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## **Standards for good teaching**

A discussion paper on the development of a contemporary teaching-study concept for standardisation as a subject of study at higher education establishments in Europe.

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Further information is available at [www.pro-norm.de](http://www.pro-norm.de)

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# Standards for good teaching

A discussion paper on the development of a contemporary teaching-study concept for standardisation as a subject of study at universities in Europe.

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# 1 Introduction

This contribution is concerned with expounding the fundamental change in education in the field of standardisation in Asia and Europe.

In the post-war period there have been various different technical structures and regulations, e.g. standards, within the member states of the EU that have had an inhibitory effect on the free traffic of goods within Europe. In order to eliminate this problem, the organs of the EC employed standardisation as an instrument for controlling economic policy at the end of the 1960s. A uniform European standardization system was intended help to dismantle the technical barriers to trade within Europe. However, the first method chosen, later designated the “Old Approach”, failed and was replaced in the mid-1980s by the so-called “New Approach. Instead of drawing up individual European standards itself, within the New Approach the EU moved over to laying down essential requirements in areas that affect the common good. The drafting of standards in which the aforementioned essential requirements have to be considered was entrusted to the European standardization bodies. The New Approach has remained in force practically unaltered up to the present day and can definitely be viewed as a model for success.

The development of the European standardisation system can be seen most clearly in the following figures. Starting from the decision in favour of the New Approach in the 1980s, the number of European standards (ENs) had already reached the 500-standard mark by the year 1990. With an average rate of increase of approx. 600 new standards per year, a notable stock of 14,578 (as of 2012) European standards has been drafted for all areas of life. European industry and commerce invested of approx. 14,6 billion euros in the development of the European standardisation system during the period from 1990 to 2012 /20/ page 8 point 2.4/. Independently of this, some 3,200 harmonised documents (HDs) were drawn up during this same period and are part of the European legal structure. Drafting of the harmonised documents (HDs) was financed by the European Commission (European Commission DG Enterprise and Industry) with an investment volume amounting to approx. 180 million euros. Between 1990 and 2012, a total of approx. 18 billion euros were invested in establishing the European standardisation system. Regardless of the importance of the European standards system for the success of industry and commerce, the sales of European standards, e.g. as EN DIN standards or EN BS standards, guarantees the national standards bodies a considerable part of their annual budget.

“The budget of the DIN group, for example, amounted to €94m in 2010 and €100m in 2011. Of these amounts, 66% in 2010 and 68% in 2011 were their own earnings. An important constituent of these own earnings are the revenues generated from the sale of European standards (ENs), mainly via Beuth Verlag.” (see Einfluss-Sphären, DIN Geschäftsbericht 2011 [Spheres of Influence, DIN business report 2011]). (see Annex 5-6)

Contrasting this development in the European standards system from 1990 to 2012 with the issue of academic education in the field of standardisation in Europe, the following picture emerges.

Since the year 2000, members of EURAS e.V. have been campaigning amongst decision-makers at national, European and international level, both within standardisation organisations and in the European Commission DG Enterprise and Industry for the

establishment of an academic education system for standardisation in Europe.<sup>1</sup> In all the talks conducted, our request has been met with a great lack of interest and understanding as well as a display of ignorance.

Since the emergence of standardisation in the 20th century, education in this subject has traditionally taken place in the form of in-service training through short seminar courses. Until the present day, essentially nothing has changed in connection with this form of training. In Europe, training and education in the field of standardisation is performed by the national standardisation institutes in training courses organised over a number of days for employees of industry and commerce. This type of training only partially conveys a knowledge of standardisation commensurate with the respective professional profile. Further education in standardisation represents a continuously growing commercial market for the NSBs which needs safeguarding and protection.

In Europe, standardisation is currently taught at very few higher education establishments as a separate subject of study (option). Essentially, a limited knowledge of standardisation is included in individual lectures as one of the subjects studied in courses such as mechanical engineering, electrical engineering, information technology, business administration and law.

No transfer of knowledge on standardisation under the aspects of a technological, economic, social or holistic considerations takes place at higher education establishments.

Academic teaching in the field of standardisation in Europe does therefore not correspond to the status that it should have in safeguarding the worldwide competitiveness of Europe.

Contrasting with this is the development of the academic education system with regard to standardisation in Asia. The academic infrastructure for standardisation in Asia is distinguished by the dynamic developments in China, Japan, Korea, Thailand, Indonesia and Malaysia. As from 2005, Korea alone invested approximately USD 5–8 million per year in the University Education Programme on Standardization (UEPS).

### **APEC SCSC Strategic Education Programme for Trade Facilitation**

The importance of education on standards and conformance is highlighted in the 2006 APEC Ministerial Joint Statement: “Ministers recognised the importance of standards education and encouraged members to develop reference curricula and materials to address the significance of standards and conformance to trade facilitation in the region.” This project is addressing the above Minister's instructions”.

The educational programme outlined in this report, in which more than USD 100m has been invested to date, clearly shows the status that standardisation currently has in Asia. Independently of the commitment of individual countries, a strategy crossing international borders has been under development from 2005 up to the present day aimed at preparing a uniform curriculum and teaching materials in particular, i.e. textbooks in the field of standardisation. (see Annex 34-39) and <http://www.wisestandard.org/>

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<sup>1</sup> First contact: Evangelos Vardakas, EUROPEAN COMMISSION Directorate-General III – Industry, 15 July 1999, “A Brief Project Description” – July 1999 “E-learning for standardization within the EU”. First meeting: February 1st 2000 at 10 a.m. The meeting was held in Mr Vardakas' office.

This report is prompted by the overall situation and offers an overview of both the results in Asia and of international developments such as ISO, ITU, IEEE and UNIDO. At the centre of the discussion, however, is academic education in the field of standardisation in Europe and also the issue of the standards of good teaching in standardisation as a subject of study.

## **1.1 Standardisation education infrastructure in Asia and in the International context**

Development of the academic infrastructure for standardisation in Asia is characterised by developments in China, Japan, Korea, Thailand, Indonesia and Malaysia.

Examination of the documents at my disposal reveal a vision that may be described in brief as follows:

### **AN INVESTMENT IN STANDARISATION KNOWLEDGE PAYS THE BEST INTEREST**

#### **Why Standardisation Education NOW?**

- International Trade
- International Harmonisation
- Dynamic Industry

#### **1.1.1 JSA Japan Standards Association, Japan**

Japanese Standards Association (JSA) promotes industrial standardization and quality control through development and publication of JIS and education.

Mr Masami Tanaka, President of Japan Standards Association, gave the following account in a presentation at Jiliang University Hangzhou, China, in 2011:

##### Japanese Policy on Standardization Education Programs

- The Council for Science and Technology Policy issued The 3rd Science and Technology Basic Plan (FY2006-FY2010)
- The Plan mentions the importance of human resources responding to the standardization activities and reinforces the training & educational programs with the production of teaching materials.
- Setting up the program “Standards Education“ 2005 - 2010 Total budget; **about one million dollars/year.**

It also describes the key contents for an educational programme dealing with standardisation.

##### The Significance of Standards Knowledge in Higher Education.

Education gives students comprehensive knowledge

- Economic benefits,

- Development processes,
- Business applications,
- International trade etc.

The package of standards knowledge gives students insights into

- Understanding business transaction,
- Government policies,
- Working in the present global environment, etc.

**Change a typical perception that standardization is purely a technical matter and having a strategic thinking in a way considering in relation to business strategies and public policies.**

One of the crucial players in developing the educational programme in Japan is METI. METI is developing teaching materials (text books, e-learning), training curricula, and e-testing systems as the knowledge confirmation tools.

In Japan, with the support of METI and JSA “A Special Committee on Human Resources Development in JISC” has been established under the directorship of Prof. Masami Tanaka, JISC Vice President, former ISO President. This committee has the tasks of:

“Confirming present policy of human resource development of standardization” and “Investigating and discussing new policy of human resource development of standardization”.

JISC starting program for SE during 2005-2010

(see Annex 7-16)

- Expanding the number of academic institutes having SE with the course of SE (from partly to one term program)
- Developing standards materials of SE by JSA and several published books
- Pedagogical methods have been improved ( from Broadcasting to Dialogues)

With reference to an e-mail from Prof. Tanaka (Thurs. 20 May 2013), the result may be described as follows: “Most of the universities and polytechnics are teaching standards to students at engineering faculties in their regular scientific and engineering courses. Many similar education courses for standards have been carried out at many Japanese academic education facilities.

Our organization, JSA, conducted a survey of standards education on two occasions, in 2005, and 2009, which covered the comprehensive education as well as partly education, wide variety of spectrum.

For the survey in 2005, JSA contacted with universities and 18 of them responded that they had 33 course of standards educations, the number of student was 2,700. (see Annex 2)

JSA then increased the contact points to 142 universities and polytechnics: 24 out of 87 universities and 13 out of 55 polytechnics responded that they had courses. Total number of students is 2,100 (universities 1,400 and polytechnics 700). It is very difficult to estimate the whole figures for Japan. If standards education covers part of the education in courses

for scientific disciplines, which I experience with my students, the number will be huge. But focusing on the narrower definition will come to the figure of the number as in the Excel table”.

### 1.1.2 BSN National Standardization Agency, Indonesia

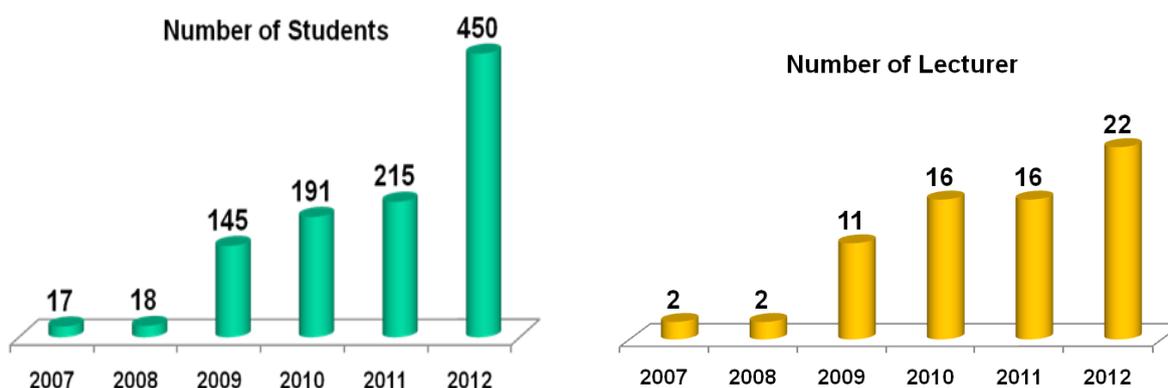
The development of the educational system for standardisation in Indonesia is closely connected with the EU-Asia Link project. The BSN together with professors of the Institut Teknologi Bandung became partners of the Helmut Schmidt University on the EU-Asia Link project.

As part of a master plan under the directorship of BSN, great commitment has been shown in establishing an educational infrastructure at universities in Indonesia. However, this commitment is not only directed towards universities but also includes primary, secondary and higher education.

The BSN has signed a memorandum of understanding (MoU) with 30 universities. Today standardisation is taught as a subject of study in 10 universities. There are 18 courses in standardisation (4 as stand-alone courses and 14 as embedded course elements).

Working with professors, BSN has developed (see Annex 17-28)

- a textbook as both a hard copy and CD, as well as an
- ONLINE COURSE (E-LEARNING ON STANDARDIZATION)



The number of courses has grown from two in 2007 to twenty-two in 2012. During the same period, the number of students participating rose from 17 in 2007 to 450 in 2012. The total number of students for the period 2007-2012 is 1,036.

To summarise, it may be stated that the BSN has succeeded in establishing an educational infrastructure for standardisation in Indonesia.

### 1.1.3 NIST National Institute of Standards and Technology, USA

On 14 January 2013, NIST issued an invitation to tender with the following aim:

**Funding Opportunity Description:** The Standards Services Curricula Development Cooperative Agreement Program provides financial assistance to support curriculum development for the undergraduate and/or graduate level. These cooperative agreements support the integration of standards and standardization information and content into seminars, learning resources, and courses. The recipients will work with NIST to strengthen education and learning about standards and standardization.

**Anticipated Amounts:** In Fiscal Year (FY) 2013, NIST anticipates funding approximately two (2) to eight (8) projects in the \$25,000 - \$100,000 range per year, with project performance periods of up to two (2) years, consistent with NIST multi-year funding policies (see Section II. of this FFO). Approximately \$200,000 may be available for new awards in FY 2013, subject to the availability of funds.

**The recipients will work with NIST** to strengthen education and learning about standards and standardization. Specifically, the recipients are expected to:

- 1 develop a curriculum for the undergraduate and/or graduate level to educate students about the impact and nature of standards and standardization so that they enter the workforce and/or continue their academic studies with a strong understanding and appreciation for the value and benefits of standards and standardization, in accordance with the supporting or advancing standards and standardization in the educational infrastructure evaluation criterion (see Paragraph (1) Technical Project Approach of Section V.1. Evaluation Criteria, of this FFO)...

This excerpt from the NIST invitation to tender and the project it aspires to particularly illustrates the reaction of the United States industry and economy to the development of the educational system for standardisation in Asia.

### 1.1.4 Korea, KATS Korean Agency for Technology and Standards and the KSA Korean Standards Association

(see "Integrating standardization into engineering education: the case of forerunner Korea". By Dong Geun Choi • Henk J. de Vries, Int J Technol Des Educ DOI 10.1007/s10798-012-9231-7)

Alongside Japan, Korea is currently one of the leading nations in academic education in the field of standardisation. Systematically and on the basis of five-year plans, there has been great success in establishing an academic infrastructure at Korean universities.

"Two organizations, the Korean Agency for Technology and Standards (KATS) and the Korean Standards Association (KSA), have played central roles in planning and operating the University Education Programme on Standardization (UEPS).

"The first KNSP 2001–2005 highlighted the importance of the systematic development of human resources for national and international standards activities. The Korean Government aimed to develop a stronger national standards capacity and to improve its effectiveness in national and international standard settings.

The second KNSP 2006–2010 was more specific in section 4.3, “Training standards experts and building expert network” and section 4.4, “Increasing awareness about standardization and strengthening promotion and education activities.” These two sections guided the Korean Government to expand the standardization program in its universities nationwide. As a part of the KNSP, it was envisioned that educating university students about the role and importance of standards may be crucial in enabling them to better play roles in their future jobs in companies, government, and academia.

The third KNSP 2011–2015 reaffirms the importance of human resources and presents specific objectives for education and training in one of the subsections of 4.2, “developing standards professionals and improving the capacity of the private sector.” It specifies the objective of educating 10,000 students in formal education from primary school to graduate school levels during the years 2011–2015.

The KATS has secured funding of approximately USD 5–8 million each year since 2005 for the UEPS implementation. That funding has enabled the KSA to allocate a few full time staff to develop and operate the UEPS program along with government and private sector experts. Around 30–40% of the UEPS funding from the KATS has been used for the KSA’s administration, textbook development, publications, organizing events, and surveys. The other 60–70% of the funding has been used for direct grants to each participating university, around USD 5–10 thousand for each semester course.

The KSA provides participating universities with a basic teaching syllabus, free common textbooks, a teaching manual, a lecturer pool and field trip contacts so that new participating universities and professors can easily and effectively implement a course on standards.

The KSA operates a UEPS website for efficient communications among professors and lecturers. The website provides professors and lecturers with teaching materials, references, a quiz, and a questionnaire for exams.”

**The result may be formulated as follows:**

Korea has presumably the largest number of university-level technical standards and standardization courses in the world: 81 courses in 41 universities in 2011.

