and related institutional mechanisms
6. Managing risks through standards, regulations and regulatory impact assessments (RIAs)
7. Metrology
8. Conformity assessment
9. Market surveillance
10. Management system standards
11. International standardization
12. International trade, standards and regulations
13. Standardization of information requirements and supply chains
14. A practical exercise: Standardization within a company
15. Policy issues and challenges in standardization

The module character of the programme provides the necessary flexibility for professors and at the same ensures that a graduate has at least the minimum knowledge of the subject. For example, module 14 is devoted to a practical exercise to show how standards can be incorporated into a company's strategy and how they can support procurement, production, etc. These issues are important, for example, for graduates who will work in a manufacturing company. It is suggested to include this module when teaching to students who did not study such issues previously under general education curricula. Thus, this module might be an optional or mandatory depending on the preparedness of a particular group of students.

6. UNECE Recommendation on education on standards

In November 2012, the UNECE Working Party on Regulatory Cooperation and Standardization Policies (WP.6) hold an international workshop on "introducing standards-related issues in educational curricula", with close to 100 delegates from governmental authorities, standards bodies, international organizations, the academic community, as well as business, from more than 20 countries. Participants noted the growing demand for specialists with a knowledge and skills of standards and at the same regretted that very few programmes on standardization matters existed in the UNECE region.

As the result of the discussions, the WP6 adopted a revised recommendation "I" (on education on standardization) stressing the importance of promoting and teaching standardization through the elaboration of coordinated approaches and building on existing national best practices.⁷

⁷ UNECE document ECE/TRADE/C/WP.6/2012/7

In particular, the Recommendation calls on Governments to encourage:

“(a) the introduction of the subject of standardization into the curricula of educational establishments and particularly of universities for students majoring in technical and scientific subjects, as well as in legal, economic and management studies;

(b) the vocational education and training of specialists in standardization, including staff of authorities responsible for trade and customs, also using the expertise and training materials available in national, regional and international institutions (i.e. standards-setting bodies, conformity assessment and accreditation institutions, metrological institutions...)

(c) the enhancement of awareness-raising activities targeted to the business community and regulatory authorities...

(d) the further study of standardization issues in order to identify best practices in ensuring that standardization and regulatory regimes contribute to meeting the legitimate concerns of society (e.g. human safety, environment) without creating unnecessary technical barriers to trade.”

As a practical tool of introducing standardization into current curricula the above mentioned “UNECE model programme on education on standardization” was also endorsed (see UNECE document ECE/TRADE/C/WP.6/2012/6). During the debate it was noted that this programme does not only provide educational institutions with a check list of essential standards-related issues but also marks a first step towards the harmonization of educational programmes and eventually to the mutual recognition of acquired skills and of diplomas (it is recalled that today the transfer of credits between programmes/institutions is primarily based on the length of a course/number of instructions hours and not on its content or learning outcome).

To monitor developments in the education area within the existing UNECE team of experts “STaRT (Standardization and Regulatory Techniques”) in 2012 a sub-group representing academia was established (“STaRT-ED”). During the consecutive years STaRT-ED Team organized an exchange of experiences between universities on teaching standards.

7. New educational courses on standards

One of the practical results of such awareness and capacity building efforts by UNECE was an introduction in the region of new courses on standards and wider attention to these issues within existing programmes.⁸ Here we provide experiences of one such institution – Moscow State Regional University which introduced in 2013 a new course “fundamentals of standardization” with a content (15 themes) practically following the thematic areas suggested by the UNECE model programme.

The course is taught for the following management specializations (in brackets the number of students in 2013/2014 and in 2014/2015 school years): personnel management (81; 82); state and municipal management (72; 85); project management (9; 27); small business (41; 33); production management (30 – in 2013/2014). In 2014/2015 this course was taught also in addition to a new specialization: information management (18 students). Thus, in 2013/2014 – 273 students and in 2014/2015 – 254 students received supplementary training on standardization matters (moreover, according to MSRU, students evaluated the new course as useful).

Another area positive example is from Matej Bel University, Banska Bystrica, Slovakia, where a course “standardization and international standards” (5 credits, 150 hours out of them 39 – lecturers and seminars) is offered at the master degree programme “finance, banking and

⁸ Information from UNECE secretariat

investment”. The programme includes five specializations and at two of them (accounting and international finance) the course is offered as an optional course.

The content of the course is also close to the UNECE model programme. It consists of 13 areas with two of them different from UNECE suggestions (they are: “standardization in the EU” and “political implications of standardization”).

In other countries the content of programmes may differ. For example, in Portugal, – the School of Management and Technology of Porto Polytechnic Institute offers a two-year programme “master in integrated quality, environmental and occupational health and safety management systems”.

The 1-st semester of the first year includes such subjects as: quality management, occupational health and safety, leadership and team management, research and innovations management. During the 2-nd semester students study human resources, environmental management, food safety, social responsibility, integrated management system and audit. The second year is devoted to research and preparation of a thesis.

The programme is compliant with Bologna process; it started in 2010-2011 with 40 students; in 2011-2012 there were 30 students (15 of them left) and in 2012-2013 – 30 enrolled students (10 left).

