Forum Standaardisatie

Standaard Samenwerken

Standardisation Education in Dutch Higher Education

An assessment of the current situation, opportunities for structural strengthening, and alignment with the Pan-European Certificate

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Executive Summary

Standardisation determines who has influence over technological norms, who enters markets, and who is left on the sidelines. Europe has explicitly identified it as a strategic instrument in the European Standardisation Strategy of 2022, in the High-Level Forum on European Standardisation, and in its response to China's targeted standardisation policy. Companies such as Philips and ASML actively manage it. And yet virtually no Dutch student learns about it.

This report maps the state of standardisation education in Dutch higher education, identifies opportunities for structural strengthening, and examines how the Netherlands can align with the Pan-European Certificate for Standards and Standardisation that is currently under development. The research is based on 27 semi-structured interviews with Dutch and international universities and universities of applied sciences, European and national standardisation organisations, policymakers at the Ministry of Economic Affairs and Climate Policy and the Ministry of Education, Culture and Science, and representatives of the business community.

The picture: present but not embedded

Standardisation is not absent from Dutch higher education. It surfaces in courses on IT law, innovation strategy, data governance, and European regulation. But it is rarely present as an identifiable learning objective, and almost never as something a programme has adopted as its own. Its presence almost everywhere depends entirely on a single motivated lecturer. When that person leaves, the topic quietly disappears.

Four patterns emerge from the interviews that characterise this landscape: standardisation is *substantively recognisable but institutionally invisible*, *person-dependent and therefore fragile*, *limited in reach* (even the strongest Dutch initiatives reach tens to at most a few hundred students per year), and *not driven by external incentives*. There is no accreditation requirement, no policy measure, and no visible labour market demand that compels or invites institutions to act.

The context: urgency is rising, capacity is not

Outside the educational institutions, the picture is sharper. Philips describes standardisation expertise as a core competency that develops over years and that the company now has to build up itself. VNO-NCW positions standardisation as an instrument for technological sovereignty. The Ministry of Economic Affairs and Climate Policy identifies a structural knowledge deficit among central government officials as a contributing cause of the persistently weak compliance with the *'Comply or Explain'* principle.

European standardisation organisations have not been idle. AFNOR developed a free MOOC with over two thousand enrolments. DIN has organised an annual European teachers' conference for years and offers students an official certificate jointly with TU Berlin. ILNAS in Luxembourg built up a full master's programme, starting from a University Certificate for professionals. Austria included standardisation education in its national standardisation strategy of 2024. The Netherlands does not yet have comparable initiatives.

In addition, the standardisation community is ageing. A significant share of the current generation of experts will retire within five to ten years. Informal knowledge transfer through committee work is less effective for younger generations. Without targeted education, there is a risk of a structural capacity shortage in European standardisation structures.

The opportunities: LLL as a starting point, institutional incentives as the key

The most promising short-term route is through Lifelong Learning (LLL) and professional training. Professionals who encounter standardisation issues in their work recognise its relevance immediately. Institutional barriers are lower than in regular education, and there is proven industry demand: an in-company pilot by TU/e and Tilburg University at NXP, with participants from ASML and Philips, demonstrated this. A successful LLL programme can then act as a catalyst for integration into standard curricula.

In parallel, supporting existing teacher-champions has an immediate effect: providing them with ready-made teaching materials, case studies, and guest lecturers reduces the barrier to embedding the topic in existing courses to virtually zero. Framing is important here; standardisation lands better as innovation strategy, European law, or data governance than as a stand-alone topic.

For structural anchoring in the longer term, institutional incentives are indispensable. Embedding in accreditation frameworks, linking to major policy dossiers on

AI, quantum, and the energy transition, and performance agreements between ministries and universities, modelled on the Austrian national standardisation strategy, are the levers by which loose initiatives are turned into a coherent offering. The national platform SOONS was established for precisely this purpose but has effectively become inactive; reactivating it is a priority step.

The Pan-European Certificate: catalyst, not endpoint

The Pan-European Certificate for Standards and Standardisation, developed under the responsibility of CEN, CENELEC, and ETSI and based in part on the EU Horizon project Edu4Standards, is seen by virtually all interviewees as a promising instrument. Provided it is used as a catalyst and not as an end in itself. For students, its direct labour market value is as yet unproven. Its value lies elsewhere: it gives lecturers an argument to put to programme directors, gives professionals European-recognised proof of the knowledge they have acquired, and gives policymakers a concrete instrument.

Three implementation routes are realistic for the Netherlands. Linking the certificate to existing courses through a *'presumption of conformity'* model, whereby a pass mark automatically leads to the certificate being awarded, is the most structural route; TU/e stands ready as an *early adopter*. An online route offers a solution for institutions where standardisation is covered in only a few classes. LLL and professional training represent the fastest and most impactful starting point.

Five conditions are critical for success: timely and clear learning outcomes, flexibility in didactic design, industry recognition, a low administrative threshold in the initial phase, and European safeguarding combined with national implementation via NEN.

Recommendations

Forum Standaardisatie is well placed to put standardisation education on the agenda at governance level, with educational leaders, with the Ministry of Education, Culture and Science, and in the political debate on digital sovereignty. Linking it to existing skills ecosystems around AI, quantum, and the energy transition turns an educational initiative into a policy-relevant instrument. The model of the Battery Academy in the Net Zero Industry Act shows how this works in practice.

NEN is recommended to start with an LLL pilot that links directly to the Pan-European Certificate, to communicate actively about the standards access through

NEN Connect (largely unknown among lecturers), to extend access to universities of applied sciences as soon as possible, to revitalise SOONS as a national platform, and to fulfil the bridging function between the European certificate development and Dutch practice.

Forum Standaardisatie and NEN jointly can have the greatest impact by actively supporting lecturers who already provide standardisation teaching with materials and guest lecturers, making existing initiatives visible so that institutions can learn from one another, and organising an annual meeting event modelled on the DIN teachers' conference that the German standardisation organisation organises every year.

The Ministry of Economic Affairs and Climate Policy can position the certificate as part of the broader capacity-building agenda, explore the possibilities for performance agreements with universities on the Austrian model, reactivate the weakened intermediary function of trade associations vis-à-vis SMEs, and address the weak compliance with the *'Comply or Explain'* principle through targeted training pathways for central government officials.

The Ministry of Education, Culture and Science can contribute to stimulating standardisation education through indirect policy instruments, such as programmes comparable to Npuls, sector advisory councils, and administrative agreements, without undermining the autonomy of institutions. In addition, the positioning of the Pan-European Certificate deserves attention: careful communication is needed to prevent it from inadvertently functioning as an implicit admission requirement for the labour market.

Educational institutions are encouraged to explore LLL as a first step, to protect existing teacher-champions and broaden their knowledge to colleagues, to leverage the link with the European certificate as an internal argument to programme directors and accreditation committees, and to frame standardisation in the language of their own discipline.

Act now, or join later

The foundation is in place: there is substantive expertise, there are motivated lecturers, a European instrument is under development, and there is support among policymakers and the business community. What is missing is the connection between these elements and the institutional anchoring needed to move from loose initiatives to a coherent offering.

The learning outcomes for the Pan-European Certificate are being developed now. European funding is running. Political attention for standardisation is at a historic

high. The Netherlands can co-design the system now and claim an active role, or connect later to a system that has already been shaped.

Chapter 1

Introduction

1.1 Background

Standardisation plays a central role in the functioning of the European internal market, in innovation policy, in digital infrastructure, and in geopolitical strategy formation. Yet knowledge about standardisation and the standardisation process is barely present in Dutch higher education. Students who later work at companies, governments, or knowledge institutions where standardisation plays a role typically learn about it on the job, or not at all.

This is not a new phenomenon, but its urgency is increasing. Europe has explicitly identified standardisation as a strategic instrument in the European Standardisation Strategy of 2022, and within the framework of the High-Level Forum on European Standardisation (HLF), agreement has been reached on the development of a Pan-European Certificate for knowledge about standards and standardisation processes. At the same time, the standardisation community itself is signalling an ageing problem: a new generation of experts who understand the importance of standardisation and can actively contribute is urgently needed.

Earlier research into Dutch participation in European and international standardisation, commissioned by Forum Standaardisatie, also pointed to the need for capacity building. Education is an indispensable link in this: without basic knowledge in education, the inflow of well-equipped professionals will remain structurally inadequate.

1.2 Aim of this research

This research maps the current state of standardisation education in Dutch higher education, identifies opportunities for structural strengthening, and examines how the Netherlands can align with the Pan-European Certificate. In doing so, it aims to provide a factual basis for policy choices and follow-up steps.

Specifically, three questions are addressed:

1. What is the current state of standardisation education in Dutch higher edu-

cation?

2. Where are the opportunities to strengthen it structurally?
3. How can the Netherlands align with the Pan-European Certificate, and is there a need for this?

1.3 The Pan-European Certificate as context

An important framework for this research is the development of the Pan-European Certificate for Standards and Standardisation. This certificate is being developed under the responsibility of the European Standardisation Organisations CEN, CENELEC, and ETSI, partly on the basis of the learning outcomes being developed in the EU Horizon project Edu4Standards. The certificate is intended as a low-threshold entry level for a broad audience (e.g. students, professionals, and civil servants) and will be valid in all Member States.

For the Netherlands, this initiative is both an opportunity and a challenge. An opportunity, because it offers a European-recognised instrument to make standardisation visible in education and on the labour market. A challenge, because successful implementation requires support from educational institutions whose curricula are full and which accept little external direction. This is not unwillingness but a structural given: institutions have formal autonomy over their teaching, and the Ministry of Education, Culture and Science does not prescribe what is taught in programmes. Implementation will therefore have to proceed via indirect routes: through stimulation, collaboration, and policy programmes, not through obligation.

1.4 Scope

This research focuses on higher education in the Netherlands: research universities and universities of applied sciences. Senior secondary vocational education and secondary education fall outside the scope. In addition, for comparison, interviews were conducted with institutions and organisations in other European countries, to draw lessons from more advanced approaches elsewhere.

The research is exploratory and qualitative in nature. The findings are based on interviews and provide a representative picture of the situation, but are not statistically generalisable to all Dutch educational institutions.

1.5 Reading guide

Chapter 2 describes the research design and the parties interviewed. Chapter 3 provides a picture of the current state of standardisation education in the Netherlands. Chapter 4 presents the perspectives of standardisation organisations, the business community, and government: parties with their own agendas and initiatives that shape the broader ecosystem. Chapter 5 analyses the opportunities for structural strengthening. Chapter 6 addresses the Pan-European Certificate specifically: awareness, support, and implementation possibilities. Chapter 7 concludes with conclusions and recommendations.

Chapter 2

Methodology and justification

2.1 Research design

This research was designed as a qualitative exploration based on semi-structured interviews. The interview questions focused on three themes: the current position of standardisation in the teaching of the institution or organisation in question, the opportunities and barriers for structural strengthening, and the attitude towards the Pan-European Certificate.

The interviews were conducted between December 2025 and April 2026, and lasted approximately one hour on average. A detailed interview report was prepared for each conversation. These reports form the primary data source for the analysis and are included as appendices to this report.

The analysis was carried out in two steps. In a first step, the core of each interview was summarised and relevant statements were categorised per research question. In a second step, the findings were thematically analysed across all interviews, looking for patterns, similarities, and divergent perspectives.

2.2 Selection of interviewed parties

For the selection of interviewees, the aim was to achieve broad and representative coverage of relevant stakeholders. The selection comprises five categories.

Dutch research universities and universities of applied sciences form the core of the research, as they are the primary target group for the implementation of standardisation education and the Pan-European Certificate. Institutions with a variety of profiles were interviewed: technical universities, law-focused and policy-focused universities, a business school, and two universities of applied sciences.

European and national standardisation organisations were interviewed to gain insight into the design and progress of the Pan-European Certificate, and to draw lessons from approaches in other countries.

Policymakers at the Ministry of Economic Affairs and Climate Policy were in-

volved as the department responsible for the standardisation system in the Netherlands.

The business community and trade associations are represented via Philips, as a company with an outspoken and strategic standardisation practice, and VNO-NCW, as a cross-sectoral representative of the Dutch business community.

International academic institutions were interviewed as a comparative reference point. TU Berlin, the University of Graz, and the University of Belgrade show how standardisation education has developed further elsewhere in Europe and what lessons can be drawn from this.

2.3 Overview of interviewed parties

Organisation	Category	Ctry	Date
TU Delft	University	NL	04/12/2025
TU/e	University	NL	03/12/2025
University of Amsterdam	University	NL	08/12/2025
Vrije Universiteit Amsterdam	University	NL	04/12/2025
Utrecht University	University	NL	05/01/2026
University of Groningen	University	NL	04/02/2026
Tilburg University	University	NL	08/12/2025
Rotterdam School of Management	University	NL	17/02/2026
Open Universiteit	University	NL	20/04/2026
HAN	University of Applied Sciences	NL	09/12/2025
Windesheim	University of Applied Sciences	NL	13/01/2026
NEN	Standardisation organisation	NL	18/11/2025 03/02/2026
SOONS (NEN)	Standardisation organisation	NL	06/01/2026
CEN-CENELEC	Standardisation organisation	EU	19/01/2026
ETSI	Standardisation organisation	EU	14/01/2026

Organisation	Category	Ctry	Date
AFNOR	Standardisation organisation	FR	08/01/2026
DIN	Standardisation organisation	DE	05/01/2026
ILNAS	Standardisation organisation	LU	15/01/2026
Ministry of Economic Affairs and Climate Policy	Policy	NL	29/01/2026
Ministry of Education, Culture & Science	Policy	NL	26/03/2026 09/04/2026
VNO-NCW	Trade association	NL	09/02/2026
Philips	Business community	NL	02/02/2026
TU Berlin	International academics	DE	06/01/2026
University of Graz	International academics	AT	19/01/2026
University of Belgrade	International academics	RS	19/12/2025

Table 2.1: Overview of interviewed parties

2.4 Justification and limitations

The Dutch institutions interviewed are not statistically representative of higher education as a whole: the selection focused on institutions where it was plausible beforehand that standardisation plays, or could play, a role in teaching. Institutions where the topic is completely absent and where there is also no awareness are therefore under-represented. This means that the findings reflect the picture of the most engaged and aware institutions, and that the actual situation in higher education at large may be even less developed than this research suggests.

In addition, the quality and depth of the interviews depended partly on the position and level of knowledge of the interviewees. In most cases, these were individual lecturers or policy officers with a personal affinity for the topic, not necessarily the formal decision-makers on curricula. Their perspectives are informative and valuable, but do not always represent the institutional position of their organisation.

2.5 Justification for the use of AI tools

AI tools were used in two ways in the preparation of this report. The interviews were transcribed using Whisper, a locally running speech recognition model that was executed entirely offline on a dedicated device. No audio recordings or personal data were shared via the internet. In addition, a commercial language model was used during the writing of the report to edit sentences.

The substantive analysis, the interpretation of the interview data, the structure of the report, and all conclusions and recommendations are entirely the work of the researcher. The use of AI tools was limited to supporting tasks and did not take over substantive responsibility. The researcher vouches for the accuracy and completeness of the content.

2.6 Translation and language justification

The interviews for this research were conducted in both Dutch and English, depending on the preference and background of the interviewee. For the reporting, the choice was made to produce the main report and the interview summaries in Dutch, with an English-language parallel version for international readers. This entails two types of translation movements that merit mention.

First, the English-language interviews were translated into Dutch for the Dutch report. In this translation, the aim was substantive fidelity rather than literal translation: discipline-specific terms from the English-language standardisation discourse were retained in English where possible, because a Dutch translation would be insufficiently precise or would carry a different connotation. Where a common Dutch equivalent exists, it was used. Quotations and specific formulations by interviewees have been kept as close as possible to the original meaning, but have inevitably passed through the translation.

Second, for this English-language parallel version, the entire report has been translated from the Dutch, including the Dutch-language interviews. Here the opposite risk applies: Dutch policy, educational, and administrative terms do not always have an exact English equivalent.

In both directions, translation is not a neutral act. For the critical interpretation of specific statements by interviewees, the original language of the interview is therefore authoritative. The researcher has checked the translations for substantive consistency between the two versions, but readers are advised, in case of doubt about specific formulations, to consult both versions side by side or to contact the researcher for clarification.

Chapter 3

Standardisation education in Dutch higher education: the current state

3.1 General picture

As a topic, standardisation is not absent from Dutch higher education, but it is rarely present as an identifiable and stand-alone learning objective. The topic surfaces in courses on innovation strategy, IT law, market dynamics, governance, and data architecture, but as context or example, not as a core subject. Almost everywhere, the presence of the topic depends entirely on individual lecturers with a personal affinity. When they leave or change their teaching, standardisation often quietly disappears from the programme.