The number of students stabilised in the years 2010 and 2011, at 3,957 and 3,883 students respectively.

The number of lecturers in the expert pool rose from 50 in the year 2005 to 294 in the year 2011. (see Annex 29-32)

### **1.1.5 APEC SCSC Strategic Education Program for Trade Facilitation**

The educational programmes illustrated here clearly show the status that standardisation currently occupies in Asia. Independently of the commitment of individual countries, a strategy crossing international borders has been under development from 2005 up to the present day aimed at preparing a uniform curriculum and teaching materials in particular, i.e. textbooks in the field of standardisation. (see Annex 33-40 and <http://www.wisestandard.org/>)

## **APEC SCSC Strategic Education Programme for Trade Facilitation**

Proposing APEC Economy: Republic of Korea Co-sponsoring APEC Economies: China, Indonesia, Japan, Singapore, Thailand, USA, Vietnam (7)

### **Brief Description of Project -- its purpose and the principal activities (including when and where):**

The importance of education on standards and conformance is highlighted in the 2006 APEC Ministerial Joint Statement: "Ministers recognized the importance of standards education and encouraged members to develop reference curricula and materials to address the significance of standards and conformance to trade facilitation in the region." This project addresses the Ministers' instructions stated above.

Phase I (2007) of this project, currently ongoing to develop reference curricula, conducted a survey on education activities and its result shows strong demands for reference materials:

1. The majority of Members, fourteen out of the sixteen who responded to the survey, have set up a national strategy to increase public awareness of the significance of standards; (e.g. Indonesia plans to expand its educational programme to 30 state universities, half of the total of 60, by the year 2010)
2. However, in implementing the national education strategy, the Members express difficulty in developing good textbooks in educational programmes and the need for cooperation in APEC to develop textbooks, particularly case studies and teaching manuals.

The purpose of this project phase II (2008~9) is to provide teaching materials for educational programmes on standards and conformance for member economies:

- 1) Since there are limited cases of textbooks on standards and conformance, it is a challenging task for individual economies to develop teaching materials, particularly for developing economies due to lack of experiences and resources. Also such individual developments will cause an overlap in the consumption of resources for the same goal.
- 2) In this sense, it is expected that the development of teaching materials in this phase II project will not only enable members to save time and efforts in the process, but also build fundamental bases for future standards education activities in the region, one which will increase public awareness in companies and public authorities in member economies, in addition to schools/universities, and thus contribute to trade facilitation in our region.

The key objectives of this Phase II project, for eighteen months from Jan 2008 to Jun 2009, are to develop practical textbooks and teaching manuals, rather than theoretical materials. The expected specific outcomes will be two textbooks and one teaching manual:

1. Textbook I - Basic Essentials

- Textbook I will provide essential information such as definition, history, process, general aspects, theory, key issues in the area of standards and conformance
2. Textbook II - Case Studies
    - Textbook II will highlight various aspects of standards and conformance in trade based on market practices, mainly for businesses and graduate students such as those studying for MBA
  3. Teaching manual
    - The teaching manual will provide guidelines for teachers /trainers on how to deliver the two proposed textbooks for different target groups.

The target beneficiaries of this project are university students and business communities:

1. University students undergraduate and graduate
2. Businesses, particularly SMEs - executives, managers and working level staff

However, the main outcomes of this project could be widely used in training various levels of interest groups such as policy makers, regulators and experts in private industry sectors to learn the area of standardization since the textbooks and teaching manuals contain essential contents on standards and conformance.

This Phase II project, with development of textbooks, will be the most crucial period for the maximum success of the project, as textbooks are a decisive factor in any programme of education and training. Ultimately, increased awareness of commonly accepted standards and conformance practices will make it possible for Member economies to derive associated benefits to foster industrial activities and facilitate trade as well as investment in the region.

### **Education Guideline 3: Textbook for Higher Education - Standardization: Fundamentals, Impact, and Business Strategy**

#### **Part I. Fundamentals**

Chapter 1 Definitions and Functions

Chapter 2 Lifecycles, Organizations, and Development Procedures

Chapter 3 Conformity Assessment

#### **PART II. IMPACTS**

Chapter 4 Economic Impacts - Macro Perspective

Chapter 5 Economic Impacts - Micro Perspective

Chapter 6 Legal Impacts

#### **PART III. BUSINESS STRATEGY**

Chapter 7 Standardization and Innovation

Chapter 8 Competitive Strategy

Chapter 9 Collaborative Strategy

Chapter 10 Two Case Studies of ICT Standard

(see ANNEXES 33-39)

## Summary

The development of teaching/study concepts for the subject area of standardisation has accelerated sharply in Asia during the past years.

Since the education offensive in the APEC states during the years from 2004 to 2010 in the field of standardisation, a paradigm change has occurred from the educational form of in-service training by means of short seminars towards education with a sound academic basis, graded according to Bachelor or Master courses of study. In the long to medium term, this concerted educational initiative by the APEC states will result in management in industry and commerce but also government officials in ministries and certification and testing institutions obtaining a sound academic education in standardisation. According to the existing teaching curricula, this will include not only technical, economic and legal but also social teaching contents and will, consequently, provide the future managers of these countries with an expertise in standardisation that will lead to a strategic advantage for the companies and hence to a stronger level of competitiveness for these countries. The expertise in standardisation will have an effect on the positioning of the companies in global competition and provide a foundation for decisions of industrial policy in the APEC states.

### 1.1.6 China; China Jiliang University (CJLU CJLU)

China was a partner in the EU-Asia Link project “Standardisation in Companies and Markets”, which ran from 2003/2004 to 2006/2011 at Helmut Schmidt University. Prof. Song Mingshun developed “The Undergraduate Programme in Standardisation”. The curriculum was organised into basic courses in engineering and technology, economics and management, fundamental courses related to standardization, theory and methods of standardization, field practice in standardization. More than 10 textbooks were prepared and an e-learning platform was established for standardisation.

The general objectives of the programme were to cultivate undergraduate skills in a basic knowledge of economics, management, law, engineering and technology, standardization theories and methods, and to develop their ability to draft, manage and implement standards. Since the year 2000, more than 800 students (2010) have completed the undergraduate program in standardization and about 95 percent of them are working in standardization jobs.

#### Future Developments:

(Dr. Wang Yiyi, Washington 2011)

To improve the degree of internationalization of higher education in standardization; to improve the standardization curriculum system and to widely promote the curriculum to other domestic universities; to actively develop the graduate programme in standardization.

#### Framework for the Future

- Theory:
  - To create a roadmap towards standardization theory research (the status quo, system and elements) and standard discipline
- Education - Master of Engineering:
  - To promote standardization education within the national education system
  - To make standardization a major in the Master course for engineering
- Standardization Certification for Engineers:

- Classifying the levels
- Training requirements for each level

As a result of this master plan, courses have now been set up at more than 200 higher education establishments.

### **1.1.7 ITU International Telecommunication Union, IEEE Institute of Electrical and Electronics Engineers, ISO International Organization for Standardization, UNIDO UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE**

In the following section excerpts have been taken from the websites of organisations that make reference to involvement in academic education in standardisation. The aim is to provide an overview of the activities at an international level. It should be explicitly pointed out that this is in no way connected with any value judgement of the commitment of the respective organisations. At a later stage, we will take a closer look at the services offered by the organisations. This will raise questions concerning the aims pursued by the organisations in their presentations and the extent to which these aims are beneficial to the promotion of academic education in the field of standardisation.

#### **1.1.7.1 ITU International Telecommunication Union**

(see <http://www.itu.int/en/ITU-T/membership/Pages/default.aspx> )

Raise the profile of your academic institution and see the advancement of your ICT innovations through worldwide recognition and adoption of global standards... ITU-T membership is an opportunity to directly influence the creation of globally recognized standards. Alongside the elevation of an institution's public profile, members enjoy unlimited access to ITU-T Standards and all ITU-T Study Groups. Participation in Study Group activity is especially beneficial, ensuring standards accurately reflect the outcomes of academic research.

#### **Joint ITU-IEICE-CTIF-GISFI Workshop on Education about Standardization Kyoto, Japan, 25 April 2013**

International Telecommunication Union ITU Kaleidoscope 2013

<http://www.itu.int/en/ITU-T/academia/kaleidoscope/2013/Pages/Joint-ITU-IEICE-CTIF-GISFI-Worshop-on-Education-about-Standardization.aspx>

Recognizing the important role international standards play in the Information and Communication Technology (ICT) field, and the key contribution academia makes by producing standards-minded graduates, the ITU Telecommunication Standardization Sector (ITU-T), the Institute of Electronics, Information and Communication Engineers (IEICE), Aalborg University's Center for TeleInfrastruktur (CTIF), and the Global ICT Standardization Forum for India (GISFI) are organizing the Joint ITU-IEICE-CTIF-GISFI Workshop on Education about Standardization to be held at Kyoto University on 25 April 2013.

The objective of the workshop is to collect elements to assist in the creation of guidelines for a Syllabus on Education about Standardization. The event targets an audience of ITU Academia Members and other academic institutions, research centres and

laboratories; international, regional and national standards development organizations (SDOs); international organizations and industry associations; and all other interested regional bodies, government representatives, private-sector players and individuals.

This workshop also builds on the outcomes of the Joint ITU-GISFI-DS-CTIF Standards Education Workshop held on 8-9 October 2012, with the objective of exploring the standardization curricula currently offered by different academic institutions.

The programme includes the second meeting of the TSB Director's Ad hoc Group on Education about Standardization.

Kyoto, Japan, 25 April 2013

Inaugural Speech... by Malcolm Johnson, Director, ITU

Since the new academia membership category was introduced in 2011 we have welcomed 55 universities join ITU, 38 in the Standardization Sector.

...We need to emphasize the importance of standardization in business and government circles to ensure that standards are implemented effectively, and so reaching the students of today is very important.

These young intellects are the experts of tomorrow who will drive the development of technologies, and hence the standardization process enabling these technologies' to have wide-spread adoption and interoperability.

In this context, "education about standardization" is related not to specific technologies, but rather to the process that can inform business executives, government officials, and students at undergraduate and graduate levels, on all aspects related to international standards, standardization processes, and standards development...

### **1.1.7.2 IEEE Institute of Electrical and Electronics Engineers**

Welcome to the IEEE Standards Education e-Magazine  
March 2011

(see <http://iee-elearning.org/outreach/mod/book/view.php?id=315>)

A publication for those who learn, teach, use, deploy, develop and enjoy Standards! The Editorial Board as well as the members of IEEE Standards Education Committee (SEC) are truly very excited to bring the inaugural issue of the IEEE Standards Education eZine to you.

We are launching the IEEE Standards Education eZine to keep information in front of those who are interested in education about standards. If you think creating/developing standards is an arduous process, think about those who do so many other things with the standards. Having a published standard is just the first step. It has to be used by the practitioners to really become a standard beyond the book. It needs to be taught to students, needs to be designed into products, tested for compliance, and celebrated for wide adoption and deployment. There are experiences that each of us encounter on our path to interacting with many standards in our daily routine. We need to share those. So, think of the IEEE

Standards Education eZine as a quarterly publication for those who learn, teach, develop, deploy, use and enjoy Standards.

The topics we intend to address include challenges and opportunities for teaching about standards in engineering curriculum. Of course, education does not end with colleges or universities. Continuing Education is an important part of our learning experience. We will invite various educators and practitioners to share their experiences and views on standards and their applications. Though we may focus on and use examples from various IEEE standards, you can apply the same information for other standards such as those from ANSI, IEC or any of the national standards.

IEEE is committed to:

- promoting the importance of standards in meeting technical, economic, environmental, and societal challenges;
- disseminating learning materials on the application of standards in the design and development aspects of educational programs;
- actively promoting the integration of standards into academic programs;
- providing short courses about standards needed in the design and development phases of professional practice.

Serving the community of students, educators, practitioners, developers and standards users, we are building a community of standards education for the benefit of humanity.

Learn more about the three fundamental dynamics of standards--technology, economics and politics, and enjoy our feature articles about the use, deployment, implementation and creation of technical standards.

Technical standards are formal documents that establish uniform engineering or technical criteria, methods, processes and practices developed through an accredited consensus process.

What are Standards?

Standards are:

- developed based on guiding principles of openness, balance, consensus, and due process;
- established in order to meet technical, safety, regulatory, societal and market needs;
- catalysts for technological innovation and global market competition.

### 1.1.7.3 ISO International Organization for Standardization

#### Education about standards

(see (<http://www.iso.org/iso/home/standards/standards-in-education.htm>))

International Standards bring technological, economic and societal benefits. They help to harmonize technical specifications of products and services, making industry more efficient and breaking down barriers to international trade. International Standards also contribute effectively to sustainability, by providing good practices on the use of technologies and the management of processes affecting economic, social and environmental aspects.

Educational institutions are increasingly recognizing these benefits and international standardization features in many curricula. We recognize the vital contribution educational institutions bring to raising awareness of standardization and its benefits, and are keen to support their work.

Some of the actions we have taken are highlighted below:

- - A repository of resources and teaching materials.
- - Awards to promote education institutions leading the way in standardization.
- - Organization (in partnership with IEC and ITU) of the World Standards Cooperation academic days.
- - Promoting cooperation between standards bodies and education institutions in developing countries.
- - Contribution to postgraduate courses.

#### Promoting cooperation between standards bodies and education institutions

As part of our work with members in developing countries we aim to better integrate standardization into educational curricula.

In order to do this we are:

- organizing a series of regional events supporting developing countries to set up or strengthen university courses on education about standardization,
- committed to developing a publication ("Good practices on cooperation between standards bodies and education institutions") based on the outcome of the above regional events.

More information can be found in ISO's Action Plan for Developing Countries.

The first regional workshop of this kind "Enhancing collaboration between national standards bodies and academia", was organized in Bali (Indonesia), on 7-9 May 2012. The workshop covered the South Asia and South-East Asia regions, and was co-sponsored by ISO and the national standards body of the Republic of Korea, KATS. The summary of the outcome of the workshop represents a first step towards the development of a general ISO publication describing guidelines and good practices on the matter.

At the ISO General Assembly 2012, held in San Diego (USA) from 17-22 September, a break-out session was devoted to Education and Standardization.

Click ISO Courses or follow simple steps below steps below:

**ONLINE ISO COURSES:**

- ISO 27001 Lead Auditor Training
  - ISO 22000: 2005 Overview of the Food Safety Management System
  - OHSAS 18001 Certified Auditor
  - ISO 14001:2004 Environment Management System Certified Auditor Training
  - ISO 9001:2008 Internal Auditor
  - ISO 14001: 2004 - Overview and Implementation
  - ISO 9001: 2008 - Benefits and QMS Requirements
  - OHSAS 18001:2007 Overview
  - ISO 9001:2008 Management Overview
  - Introduction to ISO 14000
  - Introduction to OHSAS 18001
  - Packages
- and more..

**Simple Steps:**

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2. Add course to shopping cart & checkout
3. Login & click on the course you purchased
4. Take course in one or multiple sessions
5. Pass quizzes & final exam
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## **1.1.7.4 UNIDO UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE**

### **Economic and Social Council**

(see <http://www.unece.org/trade/wp6/educationonstandardization.html>)

### **Recommendations on regulatory cooperation and standardization policies**

#### **Working Party on Regulatory Cooperation and Standardization Policies**

Rationale of "education on standardization issues" project (note from UNECE secretariat)

#### **Concept note for the Workshop on "Introducing standards - related issues in educational curricula", including a proposed model programme on standardization**

Following up on a recommendation to further education on standards-related issues, adopted in 1970 by the predecessor of the Working Party, the UNECE secretariat conducted a preliminary, informal review among universities and other higher-level academic institutions. The exercise revealed that very few of these institutions include standards-related issues in the standard curriculum of students majoring in technical and scientific subjects. Additionally, there are substantial differences in the curricula adopted by the few institutions that offer courses in this domain. The present document presents as an annex the first draft of a "model educational programme on standardization". With its 15 subject areas or modules, the model programme aims at promoting increased consistency internationally among educational programmes.