To assist professors, the UNECE website contains a library of programmes (from various universities) on teaching standards and which are available to any educational institution interested in launching similar training (see at: <http://www.unece.org/trade/wp6/educationonstandardization.html>). The website also contains links to the work done by other organizations, for instance, ISO (repository of teaching materials and studies on the benefits of standardization) or APEC (on teaching standardization in universities: files on various standardization issues which can be used in teaching and on experiences).⁹

In order to help universities to introduce standardization courses UNECE in cooperation with academia initiated a work on preparation of teaching materials. As a part of this project the Moscow Academy of Standardization, Certification and Metrology, a leading global educational institution in the area of standards, has prepared (on the basis of the “UNECE model programme”) the first three teaching modules which were presented to the STaRT-ED Team and also endorsed by the Working Party 6 at its November 2014 annual session. These modules (on benefits of standardization; standards in the WTO context and on quality management systems) are freely available to any university which is interested in teaching standards and they mark the de-facto launching of the UNECE educational programme as a practical teaching tool (see at the UNECE website mentioned above).

These modules will facilitate the inclusion of introductory and awareness building courses on standards in institutions which may currently lack qualified expertise on this subject. Interest was also expressed in the development of similar teaching modules on standards issues in other areas, such as transport and customs (for example, negotiations on this subject are currently underway with the Ukrainian Customs Academy).

The major stakeholders in the area of education on standards include: companies, employees, ministries of education, universities, students, regulatory authorities/policy makers, standards-setting bodies (national, regional, international). In future UNECE is planning to involve all these groups in the process of identifying and building the portfolio of desired qualifications/

⁹ See UNECE website

competencies and personal skills of graduating students, company's employees and public administration officials.

It should be noted that education on standardization is also significantly influenced by an organization of a national educational system. On the one hand, there are countries with more centralized approach where education ministries influence the content of the universities' educational programmes (i.e. France, Italy, Russia, etc.). In such case the promotion of a new subject (like standards) shall be first made on the level of ministries. On the other hand, in countries (i.e. UK, Germany), where universities decide themselves on an education content, it is necessary to approach each university individually and to persuade it in the importance of adding new areas to the curricula. The UNECE is prepared to work in both such directions.

Summary and concluding remarks

The role of standards both as a trade facilitation and as a trade distortion factor is growing at international arena and causes permanent concerns for business. As the result, today standards and related regulatory tools began to play a critical role in influencing the competitive positioning of companies and countries.

The knowledge of standards is an important part of the portfolio of competencies and skills that have been (and to continue to be) required for job seekers in engineering professions. Recent studies show that large companies are starting to understand that standards awareness can be also an asset for other employees (non-engineers) dealing with the placement of products on the market (marketing, legal, etc. departments).

In this context UNECE recommendation on introducing standards-related issues in educational curricula is timely and market based and shall be further promoted. In general terms it can be noted that the awareness of the importance of standards will be of benefit to the society as a whole and not only to graduates seeking jobs. Hence, the education on standards would be useful not only for high educational institutions (which is the focus of UNECE activities) but also for secondary and primary schools (adequately tailored to specific needs of each group).

The current situation (in particular in Europe) with education on standards (number of offered courses, scope and students attending them) is not satisfactory and is below the market demand.

There are various reasons for the weak response of educational institutions to introducing standardization into curricula which include: often ambiguous requirements from business (standardization needs are not clearly articulated); lack of nationally (regionally, internationally) agreed content for programmes; lack of trained professors and of agreed textbooks; specific national conditions relating to educational systems (approaches).

The approach to teaching standardization shall also be changed. Traditionally standardization was considered to be part of curricula of engineering professions (or as a part of vocational training) and was usually highly specialized and linked to a specific professional profile. An appearance of new standards that go beyond technical matters (ecology, social, etc.) shows the necessity to see and to understand the multidisciplinary character of standards and to teach them accordingly.

The future work in this area can include: awareness building and promotion of education on standardization among all major stakeholders; elaboration of an agreed content of harmonized educational programmes; building up an expertise on teaching standards at educational

institutions; preparation of training materials and textbooks; continuation of professional and vocational training on standards.

Endnotes

1. "What price precaution? European harmonization of aflatoxin regulations and African groundnut exports", *European review of agricultural economics*, vol. 208 (2) 2001
2. World Trade Report 2012 Trade and public policies: *A closer look at non-tariff measures in the 21st century*, 16 July 2012, WTO
3. "The role of public support to in the commercialization of innovations", May 2014, European Commission
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6. Discussion paper on standardization in higher education, professor W. Hesser, Helmut Schmidt University, Hamburg, 2014.
7. UNECE documents ECE/TRADE/C/WP.6/2012/6 and ECE/TRADE/C/WP.6/2012/7
8. Information presented by national experts in the context of the work of the UNECE group of experts on education on standardization ("STaRT-ED")
9. UNEECE website of the project on education on standardization (<http://www.unece.org/trade/wp6/educationonstandardization.html>).