This pattern is consistent across all the institutions interviewed: there is substantive recognition and sometimes genuine interest, but no structural anchoring. The explanations for this are multiple. Curriculum changes take time, sometimes five to ten years, and require broad internal support. Standardisation moreover spans multiple disciplines: it is neither exclusively technical, legal, economic, nor administrative, and thus belongs naturally to no single department or programme. Finally, an external incentive is lacking: there is no accreditation requirement, no policy measure, and no visible labour market demand that compels or stimulates institutions to include the topic structurally.

3.2 Research universities with a technical profile

At the technical universities, standardisation is most recognisably present, but here too the anchoring is fragile and person-dependent.

TU/e (Department of Industrial Engineering & Innovation Sciences) has a relatively rich history on this subject. Dr Paul Wiegmann (assistant professor and standardisation researcher) taught for years within the USE learning line (User, Society & Entrepreneurship), with both an introductory and an in-depth course featuring guest lectures and a report assignment. Topics such as charging connectors for electric vehicles, central heating boilers, and quantum standards

made the subject concrete and accessible. That learning line has since been abolished, leaving a temporary gap in the offering. On a positive note, TU/e is working on a successor: an elective course of five ECTS (European Credit Transfer and Accumulation System), open to all bachelor's students from all faculties, with as its core design generic process knowledge combined with a domain-specific application assignment. The assessment will consist of a final exam, a group assignment, and a serious game focused on consensus-building. Wiegmann is also active in EURAS (European Academy for Standardisation) and involved in Edu4Standards, which makes alignment with the European certificate promising.

TU Delft (Faculty of Technology, Policy and Management) addresses standardisation structurally, particularly within the Master's programme Management of Technology (MOT). Dr. Geerten van de Kaa (Associate Professor of Innovation Management) does not approach it as a stand-alone technical subject, but as a strategic instrument within industry and market dynamics. Central themes include network effects, path dependency and dominant designs. Classic cases such as the development of Wi-Fi through IEEE illustrate how standardisation processes unfold in practice, including the interests surrounding patents, collaboration and competition. The scale is limited, however, ranging from a few dozen up to around a hundred students, and the structural presence is currently closely tied to Van de Kaa's expertise. Van de Kaa is explicit about the fundamental inadequacy of the current situation: individual courses, guest lectures and personal initiatives are valuable, but insufficient for structural European capacity building. He argues for top-down incentives through accreditation and quality assurance systems, and sees geopolitical issues as potential catalysts for raising the topic higher on the administrative agenda.

3.3 Law-focused and policy-focused universities

At universities with a strong legal or administrative profile, standardisation is likewise present, but through the lens of regulation, market ordering, and European governance. Here too the picture is consistent: substantively relevant, institutionally invisible.

Utrecht University (Faculty of Law, Economics and Governance) offers the most developed teaching practice among the non-technical institutions interviewed. Dr Olia Kanevskaia Whitaker (assistant professor of European law and standardisation) organises an international summer school on standardisation, which has now been held twice with a third edition in preparation. The content varies each year and ties in with current themes such as China and governance, AI, and

quantum. The summer school is organised in cooperation with the bureau of Netherlands Standardisation Forum, NEN, ETSI, and experts from the European Commission. In addition, she teaches short three-week elective courses on specific aspects such as Standard Essential Patents, in which students work towards a presentation or paper with external stakeholders as the audience. Finally, she integrates standardisation into regular compulsory courses, such as a master's course on market regulation. A significant bottleneck is that there is no faculty-wide strategy: all initiatives are personally driven and vulnerable to budget cuts and shifting priorities.

University of Groningen (Faculty of Law) addresses standardisation indirectly in IT law, where ISO standards such as ISO 27001 and 27002 come up tangentially as specifications of open norms in privacy law. Dr Mathieu Paapst (assistant professor of IT law) devotes one separate lecture to the distinction between standard, norm, and harmonised standard, and to the legal, political, and competition law dimensions of the standardisation process, including the geopolitical dimension of China's strategic focus on international standards. Structural embedding in the regular curriculum is considered hard to achieve: the programme has a full agenda and priority goes to the core areas of law. The most promising route lies in postgraduate education and in-company training, provided there is demonstrable market demand. The interviewees emphasise that demand often arises only when professionals concretely encounter standardisation issues in their work. Without this felt urgency, it is difficult to stimulate participation. They also argue for inter-university cooperation: it is inefficient for every law faculty to develop an offering separately; a nationwide course programme would be more effective.

Tilburg University (Tilburg Law School and Tilburg School of Economics and Management) has several researchers with substantial expertise at the intersection of standardisation, law, and economics. Professor Panos Delimatsis (professor of EU and international economic law) and Dr Stephanie Bijlmakers (assistant professor of law and standardisation) are both active in international networks, including Edu4Standards and SOONS, and conduct research on topics such as ISO 26000, supply chains, semiconductors, critical raw materials, and WTO trade agreements (TBT/SPS). In regular teaching, standardisation is present in fragmented form: no separate course, but references in courses on WTO law, cybersecurity, and AI. Bijlmakers is developing an elective course on semiconductor supply chains with an explicit session on standardisation and the Chips Act. In addition to regular teaching, Tilburg also has proven experience with professional training: a three-day course for the Belgian Electrotechnical

Committee (12 hours in total, around 20 participants including judges) demonstrated the added value of a certificate for professionals as a CV credential and as recognition of the knowledge acquired. The in-company pilot within Edu4Standards together with TU/e and NXP (with participants from ASML and Philips) is concrete evidence that industry demand and LLL can be combined. Delimatsis argues for a coalition approach: a joint fund from public and private partners (e.g. €30–50k per year per position) would finance a limited number of centres of excellence (technical, legal, economic/management) through a tender mechanism, each contributing their expertise and making materials widely available. He criticises the limited involvement of large Dutch companies such as ASML and Philips compared to international players.

University of Amsterdam (Faculty of Humanities, European Studies programme) fits standardisation into governance and policy programmes, in particular European Studies. Dr Niels ten Oever (assistant professor of digital governance and standardisation) addresses standardisation as part of European technology and governance issues. Attempts to integrate comparable content into Media Studies proved considerably more difficult. Ten Oever points to the slow formal decision-making via the Education and Examination Regulations (OER) and, for the short term, advocates a bottom-up approach through teacher-champions (pioneers in standardisation teaching) supported by ready-made teaching materials.

Vrije Universiteit Amsterdam (Faculty of Law) has expertise at the intersection of public regulation and private standard-setting, but teaching on this is almost exclusively post-initial and postgraduate. Professor Richard Neerhof (professor of administrative law and standardisation) teaches an intensive one-day course for legislative and policy officials through the Academy for Legislation and the Academy for Government Lawyers, with participants from all ministries. The course addresses the legal embedding of standardisation in policy and regulation: European and national references to standards, conformity assessment and notified bodies, and legal risks around market access and competition. A concrete example is building regulation following the Environment and Planning Act (2024): the shift of control from municipalities to private quality assurers illustrates the hybrid public–private regulation in which knowledge of standardisation is directly relevant. In regular teaching at VU Amsterdam, the topic returns at most tangentially. Neerhof is cautious about a stand-alone course: too few students, unless it is promoted nationally. He sees more merit in modest embedding through existing courses, with guest speakers not only from NEN but also from certification bodies and the Dutch Council for Accreditation.

Rotterdam School of Management (Erasmus University, Department of Strategic Management) has weakly anchored standardisation: effectively dependent on a single elective course that is barely being kept alive after the departure of the previous chair holder. Dr Eugene Pyun (assistant professor of innovation strategy) deliberately approaches the topic not as standardisation but as an underlying theme in innovation strategy and platform dynamics. This deliberate reframing has proven effective: students who take the course generally become enthusiastic once they understand the role of standardisation in innovation and platform dynamics, even if they had no prior idea of it. Earlier collaborations with TU Delft and Leiden in a joint minor were valued by RSM and helped legitimise the programme internally. Pyun sees the certificate primarily as a structural instrument: not to attract students directly, but to strengthen the institutional position of standardisation education and to reduce its vulnerability to staff turnover. He does, however, raise a caveat: a certification framework must not lock lecturers too tightly into prescribed learning outcomes, since the flexibility to frame the topic attractively itself, is essential.

Open Universiteit occupies a distinct position in the Dutch university landscape through its modular teaching model: students take individual courses rather than a fixed annual package. Professor Rogier van de Wetering (professor of Digital-Driven Transformation and Vice-Dean) and Frank Niesten (enterprise architect) indicate that standardisation probably comes up in several courses, but as a building block within broader subject matter rather than as a self-standing learning objective. The subject lands most naturally within computer science and information science, where interoperability and technical infrastructure already play a substantive role. The Open Universiteit has experience with *focus programmes*, thematic bundles of courses with an overarching certificate, particularly in the context of continuing education. This model offers a concrete point of entry for an LLL route: a standardisation certificate could in future function as part of a focus programme, provided its level, scope, and labour market relevance are clear.

3.4 Universities of applied sciences

HAN University of Applied Sciences (Academy of ICT & Media Design) has ample experience with teaching on interoperability, data, and ICT architecture, fields in which standardisation is implicitly present. Dr Erwin Folmer (professor of open standards and linked data) and Timo de Laat (Project Leader HAN) emphasise that raising awareness already yields a great deal, provided the topic is offered in a context- and sector-specific manner. Students appreciate the

content but are primarily focused on the diploma; a stand-alone certificate has limited appeal in regular teaching. They see the most promising route in the LLL offering of the university of applied sciences, where professionals experience direct added value from concrete practical questions on data, AI, and interoperability. A successful ongoing LLL course can later serve as a flywheel for progression to regular higher professional education modules, without requiring major curriculum changes. Microcredentials are seen as potentially interesting, but currently have limited recognition in the business community; a European-recognised certificate has more potential value for professionals. Preconditions for success are cost-neutrality of the LLL offering, active promotion, and support from NEN and Forum Standaardisatie for reach and legitimacy.

Windesheim University of Applied Sciences (School of Business, Media and Law and School of Engineering) is in a transitional phase: the institution is orienting itself more explicitly towards societal transitions and European cooperation, including through the European University Alliance DIVERSE. Standardisation is implicitly present in technical programmes and in HBO-ICT (GDPR, NEN 27001), but there is no explicit course on the standardisation process. Anneke Spijker (lecturer in technical business administration and digitalisation) emphasises that students work with standards every day without any insight into how they come about and who has influence over them. She considers reflection on the emergence and impact of standards, especially in healthcare, digitalisation, and oversight, where standards are often normative and ethically loaded, to be precisely valuable for students. Eelke Pruim (ambition director for societal transitions) points to the curriculum logic of universities of applied sciences: programmes have around 20–30% room for local interpretation, but new themes only find their way in when urgency is high, when there are concrete practical questions, or when they fit into LLL pathways.

3.5 International comparison

The conversations with three international institutions provide a frame of reference and show what is possible when standardisation education is further developed.

TU Berlin (Faculty of Economics and Management) has worked closely with DIN for many years in a dedicated course in which students receive both academic credits and a DIN certificate, officially presented in a ceremony at the end of the semester. Professor Knut Blind (professor of innovation economics and standardisation) emphasises that the primary function of the certificate is to bring

students into contact with standardisation. He identifies the same structural vulnerability as in the Netherlands and argues not only for scaling up but also for actively protecting existing initiatives.

University of Graz (Faculty of Law) offers an interdisciplinary approach that combines legal, philosophical, and economic perspectives. Professor Elisabeth Staudegger (professor of ICT law and legal informatics) and Dr Barbara Reiter (lecturer in philosophy and ethics) are closely involved in Edu4Standards and develop learning outcomes that cover knowledge, skills, and attitudes. An important driver is the Österreichische Normungsstrategie of 2024, which explicitly calls on universities to strengthen standardisation education.

University of Belgrade (Faculty of Organisational Sciences) shows what a well-developed individual initiative can grow into. Professor Ivana Mijatović (professor of standardisation and innovation management) now offers her course to a cohort of over 400 students as a compulsory course, using gamification, AI tools, and a Moodle environment. Funding through Erasmus+ and Horizon/COST networks contributes to continuity. She identifies the main bottlenecks as limited teaching capacity for large cohorts and the high cost of access to standards.

3.6 Summary: four structural patterns

Four consistent patterns emerge from the interviews that characterise the current landscape of standardisation education in the Netherlands.

Pattern 1: Substantively recognisable, institutionally invisible. The topic fits many disciplines and is recognised as relevant, but it is nowhere formally the property of a department or programme.

Pattern 2: Person-dependent and therefore fragile. The presence of standardisation in curricula almost everywhere depends on one or a few motivated lecturers.

Pattern 3: Limited reach. Even the most developed Dutch initiatives reach tens to at most a few hundred students per year.

Pattern 4: External incentives are lacking. There is no accreditation requirement, no policy measure, and no visible labour market demand that structurally stimulates institutions.

Chapter 4

Perspectives of standardisation organisations, the business community, and government

4.1 Introduction

In addition to the educational institutions, standardisation organisations, policy-makers, and representatives of the business community were also interviewed for this research. Their perspectives are not merely of service to the question of how education can be improved; they also have their own agendas, their own initiatives, and their own bottlenecks that shape the broader standardisation education ecosystem. This chapter presents those perspectives thematically, so that they can serve as a self-standing source of insight alongside the findings from the educational institutions.

The themes addressed in this chapter are: the strategic importance of standardisation and the geopolitical context, existing initiatives and approaches of the standardisation organisations, the position of SMEs as a bottleneck, the role of trade associations and government as system players, and the ageing of the standardisation community as an urgent precondition for education.

4.2 Standardisation as a strategic instrument: geopolitical context

A consistent theme in the interviews with Philips, VNO-NCW, and the Ministry of Economic Affairs and Climate Policy is the growing strategic and geopolitical importance of standardisation. Standardisation is no longer seen as a purely technical or administrative instrument, but as a means of determining market positions, technological sovereignty, and trade policy influence.

Jos Remy (Director of Standardisation at Philips and Vice President Technical at CENELEC) describes standardisation as a core part of market strategy and competitive position, organised along three tracks: formal standardisation via standardisation bodies such as ISO, IEC, CEN/CENELEC, ITU, and ETSI, closely related to regulation and market access via presumption of conformity; consor-

tium standardisation as market-driven cooperation with an IP dimension; and strategic ecosystems in which standards make markets function better. He introduces an analytical framework of four maturity levels at which companies can leverage standardisation: from passively monitoring to actively steering at governance level. Effective standardisation expertise, he emphasises, develops over several years and requires, alongside process knowledge, above all negotiation skills, political sensitivity, and strategic judgement.

Irvette Tempelman (Director of European and International Affairs at VNO-NCW) likewise positions standardisation at a strategic and policy level: as an instrument for technological sovereignty in domains such as AI, quantum, and encryption. The central question is not whether the Netherlands wants to participate in standardisation processes, but whether the Netherlands is at the table on time and exerts influence on the dossiers that are relevant for the country.

The Ministry of Economic Affairs and Climate Policy (Competition and Consumer division) confirms this picture and adds a concern: the strategic focus on standardisation within the business community has weakened in recent years. Trade associations have dropped standardisation as a priority, which means that structural alignment within sectors is lacking. The renewed interest, partly due to geopolitical developments and the European Standardisation Strategy 2022, offers an opening, but requires active reactivation.

Remy also places a critical note on European practice itself. Europe historically had a strong model: legislation with essential requirements, standards for technical specification; but European practice has become heavier through additional layers and control mechanisms. The HAS review mechanism (harmonised standards system) and the slow processes around 'standardisation requests' and publication in the Official Journal are a drag on the system. A considerable portion of the total lead time for standards development sits in the stages before and after the actual standardisation work, which makes the European Commission partly a cause of the slowness it criticises. The Ministry of Economic Affairs and Climate Policy participates in the HLF and draws up the National Standardisation Agenda (NNA), for which feedback is gathered within the Dutch government. From this role, the Ministry recognises and shares this frustration and sees a role for the Netherlands in exerting pressure on the European Commission to make the process workable and faster, precisely now that the standardisation legislation is being revised.

4.3 Existing initiatives of standardisation organisations

The standardisation organisations interviewed, CEN-CENELEC, ETSI, AFNOR, DIN, ILNAS, and NEN/SOONS, are not passive in the area of education. Each has developed its own initiatives, with varying approaches that offer valuable lessons for the Dutch context.

CEN-CENELEC: from research to broad programme

CEN-CENELEC has not considered education a strategic priority for a long time, but this has changed due to increased political attention at EU level. Within CEN-CENELEC, education is approached from an 'external relations' perspective: connecting standardisation with research, innovation, industry, and education. The assumption is that researchers and professionals can deploy standardisation more effectively if they have been exposed to it during their education.

The Horizon Europe project Edu4Standards has delivered 'Intended Learning Outcomes' (ILOs) and a network of academic champions (pioneers in standardisation education and research). CEN-CENELEC is now launching a three-year EU-funded follow-up project that addresses standardisation education more broadly, with the following components: development of teaching materials, internship modules at national standards bodies, support for young professionals entering technical committees, and capacity building for national members in their relationship with educational institutions.