The UNECE secretariat hereby invites all interested experts from academia, governmental agencies, companies and international organizations to contribute to the further development of the model programme or supporting materials.

1. In 1970, the UNECE Government Officials Responsible for Standardization Policies, the predecessor of WP. 6, developed a recommendation that urged governments to include standardization in the curricula of educational institutions (see: [www.unece.org/fileadmin/DAM/trade/wp6/Recommendations/Rec\\_1.pdf](http://www.unece.org/fileadmin/DAM/trade/wp6/Recommendations/Rec_1.pdf).)
2. In the context of awareness - raising and capacity - building activities by the secretariat, a preliminary survey was conducted in countries with economies in transition and developed countries of the UNECE region. It revealed that more than 40 years after the adoption of the recommendation, very few universities yet include standards-related issues in the standard curriculum of students majoring in technical and scientific subjects.
3. A few programmes exist primarily in specialized institutions (usually, under the umbrella of State standards bodies) offering a high school diploma in areas such as standards, certification and metrology.
4. An analysis of such courses showed differences in the underlying educational approaches. For example, in Western Europe standardization is dealt with primarily from the point of view of companies, whereas in the countries of Eastern Europe, the Caucasus and Central Asia, it is dealt with from the point of view of regulatory authorities. Almost none of the existing programmes deal with flanking issues such as metrology and market surveillance.

5. This document presents in annex the first draft of a "model educational programme on standardization". With 15 subject areas or modules, the model programme should ideally cover, in a logical order, the minimum set of issues that a programme on standardization should contain to give a student a general understanding of the major standardization, regulatory and related issues relevant to the activities of business and of regulatory and administrative authorities.
6. This programme would be for implementation by general university level academic programmes (bachelor and master) in economics, business administration and law, rather than to specialized training in standardization. While the model programme aims at establishing a core curriculum, the specific set of issues and the time allocated to each area would clearly have to be tailored to the needs of a specific educational institution and programme.
7. The first draft of the programme was prepared in February 2012 in consultation with a group of experts from educational institutions from Europe and CIS region. The draft was then presented at various forums: at the April 2012 Geneva meeting of the DCMAS

(Network on Metrology, Accreditation and Standardization for Developing Countries), at the May 2012 ICES (International Cooperation for Education about Standardization).

## **1.2 Standardisation education infrastructure in Europe**

In January 2008 we ( HSU-HH ) undertook a short study of education in the field of standardization in Europe. The results are shown below.

Evaluation: January, February 2008

- Of 360 addressees (230 SIIT mailing list members and 130 EURAS mailing list members) 27 answered the questionnaire.
- Of 27 responses; 10 came from Germany, 3 from the Netherlands, 1 from France, 1 from Italy, 4 from Greece, 1 from Sweden, 1 from UK, 3 from the USA, 1 from Canada and 1 from India.
- 23 responses came from universities, 1 from a Ministry, 3 from other institutions, none from colleges or related institutions.

Results of Questionnaire – An Overview – Lectures/Courses

- Master Course – Standard diffusion, standardisation governance, standardisation in SMEs, standardisation in networks.
- Applications: E-business standards, Web Services and Service-oriented architectures (SOA). Every winter semester, 4 hrs/week; 40-50 students.
- Standardization part of Innovation Economics and Policy courses-strategic aspects of standardisation, 2 hrs/week, 20 students.
- Law of technics – Standardisation – 6 hrs/week, 100 students.

- Course on E-Government - technical and organisational interoperability – standardisation  
5 hrs/week, 20 students.
- Development of IT Standards and E-Business Applications, Electronic Business, 4 hrs/week, 20 students.
- Course option in Master degree – Standardization in Companies and Markets. Two trimester 2hrs/week; 10 – 15 students.

As you can see, the emphasis of the courses varies considerably from university to university, (Please see also the statistics results).

It ranges from

- standardisation governance
- strategic aspects of standardisation
- Development of IT Standards and E-Business Applications.

Student numbers and also teaching hours per week also vary.

To summarize, we are dealing here with a very heterogeneous education concept, both in terms of range and content.

It must be recognized that training and education in the field of standardization is now a global business, rapidly gaining importance. As more and more education concepts are developed in universities, for example, in Asia, USA, Latin America, the traditional providers in Europe are facing stiff competition.

As well as this increasing competition, there is an increasing need for highly qualified staff in industry and commerce in the sector of standardization.

In my opinion this must be the main task for the universities in the future, in close cooperation with Ministry, both industry and commerce as well as progressive standardization bodies.

**To summarize:**

**No uniform concept of the EU standardization education system exists.**

### **1.2.1 Development of the Joint Working Group Education about Standardization (JWG-EaS)**

Let us refer to the present development in Europe: after more than 10 years, the decision-makers of the European standards bodies established a working group bearing the title “Joint Working Group Education about Standardization (JWG-EaS)”. In April 2013, the first results of the work by this group were presented in the form of a master plan (13 pages) and an implementation plan (11 pages). It can be observed that the overwhelming majority of the projects have not been defined, either in terms of activities, personnel capacity, financing structure or in the securing of finance. Furthermore, the academic community is essentially excluded from the JWG-EaS, as can be seen by the constitution of the group.

Membership composition of the Joint Working Group Education about Standardization (JWG-EaS),

Universities		4
Companies		3
Federation of Industry		2
National	Standards	20
Organizations		
European	Standards	6
Organizations		
International	Standards	1
Organizations		
TOTAL		36

Of the 36 participants, 27 represent standards organisations, 5 industry and companies while 4 members are from universities. The expertise profile of the group raises serious questions about the development of a sustainable academic infrastructure in Europe.

Individual teaching concepts of the national standards bodies are shown here in detail as examples:

### 1.2.2 AFNOR Teaching and Information Tools

“France: AFNOR’s objective for the period 2011-2015: “Develop, in a structured manner, education on standardization at high education level as well as for technological and professional education level” Develop partnership with the main actors of the education system: Ministry of Education (April 2008), Technological Institutes Association (October 2008), Engineers and Business Schools Association (June 2009), Ministry of Higher Education and Research (current).

Launched in November 2010 in partnership with the Ministry of Education and designed in close collaboration with teachers, this website offers teachers a series of downloadable turnkey teaching resources on the subject of standardisation and certification, such as knowledge bases and teaching applications in line with official programmes.

[www.enseignant.afnor.org](http://www.enseignant.afnor.org): already over 3,500 people registered”. (see Annex 41-44)

### 1.2.3 BSI Education actively approaches all ages and all educational levels

“Welcome to the British Standards Institution education site.

Standards make our lives easier, safer and healthier. Without them, everyday actions we take for granted would be unpredictable. Standards help to make many of the products we use safer and more reliable. Once you are familiar with the idea of products meeting Standards, it will help you to understand how Standards are met in order to keep us safe and sound.

Play our interactive game Standard Eyes to find out more

About this website

Design and technology work at school often involves producing designs for real-life problems such as designing packaging for an existing product, or proposing ideas for larger

concerns such as safety in playgrounds. Normally, the solutions you develop would be made as models in the classroom. However, if they were to be produced commercially, for instance in a factory, the process of standardization and testing would be used. This is to ensure that the end product is consistently safe to use and is reliable.”<http://www.bsieducation.org/Education/11-14/default.shtml> (see Annex 45-50)

#### **1.2.4 Technical University Sofia, Bulgaria**

“I succeeded in gathering information about the subjects on standardization in our University and 1 subject in the University of Plovdiv.

Subjects on standardization are taught in the Faculty of Economics and the Faculty of Mechanical Engineering. The data concerning subjects in the Faculty of Economics are approximate but those related to the Faculty of Mechanical Engineering (some of them are taught in English language) are exact. In the Excel table I wrote the total data. If you need separate data for subjects and faculties I can send you.

I have no information if subject on standardization is taught in other universities in Bulgaria. But Quality management I think is studied in most of the Bulgarian universities. In the data I give you I did not include subjects in Quality management.

Standardisation has been taught as a subject of study at the Technical University Sofia since 2003. During the year 9 courses with a total of 285 students have been held.” (see Annex 2-3)

#### **1.2.5 DS Danish Standards Foundation**

Here are the numbers from Denmark. They are based on courses in which standardization is described as being part of the curriculum, guest lectures Danish Standards have given and courses that I personally have knowledge of.

I’m afraid I only have the numbers for 2010 and 2012, since these are analysis performed by me (and Katrine). There is no data for the other years since no one has done this study in Denmark other than us.

It is worth to mention that in:

2010: 6 courses focused mainly on standardization in general (e.g. standardization and patents) and 1 course was completely about standardization. The rest of the courses focus mainly on areas of standards e.g. CSR and ISO 26000 or standards in regard to IT-safety, and less on standardization in general; however none of the courses focus completely on a/one standard.

2012: 13 courses focused mainly on standardization in general (e.g. standardization and patents) and 2 courses were completely about standardization. The rest of the courses focus mainly on areas of standards e.g. CSR and ISO 26000 or standards in regard to IT-safety, and less on standardization in general; however none of the courses focus completely on a/one standard. (Email Mo 13.05.2013 18:27)

Development of the educational system in Denmark may be regarded as unusual. Within a few years, a large number of courses on standardisation have been prepared and carried out at higher education establishments.

In 2010, 86 courses with 1,290 students were conducted and in 2012, a total of 1,760 students successfully completed 177 courses. (see Annex 2-3)

### **1.2.6 DIN academic education**

The teaching module »Strategische Normung [Strategic Standardisation]« at the Chair of Innovation Economics at the Technical University Berlin is run every semester by DIN and regularly attended by more than 50 students from different disciplines. Contributing to the success of this teaching module are the numerous guest lectures by representatives from companies actively involved in standardisation and other organisations participating in standardisation as well as the very distinct practical orientation of the lectures and the possibility to take part in a number of committee meetings for standardisation with DIN as part of the exercise. Further activities in this direction are the lectures on the topic of »Strategic Standardisation« which DIN staff hold at the Beuth-Hochschule für Technik Berlin, Hochschule für Technik und Wirtschaft Berlin, Potsdam University as well as the Bielefeld University of Applied Sciences. DIN is also actively involved in the European working group »Education about standardization«. (see EINFLUSS-SPHÄREN Geschäftsbericht 2011 [Spheres of Influence, DIN business report 2011]) (see Annex 51-53)

### **1.2.7 TU Clausthal**

Furthermore, since 1983 Clausthal University of Technology has been offering a lecture course entitled "Technische Normung, Inhalte, Methoden, Auswirkungen" [Technical standardisation, contents, methods, effects] as a compact lecture unit. The teaching module covers 2 hours per week and thus corresponds to 3 ECTS credits. (see Annex 53-59)

### **1.2.8 Helmut Schmidt University**

At the Helmut Schmidt University a Chair of Standardisation and Technical Drawing/CAD was established for the first time in Germany. The courses of Standardisation in Companies and Markets I+II were taught here until the retirement of Professor Wilfried Hesser. (see Annex 66-71)

#### **Teaching concept:**

The use of standardisation in industry and commerce as well as general principles of standardisation in a global world.

1. Importance and applications of standardisation in industry and commerce
2. General principles of national and international standardisation. Bachelor and Master theses on selected topics and an oral examination (30 min.)

#### **Learning objectives:**

- To acquire an understanding of the interrelations in the various areas of the production and business processes in which standardisation has an effect.
- To create an awareness of standardisation against the real background of global industry and commerce by showing how strongly standards affect people's fields of life and work.

The subject of standardisation in companies and markets was offered as an option in the Master's courses for Mechanical Engineering and Industrial Engineering (7<sup>th</sup> and 8<sup>th</sup> term) and as an interdisciplinary module in all Bachelor and Master courses not involving engineering.

From 2004 to 2010, the EU-ASIA Link project was conducted under the responsibility of Prof. W. Hesser as project manager. The EU-ASIA Link Project (2004 to 2010) was the first step. Together with Asian universities and the Erasmus university, financed by the EU Commission but also promoted by the European standardization bodies and ISO, as well as partners from industry and commerce, we have developed a teaching concept for standardization. It is based on a modular system, with interdisciplinary content. At the same time, we published the curriculum as a textbook. For the first time we are able to provide an educational concept at master degree level, also available online. (see Annex 69-70)

To summarize, it can be stated that today there is still no common strategy for a European academic education system even though the EU Commission, CEN, CENELEC and ETSI despite the effort that has gone into proclamations to this effect. An examination of the websites of AFNOR; BSI and DIN made this extremely clear. The focus is obviously on publicity for the institution and the standard as a product, especially on the web pages dealing with academic education. During the running of courses at higher education establishments, too, traditional concepts from the past with in-service training by means of short seminars are being introduced into university teaching. This is illustrated most clearly by the DIN teaching concept at TU Berlin. Since 2004, the lecture course has been planned, designed and run by a representative/employee of the national standards body DIN e.V. The result is that of the 12 to 13 lectures, 8 are given by representatives of the national standards body or by representatives of industry and commerce. This objection is not being levelled at the qualifications of employees of national standardisation organisations but is based on the principle of independence for teaching and research, which certainly applies in Germany. (see Annex 60-63)

This procedure by an NSB, i.e. establishing standardisation as an option in a Bachelor course, is reminiscent of the antiquated guilds-based training model of the 20<sup>th</sup> century. It is guided by interest and mainly serves to pursue the provider's own commercial interests and not least to limit competition.

Through the teaching matter, the standardisation institutes secure the authority of definition on standardisation for themselves and do not wish to relinquish this. It is all the more important to clearly draw attention to the fact that this does not serve the interests of academic teaching and research but instead tends to indicate a preservation of old structures and patterns of thought. In this way standards bodies are presenting themselves as retainers of old traditional structures and ideologies.

The challenges of a globally operating economy cannot be met with a traditional, handed-down teaching concept of "training on the job". Whereas it was sufficient to interpret and convey standardisation as an instrument of rationalisation in the 20<sup>th</sup> century, the demands of the 21<sup>st</sup> century make it necessary to develop and apply standardisation as a strategic instrument. Where, apart from at a university, is it possible to conduct research and teaching on standardisation as a strategic instrument in global competition. The development in Asia in the field of education for standardisation should be seen as a challenge to the old world. We stand on the foundations of standardisation that our grandfathers and fathers built

up in Europe over 100 years and are clinging to old structures, contents and models in the field of standardisation. The necessary transformation to academic teaching in Europe is not being appreciated and hence not implemented. Preserve, retain and safeguard advantages is the prevailing principle. Over the past 10 years, commercial interests and fierce competition among the individual standards bodies have resulted in the loss of a leading position in academic education. During these years, Japan, Korea, Thailand and China, even a country such as Indonesia, have established an academic educational structure, a teaching concept and uniform teaching material on standardisation at higher education establishments with remarkable speed. They have thus laid the foundations for the global competitiveness of their societies and particularly of their companies. The future managers from Asia will master standardisation as a “strategic instrument” in its full complexity, both in theory and in practice. The traditional, handed-down education in Europe must be recognised as a significant deficit in the skills profile of European managers.

### **1.3 The trend and the current approach within CEN/CENELEC/ETSI for implementing an infrastructure for education in standardisation**

Here is a brief overview of the contents of the CEN/CENELEC ANNUAL REPORT 2010, page 26/ and 2011.

