

Teaching Excellence Cases

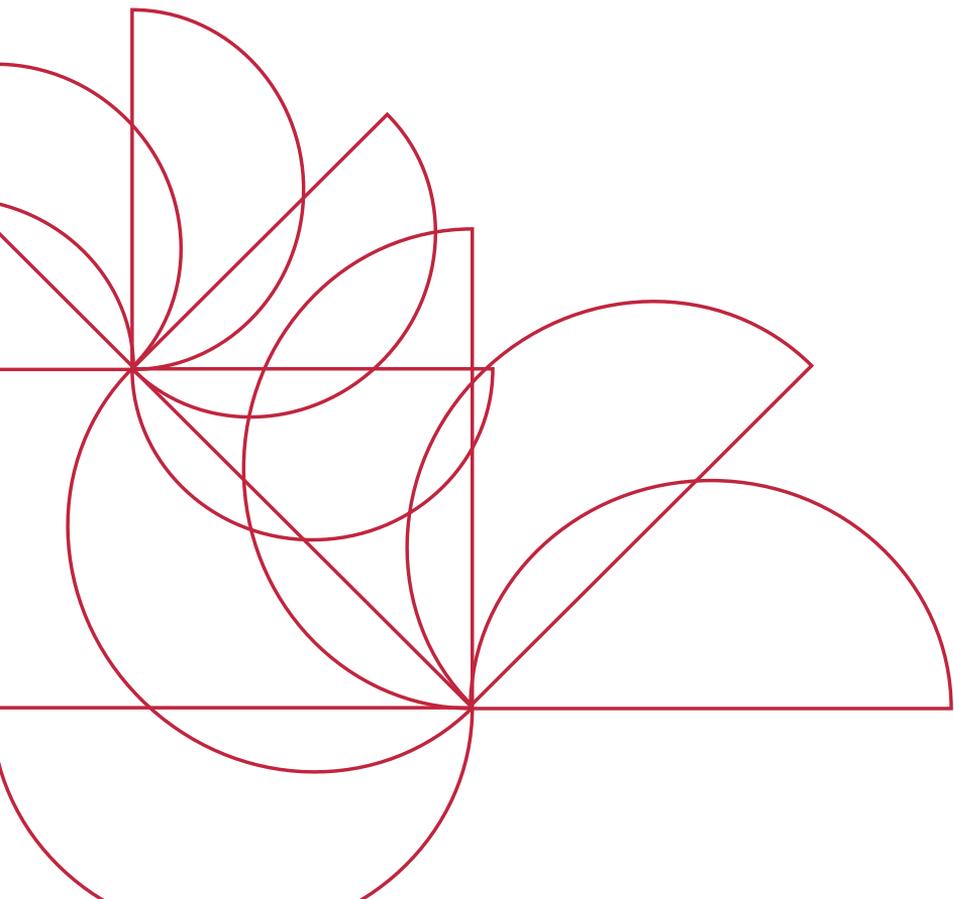
How others have taught
standards and
standardization



Teaching Excellence

Around the world, there are great teachers and lecturers who are leading the way in education about standardization.

Four European National Standards Bodies, BSI from the UK, DS of Denmark, Ireland's NSAI and Finnish body SFS, have asked those teachers to share their stories.



Dr Eujin Pei
Senior Lecturer
De Montfort University
BA / BSc / MDes Product & Furniture Design,
Undergraduate and Postgraduate course

I am a Senior Lecturer at De Montfort University, teaching Technical Definition to the undergraduate students. I believe that it is important to give lectures on standards and to raise awareness so it can help them in their studies and in their careers. The BSI has also delivered supplementary lectures on BS 8888:2011 to design students at De Montfort University in Leicester for three years. It was initially meant for first year students and the lectures has been expanded to include a school-wide lecture series, where we invite students and staff from other departments, including product and furniture design, design crafts, and interior design. The lectures have been very well received – and that’s certainly been backed up by the highly positive feedback students have given.

Partly as a result of the lectures, I have also become formally involved in the standards-making process, as part of the AMT/8 committee for additive manufacturing technologies which I joined in 2012. Essentially, the role of a member of a BSI committee is to contribute one’s expertise and experience to the committee’s standardization programme; and to represent the committee’s interests and concerns of the organization.

Learning Outcomes

- The fundamentals of three-dimensional design and the fundamentals of technical definition of products
- An overview of relevant British Standards in product design (BS8888)
- Manual 2D drafting and 2D sketch modelling



- The use of appropriate software to create 3D digital models
- Generating production data in 3D and 2D and to produce and comprehend basic technical drawings
- Producing renderings that will aid in the communication of visual information using appropriate software

How do you teach this course?

At De Montfort University, under the scope of product design, I'm module leader for technical definition. I teach standards in a broad sense in the students' first year. In their second year module, my teaching focuses more on BS 8888 and BSI's visiting lectures support that. It's a fantastic arrangement, because students get to appreciate standards from a general perspective, which gives them the opportunity to prepare more specific questions for when BSI staff visit.

This module contains a series of lectures to educate students on the principles of three-dimensional design and the fundamental concepts of technical definition of products. Current practices in technical drawings on how information is structured and presented according to relevant drawing standards (BS8888) will be covered. Tutorials and demonstrations will allow a hands-on approach in manual drafting and to learn the use of appropriate software to communicate complex details in terms of technical information and product appearance. They will also learn the techniques for rendering models at a basic level for visual presentation. Most students generally pass and do well and feedback to lectures from the NSB have been overwhelmingly positive.

Tools and Resources

Lectures and tutorials, plus external visits such as supplementary lectures from National Standards Body staff members.



Recommended Reading

Engineering drawing practice: a guide for further and higher education to BS 8888:2006

Technical Product Specification (TPS) by British Standards Institution (London, BSI, ISBN 0580501116)

Manual of Engineering Drawing: To British and International Standards by C. Simmons and D. Maguire (Oxford, Butterworth-Heinemann, ISBN 0750651202)

Learn more about this course at: www.dmu.ac.uk



Gill Whitney
Associate Professor
Middlesex University
IT Infrastructure, Software Development Projects and Emerging Technologies in Practice, Undergraduate course

Gill Whitney is an acknowledged expert in the field of Digital Systems with particular knowledge of the standardisation, legislation, training and technical factors needed to support the creation of useable, useful and fun technology. She is Head of the Design for All Research Group which carries out multidisciplinary research work in the area of digital and social inclusion.