Andreea Gulacsi (Director, Policy & External Affairs CEN-CENELEC) is explicit about the political dimension: if Europe wants to deploy standardisation strategically, greater public investment is necessary. Raising awareness, education, and continuity require structural support. The certificate could, with sufficient support from the European Commission, be promoted more widely, comparable to other EU educational initiatives.

ETSI: from textbook to supporting lecturers

ETSI has been active in education since 2018. A task group produced a comprehensive handbook on standardisation, later updated and made available under a free licence. Claire d'Esclercs (Director of Education and Knowledge at ETSI) is honest about the limitations of this approach: a traditional 360-page handbook no longer fits how students learn, and ETSI lacked the resources to promote it systematically. Reach was fragmented and ad hoc.

The key lesson ETSI draws is structural: the problem is not a lack of content but reaching the right intermediaries. ETSI cannot reach students directly; the

key players are universities, faculties, and lecturers. Many lecturers themselves have little or no background in standardisation, which makes it difficult to ask them to integrate it into their courses. This creates a structural bottleneck that individual initiatives struggle to break.

D'Esclercs therefore argues for a shift in focus to supporting lecturers, who act as the middle layer between policy and students. Toolkits, ready-made materials, and guidance for lecturers are in her judgement more effective than approaching students directly. ETSI sees promotion as a core task: through its industry members, ETSI can disseminate messages via websites and press channels, and through national standards bodies this can be expanded to national industries.

AFNOR: mass awareness via MOOC

AFNOR opts for a pragmatic approach: mass awareness as the first priority. Earlier attempts to create a dedicated diploma in standardisation failed due to low enrolments. AFNOR drew the conclusion that the threshold was too high and that the topic was not attractive enough as a stand-alone programme.

With more than 3,500 higher education institutions in France, direct reach is unrealistic. AFNOR approached federations and networks of universities, engineering schools, and management schools. The response was consistent: they recognise the importance but cannot prescribe curricula. The French Ministry of Higher Education advised: deliver a ready-made product that lecturers can adopt.

This led to the development of a four-hour MOOC (Massive Open Online Course), concluded with a quiz. Participants with a passing score receive an open badge, an awareness certificate. The MOOC is structured in four modules: what a (voluntary) standard is and the benefits of standards; the relationship between standards, regulation, certification, and innovation; how standards are developed at national, European, and international level; and how to read a standard and monitor relevant standards. The MOOC quickly reached more than two thousand enrolments from students, lecturers, and professionals, proof, for AFNOR, of interest in a short, free, and accessible entry-level course.

Alongside the MOOC, AFNOR offers guest lectures at universities and engineering schools (2 to 12 hours), focused on the strategic role and practical application of standardisation. An important instrument is 'Cobaz Education', a platform through which educational institutions gain access to French standards on favourable terms, a model comparable to the NEN Connect offering in the Netherlands.

DIN: lecturers as the lever point

Amelie Leipprand (project coordinator Young Professionals and Education & Outreach at DIN) emphasises that standardisation is structurally absent from higher education, even in technical programmes, and that this is not neutral but harmful. Standardisation is confused with legislation or imposed rules, which creates mistrust and makes the European self-regulation model vulnerable to political intervention.

DIN's central approach is investing in lecturers as the lever. Many lecturers recognise the relevance of standardisation but do not know how to teach it or lack suitable materials. Leipprand has therefore organised, for several years, a European annual conference specifically for lecturers who teach standardisation, a train-the-teacher mechanism that simultaneously facilitates community building. The conference reassures lecturers that they are not alone, facilitates exchange of teaching formats such as case studies, serious games, and interactive assignments, and stimulates cooperation between institutions.

Leipprand argues for small, low-threshold interventions: two to five minutes of explanation within existing lectures, guest lectures of 30 to 90 minutes, and explicitly naming the standardisation process when standards are used. In practice, this has proven feasible and effective. She also develops innovative formats, such as publicly accessible technical committee sessions in which students follow and discuss one clearly delineated topic, an approach inspired by BSI (British Standards Institute).

ILNAS: from pilot to structural programme

The Luxembourgish ILNAS offers the most highly developed example of what a national standards body can achieve if it actively invests in education. ILNAS has built up standardisation education through a phased approach in cooperation with the University of Luxembourg: starting with a University Certificate of 18 ECTS for working professionals, expanded to a full master's degree (started February 2021) focused on ICT, standardisation, and technopreneurship.

The choice of professionals as the primary target group is substantively motivated: standardisation is easier to understand when students already have organisational and practical context. Students in initial education lack these reference points, which makes shorter and more targeted interventions more effective than extensive curriculum components.

ILNAS takes an active role in approaching universities, supported by its position as a public institution. Formal cooperation agreements with the University of

Luxembourg make direct interaction with academic leadership possible. Standardisation education is embedded in a broader national strategy that is aligned with the Ministry of the Economy. ILNAS also co-finances doctoral and postdoctoral research at the University of Luxembourg, with researchers actively participating in standardisation committees, a two-way flow between research results and standardisation processes.

NEN and SOONS: catalysts with a dormant platform

Gertjan van den Akker (Director of Standards at NEN and member of Forum Standaardisatie) explicitly positions NEN as a catalyst: raising awareness, building networks, and creating preconditions, without abandoning the European self-regulation model. SOONS functions as a knowledge and network platform, with funding of endowed chairs as its spearhead, previously at Erasmus University, currently again at Rotterdam School of Management. The ambition is expansion towards universities of applied sciences.

Van den Akker is cautious about taking a directive role vis-à-vis educational institutions: curricula are full, changes take time, and universities are autonomous. NEN can stimulate, facilitate, and connect, but cannot compel. He is also realistic about funding: broad, generic chairs funded by the business community he considers difficult to achieve without a clear sectoral interest.

An urgent practical point concerns access to standards. All Dutch universities have reading rights via NEN Connect, but this is unknown to many lecturers, a communication problem that requires attention. For universities of applied sciences, this access does not yet exist, but this is under discussion. Finally, Van den Akker emphasises the ageing of the standardisation community: many current experts will stop within a few years, which makes education urgent in order to train a new generation that understands the importance of standardisation and can put it on the agenda.

Jolien van Zetten (Head of Professional Development and Processes, NEN) supplements this from an operational perspective. NEN already has concrete educational content that is substantively close to the learning outcomes of the Pan-European Certificate: a set of seven e-learning courses for new committee members on the standardisation process, the division of roles, and expectations. These are currently only internally available, but could be made more widely available after being recalibrated against the ILOs of the certificate. In addition, NEN has developed a *serious game* that simulates the full consensus process in around two hours, including negotiation, diverging interests, and public consulta-

tion. The game is now also used internally for the onboarding of consultants and new committees; NEN is exploring whether it can be made more broadly available to educational institutions. On the certificate, Van Zetten was initially sceptical: a certificate only has value if companies and governments recognise it. That scepticism has diminished since market needs have been explicitly considered in the HLF context, but she still identifies *ownership* at European level, who is actually taking the lead, and market recognition as the two main thresholds for implementation.

4.4 The SME participation issue

A theme raised specifically by VNO-NCW and the Ministry of Economic Affairs and Climate Policy, which lies outside the direct scope of educational institutions, is the structurally weak position of SMEs in standardisation processes. This is relevant to this research because it has direct implications for the question of who benefits from standardisation education and which target groups deserve priority.

Tempelman makes clear that the financial argument is not the primary barrier to SME participation. The real barriers are capacity (small companies cannot spare an FTE for lengthy standards committees), timing (SMEs are often only involved when a standard is already advanced), and a lack of practical participation moments in the process. The question is not whether SMEs want to contribute to standards development, but how meaningful and efficient forms of participation can be organised.

Tempelman suggests that the current model of committee participation does not fit small businesses well, and argues for targeted consultation moments and less frequent but well-prepared participation slots. Education is a first step in this, raising awareness of the importance of standardisation, but is not enough: a second step, practically organising accessible participation, must follow.

The Ministry of Economic Affairs and Climate Policy adds that the role of trade associations as an intermediary vis-à-vis SMEs has weakened in recent years. The former standardisation platform of VNO-NCW, where trade associations aligned their positions on standardisation dossiers, no longer exists. There is renewed interest, partly due to geopolitical developments and the European Standardisation Strategy, but this requires active reactivation, not a wait-and-see attitude.

4.5 Government as a system player: the Ministries of Economic Affairs and Education

4.5.1 Linking to policy dossiers as a lever

The Ministry of Economic Affairs and Climate Policy sketches a clear picture of the policy logic around standardisation education. As the department responsible for the system, the Ministry itself has little budget for direct educational intervention. Large-scale movement only arises when standardisation education is linked to major policy dossiers with substantial resources.

The mechanism the Ministry describes is relevant: when European or national strategies set requirements for skills and employment, training is structurally included. The Battery Academy in the Net Zero Industry Act illustrates how a training driver in regulation leads to ecosystems in which educators can join with recognised programmes and certificates. If standardisation knowledge, and the accompanying certificate, is positioned as an integral part of existing skills ecosystems around AI, quantum, hydrogen, or the digital transition, a structural funding basis emerges.

The Ministry also identifies an internal bottleneck: with open standards, compliance with the *Comply or Explain* principle is structurally weak. The principle is mandatory, but enforcement is absent: compliance hovers around 50 per cent, the mandatory explanations rarely appear in annual reports, and there is no supervisory authority that enforces compliance. This is caused in part by culture and the long-term outsourcing of ICT, which means that knowledge about standards is not structurally present in government. Without knowledge, ownership, and incentives, standardisation is seen as a 'last-minute compliance add-on' rather than part of the design. This makes central government officials a relevant additional target group for standardisation education.

For the bureau of Netherlands Standardisation Forum, the Ministry primarily sees a role in evangelism and concretisation: a clear narrative with practical examples and a clear 'why now' explanation is needed to move standardisation out of the technical niche and into the geopolitical arena.

4.5.2 Indirect steering within autonomous institutions

Bastiaan van Vliet (senior policy officer Higher Education & Student Finance) and Raijsa Balasingham (policy officer Higher Education & Student Finance) at the Ministry of Education, Culture and Science emphasise that the ministry does not determine what is taught in programmes. That responsibility lies with the institutions themselves. The Ministry's role is system-oriented: ensuring that public

money is spent efficiently and that the education system as a whole functions well.

The Ministry has four steering instruments at its disposal: funding, communication (putting policy priorities on the agenda), administrative agreements, and legislation. In practice, this means that the Ministry can give direction and set preconditions, but does not prescribe what content must be in a programme, except in cases where legislation sets professional requirements. Direct steering of standardisation teaching through a curriculum requirement is therefore not on the cards.

However, the Ministry can indirectly stimulate themes through programmes, subsidies, and support structures. A relevant example is the Npuls programme, focused on digitalisation in post-secondary education, in which institutions are supported through Centres for Teaching and Learning (CTLs). A comparable route is conceivable for standardisation: not imposing content, but creating preconditions. A second point of entry is the sector advisory councils that bring education and the labour market together, particularly in higher professional education. If employers explicitly name the relevance of standardisation knowledge through these channels, that can feed through into programme profiles.

Regarding the Pan-European Certificate, the interviewees raise an important point: certificates are never entirely neutral. As soon as a certificate gains value on the labour market, it influences access to jobs and thereby the competition between candidates. A certificate that is widely recognised by employers can ultimately function as an implicit admission requirement. For the standardisation certificate, which is deliberately not intended as an admission requirement for a profession, careful positioning is therefore important.

4.6 Ageing and continuity: an urgent precondition

A theme raised by several standardisation organisations is the ageing of the standardisation community. Van den Akker (NEN), d'Esclercs (ETSI), and Remy (Philips) all point out that a significant share of the current generation of standardisation experts will stop within five to ten years. The knowledge transfer that historically took place informally, experienced delegates mentoring younger colleagues within committees, is less effective for younger generations, who have different expectations of careers and learning environments.

This gives education an urgency that goes beyond the broader societal interest: without an inflow of well-prepared new experts, a structural capacity shortage in the European standardisation structures is looming. CEN-CENELEC describes

this as a European shortage of new standardisation experts, while at the same time standardisation is increasingly being deployed as a strategic instrument for trade, geopolitics, regulation, and innovation.

The certificate, as a low-threshold entry level, can contribute to lowering the initial threshold for new experts. But Remy emphasises that the certificate will not produce senior experts: in-depth expertise develops through years of practical experience, network-building, and strategic action. The certificate shortens the learning curve and enlarges process knowledge, but it is the beginning of a journey, not its endpoint.

4.7 Summary

Geopolitics and strategy: Standardisation is being explicitly identified as a strategic instrument by the business community, trade associations, and government. The urgency is high, but Dutch capacity, particularly among SMEs, is insufficient.

Own initiatives: The standardisation organisations have developed varying approaches that offer concrete lessons for the Netherlands:

- **AFNOR (FR):** A free four-hour MOOC with an open badge as its conclusion, more than two thousand enrolments in a short time from students, lecturers, and professionals.
- **DIN (DE):** An annual European conference specifically for standardisation lecturers as a train-the-teacher platform, supplemented by a joint course with TU Berlin in which students receive an official DIN certificate.
- **ILNAS (LU):** A full master's programme for working professionals, built up from a University Certificate of 18 ECTS as evidence of demand, embedded in the national strategy and linked to doctoral research.
- **University of Graz (AT):** A summer school that has grown into a multi-track capacity programme for lecturers, researchers, and technology transfer offices, supported by the Austrian national standardisation strategy.

SME participation: The SME participation issue goes beyond education: it also requires process reform and active intermediaries through trade associations.

Government as a lever: The Ministry of Economic Affairs and Climate Policy has limited budget of its own but is well placed to link standardisation to major policy dossiers. The Ministry of Education, Culture and Science steers indirectly through programmes such as Nplus, sector advisory councils, and administrative agreements, not through a curriculum requirement. Both ministries offer points of entry, but require a route that fits the autonomy of institutions.

Ageing: The inflow of new experts is urgent. The certificate is a useful entry-level instrument, but real expertise requires years of practice.

Chapter 5

Opportunities for structural strengthening

5.1 Introduction

The preceding chapters have presented two perspectives side by side: the picture from education (chapter 3) and the picture from standardisation organisations, the business community, and government (chapter 4). This chapter brings those two perspectives together and translates them into concrete opportunities.

From the education side, the picture is clear: standardisation is present but not embedded, person-dependent, and not scalable. There is no external incentive that compels institutions to include the topic structurally, and there is no shared ownership.

From the business community and government, the message is equally clear: standardisation is strategically important, capacity is insufficient, and urgency is increasing due to geopolitical developments. But here too an owner is lacking: everyone benefits, no one feels naturally responsible.

Those two diagnoses are each other's mirror image, and together they define the opportunities. The opportunities for structural strengthening lie at the intersections:

- Companies such as Philips and ASML need employees who understand standardisation processes, but currently train them internally. That is a labour market demand that education can answer, but only if education knows that demand exists and is actively made aware of it by NEN and Forum Standaardisatie.
- The Ministry of Economic Affairs and Climate Policy is well placed to link standardisation knowledge to major policy dossiers with budget and urgency, but needs education as an executing partner to do so. That connection does not currently exist.
- VNO-NCW sees awareness as a necessary first step for better SME participation. LLL provision by universities of applied sciences and universities can

provide that step, but only if there is concrete articulation of demand from the business community.

The opportunities described in the following sections are therefore not only opportunities for education; they are opportunities that arise when education, the business community, and government work together.

5.2 Lifelong Learning and professional training as a starting point

The most consistently mentioned promising route is through Lifelong Learning (LLL), postgraduate education, and professional development. This applies to both universities of applied sciences and research universities, and is endorsed by virtually all Dutch institutions interviewed.

The reasoning is consistent: professionals who encounter standardisation in their work experience direct added value from knowledge about processes, roles, and strategic implications. They have concrete practical questions, are more open to certification, and do not need to be convinced of its relevance.

Concrete examples substantiate this. VU Amsterdam has long provided an intensive one-day course for legislative and policy officials through the Academy for Legislation and the Academy for Government Lawyers. The University of Groningen sees scope for a course programme on standardisation, provided there is demonstrable market demand. Tilburg and TU/e jointly conducted an in-company pilot at NXP with modules for engineers both at the start of and mid-career, with participation from professionals at ASML and Philips.

The Open Universiteit offers, through its focus programmes, an existing modular model in which thematic bundles of courses conclude with an overarching certificate; this model is explicitly designed for continuing education and offers a concrete infrastructure for a future standardisation offering.

An additional advantage of the LLL route is the flywheel effect: when a course proves relevant and runs well, this provides a concrete argument to programme directors to include the topic in regular programmes as well.