#### **Education about standardization**

“Following two meetings of an ad hoc CEN Group on the topic of education about standardization during 2009, the CEN/CENELEC-ETSI Joint Presidents Group at its December 2009 meeting endorsed the creation of a Joint Working Group (JWG) of all three ESOs on the topic. The CEN/CENELEC-ETSI JWG Education about Standardization (JWG EaS) met three times during 2010.”/CEN/CENELEC ANNUAL REPORT 2010, page 26/

“The European Standards Organisations and their national members are committed to strengthening their links with universities and other educational institutions, in order to ensure that relevant information about standards and standardization can be included in educational curricula. This should be done across a wide range of subjects in which such knowledge could be of relevance and value to students. The CEN-CENELEC-ETSI Joint Working Group ‘Education about Standardization’ (JWG-EaS) met three times during 2011. A questionnaire, which was circulated to CEN and CENELEC members in November 2010, resulted in several members contributing information about relevant national initiatives, providing a basis for examples of good practice to be selected and shared. In April 2011, the Joint Presidents Group (JPG) endorsed the CEN-CENELEC-ETSI policy on Education about Standardization developed by the JWG-EaS – to serve as guidance material for the ESOs and their members to follow in matters concerning education about standardization. Steps toward the practical implementation of the policy elements resulted in the development of a model curriculum for educational establishments, which was finalised in June 2011. Work was also started on a curriculum addressing vocational education. The close contact with ICES (International Cooperation for Education about Standardization) was maintained through the participation of the Seconded European Standardization Expert in China in the ICES 2011 annual conference held in Hangzhou.”/CEN/CENELEC ANNUAL REPORT 2011/

### **1.3.1 Current status and development, April 2013:**

The CEN-CENELEC-ETSI Joint Working Group on Education about Standardization was founded in 2010 and on 10 June 2011.

The actual work, i.e. the drafting of the following Master Plan and Implementation Plan, took place as from mid-2011, promoted by publication in 2011 of the white paper “Academic Standardisation Education in Europe”. The results presented to date are as follows:

#### **Masterplan on Education about Standardization (page 1 to 13)**

##### **Executive Summary**

At a time when knowledge is increasingly abundant and innovation eco-systems are opening, it is crucial to raise awareness and spread knowledge about standardization as a powerful tool to bring new technologies to market and drive future businesses.

Some initiatives have been developed and launched in several European countries in order to foster education about standardization. However, a significant scaling-up is required so that, all over Europe, public authorities and educational institutions are aware about the benefits of education about standardization and include courses and trainings about standardization in their curricula.

CEN, CENELEC and ETSI, the three European Standards Organisations, are committed to promote and support education about standardization. This Masterplan on Education about Standardization defines a framework for action with European level leadership, initiatives and vision, which is also intended to support the national level in the member countries.

In section 2, benefits of standardization and education about standardization are highlighted. Key stakeholders are identified in section 3. The overall approach is explained in section 4. It envisages three workstreams: ‘Build Capacity’, ‘Engage key stakeholders’ and ‘Reach target groups’. Finally, a high-level breakdown of the overall work programme is given. Key elements are governance, coordination and concrete work areas which are ‘Analysis’, ‘Events’, ‘Consultation and Partnering’, ‘Teaching’ and ‘Projects’.

This Masterplan is complemented by an Implementation Plan describing the specific actions which will be run in the first year after the adoption of the Masterplan.

#### **Implementation Plan (page 1 to 14)**

This Implementation Plan is based on the approach and structure defined in the Masterplan. It identifies 15 actions for education about standardization in support of the Masterplan in 2013, the first year of implementation of the Masterplan. The Annex of the Implementation Plan details these 15 actions and also gives a brief outlook on the following years.

##### **Governance**

A European Stakeholder Steering Group (ESSG) will provide a top-level structure, representing all relevant European stakeholders to ensure appropriate support to the Masterplan and provides guidance and recommendations.

### *1. Action: Create a European Stakeholder Steering Group*

#### **Management**

The Joint Working Group Education about Standardization (JWG-EaS) will drive, coordinate and oversee European support and initiatives at European level and foster the creation of national structures. It will set-up Task Forces to accelerate joint work when needed.

1. Action: Refocus and empower the Joint Working Group's so that its aims and activities support and provide the driving force for the Masterplan
2. Action: Establish needs in order for members to create national EaS structures
3. Action: Implement an outreach plan for the Masterplan
4. Action: Identify cooperation partners

#### **Analysis**

A Strategic analysis will ensure that future Implementation Plans are steered in the most effective direction.

1. Action: Perform a gap analysis of education about standardization
2. Action: Make an inventory of current teaching
3. Action: Identify the barriers to standardization education, define objectives, formulate solutions

#### **Events**

Raise awareness and support for education about standardization and discuss best practices through involvement with relevant stakeholders.

4. Action: Host the ICES 2013 conference
5. Action: Host the EURAS 2013 conference

1 International Cooperation for Education about Standardization 2 European Academy for Standardization

#### **Consultation & partnering**

Ensure the involvement of key stakeholders, including business, educators and trainers. Partner with other formal or informal SDOs as appropriate.

6. Action: Identify (and define strategies to engage) key European stakeholders
7. Action: Establish a European EaS network
8. Action: Initiate a dialogue with relevant EC services to get Member State support for the Masterplan

## Projects

In order to ensure results, both in the short and long term, fast track and high impact actions should be executed at national level, and supported by 3 the European level. Projects to involve and directly work with target groups may also be setup at European level.

9. Action: Establish Task Forces (under JWG-EaS) to explore needs and feasibility and foster initiation of a series of projects having fast and/or high impacts

## Teaching

Ensure that standardization is taught throughout Europe and that a basis for standardization as an academic discipline is developed.

10. Action: Refine and extend the existing repository of teaching materials

The content of these two documents provides an overview in the sense of a skeleton plan for establishing an organisational structure at European and national level under the responsibility of CEN-CENELEC-ETSI and the national standards bodies. Individual measures have been implemented, such as Action 2: Refocus and empower the Joint Working Group's so that its aims and activities support and provide the driving force for the Masterplan. Actions 9 and 10 are on track; Host the ICES 2013 conference and Host the EURAS 2013 conference.

## **The description and planning of individual projects, their required capacities and financing are still not available.**

Furthermore, it would appear important to reiterate that the members of the Joint Working Group Education about Standardization (EaS-JWG) essentially comprise members of national (20) and European (6) standards bodies. Universities and companies in Europe are represented by 4 and 3 members respectively.<sup>2</sup>

Let us compare this with the composition of the Group "Neue IKT-Curricula für das 21. Jahrhundert" [New ICT Curricula for the 21<sup>st</sup> century] which comprises 11 members from companies, 30 from universities and one from CEN.<sup>3</sup>

The reason for this imbalance in the involvement of European universities in the Joint Working Group Education about Standardization (EaS-JWG) is given as the delegation authority of the national standards bodies, which states that the national standards bodies and CEN determine who is accepted as a member of the EaS-JWG. Furthermore, no travel expenses are refunded, which will be a future criterion for excluding the participation of university teaching staff (cf. Section 8).

This may lead to the following deductions:

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<sup>2</sup> The CEN-CENELEC-ETSI Joint Working Group on Education about Standardization comprises 36 members: Universities 4, Companies 3, Federation of Industry 2, National Standards Organizations 20, European Standards Organizations 6, International Standards Organizations 1, TOTAL 36.

<sup>3</sup> Guidelines for curriculum development. New ICT curricula for the 21<sup>st</sup> century: developing tomorrow's education. Luxembourg: Office for Official Publications of the European Communities, 2001. ISBN 92-896-0073-X. Members of the working group: Companies 11, Universities 30, CEN 1.

- Academic expertise in standardisation is being deliberately excluded in order to safeguard the authority of definition over the contents on curricula on standardisation in the future as well.
- Vocational training<sup>4</sup> is currently performed throughout Europe by the national standards bodies. An academic structure in Europe could endanger the monopoly of the NSBs.

If we remember that the CEN-CENELEC-ETSI Joint Working Group on Education about Standardization was founded in 2010 and on 10 June 2011, the results produced to date may be regarded as very limited.

The objective of the NSBs is to achieve a monopoly of teaching and research in order to counteract a critical attitude towards the focal areas of research and teaching contents.

This course of action will specify a framework for interpreting and defining standardisation that is fundamentally suited to monopolising the teaching contents within the subject of standardisation.

A key criterion for this is the “auktorialer Gestus” or omniscient attitude of the NSBs, even though they are among the most important NSBs worldwide. Consequently, this concerns issues of the institutional conditions. Another reason is certainly that the object affected here – the contents of teaching – are of special importance for the identity and identification of the decision-makers of the NSBs.

The question facing society continues to concern the extent to which NSBs should have responsibility for establishing an academic structure in Europe on the basis of their statutes (contract between Federal Republic of Germany and DIN e.V.).

### 1.3.2 EURAS and its stance on academic teaching

In accordance with its statutes, EURAS has the assignment of setting a **Standard for good teaching** in Europe and bears the responsibility for this, independently of ideologies and dogmas of national, European and international standards bodies. EURAS and hence academic expertise has to specify the quality criteria for teaching in the field of standardisation at universities at the level of Bachelor and Master courses of study.

A quotation from the EURAS statutes of 1993:

*“What are the main objectives of EURAS with regard to teaching in standardisation?”*

*The education of standardization at secondary and tertiary level has been much neglected in the past.*

*EURAS has set itself the objective of promoting the establishment of courses and programmes on standardisation in higher education. It also intends to support the founding of*

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<sup>4</sup> In Germany, higher education establishments are required by law to conduct vocational training.

*additional academic chairs in standardisation in order to achieve an improvement in the facilities for creating academic impact.*

*Another declared objective of EURAS is to play an active role in developing an interdisciplinary colloquium for the teaching of standardisation. For this purpose EURAS will propose, draft and coordinate contributions to this colloquium for all relevant disciplines.*

*The fundamental international orientation of EURAS and the use of the network principle are ultimately directed towards the main objective of EURAS, namely the development of a truly European programme for teaching in standardisation.”*

It should be pointed out that EURAS has not yet implemented the objectives relating to teaching in standardisation, as specified in the statutes dating from 1993<sup>5</sup>.

This makes it all the more urgent for EURAS members to take part in the current discussion concerning an academic curriculum. The existing barriers such as travel expenses and the delegation right of the national NSBs on participating in the Joint Working Group Education about Standardization (EaS-JWG) should be carefully scrutinized (cf. the participation of universities in the development of curricula “New ICT Curricula for the 21<sup>st</sup> Century”).<sup>6</sup>

### **1.3.3 Barriers to a uniform academic structure for standardisation in Europe**

The existing barriers to an academic infrastructure in Europe are multi-faceted but are mainly determined by three agents:

#### **Barriers arising through universities**

- Decentralised organisation of the education system in the overwhelming majority of European states.
- Independence and self-determination of the universities, faculties and professors in Europe.
- Lack of recognition and scientific reputation of teaching within the academic and social community.
- Fundamentally, too few qualified academic teachers for the subject of standardisation.
- Lack of professionalism in the use of digital media in teaching. This demand for expertise is in keeping with contemporary developments in university didactic methods, which is an indispensable requirement for the appointment of a professor.
- Research and teaching are the core of an academic education. Insufficient research funds do not offer any incentive for professors to become involved in the teaching of standardisation.

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<sup>5</sup> See Statutes in the Annex

<sup>6</sup> Guidelines for curriculum development. New ICT Curricula for the 21<sup>st</sup> Century

### **Barriers arising through standards bodies**

- The decentralised structure of the European standardisation organisation represented by the national standards bodies.
- The independence from state influence on the objectives of the NSBs.
- The commercialisation of the standards bodies in Europe.
- No obligation of accountability for their actions vis-à-vis the European Community.
- The competition and competitive strategies of individual standards bodies in Europe, i.e.:
  - A focus on the competitiveness of the body's own competitiveness to the detriment of their members in European industry and commerce.
  - A focus on the body's own competitive ability while ignoring the European objectives to the detriment of the Community.
- A conviction in their own efficiency and competitive ability and the resulting manner of individual standards bodies in Europe.
- A conviction in their own efficiency and competitive ability and the resulting incorrect assessment of development in the academic educational system in Asia.

### **Barriers arising through the European Commission**

- The incorrect assessment of decision-makers in the European Commission DG Enterprise and Industry of the development of the academic educational system in Asia (during the period from 2000 to 2011).
- The lack of a sense of responsibility for the urgent need to promote an academic educational structure for standardisation in Europe.
- The concentration on and hence lack of independence of the European Commission DG Enterprise and Industry from the European standards bodies.

## **2 University teaching and vocational training**

The following are some remarks on the distinction between vocational training and a university education.

An important decision has to be made in the discussion surrounding an academic curriculum and this concerns the distinction between teaching at universities in the field of standardisation and the vocational training sector, which is currently being organised by national standards bodies.

Continuous vocational training is every educational measure that supplements or extends prior vocational knowledge and training. It takes place in the form of organised

learning. It is preceded by earlier phases of education and interim periods of professional employment. (see ([http://de.wikipedia.org/wiki/Berufliche\\_Weiterbildung](http://de.wikipedia.org/wiki/Berufliche_Weiterbildung), 16.03.2013)

Alongside prevocational training, vocational training and professional retraining, further education is a subdivision of technical and vocational education and training. ...further education is directed towards those qualifications that have already been acquired in a skilled occupation. It should be retained, extended, adapted to technical development or expanded in such a way as to enable professional progress. The qualifications acquired through further education are generally demonstrated by examinations conducted by the relevant offices (usually Chambers of Handicrafts or Chambers of Industry and Commerce). (<http://de.wikipedia.org/wiki/Fortbildung>, 16.03.2013).

## 2.1 Principles for study and teaching

The principles for study and teaching represent guidelines and quality objectives for the refinement of existing Bachelor and Master courses and the development of new courses. New courses to be offered at universities are designed and approved by faculties in development processes and in internal inspection processes and accredited externally.

The strategic objectives and the principles for study and teaching derived from them result from the university's mission statement which thus provides a guiding framework for the development of the university.

The Bologna Process has contributed to a sharpening of awareness for strategic concepts in which the universities redefine their objectives for study and teaching on the basis of the way they perceive themselves and their previous achievements.

The conversion to a graduated qualification system, the modularisation and the view of studies with the character of providing a professional qualification are increasingly giving cause to scrutinise the quality of teaching and study. Nevertheless, it is necessary as part of the structural reform to develop a new **student-centred** culture of teaching and learning in higher education establishments at an elevated level.

Sustainability is the foundation for the development of curricular approaches to allow students to experience the link between research and teaching as the core of an academic education and open up the door to academia.

Furthermore, a number of indispensable features are able to describe a commendable teaching/study culture. These include the professionalisation of the teaching, a consideration of the heterogeneity of the students, time-related and legal freedoms for students and teachers as well as the transparency for the business of teaching and learning.

In order to raise the status of standardisation in university teaching and underline the importance for the future development of Europe as an academic location, it is essential to develop excellent teaching for the field of standardisation.

What is sought here are strategic learning concepts in which the universities recognise their objectives for study and teaching on the basis of the way they perceive themselves. It is necessary to explain how the attractiveness of the educational

establishment – especially for special courses – can be substantially increased through the subject of standardisation.

This approach promotes an improvement in teaching in the field of standardisation for the Bachelor courses, with the aim of achieving intelligently designed curricula and a good balance between the teaching of basic and specialist knowledge.

The objective is to develop and describe a core curriculum in Europe for the different faculties and subject areas/courses in order to guarantee uniform quality in teaching and, in particular, the freedom of mobility and choice for students in the subject of standardisation at different higher education establishments in Europe.