Learning Outcomes

IT Infrastructure

On completion of this module, the successful student will be able to

- Demonstrate the understanding of underpinning theory and concepts in Information Technology by the creative solving of problems and analysis of complex case studies through the use of technical report writing and presentation.
- Show that they are competent in the sourcing, verification, evaluation and précis of technical information from a wide range of on-line sources

Emerging Technologies in Practice

On completion of this module, the successful student will be able to:

- Deploy sound principles in the design creation, use and support of information systems for the solution of practical IT and computing problems and reflect on wider context of IT practice in organisations and society;
- Understand and apply sound legal, social, ethical and professional practices in the utilisation of various IT and computing technologies;



How do you teach this course?

The two IT modules are taught using a mixture of lectures and practical laboratory activities. Use is made of the BSI website which enables students to review existing standards and suggest new standards. The approach of using practical exercises and linked theoretical material has worked before but I cannot yet comment on this approach on these new modules.

Do you have any future plans for this course?

I would like to link to other academics who are teaching standards, to share ideas and to build on the ideas that me and my students and they and their students are creating.

Tools and Resources

BSI's New Proposals website: <http://standardsproposals.bsigroup.com>
Use is also made of introductory material from ISO, ETSI and ANEC

Recommended Reading

Relevant standards are used depending on both the focus on the module and any relevant news items. The CSD module makes extensive use of project management standards whereas the other two ITX modules make use of standards with respect to design, unicode etc.

Learn more about this course at: www.mdx.ac.uk

Dr Jason Underwood
Senior Lecturer
University of Salford
MSc. BIM & Integrated Design, Postgraduate course

I am currently a senior lecturer in Construction ICT and Civil Engineering Surveying along with Director of Postgraduate Research Admissions and Training and Programme Director of the MSc. in Building Information Modelling programme within the School of the Built Environment at the University of Salford. I am also Director of Construct IT For Business, an industry-led non-profit making collaborative membership-based network, comprising leading edge organisations representative of the construction industry supply chain in addition to professional institutes and R&D/academic institutions, whose aim is to improve industry performance through the innovative application of IT and act as a catalyst for academic and industrial collaboration. My background is a combination of civil/structural engineering and construction ICT with over eighteen years research experience in the area of concurrent engineering, integrated and collaborative computing in construction, product and building information modelling, and organisational e-readiness towards delivering strategic value from ICT investment through involvement in both UK and EU funded research projects, on which I have published extensively. In relation to BIM particularly, my interest is focused towards BIM implementation and deployment together with education and training in the development of BIM capabilities, in particular bringing together the concept of organisational e-readiness with BIM. At a national level I am actively engaged in the Education & Training working group to deliver the UK Government BIM strategy and the present Chair of the UK BIM Academic Forum. I am also engaged at a local level including the Northwest BIM Hub of the UK Government BIM Strategy and the Northwest Construction Hub BIM Special Interest Group. I am the Editor-in-Chief of the Journal of 3D Information Modelling (IJ3DIM) specifically focused on BIM along with 3D GIS and their integration.

Learning Outcomes

Aims and Intended Learning Outcomes of the programme include:

- Provide advanced knowledge on Lean, integrated design processes with the use of Building Information Modelling (BIM) technology;
- Educate those involved with designing and managing complex (re)development of built environments;
- Develop managerial, technical and interpersonal skills to deliver better value through integrated design, construction and operation;
- Promote high quality research skills in the area of the built environment.

How do you teach this course?

The programme is offered as full time on campus; part-time on campus; and part time distance learning via a VLE. A blended teaching and learning approach is adopted.

The learning strategy is based on the following principles:

achieving the learning outcomes through seminar-led learning; including lectures, seminars and workshops, supported by student presentations, symposia and peer feedback; lecturers that engage the students in a variety of tasks and discussion of issues, and live case study projects, involving real clients and real community projects.

The learning strategy also include activities such as site visits, a 3 day summer school.

What are the results like?

The majority of students pass the course with a good number of awards with Distinction and Merit.



How do students benefit?

The main benefit of the course is in developing future professionals and up skilling current professionals that can enable and support the transformation of the construction industry in line with the UK Government Strategy.

Do you benefit as well?

The benefits for the institution is developing and up skilling professionals and also their staff with a consistent understanding of BIM to facilitate the transformation of the construction industry that BIM proffers.

Linked to this is actively influencing the transformation.

What has feedback been like?

Approach from tutors is interesting and the variety of guest lectures facilitates improving student knowledge of practical possibilities.

Programme is very useful and beneficial with lectures and presentations being well organised and interesting along with tutors being well supportive and approachable.

Do you have any future ambitions?

Two key areas where the programme is being further developed is:

1. Level 3 BIM and beyond, i.e. Big Data, Smart Cities, etc.
2. Behavioural/people aspects of collaboration and BIM.



Do you have any other advice or thoughts?

For academics interested in BIM and, in particular, moving BIM education forward then they should become more aligned and engaged in the activities/initiatives/etc. that are driving and supporting the transformation such as the BIM Task Group, BIM Academic Forum, BIM Regional Hubs, etc.

A key aspect for Built Environment education in relation to BIM and its transformation of the construction industry is consistency (of the learning) without being too prescriptive.

Tools and Resources

The overall programme is managed through a Virtual Learning Environment and the distance learning mode of study is delivered live through this system.

Academic and industry (guest lecture) presentations are both provided.

Recommended Reading

The BIM Level 2 suite, e.g. BS1192:2007, PAS1192:2, PAS1192:3, PAS1192:4, BIM Protocol, etc.

Examples of other references (but not exhaustive):

BIM For Facility Managers, Teicholz.

The Impact of Building Information Modelling, Ray Crotty.

Eastman, C., Teicholz P., Sacks R. Liston, K. (2008) BIM Handbook: A Guide to Building Information Modelling for Owners, Managers, Designers, Engineers and Contractors, John Wiley & Sons Inc., New Jersey.