5.3 Embedding in existing courses via teacher-champions

A second route, which can be deployed in parallel with LLL, is the bottom-up strengthening of regular education through individual lecturers. The core of this approach is to support lecturers who already give teaching in which standardisation logically fits, and enable them to actively take up the topic without major additional effort.

Ten Oever (UvA) advises: offer lecturers ready-made teaching materials, slides, lesson plans, and case studies, so that the threshold is minimal. DIN representative Leipprand adds that many lecturers recognise the relevance of standardisation but do not know how to teach it. The problem is not unwillingness but a lack of tools.

Wiegmann (TU/e) describes an adoption logic in which the first step is not the certificate but the conviction that standardisation is worth teaching. NEN and Forum Standaardisatie should therefore start by activating lecturers who are already involved in standards committees.

5.4 Framing as a precondition for adoption

A recurring insight is that the term standardisation itself creates a barrier. Students associate it with dry regulation, technical specifications, or bureaucratic processes. When the same subject is addressed using case studies and presented as governance, innovation strategy, market dynamics, or geopolitics, interest increases significantly.

RSM already applies this explicitly: the elective course is not offered as standardisation but as innovation and platform strategy, with standardisation as the underlying mechanism. Students who take the course generally become enthusiastic once they understand the role of standardisation in the context of innovation and platform dynamics. TU Delft uses classical cases such as the emergence of Wi-Fi via IEEE to show that standardisation is about interests, power, and strategy, not about filling in forms. TU Berlin links the topic to sustainability and the Sustainable Development Goals, thereby connecting with the strong societal engagement of the current generation of students. Wiegmann (TU/e) uses charging connectors for electric vehicles and quantum technology as concrete entry points. Mijatović (Belgrade) always starts her course with an industry analysis, in which students work as consultants for an imaginary company, standardisation then becomes a lens through which to understand problems, actors, and governance, not an end in itself.

This finding has direct implications for the communication and marketing strategy of NEN and Forum Standaardisatie: communication towards lecturers and students should not start from the standardisation system itself, but from the societal and economic issues in which standardisation plays a role. The principle Leipprand (DIN) formulates is useful for this: the minimum a student needs to understand is that standards do not come about on their own and that everyone can and must contribute to shaping them.

5.5 Top-down incentives as a structural lever

Almost all interviewees agree that bottom-up initiatives are insufficient for structural and scalable anchoring. Sustainable embedding also requires institutional incentives from outside the individual lecturer.

Van de Kaa (TU Delft) points to accreditation and review systems as a powerful lever: if knowledge of standardisation is explicitly included in the assessment criteria for programmes, institutions must address the topic regardless of individual preferences. He notes that this mechanism works indirectly but effectively, and has parallels with how valorisation and patenting have by now been included in academic assessment criteria, whereas participation in standardisation committees has not.

The Ministry of Economic Affairs and Climate Policy points to linking with major policy dossiers that have substantial budgets. The Battery Academy in the Net Zero Industry Act illustrates how a training driver in regulation leads to ecosystems in which educators can join with recognised programmes. If standardisation knowledge is positioned as part of skills agendas around AI, quantum, hydrogen, or the digital transition, a structural funding basis emerges that individual educational initiatives do not have. The Ministry also emphasises the possibility of bringing central government officials into contact with standardisation through structured training pathways, the course by Neerhof (VU Amsterdam) at the Academy for Legislation shows that concrete demand exists.

Blind (TU Berlin) refers to Austria and Spain, where standardisation activities are indirectly stimulated through KPIs and performance agreements between universities and ministries. The Austrian national standardisation strategy of 2024, which explicitly calls on universities to strengthen standardisation education, is the most concrete example of this. The Netherlands does not yet have this mechanism for standardisation, but the model exists: similar agreements have been made around valorisation and societal impact. This offers a point of entry for the Ministries of Education and Economic Affairs to introduce standardisation into existing policy instruments for higher education.

For the Ministry of Education, Culture and Science, a similar logic applies, but with a different angle. The Ministry does not steer directly on curricula, but does have policy instruments through which themes can be stimulated indirectly. The Npuls programme for digitalisation in post-secondary education illustrates how a ministry can give direction through funding, knowledge sharing, and support structures, without prescribing content. A comparable approach for standardisa-

tion education is among the possibilities. In addition, sector advisory councils, where education and the labour market come together, provide an entry point via the labour market: if employers explicitly name the relevance of standardisation knowledge, that organically feeds through into programme profiles.

5.6 Inter-university cooperation and a national platform

Several interviewees emphasise that it is inefficient for every institution to develop an offering separately. The University of Groningen suggests inter-university cooperation between law faculties. Tilburg argues for a coalition model in which a joint fund finances several centres of excellence that each contribute their expertise and make materials broadly available.

SOONS (Foundation for Research and Education in Standardisation) was established for precisely this purpose, but according to several interviewees has effectively fallen dormant. Reactivation or re-establishment is seen by several parties as a priority step.

5.7 Access to standards as a precondition

Standards are expensive: one standard can cost more than a textbook. Van den Akker points out that all Dutch universities have reading rights on standards through NEN Connect, but that this is unknown to many lecturers. For universities of applied sciences, this access does not yet exist. Luxembourg (ILNAS) and France (AFNOR via Cobaz Education) already have operational models for broad access to standards for education.

5.8 Role of NEN and Forum Standaardisatie

A consistent picture emerges from the interviews of what is expected from NEN and Forum Standaardisatie. No steering or prescriptive role is expected vis-à-vis curricula. However, an active facilitating and connecting role is expected in four areas:

1. **Legitimising and agenda-setting**: making standardisation education a subject of discussion at the level of programme directors and policymakers.
2. **Supporting lecturers**: making ready-made teaching materials, guest lecturers, case studies, and access to standards available.
3. **Connecting existing initiatives**: organising knowledge sharing and linking the Dutch network with European developments.

4. **Bridging function**: translating the learning outcomes and certificate requirements of the Pan-European Certificate to the Dutch context.

5.9 Summary: a phased approach

Short term: LLL pilots, support for teacher-champions, communication about NEN Connect, revitalisation of SOONS.

Medium term: Linkage to major policy dossiers and skills agendas, embedding in accreditation frameworks and policy programmes, coalition-building with institutions and businesses.

Long term: Institutional anchoring through performance agreements, recognition of standardisation activities in academic assessment criteria, sustainable connection with the European certificate.

Chapter 6

The Pan-European Certificate: need and implementation

6.1 Introduction

The Pan-European Certificate for Standards and Standardisation is the most concrete European instrument currently under development to strengthen standardisation education. This chapter describes what the interviewed parties know about the certificate, how they assess the need for it, which implementation routes they see, and what conditions they place on a successful roll-out.

6.2 Awareness and initial reactions

Awareness of the Pan-European Certificate differs markedly between the parties interviewed. Awareness is high among the European standardisation organisations and among researchers active in Edu4Standards. For most Dutch educational institutions, awareness is limited to general.

Initial reactions are predominantly positive but nuanced. The certificate is seen virtually unanimously as a meaningful instrument, provided it is positioned in the right way. Rejection does not occur. However, the same caveats are consistently raised: a stand-alone certificate has limited value in regular initial education, its labour market value has yet to be proven, and it must not become a rigid content straitjacket.

6.3 European design and state of play

CEN-CENELEC and ETSI describe the certificate as an instrument still in an exploratory phase. The heart of the task is finding a balance between European comparability and national flexibility. CEN-CENELEC explicitly positions the certificate as a low-threshold entry level: a shared European reference point for basic knowledge, not as a detailed harmonised qualification.

CEN-CENELEC is launching a three-year EU-funded follow-up project, which includes the development of teaching materials, internship modules at national

standards bodies, support for young professionals, and capacity building for national members.

ETSI emphasises that the certificate must be viewed as a coordinating instrument, not as a rigid harmonisation tool. A clear common framework combined with flexibility in the way it is realised is the only way to do justice to the diversity of national education systems.

6.4 Three implementation routes

Three routes emerge from the interviews that can be deployed in parallel.

6.4.1 Route 1: Linking to existing courses through presumption of conformity

The most structural route is linking the certificate to existing or new courses, where a pass mark for the course leads to automatic awarding of the certificate. Wiegmann (TU/e) describes this as a *presumption of conformity* model. TU/e stands ready as an early adopter to apply this model to the new elective course. The precondition is timely and clear specification of the learning outcomes by the European Standardisation Organisations.

6.4.2 Route 2: Add-on via online assessment

For institutions where standardisation is covered in only one or a few classes, Tilburg and RSM describe an alternative: students follow an introduction within an existing course and can then obtain the certificate via an online route. AFNOR has shown with its MOOC and accompanying badge that this model works: the MOOC reached more than two thousand enrolments within a short time.

6.4.3 Route 3: LLL and professional training

For the short term, the LLL route is the most promising and realistic implementation route. The in-company pilot of Tilburg and TU/e at NXP shows that there is demand from industry. Philips confirms that basic knowledge can shorten the learning curve for new employees and accelerate entry into standardisation committees.

6.5 Need and support per target group

Students in initial education are the least self-evident target group. They are primarily focused on their diploma, barely know standardisation, and have no direct labour market incentive to pursue the certificate. The certificate has

indirect value for them: it can help get standardisation into curricula as a topic, and offers students who do become interested visible recognition. Blind puts this clearly: the certificate does not have to attract students directly; it must give lecturers and institutions an argument to offer the topic. Kanevskaia Whitaker (UU) emphasises that once students understand the relevance, standardisation as a lens on how European regulation, technology, and market dynamics hang together, their appreciation grows. The core challenge is framing, not resistance.

Professionals and LLL participants are the most receptive target group. They have concrete practical questions, understand the relevance, and appreciate European-recognised proof of the knowledge they have acquired. The in-company pilot at NXP with participants from ASML and Philips illustrates this: multiple modules for both young and mid-career engineers were successfully completed. Philips (Remy) confirms that basic knowledge can shorten the learning curve for new employees, although he emphasises that in-depth expertise arises through years of practice, network-building, and strategic action, the certificate is the beginning of a journey, not the endpoint.

Civil servants and policymakers form a specific but relevant target group that is explicitly mentioned in the interviews. Neerhof's (VU) course for legislative and policy officials shows that there is concrete demand for insight into the legal and governance dimensions of standardisation. The Ministry of Economic Affairs and Climate Policy identifies the opportunity to make standardisation knowledge more structurally available for central government officials. The weak compliance with the *comply or explain* principle is partly explained by a lack of knowledge and ownership; an accessible certificate can be a first step here. Neerhof does, however, add a nuance: policy officials need functional knowledge for their work, not a qualification to participate in standardisation committees themselves, the certificate fits at most as a supplementary deepening route, not as the direct conclusion of his course.

Lecturers are emphatically named by ETSI (d'Esclercs), DIN (Leipprand), and the University of Graz (Staudegger, Reiter) as the most strategic target group. Lecturers who obtain the certificate themselves or are equipped through a train-the-teacher programme become multipliers who transfer the topic to hundreds of students every year. DIN has for years organised a European annual conference for standardisation lecturers as a community-building platform and knowledge-sharing environment. The University of Graz has transformed its summer programme into a multi-track capacity programme that also reaches technology transfer offices, a group that is increasingly called upon in standardisation pro-

cesses but itself has little knowledge.

6.6 Conditions for successful implementation

Five conditions are consistently named as critical to the success of the certificate.

1. **Clear and timely learning outcomes.** Lecturers can only align their teaching with the certificate if the learning outcomes are clear and stable.
2. **Flexibility in design.** The certificate must offer a common framework, not detailed content prescriptions.
3. **Industry recognition.** Without visible appreciation from employers, motivation for students and professionals remains limited.
4. **Low administrative threshold.** Minimal bureaucracy in the first phase, with an emphasis on broad and rapid roll-out.
5. **European safeguarding combined with national implementation.** The certificate is safeguarded at European level through CEN-CENELEC and ETSI, but implemented nationally through the national standards bodies.

6.7 Points for attention and minority positions

Alongside the broad support, there are also critical voices and specific points for attention that deserve their place in the analysis.

Kanevskaia Whitaker (UU) places caveats on an overly generic set of learning outcomes: what is meaningful for lawyers differs substantively from what is relevant for engineers. An overly uniform certificate risks losing its meaning; an overly specialist certificate is off-putting. She argues for a layered approach with a basic level supplemented by domain-specific deepening.

Neerhof (VU) is cautious about the direct applicability for his target group of policy officials. They need functional knowledge for their work, understanding when and how standardisation, certification, and accreditation can be deployed as a policy instrument, not a formal qualification for participation in standardisation committees. The certificate fits at most as an optional deepening route.

Tempelman (VNO-NCW) warns that the certificate must not become a threshold for participation in standards committees. Substantive expertise and engagement are leading, not formal qualifications. Its value lies in raising awareness and reducing the need for explanation within organisations.

Pyun (RSM) points to the risk of content rigidity: if a certification framework locks

lecturers too tightly into prescribed learning outcomes, they lose the flexibility that is precisely needed to frame standardisation attractively for students.

Staudegger and Reiter (Graz) point to an institutional tension: universities may resist the outsourcing of the certification of academic learning to external organisations, because academic assessment is embedded in university rules and legitimacy. An EU certificate can be a useful supplementary signal, but must not undermine or replace academic quality assurance.

Mijatović (Belgrade) poses a practical but important question that is also relevant for the implementation of the certificate in the Netherlands: does the certificate apply exclusively to EU Member States, or also to EU candidate countries? This touches on the broader positioning of the certificate as a European instrument that can have strategic value outside the EU as well. She has already held discussions about this with the Serbian standards body and is willing to act as a regional amplifier, provided there is clarity about the geographical scope.

Van Vliet and Balasingham (Ministry of Education, Culture and Science) raise a point that goes beyond the education system itself: certificates are never entirely neutral. As soon as a certificate acquires broad labour market relevance, it influences access to jobs and can unintentionally function as an implicit admission requirement. The standardisation certificate was deliberately not designed as a formal admission requirement for a profession, its aim is awareness-raising and knowledge-building. Careful positioning and communication are important to prevent it from nevertheless acquiring that role through the labour market. In this connection the question is also relevant as to what exactly is being certified: programmes or individuals. Both have different policy implications for recognition, regulation, and access.

6.8 Summary

The Pan-European Certificate is broadly seen as a promising and valuable instrument, provided it is deployed as a catalyst and not as an end in itself. The most realistic implementation routes for the Netherlands are the presumption-of-conformity linkage to existing courses, an online add-on route, and professional training through LLL as the fastest starting point. The key role for NEN is threefold: as the recognised issuing body, as an active facilitator vis-à-vis educational institutions, and as a link between European development and Dutch practice.

Chapter 7

Conclusions and recommendations

This report was commissioned to map the current state of standardisation education in Dutch higher education, to identify opportunities for structural strengthening, and to examine how the Netherlands can align with the Pan-European Certificate for Standards and Standardisation. The conclusions below answer each of those three questions on the basis of 27 semi-structured interviews with educational institutions, standardisation organisations, policymakers, and the business community (see chapter 2 for a full overview of the parties interviewed). The recommendations that follow are addressed to the parties with the greatest leverage, and build directly on the findings from chapters 3 through 6.

7.1 Conclusions

7.1.1 Question 1: What is the current state of standardisation education?

As a topic, standardisation is present in Dutch higher education, but not as a recognisable and structural learning objective. Its presence is almost everywhere dependent on individual lecturers with a personal affinity, and disappears when they leave or change their teaching. Even the most developed initiatives reach only tens to hundreds of students per year, while the institutions in question educate thousands of students. There are no external incentives, through accreditation, policy, or the labour market, that stimulate institutions to include the topic structurally. See chapter 3 for a full overview per institution and the four structural patterns that flow from it (§3.6).

7.1.2 Question 2: Where are the opportunities for structural strengthening?

The opportunities are there, but require a phased and multi-track approach. For the short term, most opportunities lie in Lifelong Learning (LLL) and professional training: institutions such as TU/e, HAN, and Tilburg University have proven experience and are willing to take a leading role (§5.2). In parallel, embedding in existing courses can be strengthened by supporting teacher-champions with ma-

terials and access to standards via NEN Connect (§5.3 and §5.7). For structural anchoring in the medium and long term, top-down incentives are indispensable: linking to accreditation frameworks (compare how valorisation and societal impact have by now been included in academic assessment criteria), embedding in national skills agendas around AI, quantum, and the digital transition, and reactivating the national platform SOONS (§5.5 and §5.6).

7.1.3 Question 3: How can the Netherlands align with the Pan-European Certificate?

There is broad support for the certificate as a catalyst and legitimising instrument: it is seen as a means to get standardisation into curricula and to strengthen awareness among professionals and civil servants, not as an end in itself. See chapter 6 for a full discussion of awareness, support, and implementation possibilities. The most promising implementation routes are:

- the *'presumption of conformity'* linkage, whereby a pass mark for an existing course automatically leads to awarding of the certificate, TU/e stands ready as an *early adopter* to apply this model first (§6.4.1);
- an online *'add-on'* route for institutions where standardisation is covered in only a few classes, modelled on the AFNOR MOOC with more than two thousand enrolments in a short time (§6.4.2 and §4.3);
- LLL training as the fastest and most impactful starting point, with the in-company pilot of TU/e and Tilburg at NXP, in which professionals from ASML and Philips also participated, as a concrete reference point (§6.4.3 and §5.2).