In this context, it can be assumed that there has previously been a lack of teaching culture in the field of standardisation at higher education establishments in Europe.

Furthermore, the objective should be to create incentives for new and at the same time exemplary subjects of study in the field of standardisation, which are aimed at conveying basic knowledge and an ability to see the bigger picture, in keeping with the academic specialisation offered. Work should be directed towards establishing university alliances that coordinate their curricula with each other so that students are not only able to move easily between the participating universities but are also motivated to do so.

At the same time, universities or faculties should be encouraged to form cooperation agreements in order to jointly establish the subject of standardisation or even a new course in standardisation in a certain faculty or discipline.

Because the individual faculties/disciplines have different ways of working, general conditions and scope for action, the implementation of standardisation as a subject of study or course should be coordinated as closely as possible with the specific discipline. What is particularly required is interdisciplinary collaboration with a skills-centred and problem-oriented approach and, additionally, the establishment of cooperation agreements and partnerships extending beyond national boundaries.

For motivated students there is no doubt that they should be able to specifically select different locations or university chairs where they can acquire certain subject specialisations or methods. In particular, it is necessary to convey the variety of standardisation as a subject to students. If this important element of variety is neglected in education, it will jeopardise the international competitiveness of European students.

A newly established network (Internet platform) between the faculties or professors should assist and promote a change of location.

To allow the faculties to mutually recognise each other's credit points, the professors of the various universities must arrive at similar assessments for comparable teaching programmes.

A comparable teaching programme offers a core curriculum to be developed jointly, corresponding to the framework directive. This core curriculum for the subject of standardisation should be provided with a defined intersection to all involved focuses of study. This will be facilitated by a common Internet platform via which the individual faculties/institutes/academic chairs will be able to supply information on the possible combinations in individual subjects.

Another focus of promotional effort should be international conferences, workshops and symposia to provide thematic support. The aim is to establish a discussion forum/platform for cross-border comparisons with such events and to force the pace of the debate on focal points in the subject matter in the field of standardisation within the individual disciplines in which examples of good teaching are presented, experience is exchanged and important aspects of teaching in the Bologna Process are discussed.

Different subject-related focal points could be: engineering science, humanities and social sciences, business administration, economics and law.

The objective should be to invite committed teachers to develop key contents in the subject of standardisation for Bachelor and Master courses. The aim is always to create more stimulating and intelligently coordinated study units in which the students learnt to deal with their knowledge in a manner appropriate to the respective discipline.

The curricular principles of a lecture in vocational education<sup>7</sup> include three aspects:

- \* scientific orientation
- \* situational orientation
- \* personality-based orientation

The curriculum:

- 1 contains the knowledge of the subject area,
- 2 is self-contained and up to date,
- 3 provides an outlook into the future development of the subject area,
- 4 is not interest-led and therefore independent,
- 5 reflects the social relevance,
- 6 is prepared didactically according to the state of the art,
- 7 is linked to the anticipated competency level of the listeners,
- 8 is directed towards the objective of developing skills.

The vision of **good teaching** also has to provide answers to the following questions:

- What objectives do we associate with the lecture?
- What learning objectives are to be achieved?
- What are the students intended to learn?
- In what ways can students acquire the knowledge independently?
- What exercises can be used to convey the teaching/study objectives?
- How can an examination be designed so that the students are motivated to continue learning?

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<sup>7</sup> After Lothar Reetz, <http://www-user.uni-bremen.de/~sept/current/deutsch/Pdf/Material/Ma-A/Ma-A-II.pdf>

In future, it will be also be especially important to promote the independent commitment of students. This may, for example, be the setting up of a cross-border support programme in the subject of standardisation by means of peer tutoring (students advise other students/their fellow students independently)<sup>8</sup>.

In conclusion it should be pointed out that communication will be the decisive tool in setting up standardisation as a taught subject at higher education establishments, i.e. repeated explanations are needed of the potential that standardisation has for strategic management within a company and the importance that standardisation has for the existence and competitive ability of Europe.

All in all, a sustainable infrastructure has to be created in Europe, which supports and strengthens all the relevant aspects of university teaching in standardisation as a subject of study.

### **3 Academic education**

An academic education is competency-oriented and research-based. The close link between teaching and research offers the foundation for qualitatively high-value teaching, for “excellence in teaching”.

The aspiration is to achieve studies with the broadest possible support as the basis for future research and teaching but also and especially for “socially responsible behaviour”.

The aim is nothing less than the future teaching of standardisation as a subject of study, in the spirit of Humboldt’s classical vision of education.

A joint core curriculum for all students in Europe is desirable so that they will specifically learn to think in a cross-disciplinary manner, which will, for example, promote project work involving a range of different subjects.

In the Master’s course, in particular, students should become familiar with the subject of standardisation from the perspective of various disciplines. This will firstly enable relationships to different disciplines to be imparted and secondly relationships with practical work outside of the university environment.

The aim is not only for students to develop into academics but to prepare them for tasks in a complex world in which it is still unclear what form the challenges of tomorrow will take.

A network should be created at European level that will allow a discussion on the further development of teaching and study in the subject at an international level as well.

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<sup>8</sup> See Elke Appel: Auswirkungen eines Peer-Education-Programms auf Multiplikatoren und Adressaten - eine Evaluationsstudie (<http://www.diss.fu-berlin.de/2002/1/index.html>). [Efficacy of a peer education program in multipliers and addressees - an evaluation study]

Why is this important? Numerous challenges face standardisation as a subject of study. The innovation cycles of products are becoming ever shorter, the digitisation of society is advancing dynamically, climate change and environmental pollution are leading to more stringent standards for new products. Involvement with new growth markets outside of Europe is demanding new social and cultural skills from professionals; alongside technical knowledge social skills determine who is capable of meeting professional challenges after graduation.

The important aspect is to examine the shift from classical teaching to a problem-based approach to learning based on joint research as well as the development of new competency-oriented teaching methods.

The aim is to develop an academically based and context-specific curriculum. This is the reason for including different curricula with different focuses for the subject of standardisation in one course, such as business administration or engineering science, etc. The core curriculum forms the basis for this context-specific curriculum.

### **3.1 Development of a curriculum in the field of standardisation**

The framework should serve as a guide in the development of subjects/courses of study that cover the entire demand in certain areas. It describes the ideal model for the content design of the curricula and contain general rules for the curriculum development as well as specific proposals for new curricula. They underline the importance of a curriculum with a balanced content that includes specialist knowledge and competencies, behavioural skills, work experience placements and project work. At the centre of attention here are university qualifications of the first and second study cycle at Bachelor/Bakkalaureus and Master/Magister level. Studies for postgraduate degrees are not considered here because of their highly specialised and research-oriented character.

The education required by graduates in the field of standardisation is not only a combination of already existing individual elements from the various subject areas. The need for a comprehensive, systematic method of consideration is of key importance as it includes the ability to understand the possibilities and limits of standardisation in the various subject areas and share a common language with all those involved.

Standardisation plays a central role in the business processes of companies. Business processes are frequently inseparably connected with one another, and the functions that they fulfil are not infrequently the basis for a company being able carry out business transactions at all. Imparting fundamental knowledge of business administration is therefore a necessary constituent of a comprehensive education in the field of standardisation. However, this aspect appears to have received only little attention in already existing curricula.

#### **Structure of the curricula:**

Here it should be mentioned in advance that no curriculum can prepare students for employment as an expert. All curricula in the field of standardisation, however, should contain one common objective. This would enable the graduates to work in teams on joint projects and to communicate in a common language even though they have specialised in

different sectors. Building on this, a more detailed qualification should be provided that is relevant for a group of largely matching requirements profiles with a shared basis of knowledge and skills. This more detailed qualification should generally satisfy the requirements of a certain generic requirements profile and cover the knowledge and competencies required for this profile.

Each curriculum should consist of modules following on from each other, as follows:

- (a) core modules,
- (b) subject-specific core modules and
- (c) optional modules.

**Specialist knowledge:**

(a) The core modules convey the academic and technological foundation that forms the basis of all qualification profiles. They also contain the comparatively constant knowledge. Students are recommended to study a selection of these modules during their first year of study.

(b) The subject-specific core modules convey the technological and engineering foundation which is characteristic of the technological section of the respective group of core requirements profiles. They also contain the knowledge that is subject to rapid changes. It is suggested that these modules should be taken as from the second year of study.

(c) The optional modules convey the rapidly changing knowledge that becomes outdated within a period of three to five years. They encompass new technological and engineering knowledge. These modules are aimed at the subject-specific specialisation and to balance out the differences in the core modules. They thus enable greater flexibility and specialisation in certain areas.

This structure can be applied to both curricula for the first cycle of study and to curricula for the second cycle of study, although it should be borne in mind that all modules of the second cycle of study should be at an advanced level.

## **4 Structural principles of Bachelor and Master courses**

The common structural guidelines of the German länder for the accreditation of Bachelor and Master courses of study in Germany were passed in 2003<sup>9</sup>.

These guidelines also represent an important step on the way to setting up the European Higher Education Area within the scope of the Bologna Process. In this context, there is a constant discussion on the “breadth” of the teaching contents in the first semesters, with the tendency now being to offer more general education and less specialisation with a view towards the requirements of life-long learning.

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<sup>9</sup> Resolution of the Conference of German Cultural Ministers from 10 October 2003 in the version dating from 4 February 2010, Germany

#### 4.1 Consecutive subject or course of study.

Good teaching is distinguished by the sequence and structure of the course unit following a thematic logic. The sequence of the lectures is characterised by a content structure that matches the defined teaching/study objective. Consequently, course units that build up on each other can only be attended consecutively. The foundation of a course unit is a lecture course that refers to a manuscript or a bibliography.

The contents imparted in **Bachelor courses** are academic principles, methodological competence and professionally relevant qualifications in keeping with the profile of the higher education establishment and the course of study. This ensures a broad level of academic qualification in Bachelor courses. Proof of 180 ECTS credits has to be provided for the Bachelor qualification. The scope of the work for the Bachelor thesis is at least 6 ECTS credits and must not exceed 12 ECTS credits.

**Master courses** are intended for subject-specific and academic specialisation and can be distinguished as having either an application-oriented or a research-oriented profile type. Generally 60 ECTS credits are awarded per year of study, i.e. 30 per semester.

A total of 300 ECTS credits – including those from the preceding qualification – are required for the Master's qualification. The scope of the work for the Master thesis attracts 15 – 30 ECTS credits.

During the development of curricula in the field of standardisation a clear distinction has to be made between the specialist contents for the Bachelor and Master courses.

#### 4.2 Description for accompanied self-study; prospects of software-assisted learning process control and learning process support (drafted by Karola Koch)

The Bologna Process has been accompanied by a shift in accent of university education: away from the range of study (number of units that have to be attended to obtain the qualification) towards the learning outcome achieved. Traditionally, the teaching/study units were characterised by the imparting of learning content by means of curricula standards which were expressed in a quantity of hours per week in class instruction. The independent preparatory and follow-up work for the course units, further reading or even the preparations for examinations were not quantified constituents of the course of study and generally not organised at all or only in an informal manner.

With the transformation from **teacher-centred to learner-centred** paradigm in the Bologna Process, the focus is on the qualification objectives to be obtained, the skills to be acquired and the anticipated result of learning. The study outcomes are no longer merely measured in terms of attendance time but by the entire input of effort by the student, referred to as the workload.

“The working time that a student has to spend on completing a subject/course of study moves to the centre of the definition of studies and authorisation for the qualification. Here the studying hours encompass all activities that are part of a course of study in the broadest sense: attendance at lectures, courses and seminars (attendance time plus

preparation and follow-up), practical sessions, self-study (in the library or at home), preparation for examinations and participation in final assignments and examinations, etc.) The shift in focus from teaching to learning that thus occurs ultimately involves a fundamental change in roles for all those involved in the teaching and learning process.” (cf. Landwehr Norbert, Müller Elisabeth, “Begleitetes Selbststudium” [Accompanied self-study], p.24)

Consequently, the terminology of Bologna uses the term “self-study” as distinct from “contact study” and distinguishes between “accompanied, individual and free self-study”, each with different degrees of freedom. In contact study, the time and location of the course unit is fixed and binding structure as defined by the teacher. In contrast to the attendance-based course unit, students engaged in self-study have a higher level of independence within the learning process in the sense of being responsible for their own organisation and control, as demanded by the following factors:

- the design of learning as an active process: knowledge can only be acquired by the learning participating in an independent and proactive manner in the learning process
- the triggering of learning as a constructive process: knowledge can only be acquired if it is already included in the existing knowledge structures and can be interpreted on the basis of individual experiences
- a self-controlling process in learning: the examination of an area of content requires learners to control and monitor their own learning process
- learning under multiple perspectives: to construct learning assignments in such a way that problems can be viewed from different perspectives
- learning within a social context: this means not learning in an exclusively individual manner but in a balanced way within groups
- learning with instructional support: lecturers instruct the students during the self-learning phases and assist them on their way to solving the problem.

The considerations on learning theory lead to recommended actions for implementing an accompanying self-study phase, which involves exchange and interaction with the contact study components.

E-learning with teaching/study management system offers a means of support for accompanied self-study. The e-learning management system for the accompanied self-study at the Helmut Schmidt University, HSU HH, offers a large number of software tools such as wikis, forums, chat, glossaries, learning modules, tests, questionnaires, Match & Memo, media objects such as e-portfolio, video and audio files as well as learning groups.

As part of the learning process control and learning accompaniment, complex didactic scenarios are drawn up and described which unite the elements of learning objective, script and learning status and learning success monitors for the accompanied self-study.

Even though it may be assumed that professors in Germany (my assessment only applies to this country) have a conservative attitude towards the digitisation of teaching, Internet and teaching will merge in the long term.

## 5 Status of the professoriate in Germany

In Germany, a constant change in the social status of a professor has taken place in the past.

Despite their higher level of education/qualification, professors are not better paid than teachers of the same age serving in grammar schools. At the same time, a new remuneration system was introduced throughout the country, known as the “W-Besoldung, which is linked to performance-related elements. The acquisition of national and European outside funding is often used as a performance criterion in this respect. This situation means that a large proportion of professors in the subject of mechanical engineering (and my comments can only apply to this group) use the resources provided by the university, such as funds for machinery/computers, personnel funding, rooms, laboratories, test benches, etc. to concentrate on commercial sidelines. This is all the more so because the performance-related remuneration of the university, which was introduced with the new remuneration scheme, is practically never sufficient or often limited.

You may ask why I am describing this. The key word is “barriers” during the introduction of a subject of study or a course on standardisation. What barriers now exist in Germany and possibly also in other European countries to prevent the implementation of the subject of standardisation at higher education establishments? One of the key barriers is a shortage in the provision of outside funding in national and European development organisations for the subject of standardisation. Furthermore, because of their status and influence, national and European standards bodies have first pick of specific research funds for standardisation both at national and European level. Due to the lack of support from outside funding for professors, the subject of standardisation has only a limited academic reputation up to the present day. As a result of this overall situation, professors at universities and other higher education establishments concentrate on expanding their “engineering offices” and thus generating the funds that are necessary to match their status in society. (see, (<http://www.exzellente-lehre.de/videos/gruenewald/index.html>))

While research projects carry a promise of respect and attractive careers, a special commitment to teaching primarily involves additional burdens – more students, more examinations, less time for research – and subjects those who nevertheless engage in this activity to the suspicion of being only second rate in research and this leads to little recognition. There is an urgent need to counteract this phenomenon.