Smith D. K. & Tardif M. (2009) Building Information Modelling: A Strategic Implementation Guide for Architects, Engineers, Constructors, and Real Estate Asset Managers, John Wiley & Sons Inc., New Jersey



AIA. (2010). Integrated Project Delivery: Case Studies, The American Institute of Architects California Council.

AIA. (2007). Integrated Project Delivery: A Guide, The American Institute of Architects.

The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer, Jeffrey Liker

Learn more about this course at: www.salford.ac.uk



William Young
Professor of Sustainability & Business
University of Leeds
Standards and tools for business, environment and corporate social responsibility, Postgraduate course

I teach about 60+ sustainability related standards to Masters students wanting either to work as sustainability management consultants or work in sustainability/CSR departments in large companies.

Learning Outcomes

On completion of this module, students should be able to:

- demonstrate a broad understanding of the environmental management, corporate social responsibility (CSR) and sustainable management tools available for business to tackle environmental, CSR and sustainable development issues, demonstrate an understanding of the principles behind implementing each environmental, CSR and sustainable management tool in a company.
- understand the various standards and guidelines available for each tool;
- be able to weigh up the advantages and disadvantages of each environmental, CSR and sustainable development tool in deciding which is appropriate for different companies facing different issues;
- understand the experiences of companies implementing these tools from examples and case studies.



How do you teach this course?

Standards are grouped into 10 areas or topics covering include:

- environmental management systems such as ISO14001 and EMS
- sustainable management
- environmental/social/sustainable auditing
- life cycle assessment
- eco/ethical labelling
- environmental/social/sustainable development indicators
- environmental/social/sustainable development reporting
- environmental/ethical/sustainable supply chain management
- social/sustainable accounting
- stakeholder dialogue/management
- labour standards
- fair trade standards.

Students read 2 standards from each grouping and answer discussion questions in class. I lecture on how it is used in practice and research findings on the success or not of the standards. There are also guest lecture from BSI on the development of standards.

What are the results like?

The grades are good as the students generally have a good idea of what they have to learn and deliver in the assessments.

What has feedback been like?

They find reading the standards tedious but the discussions and lectures are useful. Overall they see the module as essential for their future careers.



How do students benefit?

Knowledge of sustainability related standards are essential for students going to work in sustainability related areas in consultancies or large companies.

Do you benefit as well?

It is one of the areas of my research and I am member of some BSI standard development committees. Teaching helps recruit students to the MSc programmes.

Tools and Resources

I use BSOL British Standards Online (through library subscription) as well as websites of 20 other standards organisations websites. Most other standards are available free on the latter organisations websites.

Do you have any future ambitions?

You have to be innovative to keep students interested but I feel they do have to read standards to truly understand them. Hopefully we're going to have students doing some work with the estates team within University to implement/audit/help some of the standards.



Recommended Reading

Essential reading

Reed, D, Utting, P., Mukherjee-Reed, A (eds) (2011) Business regulation and non-state actors : whose standards? : whose development?, Routledge

Useful reading

Belz, F. M. & Peattie, K. (2009), Sustainability marketing : a global perspective, Chichester : John Wiley and Sons.

Boström, M. & Klintman, M. (2008), Eco-standards, product labelling and green consumerism, Houndmills, Basingstoke : Palgrave Macmillan.

Edwards, A. J. (2004), ISO 14001 environmental certification step by step Oxford ; Burlington, MA : Elsevier Butterworth-Heinemann.

Hendrickson C.T., Lester B. Lave, H. Scott Matthews T. et al (2006), Environmental life cycle assessment of goods and services : an input-output approach : Resources for the Future.

Humphrey, N. & Hadley M. (2000), Environmental auditing, Bembridge, Isle of Wight : Palladian Law Pub.

Macdonald, K. & Marshall, S. (2010), Fair trade, corporate accountability and beyond : experiments in globalizing justice, Farnham : Ashgate.

Pain, S. W. (2010), Safety, health, and environmental auditing : a practical guide, Boca Raton, Fla. : CRC.

Pinkse, J. and Kolk, A. (2009) International business and global climate change. London : Routledge.

Raynolds, L.T., Murray, D. and Wilkinson, J.(eds) (2007) Fair trade : the challenges of transforming globalization, London : Routledge.

Sheldon, C. & Yoxon, M. (2006), Environmental management systems : a step-by-step guide to implementation and maintenance London : Earthscan.

Strasser, K. A. (2011), Myths and realities of business environmentalism : good works, good business or greenwash? Cheltenham : Edward Elgar.

Tinsley, S. & Pillai, I. (2006), "Environmental management systems : understanding organizational drivers and barriers", Earthscan, London ; Sterling, VA.



Wathey, D. & O'Reilly, M. (2000), ISO 14031 : a practical guide to developing environment performance indicators for your business, Stationery Office, Norwich.

Whitelaw, K. (2004) ISO 14001 environmental systems handbook, Amsterdam ; Boston : Elsevier/Butterworth Heinemann.

Database

British Standards Online

Journals

British journal of management.

Business Strategy and the Environment

Corporate Social Responsibility and Environmental Management
(formally Eco Management and Auditing)

Environmental management.

Ecological economics.

Greener Management International

International Journal of Life Cycle Assessment

Journal of Business Ethics

Journal of Cleaner Production

Journal of Environmental Policy and Planning

Journal of environmental management.

The Journal of Environment & Development

Journal of industrial ecology.

Journal of supply chain management

Long Range Planning.

Sustainable development

The ENDS Report

Ethical Corporation Magazine.

Learn more about this course at: www.leeds.ac.uk



Geraint Bevan
Lecturer in Applied Instrumentation and Control
Glasgow Caledonian University
Measurement Theory and Devices, Postgraduate course

I teach standards and quality in the first module taken by MSc Applied Instrumentation and Control students. The class usually starts with a discussion about what everyone understands by the words “quality”, followed by a description of how standards are used in industry, including calibration, traceability and measurement, followed by a demonstration of the BSI website and then a look in detail at BS EN ISO 5167 in the context of flow measurement.