7.2 Recommendations

7.2.1 For Forum Standaardisatie

- **Put the issue on the governance agenda.** Use the position of Forum Standaardisatie to make standardisation education a subject of discussion with educational leaders, the Ministry of Education, Culture and Science, and politicians, linked to broader policy ambitions around digital sovereignty, innovation policy, and strategic autonomy. Supporting Edu4Standards activities in the Netherlands offers a direct connection to the ongoing initiative (see §4.3 for the role that CEN-CENELEC and ETSI play in this).
- **Link standardisation to major policy dossiers.** Actively seek the connection with existing academies and skills ecosystems around AI, quantum,

hydrogen, and the digital transition, in cooperation with the Ministry of Economic Affairs and Climate Policy and the Netherlands Enterprise Agency (RVO) as the implementing organisation. The model of the Battery Academy, a training driver embedded in the Net Zero Industry Act that leads to ecosystems with recognised programmes and certificates, offers a concrete point of entry (see also §4.5 for the policy logic from the Ministry's perspective).

7.2.2 For NEN

- **Start with LLL as the first implementation route.** In cooperation with *early adopters*, develop a pilot LLL course that links directly to the Pan-European Certificate. The in-company pilot of TU/e and Tilburg at NXP (with participation from professionals at ASML and Philips) demonstrates that industry demand and LLL can be combined (§5.2 and §6.4.3).
- **Communicate actively about NEN Connect.** Many lecturers do not know that all Dutch universities have free reading rights on standards via NEN Connect, a communication problem that requires attention (see §4.3). A targeted campaign aimed at lecturers and library staff is a simple but impactful step. Extend access to universities of applied sciences as soon as possible. Comparable models at European counterparts, such as Cobaz Education of AFNOR in France and the standards access policy, show that broad access lowers the threshold for education (see §4.3 for the AFNOR approach).
- **Revitalise SOONS as a national platform.** Use SOONS as the place where lecturers, researchers, and policymakers find each other, share materials, and coordinate the implementation of the certificate, with explicit involvement of universities of applied sciences. SOONS was established for precisely this purpose but is currently effectively inactive (§4.3 and §5.6).
- **Fulfil the bridging function between Europe and the Netherlands.** Ensure timely translation of European learning outcomes to the Dutch context, and actively represent the Dutch perspective in the European development of the certificate. DIN offers an inspiring example here: by investing structurally in lecturers as intermediaries and by building an active community through an annual European teachers' conference, DIN has created a sustainable bridging function. Use the experiences of European counterparts such as DIN and AFNOR as a guide for the Dutch approach (see §4.3).

7.2.3 For Forum Standaardisatie and NEN jointly

- **Set up a working group and facilitate.** A working group with key parties, educational institutions, government, and the business community, would help to translate the findings into concrete implementation steps and to organise support.
- **Actively support lecturers and existing initiatives.** Forum Standaardisatie and NEN can play a concrete role as connecting parties vis-à-vis education, without taking a steering position. In practice, that means:
  - actively approaching lecturers who are already providing standardisation-related teaching with ready-made teaching materials, case studies, and guest lecturers;
  - making existing initiatives visible so that institutions can learn from one another;
  - organising an annual meeting event, modelled on the DIN teachers' conference and preferably in cooperation with Edu4Standards, at which on the one hand Dutch lecturers and researchers working on standardisation meet each other and exchange materials, and on the other hand those not yet familiar with standardisation can come into contact with it (see §4.3 for the DIN example).

7.2.4 For the Ministry of Economic Affairs and Climate Policy

- **Position the certificate as part of the capacity-building agenda.** Link it to larger policy dossiers with budget and urgency, such as the AI Act, the Digital Product Passport, quantum technology, and the energy transition, thereby creating the policy lever that individual educational initiatives cannot generate. The model of the Battery Academy in the Net Zero Industry Act illustrates how a training driver embedded in regulation leads to ecosystems in which educators can join with recognised programmes and certificates (see §4.5 for the policy context and the Ministry's position).
- **Explore the possibilities of performance agreements.** Following the examples of Austria and Spain, performance agreements between ministries and universities can be used indirectly to stimulate standardisation activities. The Austrian national standardisation strategy of 2024, which explicitly calls on universities to strengthen standardisation education, offers the most concrete example of this mechanism (§3.5 for the international comparison and §5.5 for an explanation of how this type of incentive

operates in the Dutch context).

- **Strengthen the role of trade associations.** Restoring a standardisation platform within VNO-NCW can help to put standardisation back on the agenda as a strategic theme within Dutch industry sectors and among SMEs. The current weakening of this intermediary function constitutes a structural bottleneck (§4.2 and §4.4).
- **Address the weak compliance with the *'Comply or Explain'* principle.** The structurally low implementation of this principle, compliance hovers around 50 per cent, is partly a consequence of a knowledge gap and a lack of ownership among officials (§4.5). Link the certificate to training pathways for central government officials, such as legislative lawyers, as a concrete first step. The course by Professor Neerhof (VU Amsterdam) for legislative and policy officials through the Academy for Legislation demonstrates that there is demonstrable demand for precisely this type of teaching (§3.3).

7.2.5 For the Ministry of Education, Culture and Science

- **Explore indirect stimulation through existing policy programmes.** The Ministry has no direct influence on curricula, but it can stimulate themes through programmes such as Nplus and through Centres for Teaching and Learning. A comparable support structure for standardisation education, with guidance, knowledge sharing, and possibly financial resources for institutions, fits within the existing policy logic.
- **Use sector advisory councils as a point of entry.** In higher professional education, education and the labour market are coordinated through sector advisory councils. If NEN and Forum Standaardisatie succeed in mobilising employers to explicitly name the relevance of standardisation knowledge in these structures, a bottom-up incentive arises that fits the autonomy of institutions.
- **Safeguard the positioning of the certificate.** A certificate that gains broad labour market relevance can grow into an implicit admission requirement for the labour market, with consequences for equality and fair access that fall outside the original objective. Careful communication about the purpose of the certificate, awareness-raising and knowledge-building, not access regulation, is important.

7.2.6 For educational institutions

- **Explore the possibilities of LLL and professional training.** The investment is limited, the target group is receptive, and it quickly yields insight into demand and support. TU/e, HAN, and Tilburg University are concrete examples of *early adopters* willing to cooperate (§5.2 and §6.4.3).
- **Support and protect existing teacher-champions.** The greatest immediate risk factor for standardisation education is the departure of motivated individual lecturers (§3.1, §3.4 for concrete examples at TU Delft, TU/e, UU, and RSM). Organise knowledge sharing, involve multiple colleagues, both within and outside the institution, with the topic, and base succession profiles in part on continuity of the theme.
- **Use the link to the European certificate as an internal argument.** The fact that an existing or new course automatically gives students a European-recognised certificate is a concrete and persuasive argument vis-à-vis programme directors and accreditation committees. It also makes standardisation more visible for the labour market (see §6.5 for an explanation per target group).
- **Frame standardisation in the context of the discipline.** Students do not choose 'standardisation', but they do choose innovation strategy, European law, market dynamics, or data governance. Lecturers who embed standardisation as an instrument within a recognisable issue reach more than lecturers who offer it as a stand-alone subject, this principle applies across all disciplines (see §5.4 for concrete framing examples from RSM, TU Delft, TU Berlin, and the University of Belgrade).
- **Make use of existing cooperation possibilities.** Inter-university cooperation, for example for postgraduate legal education or for in-company pilots, reduces the individual burden and increases the scale. Make contact with NEN and SOONS to explore where connections are possible (see §5.6 for the proposed role of SOONS as a national platform).

7.3 In closing

The foundation for structural strengthening of standardisation education in the Netherlands is in place: there is substantive expertise, there are motivated lecturers, a European instrument is under development, and there is support among policymakers and the business community. What is missing is the connection between these elements and the institutional anchoring needed to move from

loose initiatives to a coherent and scalable offering.

The Pan-European Certificate offers a unique opportunity to make that connection. Not as an endpoint, but as a starting point: a common reference framework that gives lecturers an argument, offers students recognition, and hands policymakers an instrument to give the Netherlands a recognisable position in the European standardisation education landscape.

The coming years will be decisive. The learning outcomes are being developed now, European funding is running, and political attention for standardisation is at a historic high. The Netherlands can co-design now and take a leading position, or connect later to a system that has already been shaped without Dutch input.

Appendices

List of abbreviations

Abbreviation	Meaning
AFNOR	Association Française de Normalisation — French national standards body
AI	Artificial Intelligence
AVG	Algemene Verordening Gegevensbescherming (EU privacy legislation; also known as GDPR)
BSI	British Standards Institution — UK national standards body
CEN	Comité Européen de Normalisation — European standardisation organisation for non-electrical sectors
CENELEC	Comité Européen de Normalisation Électrotechnique — European standardisation organisation for electrical engineering
COST	European Cooperation in Science and Technology — European cooperation programme for scientific research
DIN	Deutsches Institut für Normung — German national standards body
ECTS	European Credit Transfer and Accumulation System
Edu4Standards	Horizon Europe project focused on the development of learning outcomes and teaching materials for standardisation education
ETSI	European Telecommunications Standards Institute — European standardisation organisation for telecommunications
EU	European Union
EURAS	European Academy for Standardisation — European academic association for standardisation research
EZK	Dutch Ministry of Economic Affairs and Climate Policy
HAN	HAN University of Applied Sciences — Arnhem and Nijmegen University of Applied Sciences

Abbreviation	Meaning
HAS	Harmonised Standards (system) — the EU system for harmonised standards in relation to legislation
HLF	High-Level Forum on European Standardisation — European Commission advisory body on standardisation policy
ICT	Information and Communication Technology
IEC	International Electrotechnical Commission — international standards body for electrical engineering
IEEE	Institute of Electrical and Electronics Engineers — international technical professional association and standards developer
ILNAS	Institut Luxembourgeois de la Normalisation, de l'Accréditation, de la Sécurité et qualité des produits et services — Luxembourg national standards body
IP	Intellectual Property
ISO	International Organization for Standardization
ITU	International Telecommunication Union — international organisation for telecommunications standards
LLL	Lifelong Learning (Leven Lang Ontwikkelen) — Dutch policy programme focused on sustainable employability and continuing education
SME	Small and Medium-sized Enterprises
MOOC	Massive Open Online Course
MOT	Management of Technology — master's programme at TU Delft
NEN	Nederlands Normalisatie-instituut — Dutch national standards body
NNA	Nationale Normalisatie Agenda (National Standardisation Agenda) — Dutch policy framework for standardisation priorities
NXP	NXP Semiconductors — Dutch semiconductor company
OCW	Dutch Ministry of Education, Culture and Science
OER	Onderwijs- en Examenregeling (Education and Examination Regulations) — formal curriculum document of an educational institution

Abbreviation	Meaning
RSM	Rotterdam School of Management — business school of Erasmus University Rotterdam
RUG	Rijksuniversiteit Groningen (University of Groningen)
RVO	Rijksdienst voor Ondernemend Nederland (Netherlands Enterprise Agency) — implementing organisation of the Ministry of Economic Affairs
SEP	Standard Essential Patents — patents essential to the implementation of a standard
SOONS	Stichting Onderzoek en Onderwijs Normalisatie en Standaardisatie — Dutch national knowledge platform for standardisation education
SPS	Sanitary and Phytosanitary Measures — WTO agreement on sanitary and phytosanitary measures
TBT	Technical Barriers to Trade — WTO agreement on technical barriers to trade
TU Berlin	Technische Universität Berlin
TU Delft	Delft University of Technology
TU/e	Eindhoven University of Technology
USE	User, Society & Entrepreneurship — interdisciplinary learning line at TU/e
UU	Utrecht University
UvA	University of Amsterdam
VNO-NCW	Verbond van Nederlandse Ondernemingen – Nederlands Christelijk Werkgeversverbond — Dutch umbrella employers' association
VU	Vrije Universiteit Amsterdam
WTO	World Trade Organization

Table 1: List of abbreviations

Appendix A

Interview report – Paul Wiegmann – TU/e

Interviewee: Paul Wiegmann, Assistant Professor
Organisation: Eindhoven University of Technology (TU/e)
Date: 03/12/2025

Context and involvement of the interviewee

Paul Wiegmann is an assistant professor at TU Eindhoven (since 2019) and has been researching standardisation for around 13 years, with a focus on the relationship between standardisation processes and innovation. His research approaches standardisation primarily as a process (consensus-building, interests, dynamics) and uses a variety of case studies (including EV charging connectors, central heating boilers, CCS, quantum). In addition to research, he teaches on standardisation and is active in European networks, including as chair of EURAS and through the EU project Edu4Standards.

Current position at TU/e: standardisation teaching and curriculum anchoring

TU/e previously had a USE learning line (User, Society & Entrepreneurship) with three courses (introduction, advanced with guest lectures, and project/report) in which 'Patents, Design Rights & Standards' played a significant role. These learning lines have since been abolished. As a result, there has been no standardisation course for a period, but TU/e is working on a successor to start in the coming academic year: an elective course of 5 ECTS, open to all bachelor's students (across all faculties). The core design is: generic process knowledge combined with application to a standard from the student's own discipline via an assignment. Assessment will consist of (1) a final exam, (2) a group assignment, and (3) a serious game focused on consensus-building (e.g. ISO's 'Lost at Sea'). It will be positioned as an elective within a 'thematic learning area' (including entrepreneurship): students choose freely, but direction is given through information fairs and clustering.

Relevance for the Pan-European Certificate: implementation path and presumption of conformity

TU/e takes a positive view of linking with the Pan-European Certificate. Wiegmann sketches the implementation model as he understands it: if a course demonstrably meets the learning outcomes, a kind of *presumption of conformity* can be used. A pass mark for the course would then (semi-)automatically lead to the certificate being awarded. An important precondition is the timely and clear specification of the learning outcomes and requirements of the certificate, so that lecturers can design and align their course content accordingly. This turns the certificate into an instrument both for quality assurance and for legitimisation vis-à-vis educational management and students.

Bottlenecks: adoption thresholds and a chain of persuasion

Wiegmann emphasises that successful implementation does not start with the certificate but with basic conviction about the importance of standardisation. He describes a step-by-step adoption threshold among lecturers:

1. Recognising that standardisation is valuable (counterview: 'standardisation hampers innovation').
2. Recognising that students should learn something about it.
3. Only then: the added value of a certificate.

This means that proactive roll-out by NEN is not just certificate promotion, but also awareness-raising and framing standardisation as an enabling factor (interoperability, market formation, innovation, governance).

Recommendations for NEN's role and a network-based approach

Wiegmann sees scope for a more active role for NEN, but targeted and efficient: start with lecturers and professors who are already involved in NEN committees (who therefore already have intrinsic appreciation). Approach them with: (a) support and materials (e.g. Edu4Standards), (b) opportunities for integration into teaching, and (c) the certificate as an option, without making it the first selling point. He also notes that the earlier national network and platform SOONS has effectively fallen dormant since 2024, partly due to changes in responsibility. This is relevant because such a platform would be a natural place for alignment on teaching and implementation.

Implications for the research

TU/e acts as an early adopter: there is existing expertise, a concrete course in development, and willingness to link to the certificate. At the same time, the conversation shows that national scaling requires (1) clear certificate requirements, (2) strategic communication and a lecturer-focused adoption approach, and (3) reactivation of, or an alternative for, a national platform (SOONS) to organise structural cooperation.

Appendix B

Interview report – Geerten van de Kaa – TU Delft

Interviewee: Geerten van de Kaa, Associate Professor
Organisation: Delft University of Technology
Date: 04/12/2025

Standardisation in current teaching

Geerten van de Kaa addresses standardisation structurally in his teaching, in particular within the Master of Management of Technology (MOT). Standardisation is not approached there as a stand-alone technical subject but as a strategic instrument within industry and market dynamics. Central themes are network effects, path dependency, dominant designs, and the strategic choices companies make to influence or set standards. Classical cases (such as the emergence of Wi-Fi via IEEE) are used to provide insight into how standardisation processes unfold in practice, including the interests around patents, cooperation, and competition. Several learning outcomes that align with those envisaged for the European Certificate are thereby addressed in effect: awareness of standards, understanding of the standardisation process, and insight into strategic considerations. At the same time, the scale remains limited: the teaching reaches tens to at most a few hundred students, while the university as a whole educates thousands.