The following questions have to be posed in this context. They ask whether there any established or young academics in the field of standardisation in Germany

- who are distinguished because of their excellent research work in the field of standardisation,
- who are able to show that they have successfully worked for a number of years in industry or non-university research establishments,
- who are willing to cooperate inside and outside of the university together and display a strong commitment to networking at national, European and international level in academic teaching and research,

- who are also able to demonstrate the didactic qualifications and teaching experience for attendance-based teaching,
- who are able to demonstrate a level of professionalism in the use of digital media for teaching and
- who are able to demonstrate a teaching concept for the subject of standardisation for the faculty during the appointments procedure.

The conclusions from the above are as follows:

- In principle, we have too few qualified academic teaching staff for the subject of standardisation,
- We can no longer leave whether we have young academics and hence professional teachers in the subject of standardisation to chance.
- Professionalism in the use of digital media in teaching has to be learnt; this is a contemporary development of university education that has to take place.
- Reputation in teaching should become measurable, not only in qualitative but also in quantitative parameters.
- Research and teaching are the core of an academic education. Individuals who are active in research are generally also the good university teachers.

Even with good equipment and funding of the universities/academic chairs, under these conditions a positive development in the qualification of teaching personnel within Europe would not be anticipated in the near future. Countermeasures are urgently required.

## **6 Agents for implementing a subject or course of study at higher education establishments in Germany**

(see, BMBF, <http://www.bmbf.de/de/18448.php>)

Higher education establishments perform the academic matters as part of their self-government duties. In this area they are under the legal supervision of the responsible authority within the federal state. Due to the abolition of the Federal Government's capacity to make framework legislation during the reform of Germany's federal system in 2006, the universities were increasingly released from the micro-management of the state to grant them more autonomy. Higher education establishments have to adapt their structures to contemporary requirements themselves and continue developing accordingly.

In order to implement standardisation as a subject of study or course at a higher education establishment in Germany, various agents are required. Here it should be pointed out that higher education establishments are organised in a different way within each federal state. The following offices and bodies are customary:

**The Präsident [Chancellor]** of a higher education establishment represents it in external dealings and bears the overall responsibility. He is the first-level supervisor of all

civil servants and supervisor with respect to general service conditions for all employees of the higher education establishment. He is responsible for members of the higher education establishment fulfilling their duties in teaching and research. Traditionally he has representative duties.

**The Kanzler [Vice-Chancellor]** heads the administration of the higher education establishment. His duties are mainly concerned with financial, legal and staffing matters.

**Committees;** the **academic senate** takes decisions in all academic matters of fundamental importance. It is made up of the Chancellor, professors, research assistants, other employees and student representatives. Furthermore, committees are often formed for certain matters such as

- senate committee for teaching and studies,
- senate committee for research and academic recruitment,
- senate committee for budgetary, planning and construction affairs,
- senate committee on library affairs,
- senate committee on IT affairs,
- senate committee on sporting affairs, etc.

**Die Fakultät [faculty]** is the basic organisational unit of the higher education establishment; it fulfils the duties of the higher education establishments without prejudice to the overall responsibility of the higher education establishment and the authority of the principal university bodies for its area. It ensures that its members and its academic facilities are able to fulfil the duties incumbent upon them. Essentially these will consist of:

- guaranteeing the range of courses offered,
- passing resolutions on the regulations for study and examinations as well as the regulations for postgraduate study and qualifications,
- conducting the examinations for the higher education establishment,
- continuing to develop the curricula,
- maintaining research and teaching,
- selecting the appointments committees and passing resolutions on their lists of proposals.

Bodies of the faculty are the Fakultätsrat [faculty board] and the Dekan [Dean]. The faculty board is composed of professors, research assistants, other employees and students. It decides on the introduction of an option in standardisation or on the development and implementation of a course of study.

This brief introduction to the legal structure of a higher education establishment makes it clear that the implementation of standardisation as an optional subject or course of

study is subject to an independent decision by the higher education establishment, the senate and the faculty.

The development towards a common European Higher Education Area in the Bologna Process has altered the situation for higher education establishments in Germany. Due to the desired flexibility and orientation to uniform pan-EU standards, the national reference framework is increasingly diminishing in importance. Higher education establishments in Germany take part in the international, and particularly the European, collaboration within the field of higher education and in the exchange between German and foreign higher education establishments.

## **7 The academic subject of standardisation as part of the digital world: A model on the Internet**

The lecture based on PowerPoint presentations held face to face in a lecture theatre or seminar room is still the dominant form of teaching at German universities. There is often no assurance that the contents of the lecture are topical.

Breaking up these structures is a prerequisite for a future-oriented and sustainable teaching/study concept in the field of standardisation. At the same time, sustainability is a guiding philosophy for future viability and hence competitive ability.

The aim should be to create a freely accessible Internet platform in the form of a “standardisation MOOC (sMOOC)”<sup>10</sup> for academic teaching Europe in order to develop comparable forms of teaching and learning in the subject of standardisation in the future. At the same time, we would be contributing to the democratisation of education in the field of standardisation and confronting the knowledge dominance of the standardisation organisations. A competition “standards for good teaching” should also be organised to encourage professors and lecturers by providing them with funding and sufficient time for teaching.

A European Internet network in teaching will include many nationalities with different teaching and learning cultures, both on the part of the students and the teachers. The technical facilities of a modern Internet platform offer students and teachers a way to cooperate and at the same time gain insight into their teaching/learning problems which they will be able to systematically solve together in the future. This will also enable them to respect, recognise and bridge their cultural differences.

Via an Internet platform, students receive teaching contents, videos, PDF materials, workshop offers and the like placed on their virtual desktop. This will characterise the learning processes in the near future. In a first step, this Internet platform will play a key role by allowing the familiar social tools, blogs and wikis to be used. On the other hand, learner-centred education means that more reliance is placed on teamworking ability through students independently setting up study groups via the Internet platform.

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<sup>10</sup> The term massive open online course (MOOC) denotes a special form of open access online courses with a large number of participants and generally free of charge.

Digitisation of the teaching contents, modern teaching/learning concepts, e-teaching/learning management systems, particularly the Internet, are for the first time supplying the conditions for networked teaching in Europe and in a global world.

EURAS<sup>11</sup> as an alliance of academic expertise on standardisation in Europe offers the precondition for creating an infrastructure for academic teaching in Europe. Academic excellence is part of the tradition of excellent teaching; incorporated into a digital teaching/learning concept within the Internet its a precondition for developing dynamism and distribution and hence a success strategy for conveying knowledge in the field of standardisation. This new form of conveying knowledge represents a simple and free-of-charge access to the standardisation courses. As a result, we will achieve a democratisation of teaching in the future, independent of dominant institutions and will gain the **authority of definition** in the subject of standardisation in the spirit of freedom of research and teaching.

The aim is to develop online courses for standardisation that meet the quality requirements of a Bachelor and Master course of study at higher education establishments.

In order to guarantee the quality of teaching, it is recommended that cooperation agreements should be made between the higher education establishments in Europe which define a canon of elements for “good teaching” (module description). The basis for this agreement should be the joint use of an Internet platform. An initial module description is presented with the Internet platform MOOCs serving as an example.

## 7.1 Massive Open Online Course

(see <http://en.wikipedia.org/wiki/MOOC>)

The term massive open online course (MOOC) denotes a special form of open access online courses with a large number of participants and generally free of charge. A distinction is made here between xMOOCs and cMOOCs. While the former essentially represent video-recorded lectures with an examination [1], cMOOCs are based on the idea of connectivism and tend to have a seminar-based form. There are also new hybrid forms of the MOOCs in which conveying knowledge via video lecture is linked with a connectivist approach to the mentored group work [2].

### Description

The xMOOCs have their origins in the regular higher education teaching modules which were made available to a large number of participants as an online course after the event. The x preceding the abbreviation MOOC stands for extension and is based on the fact that Harvard University used an x to denote the online versions of its courses in its university calendar.

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<sup>11</sup> EURAS, the European Academy for Standardisation e.V., was founded in Hamburg in 1993 by researchers from various academic fields (i.e. economics, engineering, social sciences, law, and information sciences). It is a registered society under German civil law, and a non-profit organization. The foundation of EURAS was prompted by a common desire to promote and achieve progress in the academic treatment of standardisation, involving the widest possible range of disciplines. The society's activities focus on: promoting standardization research, a critical evaluation thereof in the interest of scientific education, improving opportunities to publish research results, and supporting the development and professionalization of standards education([www.euras.org](http://www.euras.org))

Typical elements of the xMOOCs are videos and quizzes in which test questions have to be answered. Additional elements may be added depending on the type of course, which may include texts to be read or written assignments, which due to the high number of participants are not assessed by the head of course but by other participants. xMOOCs are usually accompanied by online forums in which learners can exchange information. However, the networking between learners is not an integral constituent of the concept.

Starting from an overriding topic and a timetable with a number of defined sections and events, the course organisers of cMOOCs provide a number of resources such as texts or videos, which are generally available online, as a stimulus. Participants decide for themselves whether and in what way they include these resources. If they become active, they create further materials themselves, such as in the form of blog contributions, tweets, videos or podcasts. They are placed at the disposal of the course and from then on can be commented on, discussed or expanded. In this way a network is created between learners and their contents as they are propagated through connectivism.[4] The letter c preceding the MOOCs comes from this connectivism.

Participation typically takes place in four stages or main actions:<sup>[5]</sup>

- Orientation (Aggregation)
  - gaining an overview and selecting what appears to be interesting
- Classifying (Remixing)
  - capturing a topic for itself and searching for associations and connections to one's own daily experience
- Contribution (Re-purposing)
  - composing one's own contribution or commentary on a topic
- Distribution (Feeding forward)
  - sharing one's own contributions with other participants

## **Criticism**

Since the beginning of 2013 the subject of MOOCs has been receiving a lot of attention in the German press; however, the reporting has been restricted to xMOOCs. The improved accessibility to course offers is highlighted as a particular opportunity.[6] Contrasting with this, however, are problems of a didactic nature. In a lecture, the e-learning researcher Rolf Schulmeister criticised the lack of treatment to promote learning among the xMOOCs that has been shown up to the present.[7]. Examples included:

- a didactic method driven by technology,
- excessively close timing of the achievements to be produced,
- no support for forums,
- no monitoring of learning progress.

Schulmeister concludes his criticism with terms such as “anonymous mass teaching” or “a neoliberal programme” or “pedagogical Darwinism” if the outcome is that 90% of the students are lost after 6 months.

In its content, Schulmeister’s criticism cannot be contradicted. Yet an assessment such as Schulmeister’s does not consider the potential of this experiment.

In my opinion, the fascinating, unfinished world of the Internet, in which the developments can barely be foreseen, requires courageous and pragmatic steps. Nevertheless, colleagues from Harvard and Princeton have dared to take this step. Schulmeister justifiably criticises this step but with a classical superstructure of teaching and learning theory, which is not appropriate for this development still in its infancy.

This is all the more true because the Stifterverband für die deutsche Wirtschaft, which is the business community’s innovation agency for the German science system, has launched a competition offering prize money of 250,000 euros with the title of:

MOOC Production Fellowship: Lehren und Lernen im Web [[Teaching and Learning on the Web](#)].

The objective of the course is to trigger the development of innovative concepts for massive open online courses (MOOCs for short) and to enable ten course concepts to be implemented. Through this competition, Stifterverband and iversity are hoping to demonstrate the great potential that lies within using digital facilities in a high-profile manner and thus provide an important stimulus for the organisational development of higher education establishments in times of digital change<sup>12</sup>.

## **7.2 An overview of the most important providers of open e-learning platforms**

(<http://netzwertig.com/2013/03/11/kostenlose-onlinekurse-iversity-will-moocs-in-deutschland-gros-rausbringen/>)

For a long time now, the well-known US universities have not only been offering courses independently but also in cooperation with other internationally recognised higher education establishments via jointly used networks. The largest platform in the world is Coursera (<https://www.coursera.org/>), a provider initiated by a number of elite US universities, via which 33 universities around the world now provide a total of 198 courses from a wide range of subject areas. Certificates are awarded for successful completion of many of the courses.

**Udacity** (<https://www.udacity.com/>) is a project by the German Professor Sebastian Thrun, who describes how his platform came into being in an interview that can be found here. In contrast to Coursera, the portal is aimed exclusively at prospective programmers and developers, for whom the video courses are on various topics and graduated by different levels of difficulty.

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<sup>12</sup> ([http://www.stifterverband.info/bildungsinitiative/quartaere\\_bildung/mooc\\_fellowships/index.html](http://www.stifterverband.info/bildungsinitiative/quartaere_bildung/mooc_fellowships/index.html))

At **edX** (<https://www.edx.org/>), however, a rather more limited approach is taken. At the time of writing, MIT and the universities of Harvard, Berkeley and Texas System provide a total of 59 modules. The range is presented in a more targeted manner and is directed towards a specialist public that does not need to be “recruited”, but instead is specifically looking for web services of this kind. Here, too, courses and certificates are free of charge.

## 8 Founding of a skills pool and deductions

The founding of a skills pool acts as a means of promoting the teaching of standardisation in Europe. The task of the skills pool will also be to form and support groups of experts for the various subject areas in higher education teaching.

It represents a way of combining existing and yet-to-be-gathered knowledge and experience to improve the quality of teaching in the field of standardisation. The duties of higher education teachers in the skills pool include the planning of skills-oriented curricula or the organising of balanced examination methods.

The members of the skills pool have the objective of working together in a quality circle, oriented towards the guidelines of the Bologna Process. The main task in the next two years is to draw up a “regulatory framework”<sup>13</sup>. This involves specifying institutional principles and “prerequisites for good teaching”. The regulatory framework drawn up in the skills pool is also used for the cross-border evaluation of lecture courses. The framework regulation should be published after completion.

At the same time the regulatory frameworks should be the basis for being able to better assess teaching performances by higher education establishments in the subject of standardisation. Until now there has been a lack of consensual criteria for this purpose.

Furthermore, it is also necessary to form groups of six to twelve teachers in higher education who undertake to work together as a “professional teaching/learning community” on a topic of their own choice for one year. This might involve the designing of new teaching modules or complete curricula, the designing of teaching exercises or the development of activating working methods for students.

Generally it is taboo for teachers to attend a colleague’s lecture. The higher education teachers in the skills pool will agree to open their lectures and allow other colleagues to attend or invite them to an exchange of experience. This will lead to synergies resulting in better teaching methods.

Sitting in on a colleague’s lectures is a successful method of activating the potential for good teaching. The intensive exchange is intended to develop trust among the teaching staff.

Sustainable and dynamic development of quality in teaching also requires reliable outside funding along the lines of the model of research funding practised by the German Research

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<sup>13</sup> The regulatory framework contains features such as a structure of core units which, as part of sample examination regulations, provide students with a guarantee of validity at the individual higher education establishments in Europe. (The framework includes sample examination regulations for test which individual higher education institutions...)

Association (DFG). This concerns financial support for innovative targets in teaching such as the inclusion of digital media and the Internet. A crucial aspect here is not only the material support; equally important is the consideration that outside funding for teaching is an important reputational factor within the academic scientific system.

## **8.1 Arguments for reaching a consensus**

It is crucial to bring about a consensus on an academic infrastructure for standardisation in Europe. This comprises decisions on

- the financing and structure of independent academic chairs/professorships for the subject of standardisation.
- a skills pool for promoting teaching, made of up teachers in higher education, representatives of industry and commerce, representatives of NSBs, representatives of state institutions (e.g. PTB, BAM, etc.)
- the development of curricula for teaching the subject of standardisation for various Bachelor and Master courses with an agreement on core contents (core units).
- the provision of and access to digitally processed teaching materials
- a fundamental didactic concept including digital media for teaching (guideline for lecture manuscript, exercises, multiple-choice tests, FAQs and forms of support, etc.)
- fundamental examination requirements in the various subject areas (courses) at higher education establishments in Europe.
- an agreement on mutual, cross-border recognition of student examination achievements in Europe.
- an agreement on the exchange of higher education teachers as well as mutual observation by teaching staff in the subject of standardisation at higher education establishments in Europe.
- a system of tutorial support with a European design for students in the subject of standardisation based on the NEW MEDIA (Internet platform, chat, forums, blogs, wikis, e-mail), with the organisation and responsibility in the hands of teachers in higher education together with representatives of industry and commerce as well as the NSBs.