Learning Outcomes

On completion of this module, the student should be able to:

- Adopt a generalised approach to the synthesis and analysis of measurement systems.
- Understand the principles of operation of devices based on physical measures.
- Appreciate the factors which affect the design of a measurement system based on a customer specification requirement.
- Critically appraise a range of optional devices for a specific industrial measurement task.
- Understand the relationship of measurement to quality standards and vice versa.
- Apply techniques to improve the performance of measurement systems.



How do you teach this course?

Class discussion -> short lecture on traceability, calibration and standards, including ISO 9001 and ISO 14000 -> BSI website demonstration -> tutorial using BS EN ISO 5167.

The class generally includes a large proportion of international students, so discussion about interaction between various international bodies often features.

What are the results like?

The module is examined 50 % coursework and 50 % exam. Most students pass; a small proportion require a resit in the exam. Standardisation is examined in the context of flow measurement and the ability to use a standard in design calculations. Most students who attempt this question do well at it.

How do students benefit?

Students learn that standards can be of use to them; that they are not simply dry documents that create bureaucracy.

Do you benefit as well?

Our students are better prepared for industry, thus making them more employable, which in turn improves our graduate employment figures and hence the attractiveness of the programme to potential applicants.



What has feedback been like?

Feedback isn't solicited regarding standards in particular, but overall the student feedback for the module (and the degree programme as a whole) is extremely positive.

Do you have any other advice or thoughts?

Group discussion helps to generate interest in a topic that would be quite dull if presented only as a lecture.

Where possible, we also try to arrange visits for our students to TUV SUD NEL (the former National Engineering Laboratory in East Kilbride) where they can learn in more detail about calibration of flow measurement devices and see the facilities that are there.

Learn more about this course at: www.gcu.ac.uk/ebe/staff/drgeraintbevan/



Henk de Vries
Associate Professor of Standardisation
Rotterdam School of Management, Erasmus University
Innovation and Interface Management, Undergraduate course

Henk J. de Vries is Associate Professor of Standardisation at the Rotterdam School of Management, Erasmus University. His research and teaching focus on standardisation from a business point of view. Henk is President of the European Academy for Standardisation EURAS, Special Advisor to the International Federation of Standards Users IFAN, and Immediate Past President of the International Co-operation for Education about Standardization ICES. He is (co-)author of more than 300 publications in the field of standardisation.

Learning Outcomes

Learning objective of this course is to provide you with basic knowledge about interface management and, next, its integration in innovation management. This should enable you to develop and employ a strategy for an individual company, a supply chain or a branch of business on how to manage product or service innovation in combination with interfaces. The multidisciplinary scientific basis of this course will be complemented with business input in the form of business cases, company visits, guest lectures and company-related assignments.

At the end of this course, you should have gained an improved understanding of

- the phenomenon of interface management and the related theme of standardisation including theories, models and approaches
- how interface management can impact innovation
- how to integrate interface management in innovation management.



In the form of learning by doing, this course should improve your skills in:

- doing empirical research;
- reviewing literature;
- providing advice to an organisation;
- writing a structured report;
- presenting.

By doing so it prepares you for the master thesis.

How do you teach this course?

This course provides you with basic knowledge about interface management and, next, its integration in innovation management. This should enable you to develop and employ a strategy for an individual company, a supply chain or a branch of business. The multidisciplinary scientific basis of this course will be complemented with business input in the form of business cases, company visits, guest lectures and assignments related to business cases.

The course covers the entire area of interface management, not only at company level but also at the level of industry associations and governments, nationally as well regionally and globally and relates this to innovation management. After a general introduction, the course addresses subsequently interface management in the form of formal standardisation at the national, regional and global level, interface management by industry associations and by industrial consortia, interface management at company level, and interface management in chains and networks of organizations. A next topic is conformity assessment: how to make sure that interfaces indeed meet the specifications set for them. Then we pay attention to methods and techniques of standardisation, and the several legal implications (including the use of standards as 'soft laws' and the relation with Intellectual Property Rights). Next, we collect all this to innovation by linking interface management, standards and standardisation to the phases of the innovation process and seeking evidence for the impact on innovation. Finally, the question is how to manage an integrated approach of innovation and interface management, including the way of



organizing it, within companies and in cooperation between companies and other stakeholders.

The course includes scientific contributions from disciplines like economics, law and political science – and the challenge is to combine these disciplines to solve real business problems and generate new business opportunities. The scientific basis of this course is complemented with business input in the form of business cases, company visits, guest lectures, and real-life assignments.

The teaching method is a mixture of

- lectures;
- guest lectures;
- company visits;
- teaching cases;
- role playing game;
- class discussions;
- presentations by students;
- individual assignments;
- group assignments.

The total workload of the course is 168 hours (6 ECTS). The last week is a scheduled for exams but instead of a written exam you will have to hand in the report of both your main individual assignment.

How do students benefit?

They become familiar to a topic very relevant for innovation management and learn to use it for the benefit of companies – their future employers.



Do you benefit as well?

First, I enjoy teaching. For my institution it is relevant that they can excel as a business school not only by copying what other top business schools do but also by distinguishing themselves from them by providing this unique course. Moreover, my teaching (including the other courses) won the ISO Award and of course this is also appreciated.

Do you have any future ambitions?

I also included a shortened version of this course in a new Bachelor Elective Responsible Innovation, together with Leiden University and Delft University of Technology. In future we might offer this course in the form of blended learning also for students in other countries.

Recommended Reading

Teaching materials include own unpublished papers, materials written by PhD students and students, documents from companies to be visited, and:

Basic module on Conformity Assessment

ISO/IEC (2008) ISO/IEC Guide 76 'Development of service standards – Recommendations for addressing consumer issues.' Geneva: International Organization for Standardization & International Electrotechnical Commission

Jan van den Ende, Geerten van de Kaa, Simon den Uijl & Henk J. de Vries (2012) The Paradox of Standard Flexibility: The Effects of Co-evolution between Standard and Interorganizational Network. *Organization Studies*, 33, 5-6, 705-736.

Vries, H.J. de, Joost P.M. de Ruijter, & Najim Argam (2011) Dominant design or multiple designs: The flash memory card case. *Technology Analysis & Strategic Management*, 23, 3, 249-262.