Limitations of a bottom-up approach

Van de Kaa emphasises that the current situation is heavily dependent on individual pioneers. Standardisation finds its way into curricula because a lecturer considers the topic important and has expertise in it, not because it is structurally anchored. This leads to a fragmented and fragile system: when these people leave, the topic often disappears from the programme again. In his view, this is fundamentally insufficient to build capacity on a European scale. A purely bottom-up model — individual courses, guest lectures, or individual initiatives — is a drop in the ocean.

The need for top-down incentives

A key point in the conversation is the importance of institutional incentives. For researchers, participation in standardisation committees is barely taken into account in assessment criteria. As a result, there is no structural incentive to invest time in standardisation, despite its societal and economic relevance. Van de Kaa sees clear parallels here with valorisation and patenting, which are explicitly rewarded. For education, he sees opportunities through accreditation and quality assurance systems: if knowledge of standardisation were explicitly included in the assessment criteria for degree programmes, this would create a powerful top-down mechanism encouraging programmes to embed the topic structurally, that it less dependent on individual preferences or staff continuity.

Relevance for geopolitics, security, and innovation

Alongside economic arguments, Van de Kaa explicitly names security and geopolitics as justifications for greater attention to standardisation. In domains such as defence, ICT, and emerging technologies (e.g. additive manufacturing, data interoperability), standardisation co-determines who holds technological control and a knowledge lead. Europe cannot afford to take a passive stance here.

Role of the Pan-European Certificate

The Pan-European Certificate is seen as a meaningful instrument, but not as a stand-alone solution. Its added value lies in creating recognisable learning outcomes, offering legitimacy vis-à-vis programmes and policymakers, and linking education to broader policy goals (innovation, security, strategic autonomy). Its effectiveness depends strongly on the extent to which it is institutionally embedded through reviews, policy frameworks, and incentives for lecturers and researchers.

Implications for the research

This interview underlines that sustainable scaling of standardisation education does not arise by itself. Structural impact requires a combination of bottom-up substantive expertise *and* top-down policy and assessment mechanisms. The certificate can be a catalyst in this, provided it is linked to existing governance structures within higher education.

Appendix C

Interview report – Niels ten Oever – University of Amsterdam

Interviewee: Niels ten Oever, Assistant Professor
Organisation: University of Amsterdam
Date: 08/12/2025

Positioning of standardisation within UvA teaching

Niels ten Oever indicates that teaching on standardisation fits well within programmes with a governance and policy orientation, in particular European Studies. In that context, he already addresses standardisation as part of European technology and governance issues. Attempts to integrate comparable content within Media Studies proved considerably more difficult, because students there have less intrinsic interest in governance and institutional processes. For technical deepening, he sees better connections with technical universities such as Delft and Eindhoven. According to Ten Oever, it is important for future policymakers to have insight into the role of standardisation: not only as a technical instrument, but as a mechanism of power and governance within Europe.

Decision-making and institutional preconditions

The inclusion of new topics in the curriculum at the UvA proceeds through formal structures. Central is the Education and Examination Regulations (OER) per programme, in which what students must know and be able to do is laid down. Ten Oever emphasises that structural, top-down anchoring of standardisation in curricula is possible, but takes a very long time (five to ten years). Universities deliberately function as a slow ship: this offers stability and academic freedom, but limits rapid thematic adjustments. For an external party, it is virtually impossible to exert direct influence on these internal prioritisation processes.

Promising implementation strategy

As a realistic short-term strategy, Ten Oever advises a bottom-up approach via so-called champions: lecturers who already give teaching in which standardisation logically fits and who are willing to actively carry the topic within their own department. He suggests supporting these lecturers with ready-made teaching materials (slides, lesson plans), so that the additional development burden is minimal. Rather than developing new courses, he considers it more effective to enrich existing courses and link the certificate to them. When a lecturer can demonstrate that students can automatically obtain a European certificate through an existing course, that considerably lowers the threshold. He also suggests academic incentives such as workshops, and paper or thesis prizes for students who choose standardisation as a topic.

Implications for the research

The conversation shows that the Pan-European Certificate aligns well with governance and policy programmes in terms of content, but that structural anchoring within university curricula is time-consuming. The most promising route lies in supporting individual lecturers with concrete teaching materials and linking the certificate to existing courses.

Appendix D

Interview report – Richard Neerhof – Vrije Universiteit Amsterdam

Interviewee: Richard Neerhof, Professor
Organisation: Vrije Universiteit Amsterdam
Date: 04/12/2025

Position and focus of the interviewee

Richard Neerhof researches and teaches the relationships between public regulation (government/legislation) and forms of private regulation: standardisation, certification, and (underlying this) accreditation. His teaching on this, however, is mainly post-initial and postgraduate. In regular teaching at VU Amsterdam (administrative law and environmental law), the topic returns at most tangentially — for bachelor students hardly at all, and for master students only to a limited extent. This makes him particularly relevant as a conversation partner for the part of the research concerning professionals and officials and the legal embedding of standards in policy and legislation, and less so for curriculum implementation aimed at regular students.

Practical demand from government: postgraduate education

On request, Neerhof teaches an intensive one-day course for legislative and policy officials through, among others, the Academy for Legislation and the Academy for Government Lawyers. The participants come from all ministries (SZW, EZK, Finance, I&W, BZK, etc.). The demand arises from a concrete need: officials want to understand how and when they can deploy instruments such as standardisation, certification, and accreditation in policy and regulation — for example by referring to NEN standards or European harmonised standards — and how conformity assessment (including notified bodies) works legally. Design: a day-long programme with a fixed content block and a concluding section (around 1.5–2 hours) in which participants bring their own casework.

Substantive core: legal framework and risks

The course addresses the legal embedding of standardisation and certification when government makes use of it: European references to standards (CEN/CENELEC/ETSI), national references to NEN standards, declarations of conformity, and notified bodies. An important additional element is attention to legal risks:

- Effects on the free movement of services (market access and market effects).
- Potential tension with competition rules (not distorting markets).

Relationship with building regulation

In the master's course on environmental law, Neerhof discusses aspects that touch on quality assurance and private control in construction, partly due to changes since 1 January 2024 (Environment and Planning Act). This is a concrete example of hybrid public-private regulation in which an understanding of roles, responsibilities, and governance is relevant.

Limited feasibility: a dedicated university course or certificate route

Neerhof is cautious about a full university course on standardisation within a law faculty: he expects too few students (not viable), unless it is positioned nationally (in which case a group of perhaps 20–30 students per year would be possible). For a certificate linked to his postgraduate course, he sees this as possible in principle, but it is not self-evident: the target group needs functional knowledge to perform their own work better, not in order to participate in standardisation committees. The Pan-European Certificate fits less well as a direct conclusion, at most as a reference or an additional route for those who wish to deepen their knowledge further.

Strategic suggestion

Neerhof sees more potential in modest embedding in existing courses (legal, business, or technical) with guest speakers from practice — not only from NEN, but also from certification bodies and the Dutch Council for Accreditation. This supports an approach in which the certificate does not primarily land through new, stand-alone courses, but through modular integration and recognisable, sector-specific applications.

Implications for the research

Neerhof confirms that standardisation is barely structurally embedded in legal curricula, but that there is concrete demand among professionals within government. For the implementation strategy, this suggests a twin-track approach: (1) educational anchoring through context-based modules and guest lectures within existing programmes, and (2) a parallel route aimed at postgraduate and professional target groups.

Appendix E

Interview report – Olia Kanevskaia Whitaker – Utrecht University

Interviewee: Olia Kanevskaia Whitaker, Assistant Professor
Organisation: Utrecht University
Date: 05/01/2026

Current teaching practice on standardisation

Kanevskaia Whitaker describes three concrete teaching activities. First, she organises an international summer school on standardisation, which has now been held twice with a third edition planned. The content varies each year and ties in with current themes (including China and governance, AI, and soon quantum). The summer school is organised in cooperation with Bureau Forum Standaardisatie, NEN, ETSI, and experts from the European Commission. The group is selective and small ($\pm$10–15 students), selected on motivation. Second, she teaches short elective courses (three weeks) focused on specific aspects of standardisation, such as Standard Essential Patents and the EU legal framework around standards. Students work towards a presentation or paper, often with external stakeholders as the audience (e.g. presentations at NEN). Third, she integrates standardisation into regular compulsory courses, such as a master's course on market regulation, which reaches a broader audience but remains limited in substantive depth.

Person-dependence and lack of strategy

There is no faculty-wide or university-wide strategy for teaching on standardisation. Initiatives emerge almost entirely from individual lecturers. Although standardisation is increasingly present in research (e.g. in debates on AI and digitalisation), this hardly automatically translates into teaching. Summer schools run largely on voluntary work and are vulnerable to budget cuts.

Student motivation and the didactic challenge

Kanevskaia Whitaker confirms that standardisation is often seen by students as dry or technical. Once students understand the relevance, their appreciation increases: standardisation opens new insights into how European regulation, technology, and market dynamics hang together. The core challenge lies not in resistance, but in framing: why is standardisation relevant for your field?

View on the Pan-European Certificate

She takes a positive view of the certificate as a supplementary instrument, provided it is carefully positioned. The certificate is not a primary attractor, but can help to structure and legitimise interest, especially if it is linked to existing courses via accreditation of learning outcomes. She argues for a layered approach — a basic level plus domain-specific deepening — because what is meaningful for lawyers differs substantively from what is relevant for engineers.

Expectations of standardisation organisations

From national and European standardisation organisations, she mainly expects practical support: guest lecturers, case studies, serious games, and financial sponsorship. Experiential learning in particular works better than purely theoretical explanation. Budgetary pressure is a structural impediment; support from organisations can make a direct difference.

Implications for the research

Successful standardisation education comes about bottom-up, but is vulnerable due to person-dependence and limited resources. The Pan-European Certificate can be valuable as a catalyst, provided it is flexible, multidisciplinary, and linked to concrete teaching practices.

Appendix F

Interview report – University of Groningen

Interviewees: Jaap Dijkstra (Director of Education, Faculty of Law), Mathieu Paapst (Assistant Professor of IT Law)
Organisation: University of Groningen
Date: 04/02/2026

Current attention to standardisation

Within the regular curriculum, attention to standardisation is limited and usually indirect. In IT law, ISO standards such as ISO 27001 and 27002 come up tangentially as specifications of open norms from privacy law. In a separate lecture, Paapst devotes explicit attention to the distinction between standard, norm, and harmonised standard; the role of organisations such as ISO and NEN; and legal aspects such as copyright and publicity. In other areas (tax law, construction law), standards are sometimes used, but without systematic reflection on the standardisation process itself.

Substantive relevance for law

Both interviewees recognise that standardisation is legally and politically more relevant than is often realised. From European law, competition law, and international law, there are clear points of contact:

- The geopolitical dimension (e.g. China's strategic focus on international standards).
- The relationship between harmonised standards and EU legislation.
- Competition law issues around standardisation.
- The tension between public regulation and private standard-setting.

Nevertheless, this is not addressed as a separate theme, but rather as an implicit part of other areas of law.

Embedding in the regular curriculum is difficult

Structural inclusion of a separate certificate or fixed module in the existing bachelor or master curriculum is considered hard to achieve. The programme faces a full agenda and numerous requests for new topics. Priority is given to educating good lawyers in the core areas of law.

Promising route: Lifelong Learning

A more realistic route is seen in postgraduate education. The faculty has its own bureau for postgraduate education and offers individual courses, course programmes, and in-company training via this route. A course programme on standardisation could fit here, provided there is demonstrable market demand. It is emphasised that demand often arises only when professionals concretely encounter standardisation in their work.

Inter-university cooperation

It is inefficient for every law faculty to develop an offering separately. A national collaboration — possibly with Nijmegen as a player in postgraduate legal education — would be more effective. International contacts (e.g. Oldenburg) are also considered valuable.

Implications for the research

Standardisation is substantively relevant in legal terms, but is not yet recognised as a self-standing theme. Structural embedding in the curriculum is difficult given the limited space. The most promising route lies in postgraduate education, course programmes, and inter-university cooperation. Without an experienced practical need, no demand arises.

Appendix G

Interview report – Tilburg University

Interviewees: Panos Delimatsis & Stephanie Bijlmakers
Organisation: Tilburg University
Date: 08/12/2025

Context and expertise

Tilburg University has several researchers with substantial expertise in standardisation, with a clear emphasis on legal, economic, and governance aspects. Stephanie Bijlmakers conducts research on ISO and private/social standards (such as ISO 26000), supply chains, semiconductors, and critical raw materials. Panos Delimatsis is professor of EU and international economic law and works on standardisation in relation to Technical Barriers to Trade (TBT/SPS), the role of standards in legislation, and the interaction between standardisation, market access, and regulation. Both are active in Edu4Standards and SOONS.

Standardisation in current teaching

The picture is present but fragmented and largely dependent on individual lecturers. There is no dedicated course. Standardisation appears as part of existing courses (WTO law, internal market law, cybersecurity/AI, regulation). Bijlmakers is developing an elective top class on semiconductor supply chains with an explicit session on standardisation. In addition to regular teaching, there is executive and professional training, including a course for the Belgian Electrotechnical Committee (three half-days, 12 hours, around 20 participants including judges). Participants already had basic knowledge or concrete practical questions; the added value of a certificate is clear here as CV evidence and as recognition of the knowledge acquired.

In-company pilot within Edu4Standards

A central contribution is Tilburg's involvement in the in-company pilot on standardisation, developed jointly with TU/e and NXP. The pilot consists of three mod-

ules for different target groups: young engineers, mid-career engineers, and senior/management staff. The first two modules were successfully delivered as full-day programmes on the TU/e campus with participants from ASML, Philips, and NXP. This concretely shows how the certificate ambition aligns with industry demand and LLL.

Linking to the certificate: opportunities and limitations

The most realistic implementation route is an add-on/incentive model: students follow an elective or receive an introduction within existing courses and can then obtain the certificate via an online route. Course accreditation is possible but requires institutional decision-making and is not feasible in the short term.

Governance and curriculum dynamics: latent demand and rigidity

Students cannot articulate demand for something they do not know ('they see the CE mark, but do not know what it is'). Awareness is a precondition. At the same time, curriculum change is rigid. This supports the hypothesis that a European certificate will only succeed if it does not rely exclusively on curriculum change, but also works through flexible routes (microcredentials, online assessment, executive training).

Role of NEN and broader coalitions

Panos is explicit: NEN cannot carry this alone. He sketches a model in which a coalition of public and private actors forms a joint fund (e.g. €30–50k per year per position) to finance, via a tender, a limited number of centres of excellence (technical, legal, economic/management). This serves two goals: structural capacity-building, and demonstrating external demand and legitimacy to university leadership. He also criticises the limited involvement of Dutch companies (ASML/Philips) compared to international funders (such as Qualcomm in earlier projects).

Implications for the research

Tilburg illustrates that substantive expertise is present in the Netherlands, but that embedding in teaching remains fragile without structural governance and capacity. The greatest opportunity for the certificate lies in a hybrid implementation strategy: (1) introduction and modular embedding in existing courses, (2) the certificate as an add-on/online route, (3) scaling through open teaching ma-

terials and professional training, and (4) a coalition approach for long-term educational positions and networks.

Appendix H

Interview report – Eugene Pyun – Rotterdam School of Management

Interviewee: Eugene Pyun, Assistant Professor of Innovation Strategy
Organisation: Rotterdam School of Management (Erasmus University)
Date: 17/02/2026

Current position of standardisation within RSM

Standardisation is weakly anchored in the RSM curriculum. It currently depends largely on individual initiative. Since the departure of the previous chair holder in standardisation, the topic is effectively kept alive by a single elective course. If that course were to disappear, standardisation would no longer have a visible presence. This points to a broader structural issue: standardisation education is not institutionally anchored but rests on a small number of motivated individuals. Continuity is therefore fragile.

Student interest and barriers

A core challenge is that standardisation as a term does not resonate with students. They are not familiar with it and see it as technical, abstract, or uninteresting. RSM has deliberately reframed the course from standardisation to innovation, with standardisation as the underlying theme. This approach has proven effective: students who take the course generally become enthusiastic once they understand the role and impact of standardisation, particularly in innovation and platform dynamics. The main barrier is therefore not the content itself, but initial awareness and framing.

Perspective on the certificate

Pyun has a mixed view. Positive: a certificate can serve as a clear signal that a student has knowledge about standardisation processes and their impact, and can improve the visibility and credibility of the topic. Negative: a certification framework can introduce rigidity into the curriculum by requiring courses to align

with predefined learning outcomes, which limits lecturers' flexibility to design engaging and context-specific approaches. A one-size-fits-all approach is therefore difficult to implement effectively.

The certificate as a structural instrument

Despite these reservations, Pyun sees potential in the certificate as a structural instrument: formal certification can give institutions a stronger incentive to maintain and develop standardisation education. It provides concrete justification for including the topic in curricula and reduces dependence on individual staff members. In the case of RSM, Pyun states explicitly that without such a structure, standardisation education can easily disappear.