## 9 Establishment of a university infrastructure for the field of standardisation in Europe

As pointed out in Section 1.1 “Standardisation education infrastructure in Asia”, the necessary investment has been provided to build up a university infrastructure in the field of standardisation within the key APEC states since 2005.

In Europe, it can be shown that there is only a very limited university infrastructure for the field of standardisation. This gives cause to submit a proposal.

To this end, a description will be provided of the financial framework for the European standards system, using a report from the EUROPEAN COMMISSION, Brussels, 01.06.2011; SEC (2011) 671 final /20/.

### 9.1 The cost of European standardisation

The cost of creating standards within the **ESOs was approximately €3,000 million in 2009**. The approximate cost of creating **one standard is estimated at approximately €1,000,000**. This includes the cost of experts, the organization of meetings, travel etc.

The ESOs point out that this cost is financed primarily by

- Industry 93 – 95 %
- National government 3 – 5 %
- European Commission/EFTA, around 2 %. “ (page 8)

In the years from 2000 to 2010, the amount supplied by the **EC to support activities in European standardisation was €186.68 million**. /20/ (EC 9.3 ANNEX 3, page 131/132).

The portfolio of European standards (EN) evolved from 1,280 in 1990 to 18,286 in 2009./20/(EC ANNEC 9.3.8.4, page 139).

The approximate cost of creating one standard is estimated at approximately €1,000,000. The yields a total investment of 18,286 EN x €1,000,000 /20/(EC ANNEC 2.4,page 8).

**Total investment = EUR 18,286,000,000**

9.5.2 CEN and CENELEC adopt European standards which are transposed into national standards and are then sold by NSBs.

(2) The total operating budget in **2008 for the 32 NSBs was €437m,...The total revenue from the sale of standards for the 32 NSBs was €113 million,...”**

**This result clearly needs to be queried because the vast majority of standards institutes have not answered the question referring to revenue from standards.**

Another example:

The budget of the DIN group, for example, amounted to EUR 100m in the year 2011. Of this amount, 68% in 2011 came from their own earnings. An important constituent of these independent earnings are the revenues generated from the sale of European

standards (ENs) mainly via Beuth Verlag, (page 5, Standards for good teaching by Wilfried Hesser, 2013).

Another example:

This table represents an extract from the annual reports and financial statements for 2012 from AFNOR, BSI, DIN. Here it should be pointed out that the organisations named are non-profit organisations which generate profits but deploy/utilise them in accordance with their legal form. The result of AFNOR in 2012 illustrates this most clearly with a profit of €0.038m on a revenue of €150,134m.

#### Financial overview 2012 AFNOR, BSI, DIN

	2012 Revenue	Costs	Profit
<b>DIN group</b>	€106,500m	€102,700m	€3,800m
<b>BSI group</b>	€255,500m	€222,600m	€32,000m
<b>AFNOR group</b>	€150,134m	€150,096m	€0.038m

With these relatively few figures, we aim to shed a little light onto the business with European standards and at the same show how much money is in the European standards system. For anyone who would like to gain more insight, we would recommend the report of the European Commission, Brussels 01.06.2011; SEC (2011) 671 final /20/.

The **total investment of EUR 18,286,000,000** made by industry into the European standards systems from 1990 to 2009 as stated above, as well as the resulting turnovers (revenues) for the NSBs are to provide the basis for a discussion on financing the establishment of a university infrastructure as well as a focus for research in the field of standardisation in Europe.

With the aid of three abstract examples, this section **aims to present possible forms of cooperation for academic teaching within the field of standardisation in Europe** (see page 26/27):

#### Teaching scenario 1

As part of a cooperation agreement between a university and an industrial association, the optional subject of standardisation is taught by a representative from industry (financed by industry).

#### Teaching scenario 2

As part of a cooperation agreement between a university and a standardisation institute, the optional subject of standardisation is taught by an employee of the NSB.

### Teaching scenario 3

As part of a cooperation agreement between a university and a standardisation institute, an endowed chair is established at a faculty and furnished with long-term financing by the standardisation institute. The faculty appoints a professor to the chair of standardisation through an official application procedure by the university.

**Teaching scenario 3 could be a suitable recommendation**, supported by an authorised advisory board made up of representatives from universities, industry, government authorities, consumers, NSBs, etc.

The financing of an endowed chair, equipped with (a W3 professorship in accordance with German higher education law)

- one W3 professorship, ½ secretarial post, 2 half-time employee posts, 2 assistant posts

requires long-term financing of approx. 200,000 to 250,000 euros per year and per professorship.

**If the overall situation in the field of academic education in Europe is assessed in this way, it is urgently recommended that at least 15 chairs for standardisation be created with total financing costs of 3.0 to 4.0 million euros/annum.**

**To summarise, this means a total investment of approx. 30 to 40 million euros over a project term of 10 years for the establishment of a university infrastructure within the field of standardisation in Europe.**

The task of standardisation is to promote industry and the economy but also, and especially, society in terms of the common good. The question arises as to what extent the business model of national standardisation institutes in Europe and hence CEN/CENELEC, which function as monopolists within Europe, is accompanied by this argument of social responsibility, responsibility for the economy of a country and of Europe or a historical responsibility for the European standards system.

From a neoliberal point of view, refusal to finance the European education system on standardisation is (would be) understandable. Standardisation is a function of national standardisation institutions which at the same time includes social responsibility. National standardisation institutions are obliged to be aware of, exercise and stand up for this responsibility<sup>14</sup>. Standardisation is a valuable part of society and has been part of our European culture for more than 100 years.

When taking a decision on financing academic education in the field of standardisation, it is also necessary to point out that education is also a form of economic development and hence not least a long-term means of promoting the NSBs.

Promoting academic standardisation not only supports the education of future generations of standardisation experts but also develops and strengthens the infrastructure of European standardisation. The message is that by promoting academic education in the

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<sup>14</sup> The task of DIN is to initiate, organise, steer and to moderate standardisation for the benefit of the general common good while safeguarding the public interest.

([http://de.wikipedia.org/wiki/Deutsches\\_Institut\\_f%C3%BCr\\_Normung#Grundprinzipien](http://de.wikipedia.org/wiki/Deutsches_Institut_f%C3%BCr_Normung#Grundprinzipien))

field of standardisation, we are supporting the European economy and also the culture of standardisation in Europe.

Of course it is not possible to impose solidarity with the promotion of academic education in the field of standardisation, even less so in the case of the national NSBs, who have a monopoly position in Europe and are therefore in a secure position. They have every right to adopt the attitude that academic education in the field of standardisation is not the task of the national NSBs but that of the respective states or the respective governments.

At the same time, it is difficult to imagine that the decision-makers of European standardisation – which has been developed over the last 100 years – will be able to view the development in Asia and the USA without reacting, without developing a strategy that secures the position of European standardisation for the future within the context of a global world.

The question concerning the overall responsibility of the NSBs for a European education system in the field of standardisation needs to be asked. This question then needs to be answered by the NSBs. At the same time, the current dependence of education on standardisation needs to be critically assessed by the NSBs.

Education based on the principle of independence, free from ideologies, will not be provided by the NSBs and is not to be expected.

NSBs as institutions are only integrated to a limited extent into society. They are self-contained commercially organised economic enterprises and therefore not only profit-centred but also market-oriented in the social context. Today NSBs are neither socially nor nationally oriented; they exist together with commercial, market and power-political interests in a global world and defend their markets that have evolved over the decades in the context of their traditional role.

It is therefore important to clearly point out that it is necessary to organise the field of academic education within the field of standardisation in a manner independent of ideologies and commercial interests. The field of academic education, which has been prepared for more than 10 years by members of EURAS, has obtained a new dynamism through the White Paper 15, /40/. In the last 10 years, the standardisation institutes have made no significant contribution to academic education apart from the marketing campaigns such as prizes awarded for Bachelor, Master and PhD theses or the provision of PowerPoint presentations without any written manuscript (consider how little know-how can be conveyed by this means) or the preparation and provision of a literature database. This clearly indicates the limited extent of the support for academic education. Examination of the websites of ISO, IEC, ITU, DIN, AFNOR, BSI, etc. reveals that the majority of documents, such as PowerPoint images, case studies and so on, are provided with password protection. Assessing this from the didactical concept, it can be seen that what has been done is no more or less than to transfer the traditional approach of “training on the job” to the Internet.

No substantial contribution has been to creating educational material for academic teaching in the field of standardisation at universities.

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<sup>15</sup> WHITE PAPER; ACADEMIC STANDARDISATION EDUCATION IN EUROPE. Wilfried Hesser and Henk J. de Vries (2011)

## 10 Recommendation concerning the establishment of an academic council for European standardisation

This concept paper recommends the founding of an academic body with the task of continuously observing the European standardisation system and its relevant environment (e.g. the national and international standardisation level, US and Asian standardisation systems, forums and consortia for standardisation, national, European and international political stakeholders, interested parties from civil society, e.g. from the fields of environmental or consumer protection, etc.). The aim is to take a stance on European standardisation at regular intervals and, as appropriate, to submit proposals for action and organisation within the context of the European economy and society to the relevant stakeholders, in particular the EU bodies, the European standardisation organisations and the users of standards.

In many areas of politics, consultancy for political decision-makers by independent experts and academics takes place as a matter of course, even if their verdicts, forecasts and recommended actions do not always meet with the unreserved approval of those at whom they are directed. In Germany, for example, the issuing of the Annual Economic Report on the overall economic development by the German Council of Economic Experts (often referred to as the “five wise men” is therefore an institutionalised, official act, which – like the results it announces – always meets with broad public interest. Such instances of consultancy, which do of course also exist in many other countries and areas of politics are an expression of a political culture and the implicit social consensus that, in view of the increasing complexity of social conditions, the political decision-makers have to rely on academic advice.

No such institutionalised instance of academic consultancy exists in the field of national and European standardisation, and the following intends to justify why the establishment of such a body would definitely make sense. However, first of all a number of arguments will be developed which ostensibly oppose the establishment of such a body.

In matters of standardisation, the EU does indeed resort to independent academic advice, as is demonstrated by whole range of relevant reports prepared by prominent representatives of the academic community on behalf of the Commissions (cf. e.g. Egyedi, 2001; Blind et al, 2002; Jakobs/Egyedi/Monteiro, 2002). At the same time, national standards bodies then commission academic studies if a specific demand for knowledge exists (and the necessary financial resources for this are available). One example that comes to mind is the extensive study on the economic benefits of standardisation which DIN commissioned the Technische Universität Dresden and the Fraunhofer Institute for Systems and Innovation Research to conduct (DIN, 2000). However, these and other reports have neither been prepared on a continuous basis nor do their contents address the state of the European standardisation system as a whole. Instead, they have been instigated sporadically when a standards body or the EU Commission has identified a need for clarification in specific issues relevant to standardisation.

A further argument against the founding of an **academic council** on standardisation might state that close and wide-ranging cooperation between standardisation organisations and research establishments already exists on the factual level, i.e. within the specific standardisation work. Hence one could take the view that close cooperation does in fact exist between the EU and the standards bodies, on the one hand, and the scientific community, on

the other, and that the stakeholders in European standardisation take advantage of the academic expertise even though no such institution as an “**academic council on European standardisation**” exists on the academic side. At this point, the immediate conclusion might be that cooperation between the scientific community and the key stakeholders in European standardisation already exists to a sufficient extent and that the establishment of an “**academic council on European standardisation**”, regardless of its form, is unnecessary.

On the other hand, there is a host of good reasons that support a higher level of organisation for the scientific community as regards European standardisation. First of all, standardisation is not an obscure marginal topic but of fundamental technical and socio-economic significance. The fact that European standardisation policy exerts a far-reaching effect on various areas of EU citizens’ lives, e.g. because in its New Approach Directives the EU demands a high level of protection in the fields affecting consumer safety as well as occupational and environmental safety, gives rise to a direct public interest in receiving regular information on developments in this field.

However, it is relatively difficult to maintain an overview of the state of the European standardisation system even for standardisation experts – not to mention normal citizens of the EU. Yet this is by no means due to an inadequate information policy pursued by the relevant actors, such as the EU bodies or the European standards bodies. **On the contrary, they are at great pains to achieve transparency. Instead, the reason is to be found in the complexity and lack of clarity within the entire system.** In this connection, a body that continuously observed, analysed and regularly made firm pronouncements on the European standardisation system would be able to increase the transparency of the system and improve awareness of (European) standardisation both within the standardisation community and among the general public. In actual fact, such an improvement in awareness is a prerequisite for the public being able to recognise its interest in European standardisation and exert influence as necessary.

As already indicated, certain activities and events within the European standardisation system (ESS) and within its environment do have some far-reaching technical, economic or political consequences for the affected stakeholders and thus require constant critical evaluation from an independent party. Examples of these events and activities include:

- New initiatives in standardisation policy by the EU, which in some cases may have a major impact on the affected entities, such as the European standards bodies or the users of standards. The standardisation policy of the EU has a direct effect in areas such as occupational safety, product safety, consumer protection and environmental protection.
- Strategic and organisational or administrative measures by the European standards bodies. For instance, the development of new fields of standardisation by standards bodies, which sometimes have a tendency to continue expanding their own scope of activities, is a reason for scrutiny. The same applies to certain individual standardisation projects, some of which may also entail far-reaching technical, economic, political or even ethical implications.
- Modifications to the legal and political conditions governing the ESS. Changes in the personnel or structure of the EU machinery as well as shifts in political priorities may

affect the status of standardisation as a regulatory instrument. Such changes in structure or personnel occurred, for instance, when Baroso Commission I was replaced by Baroso Commission II on 10 February 2010, a process which involved new appointments in the departments responsible for enterprise and industry and for European standardisation policy. (Günther Verheugen was replaced by Antonio Tajani.) There is no doubt that such changes in personnel within the EU machinery may have far-reaching effects on European standardisation and should be continuously observed by a suitable body.

- Developments and changes in non-European standardisation, e.g. on the level of international standardisation, in other regions such as Asia or in the case of standardisation within forums and consortia. For example, there is a unanimous opinion within the academic community that an appropriate European response is required to the comprehensive strategies for academic training in the field of standardisation within Asia.
- How do standards bodies pursue their “business model”, and are there any circumstances where it may conflict with the principle of non-profit status.
- Depending on their design, standards may sometimes have far-reaching economic consequences, particularly in the growth branches of high technology, so that they may, for example, determine which markets develop with which features or which markets disappear and which stakeholders profit from this and to what extent.
- Exogenous shocks of any kind whatsoever, such as recent economic and financial crises, which may have an impact on European standardisation.

The ESS is therefore exposed to a whole spectrum of stimuli for change from various endogenous and exogenous sources that should be continuously observed so that any adverse developments can be identified in good time and brought to attention. This can be most suitably carried out by a body comprising independent academics, who continuously observe developments in the ESS and its surroundings and comment on these developments with suitable forms of publication.

If one therefore takes the view that the establishment of such a body would be useful, the question arises in the next step as to where a committee of this kind should be located and how it should be constituted.

One immediate option would be to establish this body under the auspices of EURAS, where, for example, it could function under the name of “EURAS Council”, or if this sounds too centralist or overbearing, as the “EURAS Watch Group”, “EURAS Commission” or “EURAS Subcommittee” on European standardisation.