Frank Steven Dahl Anderson (2014) Standardization and Innovation: A Systematic Literature Review. Unpublished paper. Earlier version



presented at EURAS 2013 conference and included in Kai Jakobs et al. (2013) EURAS Proceedings 2013 – Standards: Boosting European Competitiveness. Aachen: Verlag Mainz, pp. 77-91.

Paul Moritz Wiegmann (2013) Combining Different Modes of Standard Setting – Analysing Strategies and the Case of Connectors for Charging Electric Vehicles in Europe. In: Kai Jakobs et al. (2013) EURAS Proceedings 2013 - Standards: Boosting European Competitiveness. Aachen: Verlag Mainz, pp. 397-411.

Mary J. Benner and Michael Tushman. "Process management and technological innovation: A longitudinal study of the photography and paint industries." *Administrative Science Quarterly* 47.4 (2002): 676-707.

ISO 9001

Jongbae Kim & David Wilemon (2003) Sources and assessments of complexity in NPD projects. *R&D Management* 33, 1, 1, pp. 15-30.

BT/WG 209/TG 2 report – Research needs relevant to the development of standards for Bio-based Products

Final Report of CEN/BT/WG 209 "Bio-based products"

BT/WG 209/TG 2 report – Research needs relevant to the development of standards for Bio-based Products

Final Report of CEN/BT/WG 209 "Bio-based products"

Mandates M/492 "horizontal mandate on bio-based products" and M/491 "bio-surfactants and bio-solvents"

Henk J. de Vries (2008) Standardisation: A Business Science Perspective. In: Judith Schueler, Andreas Fickers & Anique Hommels (Eds) *Bargaining Norms, Arguing Standards – Negotiating Technical Standards*. STT74. The Hague: STT Netherlands Study Centre for Technology Trends, pp. 18-32.

Henk J. de Vries, Jan Dul and Hugo Verheul (2011) Stakeholder representation in standardization. Unpublished paper.

Learn more about this course at: www.rsm.nl/hdevries



Angelos Lampousis
Lecturer
City College of New York, CUNY
Environmental Site Assessments, Undergraduate course

Angelo Lampousis has significant experience in implementing standards-based curricula in both the undergraduate and graduate levels. He developed graduate and undergraduate courses in environmental site assessments, health, and safety, for the Department of Earth & Atmospheric Sciences of City College of New York of the City University of New York (CUNY). His courses were noted by ASTM and EPA, resulting in close collaborations with these organizations in the areas of curriculum development and internship opportunities (Bower, 2014; Lampousis, 2014). Distinguished guests from the standards community who have visited in person Dr. Lampousis' classes in New York City include Dr. Mary C. McKiel, 2013 chairman of ASTM International's board of directors; Dr. George W. Arnold, Director, Standards Coordination Office, National Institute of Standards and Technology; James Thomas, President, ASTM International. Dr. Lampousis serves as a member on the ASTM committee E50 and the task group responsible for developing the ASTM Standard E1527-13, Practice for Environmental Site Assessments. He also serves on the Committee on Education of the American National Institute on Standards. He is presently leading the paper review panel of the 2014 ICES conference (International Cooperation for Education about Standardization). He has been an invited author to periodicals (e.g., ASTM's Standardization News and IEEE's Series on Practical Ideas from Professors) and invited speaker to conferences (62nd Annual Conference of the Society for Standards Professionals, August 12-15, 2013 in Savannah, GA) reporting on the use of standards into the classroom. He received his B.S. in agriculture from Aristotle University, Greece, his M.Phil. in Earth and environmental Sciences and Ph.D. in environmental geophysics from CUNY's Graduate School & University Center. He is also an OSHA-authorized trainer.



Learning Outcomes

The purpose of this course is to introduce students to good commercial and customary practices in the United States of America for conducting environmental site assessments (ESA) of commercial or residential properties with respect to hazardous substances and petroleum products. A Phase I ESA is the process for determining the presence of an existing release, a past release, or a material threat of a release of any hazardous substances or petroleum products into the ground, ground water, surface water of the property, or into structures on the property. Successful completion of this course will benefit those seeking professional employment in the environmental engineering consulting industry, as well as students seeking advanced academic degrees in disciplines that involve subsurface characterization. Students are automatically enrolled in the 10-hour OSHA Outreach Training Program for General Industry, which is intended for entry level workers. The 10-hour outreach course provides basic awareness training on the recognition, avoidance, abatement, and prevention of workplace hazards.

How do you teach this course?

The course builds upon the strengths of the departmental and college curriculum in that it requires the synthesis of skills already acquired through other science courses, such as those in geology, environmental sciences, geography, and earth system sciences in general. As an upper-elective course, it also prepares graduating students to enter the workforce through the cultivation of professional skills presently not addressed by traditional curricula, including interpersonal, communication, negotiation, and leadership skills.

Tools and Resources

Each student is assigned one site within the New York City's five boroughs, and provided with electronic access through Blackboard to a thorough collection of interactive environmental databases. These



include topographic maps, aerial photographs, Sanborn maps, historical telephone directories, and the "Radius Map" for their respective sites. Students are expected to mine these databases for environmental records of interest and extend their inquiries by accessing additional publicly available databases.

What has feedback been like?

Quotes from student feedback:

I would like to thank you for your class in general. I gained a lot from your course, and not just the 40-hour HAZWOPER. I learned valuable material that prepared me to work in the industry upon graduation, more so than any other class. Because of your courses I was able to get a career as a geologist. I don't believe it would have happened so soon after graduation if not for the resources I gained from your courses.

I am happy to announce that I have been hired as an industrial hygienist.... I strongly feel that your classes have really helped me get the job and that I can finally use the things I have learned. I started Friday the 27th, and all day I filled out Excel spread sheets with air quality data, and wrote reports. It made me feel like I was back in your class. Thank you for everything.

How do students benefit?

Provide students a competitive edge by fitting them with the skills their industry is looking for, sparing employers much expensive and time-consuming on-the-job training. The courses also appeal to non-matriculated students, who are already in the field and find they lack adequate preparation.



Do you benefit as well?

The course builds upon the strengths of the departmental and college curriculum in that it requires the synthesis of skills already acquired through other science courses, such as those in geology, environmental sciences, geography, and earth system sciences in general. As an upper-elective course, it also prepares graduating students to enter the workforce through the cultivation of professional skills presently not addressed by traditional curricula, including interpersonal, communication, negotiation, and leadership skills.