Role of external actors

External support is considered important. Involvement of organisations such as NEN or European standardisation organisations would strengthen the legitimacy of standardisation education within universities. Earlier collaborations, such as the joint minor with TU Delft and Leiden, were valued within RSM and helped to justify the continuation of the programme even when enrolment was limited.

What is needed for strengthening

Three conditions: (1) The entry threshold for students must be lowered by embedding standardisation in broader and better-known themes such as innovation, AI, platforms, or ecosystems. (2) Demand from industry must be made more visible: job vacancies or career events that explicitly refer to standardisation skills can significantly increase interest. (3) Stronger institutional structures are required; a certificate can contribute to this, provided it allows sufficient flexibility in content and delivery.

Implications for the research

Standardisation is largely invisible to students, despite its relevance. The issue is not only awareness, but also institutional embedding. Pyun views the certificate primarily as a potential lever for structural change: its value lies less in directly attracting students, and more in enabling universities to organise and maintain standardisation education in a more sustainable way.

Appendix I

Interview report – Open Universiteit

Interviewees: Rogier van de Wetering (Full Professor of Digital-Driven Transformation & Vice-Dean), Frank Niesten (Enterprise Architect)
Organisation: Open Universiteit
Date: 20/04/2026

Context and involvement of the interviewees

The conversation focused on the place of standardisation and standardisation teaching within the Open Universiteit, and on the question of how the Open Universiteit views a possible European certificate. The discussion covered both the substantive relevance of standardisation and the practical question of how such a subject relates to existing curricula, accreditation frameworks, and the specific educational logic of the Open Universiteit. Van de Wetering emphasises at the outset that standardisation is not currently an explicit organising principle within the faculty's programmes, but does recognise that standards and standardisation are relevant in various disciplines, particularly where data exchange, interoperability, technical infrastructure, and digital systems are concerned.

Current place of standardisation in teaching

It is likely that standardisation is addressed in several courses, but as a component or building block within broader subject matter, not as a self-standing theme. This fits the breadth of the faculty, in which programmes range widely — from environmental studies to computer science and information science. Attention to standards is most likely within computer science, information science, and related digital programmes, but the subject is not approached faculty-wide or systematically. It finds a place where it logically fits the content of a course or application area. The Open Universiteit thereby fits the pattern also visible elsewhere: standardisation is relevant, but not usually something on which curricula are explicitly built.

Educational model and curriculum logic

The Open Universiteit has a different educational logic from campus universities: students do not enrol for a full package per year, but purchase individual courses. The student population is therefore heterogeneous, ranging from students pursuing a full programme to professionals seeking to upskill and participants interested in a single specific subject. This makes the institution flexible, but it complicates steering on fixed learning pathways or on the systematic build-up of specific topics. In addition, the Open Universiteit develops teaching with a relatively long shelf life: programmes and courses must not depend too heavily on short-term trends and must stand up for several years within accreditation cycles. Van de Wetering distinguishes fundamental academic formation from more applied, practical knowledge; he sees standardisation primarily as something that can be integrated into appropriate courses, not as a stand-alone main theme on which a full university programme should be based.

View on certification and focus programmes

Van de Wetering is not opposed to certification, but raises clear caveats. His main question is at what level and with what breadth a certificate for standardisation would be designed; that determines whether and how it can fit into the teaching of the Open Universiteit. He notes that the Open Universiteit already has experience with certificate-like forms, notably through *focus programmes*: several courses around a particular theme are bundled together and participants receive, in addition to the regular course results, an overarching certificate. This is particularly valued in the context of continuing education and professional development. Certification therefore fits the model of the Open Universiteit as such; the question is rather whether a certificate for standardisation can be positioned with sufficient sharpness, relevance, and appeal.

Conditions for a possible place for the certificate

At present, Van de Wetering does not yet clearly see how a European certificate for standardisation would fit directly into the Open Universiteit's offering. This has mainly to do with a lack of clarity about the substantive level, the breadth and depth of the learning outcomes, and the accreditation and assessment process that would be linked to it. In addition, the added value for the Open Universiteit's student population needs to be in view, as does the value of the certificate on the labour market. He explicitly does not rule out that there may be room for it in due course, but sees this as depending above all on the eventual design and

positioning. Van de Wetering indicates that the conversation gives him reason to put the subject on the internal agenda, including in consultation with programme directors, in order to explore jointly how standardisation is viewed as an educational theme.

Implications for the research

The Open Universiteit sees standardisation as a relevant subject, particularly in digital and technical contexts, but not as a self-standing theme on which curricula are directly built. The most logical place currently lies in integration within existing courses and programmes where standards, interoperability, and technical alignment already play a substantive role. For a European certificate, the stance is cautiously exploratory: the added value and fit depend strongly on level, scope, and labour market relevance. The existing model of focus programmes does, however, offer a point of entry for an LLL route, in which a standardisation certificate could in future function as part of a thematic course package.

Appendix J

Interview report – HAN University of Applied Sciences

Interviewees: Erwin Folmer, Timo de Laat
Organisation: HAN University of Applied Sciences
Date: 09/12/2025

Current situation and experience

Erwin Folmer has ample experience with teaching on standardisation, particularly embedded in broader courses on interoperability, data, and ICT architecture. In the past, individual lectures on standardisation have been given, but without formal certification. The core message is that awareness-raising already delivers a great deal of value, provided the topic is offered in a context- and sector-specific manner (e.g. ICT, data, governance).

Appreciation of the Pan-European Certificate

The idea of a Pan-European Certificate is assessed positively in substance, but there is reservation about its added value within regular bachelor and master teaching. Students focus primarily on obtaining a diploma. A supplementary certificate is not automatically experienced as attractive. The interviewees therefore expect limited direct impact from the certificate as a stand-alone element within existing curricula. However, they emphasise that the certificate fits well in substance, provided it is integrated into existing courses or modules, and provided the generic part (process, governance, legal and economic aspects) is supplemented with sector-specific applications (e.g. data interoperability in ICT).

Promising route: Lifelong Learning

The most promising route is seen in the LLL offering of the university of applied sciences. There is more substantive and organisational flexibility there, scope for professionals who directly benefit from knowledge of standardisation, and better alignment with practical questions around data, AI, and interoperability.

An LLL course can serve as a pilot and a flywheel: when the offering runs well and proves relevant, it can later progress pragmatically to regular higher professional education modules (e.g. free-elective blocks), without major curriculum changes.

Relationship with microcredentials

Microcredentials are seen as a potential future opportunity, but currently mainly as an internal educational instrument with limited recognition in the business community. An external, European certificate can be at least as valuable for professionals, particularly when issued through a recognised standardisation structure.

Success factors and preconditions

Important conditions for success are:

- Promotion and reach: without active support, it is difficult to recruit enough participants for niche topics.
- Cost neutrality: LLL courses must be at least cost-recoverable.
- Cooperation: substantive expertise at educational institutions, combined with the network, legitimacy, and visibility of parties such as Forum Standaardisatie and NEN.
- Pragmatic approach: start where the energy is (LLL, pilots), not through heavy formal trajectories.

Implications for the research

The Pan-European Certificate fits well in substance, but implementation through regular higher professional education is complex. A phased approach through LLL pilots, with active support from Forum Standaardisatie and NEN, is seen as the most realistic and impactful route.

Appendix K

Interview report – Windesheim University of Applied Sciences

Interviewees: Eelke Pruim (Ambition director Accelerating Transitions Together), Anneke Spijker (Lecturer in Technical Business Administration / Digitalisation & Automation)
Organisation: Windesheim University of Applied Sciences
Date: 13/01/2026

Positioning of Windesheim and the broader context

Eelke Pruim sketches that Windesheim has in recent years become more explicitly oriented towards societal transitions (such as healthcare, energy, and AI) and towards European cooperation. Whereas programmes have traditionally been strongly discipline- and profession-oriented, there is growing awareness that complex societal issues call for interdisciplinary thinking and cross-border cooperation. Windesheim is part of the European University Alliance DIVERSE, in which several universities of applied sciences and universities work together on joint teaching and knowledge development.

Current attention to standardisation

There is no explicit teaching on the process of standardisation within Windesheim. Standards do come up implicitly, in particular within technical programmes (manufacturing industry, safety, ISO standards), HBO-ICT (GDPR, NEN 27001), and professional practices where regulation and quality standards play a role. Anneke Spijker emphasises that students in many programmes work with standards on a daily basis, without gaining insight into how these standards come about, who has influence over them, and the fact that standards are changeable.

Curriculum logic and scope for innovation

Pruim explains how curricula come about in higher professional education: programmes typically have around 20–30% scope for local interpretation. New

themes find their way into teaching primarily when urgency is high (as recently with AI), when there are clear practical questions, or when they fit within LLL pathways, in which Windesheim has relatively much flexibility to develop customised teaching.

Relevance of standardisation for Windesheim

Pruim sees parallels between standardisation and the broader movement towards European cooperation and strategic autonomy. Spijker emphasises that standards in practice are often normative and ethically loaded (e.g. in healthcare, digitalisation, and oversight). Precisely for this reason, she considers it valuable for students to learn to reflect on the emergence and impact of standards, rather than accepting them as a given.

View on the Pan-European Certificate

The idea of a broad, generic certificate that provides insight into the standardisation process is seen as logical and relevant in substance. Embedding is most promising within domains such as Business, Media & Law, engineering, or via LLL routes. Implementation requires a clear linkage to existing curricula and support from external parties such as NEN or Forum Standaardisatie.

Implications for the research

Institutionally, Windesheim is open to European and transition-oriented educational innovation, but explicit teaching on standardisation is currently lacking. Structural opportunities lie in interdisciplinary modules, microcredentials, and LLL pathways, provided the importance is made clear and practical support is available.

Appendix L

Interview report – Gertjan van den Akker – NEN / SOONS

Interviewee: Gertjan van den Akker, Director of Standards NEN / Member of Forum Standaardisatie
Organisation: NEN / Stichting Onderzoek en Onderwijs Normalisatie en Standaardisatie (SOONS)
Date: 06/01/2026

View on standardisation

Van den Akker places standardisation explicitly within the European model of self-regulation. In his view, standardisation is primarily a private instrument in which market parties, with expert guidance, jointly make agreements. He sees precisely this voluntary and participatory character as the strength of the European system, because it ensures support and effective implementation. This distinguishes Europe from countries such as China, where standardisation is deployed far more directively and strategically by the state. He nuances the picture that Europe is lagging behind on standardisation. According to him, this applies in particular to specific domains such as IT, where the global market is dominated by American parties. In other sectors, the European position is less problematic. He thereby emphasises that standardisation is often the consequence of innovation and industrial strength.

Role perception of NEN and SOONS

Van den Akker sees a clear role for NEN — as the standards body designated by government — in promoting both the development and the application of standards. Education and research fall explicitly within this remit. SOONS serves as an instrument to give concrete shape to this role. SOONS is set up as a knowledge and network platform in which professors, lecturers, and researchers come together to exchange knowledge on education, curriculum development, and research in the area of standardisation. An important spearhead is the funding of endowed chairs at Rotterdam School of Management of Erasmus University. The

ambition is to expand this network, in particular towards universities of applied sciences, which according to Van den Akker play a key role in the training of future professionals. It is important, in his view, that SOONS not only shares knowledge internally, but also makes it visible to policymakers and the business community.

What NEN/SOONS should precisely *not* do

Van den Akker is cautious about taking a directive role vis-à-vis educational institutions. Curricula are full, changes take time, and universities are autonomous. NEN and SOONS can stimulate, facilitate, and connect, but cannot compel what is included in educational programmes. He is also realistic about funding: broad, generic chairs funded by the business community he considers difficult to achieve, unless there is a clear and direct sectoral interest.

Pan-European Certificate

The Pan-European Certificate is supported by Van den Akker, provided it is actually introduced at European level. A purely national variant would have little value. He sees scope for a layered model in which European safeguarding is combined with national recognisability. In his view, the value of the certificate lies above all in increasing understanding of the standardisation system and process, not in training certifiers.

Preconditions: access and ageing

Students in higher professional education programmes have access to NEN Connect. The same applies to a number of universities. Given the lack of awareness among many lecturers, communication about this deserves attention. Finally, he emphasises the urgency of ageing within the standardisation community. Many current experts will stop within a few years. Education is therefore essential in order to train a new generation of professionals who understand the importance of standardisation and can put it on the agenda within organisations.

Implications for the research

The conversation positions NEN and SOONS clearly as catalysts: they must increase awareness, build networks, and create preconditions, without letting go of the European self-regulation model. The greatest lever lies in structural knowledge-building, expansion to higher professional education, and alignment with European initiatives such as the Pan-European Certificate.

Appendix M

Interview report – Jolien van Zetten – NEN

Interviewee: Jolien van Zetten - Head of Professional Development and Processes
Organisation: NEN
Date: 18/11/2025

Current NEN educational activities

Jolien van Zetten sketches that NEN's educational activities broadly fall into two tracks. On the one hand, there is education for committee members: people who participate in standards committees on behalf of companies or organisations. For this purpose, NEN has recently developed a set of seven e-learning courses that give new committee members insight into the standardisation process, the division of roles, and expectations. These e-learning courses are process-oriented and already correspond closely in substance with what the European Certificate aims at, but are currently only internally available.

On the other hand, there are activities directed at educational institutions (universities and universities of applied sciences). These are mainly ad hoc: institutions approach NEN for guest lectures or contributions to specific courses. There is no structural programme or fixed cooperation. There are, however, standard introductory lectures on the standardisation landscape, the relationship with legislation, and the international context, which are adapted to the programme in question.

Cooperation with universities and didactic forms

NEN has contact in particular with TU Delft, Erasmus University, and Utrecht University. At Utrecht, NEN contributes to an annual summer school, in which students spend part of a day at NEN for a guest lecture and a serious game that simulates the standardisation process.

The serious game is seen by Van Zetten as a powerful instrument. In around two hours, participants experience the full consensus process: diverging interests,

negotiation, dealing with new information, and public consultation. The game is now also used internally (onboarding of consultants, new standards committees), and NEN is exploring whether it can be made more widely available to educational institutions.

View on the European Certificate

Van Zetten was initially sceptical about the certificate: a certificate only has value if the labour market (companies and governments) also recognises it. That scepticism has diminished over time, partly because in the HLF context explicit attention has been paid to market needs. For NEN, it is important that the Intended Learning Outcomes (ILOs) align with what organisations actually need from people who become active in standardisation.

NEN does not yet see itself as a front-runner in developing those ILOs. In the current proposal, that role lies with the European Standardisation Organisations. Van Zetten does expect that, once the ILOs are clear, NEN can make a concrete contribution by recalibrating existing e-learning courses and making them available in line with the certificate.

Generic versus programme-specific teaching

An important area of tension in the conversation is the question of how generic teaching on standardisation can be linked to programme-specific relevance. Van Zetten emphasises that students only become truly interested when the process is connected to their own field (e.g. construction, ICT, healthcare). The certificate will probably mainly cover the generic process; additional, sector-specific deepening is needed to make it attractive within curricula. NEN could possibly play a facilitating role here, for example through guidelines or sample modules.

Preconditions and governance

As the main thresholds for implementation, Van Zetten names:

- Ownership: who is actually taking the lead in Europe?
- Demand: recognition by companies and governments.

She sees a clear leading role for CEN/CENELEC/ETSI, in close cooperation with the national institutes. For the Netherlands, she considers an active role for NEN logical, partly in view of existing expertise and engagement.

Role of Forum Standaardisatie and government

Van Zetten emphasises that Forum Standaardisatie can play an important catalysing and legitimising role. Where NEN, from its neutral position, mainly responds to market demand, the Forum — together with the government — can more explicitly communicate that education on standardisation is of public interest, and can bring educational institutions together.

Implications for the research

The interview shows that NEN already has content, tools, and didactic forms in place that align well with the European Certificate, but that structural scaling requires clear governance, market validation, and a bridge between generic learning outcomes and programme-specific context.

Appendix N

Interview report – Ministry of Economic Affairs and Climate Policy

Interviewees: Juliane Eykelhoff (Coordinating policy officer Metrology & Standardisation), Elena Biscardi (Policy officer)
Organisation: Ministry of Economic Affairs and Climate Policy
Date: 29/01/2026

Capacity-building as a horizontal problem

The Ministry recognises the observation that capacity-building and knowledge about the standardisation process are typically horizontal themes: everyone benefits from them, but no one naturally feels the owner. That explains why initiatives often remain stuck at individual actions or individuals. A European-recognised certificate on the standardisation process can lay a structural basis for national implementation. It must be taken up centrally, preferably at European level, because national standards bodies cannot pull it off on a European scale on their own. The Ministry emphasises that the European certificate is particularly promising if it is taken up centrally through European bodies and ESOs, but that increasing the visibility of standardisation more broadly than the certificate is also a shared responsibility of all stakeholders.