The objective of this body might be to conduct an objective, academically based analysis and assessment of the attributes of the European standardisation system and European standardisation activities, to identify any problem areas and to submit proposals for the structuring of European standardisation. These proposals should be free of any vested interests and hence directed towards the common good and should be aimed at promoting European standardisation and raising competitiveness in the European economy. Not least, the objective should also be to secure a better audience for the academic view of standardisation and to improve the public perception of standardisation.

A body such as this should be composed of independent academics who have corresponding expertise in the field of standardisation and European standardisation. Naturally, participation in such a body would initially be open to but not exclusively reserved for EURAS members. Furthermore, in view of the technical, legal and socio-economic dimensions of standardisation, it would be appropriate for the body to have an interdisciplinary composition, including for example engineers, economists, lawyers and representatives of the social sciences.

As already indicated, the activities of this body might include the continuous observation of the European standardisation system and its relevant environment, analysis of the relevant system attributes, the activities of the key stakeholders, trends in European standardisation and their assessment from an interdisciplinary perspective, such as an engineering, economic, legal, political or sociological point of view. Of interest here in the narrow sense is how certain events and initiatives impact on the interests and possible courses of action of the affected parties and the common good, and what consequences this has in return for the state of the ESS. If any conflicts, contradictions or adverse developments are identified within the European standardisation structures or the political conditions, a response can be provided in the form of appropriate statements or suggestions for improvement. In the best case, the academic community can draw attention to adverse developments and trends of which the political decision-makers or other actors in standardisation may not be aware, submit suggestions for improvement and bring about a change in conduct or awareness among the relevant stakeholders.

The above-mentioned statements and suggestions for improvement can be published in suitable formats, such as surveys or reports that appear at regular intervals of perhaps once every two or three years. As already indicated, the contents of such reports may, for example, emphasise important events and activities by the relevant stakeholders, tackle issues of the financing of standardisations work, discuss important fields of standardisation, deliver forecasts on future developments, submit recommendations for conduct and proposals for the structure of the European standardisation system, etc. To an equal extent, it would be possible, if particular structuring requirements have been identified, to use the publication formats of the EU Commission as a guide and, for example, issue Green or White books on specific topics in order to initiate a discussion or specific initiatives.

There are of course any number of unresolved questions concerning the establishment of an academic body on European standardisation that require clarification: what would be the composition of such a body, who would be in charge and what mode of decision-making would be employed? Here, for example, it would be conceivable to have a cooperative, objective mode of cooperation on the principle of a spontaneous order with low access barriers. The question remains as to how the activities of this body would be financed. In order to guarantee its independence, any financing by parties with vested interests would in principle be excluded.

This concept paper is linked with the recommendation of stimulating a discussion on the establishment of an academic body on European standardisation and being able to initiate the first tangible steps in this direction.

## 11 Summary

Allow me to try and give you an overview of the academic infrastructure for standardisation in Asia, with the focus on China, Japan, Korea and Indonesia, as well as in Europe with states such as Bulgaria, Denmark, France, German, Great Britain and the Netherlands. Here we refer especially to the extensive annex, which provides detailed insight.

In Asia, Japan and Korea may be regarded as the frontrunners in academic education on standardisation. Indonesia is another important partner among the APEC states and is displaying an extraordinary development. China is part of the Asian area and is making great efforts in academic education for standardisation, as the example of China Jiliang University (CJLU) shows.

Here are some brief examples: in 2005, Japan, Korea, China and Indonesia all launched a five-year plan supported by their respective ministries aimed at the following:

**“Confirming present policy of human resource development of standardization” and “Investigating and discussing new policy of human resource development of standardization”.**

The project duration for the Standardisation Education (SE) Programme in Japan was from 2005 to 2010 and was provided with a budget of USD 1 million per year.

In Korea, KATS has secured funding of approximately USD 5–8 million each year since 2005 for the University Education Programme on Standardization (UEPS) implementation.

As a result of the investment made, 51 courses on standardisation were implemented at 32 higher education establishments in Japan in 2012 with a total of **2,100 students** per year and various textbooks were prepared.

In Korea there were 81 courses at 41 universities in 2011. The number of **students** stabilised in **2011 at 3,883**. The number of **lecturers** in the expert pool rose from 50 in the year 2005 to **294 in the year 2011**.

The academic education programme also displayed a commendable development in **Indonesia**. The **BSN** has signed a memorandum of understanding (MoU) with 30 universities. Today standardisation is taught as a subject of study in 10 universities. There are 18 courses in standardization (4 as stand-alone course and 14 as embedded course elements). The number of courses grew from two in 2007 to twenty-two in 2012. During the same period, the number of students participating rose from 17 in 2007 to 450 in 2012. The total number of students for the period from 2007-2012 is 1036.

At the APEC Conference in Washington in 2011, Dr Wang Yiyi held a presentation on behalf of **China** which illustrated objectives such as the following:

Theory: Building up a roadmap to standardization theory research (the status quo, system and elements) and standard discipline.

Education - Master of Engineering: To promote standardization education into the national education system, To make standardization a major in the master of engineering.

Standardization Certification for Engineers: Classifying the levels, Training requirements for each level

As a result of this commitment during the last few years, courses on standardisation have been established at more than 200 higher education establishments in China.

**The USA represented by NIST** is a member of the APEC states. On 14 January 2013, NIST issued an invitation to tender with the following aim: "The recipients will work with NIST to strengthen education and learning about standards and standardization. Specifically, the recipients are expected to: develop curriculum for the undergraduate and/or graduate level to educate students about the impact and nature of standards and standardization so that they enter the workforce and/or continue their academic studies with a strong understanding and appreciation for the value and benefits of standards and standardization,...". The invitation to tender contained funding of approx. USD 250,000 for the year 2013.

This excerpt from the NIST invitation to tender and the project it aspires to particularly illustrates the reaction of the United States industry and economy to the development of the educational system for standardisation in Asia.

The change in contents becomes particularly apparent during the analysis of the curricula, as shown by this quotation from a Japanese presentation:

**Change a typical perception that standardization is purely a technical matter and think strategically in a way which considers in relation to business strategies and public policies.**

The educational programmes illustrated clearly show the status that standardisation currently occupies in Asia. Work on the establishment of the APEC SCSC Strategic Education Programme and the development of teaching/study concepts for the subject area of standardisation have accelerated sharply in Asia during the past years. Independently of the commitment of individual countries, a strategy crossing international borders has been under development from 2005 up to the present day aimed at preparing a uniform curriculum and teaching materials, in particular, i.e. textbooks for academic education in the field of standardisation. (see Annex 33-40 and <http://www.wisestandard.org/>)

The importance of education on standards and conformance is highlighted in the 2006 APEC Ministerial Joint Statement: "Ministers recognized the importance of standards education and encouraged members to develop reference curricula and materials to address the significance of standards and conformance to trade facilitation in the region." This project is addressing to the above Minister's instructions.

To summarize it may be observed that since the education offensive in the APEC states during the years from 2004 to 2010 in the field of standardisation, a paradigm change has occurred from the educational form of in-service training by means of short seminars towards education with a sound academic basis, graded according to Bachelor or Master

courses of study. In the long to medium term, this concerted educational initiative by the APEC states will result in management in industry and commerce but also government officials in ministries and certification and testing institutions obtaining a sound academic education in standardisation. According to the existing teaching curricula, this will include not only technical, economic and legal but also social teaching contents and will, consequently, provide the future managers of these countries with an expertise in standardisation that will lead to a strategic advantage for the companies and hence to a stronger level of competitiveness for these countries. The expertise in standardisation will have an effect on the positioning of the companies in global competition and provide a foundation for decisions of industrial policy in the APEC states.

### **Development of the academic education system in Europe**

If we refer to an investigation from the year 2008 conducted at the Helmut Schmidt University, the following picture emerges.

There is only a very limited academic infrastructure in the field of standardisation at higher education establishments; there is no curriculum with defined core contents, no recognised textbook on standardisation.

The emphasis of the courses varies considerably from university to university,

It ranges from

- standardisation governance
- strategic aspects of standardisation
- Development of IT standards and e-business applications.

Student numbers and also teaching hours per week also vary.

We are dealing here with a very heterogeneous education concept, both in terms of range and content. In 2008, the estimated number of students in Europe was approx. 500.

**To summarize:** No uniform concept of the EU standardization education system exists.

A very limited survey conducted during the last few weeks essentially confirms these results, with the following exceptions:

The positive development in Bulgaria with 9 courses and a total of 285 students; the positive development at the Rotterdam School of Management, Erasmus University, with 6 course and a total of 134 students. Development of the educational system in Denmark may be regarded as unusual. Within a few years, a large number of courses with the focus on standardisation and patents/CSR/IT Safety have been prepared and run at higher education establishments. In 2010, 86 courses with 1,290 students were conducted and in 2012, a total of 1,760 students successfully completed 177 courses.

If the results are restricted to standardisation only, then in summary it can be observed that the total number of students in all European countries probably amounts to approximately 1,000. This is a generous and estimated figure that needs to be verified in a further investigation. (Annex 3)

Despite numerous requests, the standards bodies AFNOR and BSI have not replied to the question concerning the numbers of higher education establishments, courses and students.

It can be stated that there are only very few higher education establishments in Europe that teach standardisation as an independent subject (optional subject). Essentially, a limited knowledge of standardisation is included in individual lectures as part of the subjects studied in courses such as mechanical engineering, electrical engineering, information technology, business administration and law.

No transfer of knowledge on standardisation under the aspects of a technological, economic, social or holistic considerations takes place at higher education establishments.

Today, the development of academic education in the field of standardisation currently occupies a historically isolated position. Since the emergence of standardisation in the 20th century, education in this subject has traditionally taken place in the form of in-service training through short seminar courses. Until the present day, essentially nothing has changed in connection with this form of training. In Europe, training in the field of standardisation is performed by the national standards bodies in further training courses for employees of industry and commerce held over a number of days. This type of training only partially conveys a knowledge of standardisation commensurate with the respective professional profile. Further education in standardisation represents a continuously growing commercial market for the NSBs that needs safeguarding and protection.

Academic teaching in the field of standardisation in Europe does therefore not correspond to the status that it should have in safeguarding the worldwide competitiveness of Europe. The essential point is the lack of investment in an academic infrastructure for standardisation in Europe. This is the reason why it is falling behind countries such as Korea, Japan and China. There is no doubt that an excellent standards system has been built up in Europe; however, this will not protect our economic system if the agents in industry and commerce lack skills in the economic and strategic handling of standards.

**Standards of good teaching:** An academic education is competency-oriented and research-based. The close link between teaching and research offers the foundation for qualitatively high-value teaching in the field of standardisation, for “excellence in teaching”.

The aspiration is to achieve studies with the broadest possible support as the basis for future research and teaching but also and especially for “socially responsible behaviour”.

The aim is nothing less than the future teaching of standardisation as a subject of study, in the spirit of Humboldt’s classical vision of education.

A joint core curriculum for all students in Europe is desirable so that they will specifically learn to think in a cross-disciplinary manner, which will, for example, promote project work involving a range of different subjects.

In the Master’s course, in particular, students should become familiar with the subject of standardisation from the perspective of various disciplines. This will firstly enable interconnections with different disciplines to be imparted and secondly connections with practice outside of the university environment.

The aim is not only for students to develop into academics but to prepare them for tasks in a complex world in which it is still unclear what form the challenges of tomorrow will take.

A network should be created at European level that will allow a discussion on the further development of teaching and study in the subject at an international level as well.

Why is this important? Numerous challenges face standardisation as a subject of study. The innovation cycles of products are becoming ever shorter, the digitisation of society is advancing dynamically, climate change and environmental pollution are leading to more stringent standards for new products. Involvement with new growth markets outside of Europe is demanding new social and cultural skills from professionals; alongside technical knowledge, social skills determine who is capable of meeting professional challenges after graduation.

The important aspect is to examine the shift from classical teaching to a problem-based approach to learning based on joint research as well as the development of new competency-oriented teaching methods.

The aim is to develop an academically based and context-specific curriculum. This is the reason for including different curricula with different focuses for the subject of standardisation in one course, such as business administration or engineering science, etc. The core curriculum forms the basis for this context-specific curriculum.

Since the year 2000<sup>16</sup>, members of EURAS e.V. have been campaigning amongst decision-makers at national, European and international level, both within standardisation organisations and in the European Commission DG Enterprise and Industry, for the establishment of an academic education system for standardisation in Europe. In the talks conducted at all levels with various people, our requests have been met with a great lack of interest and understanding as well as a display of ignorance. On the one hand, it was clearly explained how important standardisation is for the EU economy; on the other hand, the message was conveyed that an academic infrastructure in the EU has no priority for the Commission. It was clearly formulated that it was the task of the academic world (2009) to set up an academic infrastructure.

It is important to reply to this as follows: it is not the task of the “academic world” to create an academic infrastructure for standardisation in Europe. Setting up and sustainably securing an academic infrastructure is the task of the states within Europe, with the organisation and responsibility being located either centrally or dispersed. Furthermore, it is not the task of the “academic world” to develop curricula free of charge for the various specialist disciplines for Europe, meaning the EU Commission or even for European standardisation organisations. This applies all the more so because professors do not gain any reputational benefit through such development work, as defined by the academic system of values imposed upon them (see Section 5).

In the years from 1990 to 2012, European industry invested more than 14,6 billion euros in the drafting of approx. 14,500 EN standards. During the same period, the EU Commission, represented by the European Commission DG Enterprise and Industry, invested approx. 180 million euros in the preparation of some 3,200 harmonised standards (HD). In total we can assume a total investment of more than 18 billion euros. Contrasting with this is the issue of investment in an academic education system for standardisation in Europe. It can be observed that the decision-makers have failed to establish an academic infrastructure for standardisation in Europe.

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<sup>16</sup> First contact: Evangelos Vardakas, EUROPEAN COMMISSION Directorate-General III – Industry, 15. July 1999, „A Brief Project Description” – July 1999 „e-learning for standardization within the EU”. First meeting: February 1st 2000 at 10 a.m. The meeting will be held in Mr. Vardakas' office

An explanation for this failure emerges from the different organisational and institutional structures that standardisation organisations have in Asia and Europe.

In Asia the standardisation organisations are primarily responsible to a ministry and do not pursue any commercial interests. Their tasks and objectives are subordinated to the whole, i.e. to the country's objectives and visions. Furthermore, the superiority of the Asian standards bodies lies in their direct duty to comply with the instructions of the ministries. At the forefront are the interests and hence the advancement of the country.

The European infrastructure for standardisation, i.e. the institutions CEN, CENELEC and ETSI, is organised on a decentralised basis. Behind an institution such as CEN are a large number of separate complicated institutional interests, imposed by the commercial interests and power politics of individuals. The individual decision-makers, the national standards bodies, are in competition; they are commercially oriented and profit-centred.

The concentration of the EU Commission on the national standards bodies, represented by CEN/CENELEC, is not contributing to the establishment of independent teaching of standardisation in Europe.

Again it must be emphasised that a sustainable development of the European standardisation system will only be secured by stable academic infrastructure for standardisation at European higher education establishments and by a merging of research and teaching.

It is our task, on the basis of the Bologna Process, to develop and implement a vision of academic education in the field of standardisation. The promotion and hence improvement of knowledge in the field of standardisation and here in particular the strategic-economic knowledge on standardisation will contribute to technical progress and to lasting economic growth in Europe.

Let me close my report with a quote from Upton Sinclair:

“It is difficult to get a man to understand something, when his salary (his profit, his power) depends on his not understanding it.”

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