Do you have any future ambitions?

Continue expanding available opportunities for students to inform and formulate their own views and beliefs by exploring the limits of confidentiality which bounds the client and the environmental professional, versus the (ethical) obligation of reporting any environmental conditions identified by the environmental professional, which may be potentially harmful to the general public.

Do you have any other advice or thoughts?

- Create a detailed inventory of the available opportunities within your institution for students to grow professionally.
- Engage members of standards development organizations in the development of your curriculum.
- Expand your outreach outside your institution, while using as a vehicle your standards-based curriculum.
- Continue fine-tuning the integration of standards in your curriculum to account not only for the anticipated amendments of existing standards but also for your own institution's changing goals.



Recommended Reading

10 ASTM Standards for Students Package [Publisher: American Society for Testing and Materials]:

ASTM E1527 – 13 Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process

ASTM E2600 – 10 Standard Guide for Vapor Encroachment Screening on Property Involved in Real Estate Transactions

ASTM E1528 – 06 Standard Practice for Limited Environmental Due Diligence: Transaction Screen Process

ASTM E1903 – 11 Standard Guide for Environmental Site Assessments: Phase II Environmental Site Assessment Process

ASTM D6235 – 04 (2010) Standard Practice for Expedited Site Characterization of Vadose Zone and Ground Water Contamination at Hazardous Waste Contaminated Sites

ASTM E2356 – 10 Standard Practice for Comprehensive Building Asbestos Surveys

ASTM E2255 – 04 Standard Practice for Conducting Visual Assessments for Lead Hazards in Buildings

ASTM E2418 – 06 Standard Guide for Readily Observable Mold and Conditions Conducive to Mold in Commercial Buildings: Baseline Survey Process

ASTM D653 – 09 Standard Terminology Relating to Soil, Rock, and Contained Fluids

ASTM D5092 – 04(2010)e1 Standard Practice for Design and Installation of Ground Water Monitoring Wells

Learn more about this course at: www.cuny.edu



Mohamad Kassem
Senior Lecturer in Engineering Project Management
Teesside University
Advance project planning and visualisation, Postgraduate course

Dr. Mohamad Kassem is a Senior Lecturer in Engineering Project Management. His research interests are in Building Information Modelling, information technology and virtual reality applications in architectural, engineering and construction projects and processes; sustainability, decision support systems, project planning and risk management.

Dr. Kassem has a PhD in Mechanical Engineering, an MSc in Project Management and a professional diploma in management. He is an associate member of the Project Management Institute and the Chartered Management Institute.

Dr. Kassem holds several research grants from UK and international funding bodies. He is Co-Principal Investigator on an international research project (2014-2018) funded by the Qatar Foundation (\$ 940,000) and he is the academic supervisor on three Knowledge Transfer Partnerships (£ 360,000) funded by the Technology Strategy Board. Dr. Kassem is also a leader on the exploitation plan task in the European FP7 project "SEMANCO".

Dr. Kassem acted as the coordinator of the 13th International Conference on Construction Applications of Virtual Reality in London. He is also a key contributor and member of the working committee responsible for Teesside University's Research Excellence Framework (REF) 2014 submission.

Learning Outcomes

to provide students with a knowledge and understanding of the principles of project planning and management. Students will explore a range of planning and visualisation techniques used to identify and solve strategic and operational project planning in engineering projects. Students will investigate the potential for applying innovative project planning tech-



niques to plan and monitor engineering projects to deliver within time, cost, quality and clients satisfaction.

How do you teach this course?

Lectures will introduce students to key concepts, models and theories of project planning and visualisation techniques. Tutorials will provide individual support and will involve group discussions focusing on opportunities for introducing new planning techniques in a variety of work related contexts. Practical sessions will include demonstrations of project planning and visualisation software.

What are the results like?

Most students pass.

Most score (70 % of total) are B (50 to 70 %).

20 % of student score A (Above 70 %).

The remaining score C.

How do students benefit?

They understand the backend of project management software and they appreciate the effort that has been spent over long years to get to that user friendly and effective software they use.

Do you benefit as well?

We increase student employability by forming professionals who knows what is in the black box. they are capable of developing or at least managing the purchase of their software/system in a smarter way by considering the multiple standards around a software/system.



Do you have any other advice or thoughts?

It really depends from subject to subject and at which level standards are taught. I usually teach students information technology standards that influence the use of their IT system for project management applications. The learning outcome from teaching this is to help students understand interoperability/integration issues and develop/purchase system that overcome those issues.

Recommended Reading

Haughan, T.G. (2002). Effective Work Breakdown structures. Management Concepts, Vienna, Virginia.

Buttrick, R. (2009) The project workout: the ultimate handbook of project and programme management. 4th edn. Harlow: Financial Times/Prentice Hall.

Winch, G.M. (2010) Managing construction projects: an information processing approach. 2nd edn. Chichester: Wiley-Blackwell.

Meredith, J.R. (2012) Project management: a managerial approach. 8th edn. Hoboken: Wiley.

Journals

International Journal of Project Management *

ITcon-Electronic journal of information technology in construction

Learn more about this course at: www.tees.ac.uk



Alpo Värri
Associate professor
Tampere University of Technology
Standards, Interoperability and Regulations in Health Informatics,
Undergraduate course

I have been involved in health informatics standardisation since 1994 when I was invited to participate in the preparation of the Vital Signs Information Representation standard for CEN/TC251/WGIV. I kept on participating the WGIV work and finally found myself as the convenor of this working group. Our university has focused more effort to health informatics education in recent years and having been involved with the standards of this area, I felt that I am obliged to tell about these things to our students, too.

Learning Outcomes

This course introduces student with key principles related to standards and regulations, which are essential to know while working in the health informatics domain. Health information systems interoperability and key standards will also be studied. Course requires the student to have pre-existing knowledge on basics of health information systems.

After having passed this course, the student:

- Can define what data security, privacy, and safety.
- Knows the central regulations related to health information systems and privacy and security of health data, and knows how they need to be taken into account in health information system development.
- Knows general health informatics standards and interoperability approaches, and can describe how they are applied in practice.
- Can apply the most important standards which are widely used in Finland in health information systems in software development



- Can assess whether a health information system is implemented according to regulations and interoperability principles.

How do you teach this course?

The first implementation of the course consisted of lectures, exercises in a computer class and a project work carried out in groups of two people. The next implementation may be slightly different if we manage to set up a computer system to which the students should connect to using standard-based messages composed by themselves.

Tools and Resources

We use Moodle to keep the PDF versions of the slides of the teachers. The Moodle pages contain also links to the web sites of the relevant standardisation bodies and other relevant material. Actually there is more material than the students can swallow but that is the world of health informatics.

Do you have any other advice or thoughts?

Work out the copyright restrictions imposed by some SDOs when you plan the preparation of the material. Luckily our university has a contract with the NSB about a number of standards but in some cases these limitations have made it difficult to distribute material to the students in certain areas. Some withdrawn standards can provide a rescue to teach the principle of certain types of standards as there is no longer commercial interest in these versions anymore.

As it is not possible to concentrate very deeply in one standard in a course like this but to cover a plurality of them, the students would have to buy some of the standards later if they need them in their working life. therefore it does not make sense to buy copies of so many standards to



all students. Therefore making it easier to teach standards in these kind of not-for-profit educational settings concerning copyrights would be welcome.

How do students benefit?

The students are aware that there are standards for this field, they are many and they know which SDOs produces standards for different areas. They have also got a glimpse to the complexity of some of the standards in the field in order to estimate the required work better when they design software for certain health informatics products.

Do you benefit as well?

We create awareness of health informatics standardisation and in future perhaps better comments from future experts in the field when it is time to comment on draft standards in a national mirror panel.

Do you have any future ambitions?

For the next implementation round there is interest in putting together a more coherent set of educational material for the students. This includes also self-preparing material to certain areas where copyright restrictions make things difficult.

Learn more about this course at: www.tut.fi



Dina Simunic
University Professor
**University of Zagreb, Faculty of Electrical Engineering
and Computing**
Technical Standardization and Legislation, Undergraduate course

Dina Simunic is Professor of Wireless Communications at University of Zagreb, Faculty of Electrical Engineering and Computing. She is teaching “Technical Standardization and Legislation” since 2007, as an elective course. The course attracts on average 30 students and it is held every year since start.

Learning Outcomes

- understand operation of standardization bodies
- understand interaction of standardization bodies
- learn basic values of standardization process
- learn how to interact in the standardization process
- experience inclusion in the standardization process

How do you teach this course?

- university lectures with PowerPoint
- interactive time with exercises
- active interaction with Croatian Standardization Institute

Tools and Resources

- website
- PowerPoint



- university teaching written material (so-called scripta)
- interaction with Croatian Standardization Institute

Do you have any other advice or thoughts?

Yes – it should be done as a common platform for all of us doing it, so that we can exchange and expand our knowledge and visions. I would need more material as multimedia, for the “liveliness” of the course!

How do students benefit?

they feel and report later that it is very useful for their work after finishing the studies and have stated it is the most useful course at our faculty.

Do you benefit as well?

I feel that I am teaching useful material, necessary for the further work and professional life of young engineers.

Recommended Reading

www.itu.int

www.iso.org

www.iec.ch

standards.ieee.org

Learn more about this course at: <http://www.unizg.hr>



Anders Henten
Professor
Aalborg University
Standardization of ICT, Postgraduate course

I have been teaching courses on standardization for more than 10 years. First at the Technical University of Denmark and later at Aalborg University in Copenhagen. These courses have been for ICT Engineering students. For the past 2 years I have also been teaching a course on standardization for students at an education entitled Management and Informatics in the Construction Industry.

Learning Outcomes

Knowledge

Must have knowledge on different types of standards, including open and closed standards and de facto and de jure standards

Must be able to understand the importance and role of standards, standardization strategies, and standardization processes

Must have knowledge on standardization organizations in the area of communication, media and information technologies

Must have knowledge on the relationships between innovation and standardization

Skills

Must be able to apply theories on network economics, information economics, and transaction costs analysis on standardization issues

Must be able to analyse and evaluate the importance and role of standards, particularly within the area of communication, media and information technologies

Must be able to appraise the role of standards in relation to processes of transaction between market players



Competencies

Must have competencies to interpret the interests which underlie the development of standards

Must have competencies to outline the role of standards in business development for companies in the communication, media and information technology area as well as companies using these technologies

Must have competencies to compare standardization strategies

How do you teach this course?

Course with lectures, external presenters from industry, exercises, discussions of readings, and the writing of a final report.

Tools and Resources

For Communications with students, Moodle is used. In class slides are used for lectures and presentations.

What has feedback been like?

Each year feedback from students has been very positive. It has also resulted in semester projects on standardization or involving standardization issues.



How do students benefit?

This is a topic that most of the students often do not really know what to expect from before starting. Engineering students work with standards, but they seldom understand standardization processes.

Do you benefit as well?

We get students who do not only understand the importance of standards but also know how they are developed.

Do you have any future ambitions?

The course continually develops. In addition to the two educations we offer, standardization courses are offered, we will also offer it as a continuing education for people in jobs.

Recommended Reading

Swann, P. (2010). *The Economics of Standards: An Update*. Report for the UK Department of Business, Innovation and Skills, pp. 1-38.

Kindleberger, C.P. (1983). Standards as Public, Collective and Private Goods. *Kyklos*. Vol. 36, pp. 377-396.

Krechmer, K. (2000). The Fundamental Nature of Standards: Technical perspective. *IEEE Communication Magazine*. Vol. 38. 11 pages.

Krechmer, K. (2000). Standards Mark the Course of Economic Progress. Paper presented at the International J.A. Schumpeter Society Economics Conference, 28 June – 1 July 2000, Manchester, England. 16 pages.

David, P.A. & Greenstein, S. (1990). The Economics of Compatibility Standards: An Introduction to Recent Research. *Economics of Innovation and New Technology*. Vol. 1, pp.3-41.



- Blind, K. & Gauch, S. (2008). Trends in ICT Standards: The Relationship between European Standardisation Bodies and Standards Consortia. *Telecommunications Policy* 32 (2008), pp. 503-513.
- Foray, D. (1998). Standards and Innovation in Technological Dynamics. *StandardView*. Vol. 6, no. 2, pp. 81-84.
- Krechmer, K. (2004). Standardization and Innovation Policies in the Information Age. *International Journal of IT Standards and Standardization Research*. Vol. 2, no. 2, pp. 49-60.
- Stango, V. (2004). The Economics of Standards Wars. *Review of Network Economics*. Vol. 3, issue 1. 19 pages.
- Besen S.T. & Farrell, S. (1994). Choosing How to Compete: Strategies and Tactics in Standardization. *Journal of Economic Perspectives*. Vol. 8, no. 2, pp. 117-131.
- Shapiro, C. & Varian H.R. (1999). The Art of Standards Wars. *California Management Review*. Vol. 41, no. 2, pp. 8-32.
- Hawkins, R. & Ballon, P. (2007). When Standards become Business Models: Reinterpreting 'Failure' in the Standardization Paradigm. *INFO*. Vol. 9, no. 5, pp. 20-30.
- Steen, H.U. (2009). Technology Convergence, Market Divergence: Fragmentation of Standards in Mobile Digital Broadcasting Carriers. *Information Systems and E-Business Management*. (2009)7, pp. 319-345.
- Fujii, A. (2011). Standardization of Electronic Commerce in the Cloud Environment and its Future Evolution. *Quarterly Review*, no. 41, pp. 21-30.
- Rysman, M. & Simcoe, T. (2009). Patents and the Performances of Voluntary Standard Setting Organizations. Technical Report. Hitotsubashi University Repository. 33 pages.
- Blind, K. & Iversen, E. (2004). The Interrelationship between IPR and Standardization: Patters and Policies. 17 + 11 pages.
- Pedersen, M.K. & Fomin, V.V. (2005). The Economics of Standards and Standardization in Information and Communication Technologies: Open Standards and Their Early Adoption. Department of Informatics, Copenhagen Business School. Open Standards Research Report 1/2005. 37 pages.



West, J. (2004) What are Open Standards? Implications for Adoption, Competition and Policy. Paper presented at Standards and Public Policy conference, Chicago, May 13 2004, 31 pages.

Dedrick, J. & West, J. (2004) Why Companies Adopt Open Source Standards: A Grounded Theory of Innovation and Standards Adoption. MISQ Special Issue Workshop, pp. 235-257.

European Commission (2000). Guide to the Implementation of Directives based on the New Approach and the Global Approach. Luxembourg: Office for Official Publications of the European Union, pp. 5-65.

Whang, T-K. & Hobday, M. (2011). Local 'Test Bed' Market Demand in a Transition to Leadership: The Case of the Korean Mobile Handset Industry. World Development, Vol. 39, no. 8, pp. 1358-1371.

Learn more about this course at: www.aau.dk



Dr Jon G. Hall
Senior Lecturer
The Open University
Information Security, Postgraduate course

I build new thought tools for problem solving. The client portfolio for applications of my research includes General Dynamics UK (Lynx helicopter and Harrier JumpJet), Bank of America, Siemens, the UN FAO and many others.

Problem solving is creative and there's no getting round the need for domain expertise. Problem solving is also risky, expensive, and can be disruptive to other parts of a business. Problems 'tangle' together to rule out simple solutions. The tools I've built in Problem Oriented Engineering (POE) provide a problem focus for understanding those tangles. That means more appropriate validation, less rework of solutions, and better management of emergent properties.

Standards work in organisational problem tangles to ease problem solving. Seeing them in this light is the basis of my teaching of them.

Learning Outcomes

M811 aims to provide the skills and knowledge necessary to develop and run a practical information security management system, in accordance with current international standards.

In particular, it aims to:

- provide you with an understanding of current issues in information security and its management;
- teach you a variety of techniques for information security management, including risk assessment and management, and to provide practice in their use;



- provide you with sufficient knowledge to be able to choose between different development techniques, tools and process models for a given information security context;
- make you aware of the policy and technology trade-offs involved in developing information security management systems of sufficient quality;
- give you an understanding of the importance to information security management of risk assessment and management, impact assessment, human factors, and legal and ethical issues.

M811 aims to equip you with the skills and tools necessary to audit your home computer and/or network for information security risk.

Additionally, M811 aims to:

- provide you with an understanding of the information security risks that you face as an individual;
- provide you with sufficient knowledge to be able to manage those risks to be less threatening.

M811 aims to equip you for membership of a professional community, the information security (InfoSec) community.

Additionally, M811 aims to:

- provide you with an ability to evaluate current practice within the discipline of information security against legal, regulatory and commercial expectations;
- provide you with an understanding of the workings of the profession in terms of progression through professional qualifications;
- provide you with the research skills to stay at the leading edge of information security.



How do you teach this course?

I use 'Quines Island' as the teaching model (J. G. Hall and L. Rapanotti. Enterprising research skills: academia's changing role. International Journal of Learning and Intellectual Capital, 10(1):1–17, 2013).

Quine's Island recognises that the student's rich context – their organisation, for instance – provides a perfect habitat to explore Information Security issues. I apply the standard in this context.

How do students benefit?

Every organisation has responsibilities under Information Security. In studying Information Security with the Open University, students are able to understand those responsibilities and contribute to their discharge.

Do you benefit as well?

We contribute to the Information Security of UK plc.

Tools and Resources

OU materials, the standard, and IT Governance by Alan Calder and Steve Watkins.

What has feedback been like?

Examples:

I found the course challenging and stimulating.



I've been really impressed with the content of this module – so thanks to the OU staff who have contributed towards it. I've certainly learnt a lot and will forever be interested in making a contribution to my organisation's information security, no matter where I work.

Do you have any other advice or thoughts?

Get in touch! (Jon_hall@mac.com)

Due to its embedding in industry, for best effect, it needs to work within the student's rich context. Employed part-time students gain most from the teaching of standards as they appreciate first hand the need for them, and can experience the practical barriers to their implementation. Academic case studies can work, but they're a poor substitute.

Learn more about this course at: www.open.ac.uk/postgraduate/modules/m811