Using major themes as a lever

A recurring point is that the Ministry, as the department responsible for the system, itself has little budget of its own. It can facilitate NEN — for example through limited start-up funding for exploratory studies — but large-scale movement only arises when standardisation education is linked to major policy dossiers with substantial resources. Eykelhoff names the mechanism by which themes where Europe or national strategies set requirements for skills and workforce — such as in the Net-Zero Industry Act (NZIA) and industrial value chains — structurally include training. The example of the Battery Academy in the Net Zero Industry Act illustrates how a training driver in regulation leads to ecosystems in which

educators can join with recognised programmes and certificates. In this type of trajectory, standardisation knowledge can also ride along, provided it is well positioned.

- Do not try to centrally steer the education landscape, but link the European standardisation certificate to priority technology and transition agendas (AI, quantum, hydrogen, etc.).
- The certificate becomes more promising when it becomes an integral part of existing academies and skills ecosystems that are already being funded.
- The question is less who wants to participate, and more: where is the policy lever that makes participation rational?

Business community: a key role for trade associations

Eykelhoff notes that there is a major opportunity with trade associations. Large companies often have the capacity, but SMEs and start-ups barely do. Their interests should be translated via trade associations into relevant standardisation agendas and participation. In recent years, this role of trade associations in the area of standardisation has, according to the Ministry, weakened: strategic focus on standardisation disappeared as a priority, and with it structural alignment within sectors. It is noted that VNO-NCW used to have a standardisation platform in which trade associations coordinated on what was going on. That platform no longer exists, but there is renewed interest, partly due to geopolitical developments, the European Standardisation Strategy (2022), and increasing awareness of international competition (China/US).

Impact of Bureau Forum Standaardisatie according to the Ministry

For Bureau Forum Standaardisatie, a role is seen in particular in evangelism and concretisation. Administrators and implementers often have insufficient understanding of what standards do, especially outside the security framing. A clear narrative with examples and a practical 'why now' explanation is needed to take standardisation out of the technical niche and into the geopolitical arena. In addition, an opportunity is seen to make standardisation knowledge more structurally available within government, for example through training pathways for central government officials such as legislative lawyers, where standardisation issues around references to standards and regulatory burden are relevant.

Structurally weak compliance with comply or explain

The conversation highlights that with open standards there is a pitfall. The principle is mandatory, but enforcement is weak. *Comply or explain* remains stuck at around 50% implementation, explanations disappear in annual reports, and there is no real supervisor who enforces compliance. This is linked to culture and long-term outsourcing, as a result of which knowledge of standards is not structurally present in government. Without knowledge, ownership, and incentives, standardisation is seen as a *last-minute compliance add-on* rather than as part of the design.

Implications for the research

The conversation shows that education on standardisation is not an isolated educational dossier, but is interwoven with broader policy and economic structures. Link education to major policy dossiers with budget and urgency. Position trade associations as a lever towards SMEs. Make the narrative compact and practical: a pitch with concrete examples and a clear 'why' is needed to get administrators, policymakers, and companies beyond the abstraction.

Appendix O

Interview report – Ministry of Education, Culture and Science

Interviewees: Bastiaan van Vliet (Senior policy officer Higher Education & Student Finance), Raijsa Balasingham (Policy officer Higher Education & Student Finance)
Organisation: Ministry of Education, Culture and Science (OCW)
Date: 09/04/2026

Context of the interview

The aim of this interview was to gain a better understanding of how the Ministry relates to themes such as educational content, alignment with the labour market, certification, and system-level steering. In contrast to educational institutions or individual lecturers, the Ministry does not operate at the level of concrete curricula. The approach of the conversation was therefore not whether the Ministry would actively support standardisation education, but how the ministry deals with subjects considered socially relevant, while institutions have formal autonomy over their teaching.

In addition, it was explored how a possible European certificate for standardisation is viewed from a policy perspective, in particular in relation to labour market functioning, recognition, and the division of roles between government, education, and external parties.

Role of the Ministry in higher education

Both interviewees emphasise that the Ministry does not determine what is taught in programmes. That responsibility lies with the institutions themselves. The government can, however, set professional requirements through legislation. The role of the ministry is system-oriented: ensuring that public money is spent efficiently and that the education system as a whole functions well.

The Ministry has four main steering instruments at its disposal:

- Funding
- Communication (e.g. policy priorities)
- Administrative agreements
- Legislation

In practice, this means that the Ministry can give direction, facilitate, and set preconditions, but does not prescribe in terms of content what must be in a programme, apart from professional requirements. For standardisation teaching, this means that inclusion in curricula will not take place through direct steering, but rather indirectly through incentives, cooperation, and developments in the labour market. In higher professional education, sector advisory councils are set up for this purpose, under the direction of the Association of Universities of Applied Sciences.

Certification and the labour market

An important part of the conversation dealt with certification in a broader sense. It was emphasised that certificates are never entirely neutral. As soon as a certificate gains value on the labour market, it in effect influences access to jobs and thereby also competition between certificates.

The question raised is: what exactly is being certified — programmes or individuals — and what is the purpose?

- Is it proof of additional knowledge?
- Is it a voluntary signal to educators and employers?
- Or does it develop into an implicit requirement?

If the latter happens, a certificate can function as a kind of gateway to the labour market. That raises questions about the equivalence of other qualifications, possible monopoly positions of certifying bodies, and the role of government in safeguarding fair access to the labour market.

From this perspective, it became clear that a European certificate for standardisation must be carefully positioned. Certainly when it is broadly recognised by employers, policy and legal implications can arise.

Difference from regulated professions

For professions such as doctors, teachers, or certain technical roles, certificates or diplomas are mandatory in view of public interests such as safety and quality.

In those cases, certification is an instrument to regulate access to the profession.

The standardisation certificate has a different purpose: increasing knowledge and understanding of standardisation processes. It is not intended as a formal admission requirement for a profession. It must therefore be prevented from nevertheless taking on that role through the labour market.

Steering on important themes

Although the Ministry has no direct influence on curricula, it can stimulate themes that are considered socially relevant. This takes place in particular through programmes, subsidies, and support structures.

An important example mentioned in the interview is the Npuls programme, which is aimed at digitalisation in post-secondary education. Through Npuls, institutions work together via knowledge sharing and guidance documents, and there is a subsidy programme for Centres for Teaching and Learning (CTLs).

This shows how the Ministry can indirectly give direction by:

- Making resources available
- Facilitating cooperation
- Emphatically putting certain themes on the agenda

For standardisation, this means that a comparable route is conceivable, in which content is not imposed, but preconditions are created to stimulate institutions to do something with it.

Alignment of education and labour market

The importance of existing structures in which education and the labour market are aligned with one another is underlined. In higher professional education, this happens for example through sector advisory committees in which educational institutions and employers come together.

These structures offer an important point of entry for subjects such as standardisation. If employers explicitly state that knowledge of standardisation is relevant, that can feed through into programmes via these channels. From the Ministry’s perspective, this is a more logical route than direct intervention through an external certificate.

Relevance for the research

The interview yields a number of valuable insights: (1) It is confirmed that the challenge lies not only in the importance of standardisation, but above all in how this importance can be translated into education without undermining the autonomy of institutions. (2) It makes clear that certification extends beyond education. As soon as a certificate acquires labour market relevance, it touches on broader issues such as market functioning, recognition, and regulation. (3) It shows that the Ministry can indeed exert influence, but indirectly. Strengthening standardisation education will proceed sooner through stimulation, cooperation, and policy programmes than through direct obligations.

A European certificate for standardisation can be valuable as a supplementary signal of knowledge and competence. At the same time, it must be carefully monitored so that it does not become an implicit admission requirement for the labour market.

For the strengthening of standardisation education, the most promising route seems to lie not in obligation or certification alone, but in increasing visibility, demonstrating labour market relevance, and using existing policy instruments to support institutions.

Appendix P

Interview report – Irvette Tempelman – VNO-NCW

Interviewee: Irvette Tempelman
Organisation: VNO-NCW
Date: 09/02/2026

Role and positioning of VNO-NCW

Tempelman explicitly positions VNO-NCW at a strategic and policy level, not at the level of individual standards. VNO-NCW represents the Dutch business community across sectors vis-à-vis government and Europe (including via BusinessEurope and on dossiers such as the revision of Regulation 1025/2012). Standardisation is seen by VNO-NCW as part of industrial policy and geopolitical strategy, and as relevant to technological sovereignty (e.g. AI, quantum, encryption). The focus lies on: where must we exert strategic influence? And how do we ensure that the Netherlands does not lag behind on important subjects?

Challenge: involvement of SMEs

An important point is the position of SMEs. According to Tempelman, the financial argument is not the primary barrier. The main thresholds are:

- Capacity: small companies cannot free up an FTE for lengthy standards committees.
- Timing of input: SMEs are often only involved when a standard is already advanced.
- Lack of practical participation moments in the process.

Tempelman suggests that the current model of committee participation does not fit small businesses well. Possible directions for a solution lie in targeted consultation moments and less frequent but well-prepared participation slots.

Education is necessary but not sufficient

Tempelman calls the absence of structural attention to standardisation in education a strategic failure. Knowledge of standardisation logically belongs in education and does not have to be an extensive course: a short module (e.g. 1–2 hours) can already have an effect. More important than depth is awareness: understanding that 'he who writes, decides' and that standardisation has direct impact on market position and innovation. She emphasises that education is not the full solution to the SME participation issue. It is a first step in awareness-raising, after which a second step — practically organising accessible participation — must follow.

The certificate is promising as a trigger, but not a requirement

On the European Certificate, Tempelman notes that it can be useful as a stimulating instrument, but must not become a threshold for participation in standards committees. Companies do not need formal certification to contribute substantively, and standards committees revolve around substantive expertise, not formal qualifications. The value of a certificate lies primarily in: increasing knowledge and understanding, reducing the need for explanation within companies, and putting the subject on the agenda. She sees particular potential for larger companies, but for start-ups and micro-enterprises it is less likely that a certificate will be decisive.

Who should take the lead?

Tempelman sees a joint role for EZK as the department responsible for standardisation, NEN as the facilitating organisation, and indirectly also OCW. A central, high-quality module — comparable to national AI initiatives — could be efficient: developed once, made broadly available, and voluntarily used by educational institutions.

Implications for the research

The interview underlines three insights: the strategic importance of standardisation is recognised, particularly in a geopolitical context; SME participation is an important problem, not in terms of cost but in terms of capacity and process design; education is necessary for awareness, but must be combined with practical reforms in participation. For the certificate, this means: position it as an awareness instrument and a catalyst, not as a formal admission requirement.

Appendix Q

Interview report – Jos Remy – Philips / CENELEC

Interviewee: Jos Remy, Director of Standardisation Philips / Vice President Technical CENELEC
Organisation: Philips
Date: 02/02/2026

Standardisation as a strategic instrument within Philips

Remy sketches that standardisation within Philips is explicitly approached strategically and is organised internally along three tracks: formal standardisation (ISO, IEC, CEN/CENELEC, ITU, ETSI), closely related to regulation and market access via *presumption of conformity*; consortium standardisation as market-driven cooperation aimed at market improvement and IP strategy; and strategic ecosystems in which standards make markets function better, even without a direct revenue model. Standardisation is therefore not a side issue, but part of market strategy, competitive position, and innovation policy.

Four levels of standardisation maturity

Remy introduces a relevant analytical framework of four levels at which companies can leverage standardisation: (1) monitoring — understanding what is coming, anticipating future requirements; (2) influencing — actively participating in discussions, steering content in line with business interests; (3) leadership within technical committees — co-determining the strategic direction of a TC; (4) governance level — influencing process architecture and strategic positioning of standardisation as a system. This model makes clear that effective standardisation expertise develops over several years (5+ years). Alongside process knowledge, negotiation skills, political sensitivity, network-building, and strategic judgement are decisive.

Education is valuable, but not a direct barrier

On education, Remy is level-headed but positive. He does not see the absence of a standardisation programme as a direct blockage for companies — Philips now also trains experts internally. At the same time, basic knowledge of processes, roles, and the difference between the formal and consortium worlds could accelerate the intake, especially for positions at standards bodies or in policy roles. In companies, however, a large part of value development remains dependent on political and strategic skills: negotiating, networking, weighing interests, choosing where to be active and where not, and explaining business value to management. Even with a strong technical background, it takes someone several years to function fully independently.

Strategic deployment of standardisation and European bottlenecks

In the broader geopolitical context, Remy confirms that China deploys standardisation very purposefully as a strategic instrument, including public funding and actively taking up key positions. Europe is more complex. Historically, Europe had a strong model — legislation with essential requirements, standards for technical specification — but European practice has become heavier through additional layers and control mechanisms. The HAS review mechanism and the slow processes around *standardisation requests* and publication in the *Official Journal* are a drag on the system. A considerable portion of the total lead time sits in the stages before and after the actual standards development, which means that the Commission is in practice co-responsible for the slowness it criticises.

Innovation vs. the precautionary principle

Remy emphasises that the timing of standardisation is crucial. Standardising too early can block innovation, especially if the market has not yet crystallised which technical route is dominant or desirable. In rapidly evolving domains such as AI, he warns against fixing too many technical details too early. The tension between the *precautionary principle* and the space needed for innovation calls for careful weighing: risks must be covered when they are demonstrable, but unknown risks must not automatically lead to the blocking of development.

Societal visibility and the certificate

Remy emphasises the low societal visibility of standardisation: people know what patents are, but are barely aware that virtually everything in daily life rests on

standards. Increasing basic awareness through education he considers logical and valuable. For the European Certificate, this means: an entry level is realistic and useful for broad awareness-raising, while real expertise and influence arise through years of practice, network-building, and strategic action.

Implications for the research

A certificate will not produce senior experts, but it can be valuable as a basis: it shortens the learning curve, enlarges process knowledge, and strengthens strategic awareness among new entrants. Remy sees a role for EZK in exerting pressure on the European Commission to make the standardisation process workable and faster.

Appendix R

Interview report – CEN & CENELEC

Interviewees: Kirsten Glennung (Supporting corporate initiatives for a sustainable future), Andreea Gulacsi (Director, Policy & External Affairs)
Organisation: CEN / CENELEC
Date: 19/01/2026

Repositioning of education within CEN/CENELEC

Kirsten Glennung explains that education on standardisation was for many years not a strategic priority for CEN/CENELEC, largely due to the great diversity of national education systems. This has changed due to increased political attention at EU level, including the European Standardisation Strategy 2022 and the High-Level Forum on European Standardisation. Education is back on the agenda — not as an end in itself, but as a means of strengthening the European position in standardisation. Within CEN/CENELEC, education is approached from an *external relations* perspective: connecting standardisation with research, innovation, industry, and education.

From research to education: Edu4Standards and follow-up projects

The renewed focus on education is driven in part by the Horizon Europe project Edu4Standards. This project has delivered *Intended Learning Outcomes* and a network of academic champions. CEN/CENELEC is now launching a three-year EU-funded follow-up project that addresses standardisation education more broadly, aimed beyond the Pan-European Certificate also at:

- The development of teaching materials and training modules.
- Internship modules at national standards bodies.
- Supporting young professionals and new experts entering technical committees.
- Capacity-building for national members in their engagement with educational institutions.

View on the Pan-European Certificate

Andreea Gulacsi emphasises that the certificate is still in an exploratory phase. The key challenge is to find a balance between: respect for existing national initiatives and curricula, and the ambition to create a comparable European reference point. CEN/CENELEC sees the certificate primarily as a low-threshold entry level — not as a detailed harmonised qualification, but as a set of shared principles and basic elements that countries and educational institutions can interpret and implement in their own way. A multi-layered model is a possible future development, but the initial focus is deliberately modest.

Relationship with universities and national members

Both interviewees emphasise that CEN/CENELEC does not steer universities directly. Implementation always proceeds via the national standards bodies (NSBs), which maintain the relationships with universities, lecturers, and industry. The role of CEN/CENELEC is therefore facilitating and coordinating: providing frameworks, enabling knowledge exchange, and offering European legitimacy. They also note significant variation between countries: some have well-developed education initiatives, others barely any. The success of the certificate therefore depends heavily on national support.

Industry and labour market

Glennung observes that companies are generally willing to engage with universities and to explain why standardisation skills are relevant. Gulacsi places this in a broader concern: Europe faces a shortage of new standardisation experts, while standardisation is increasingly being deployed as a strategic instrument for trade, geopolitics, regulation, and innovation. The certificate is therefore seen as a way to broaden the inflow of experts: not everyone will become a specialist, but more people will recognise the relevance of standardisation and know how to deal with it.

Political dimension and European ambition

Gulacsi is explicit: if Europe wants to deploy standardisation strategically, greater public investment is required. The certificate could, if supported by the European Commission, be promoted more widely, comparable to other EU-wide educational initiatives.

Implications for the research

The interview positions the Pan-European Certificate as a facilitating and complementary instrument. Flexibility, national ownership, and political legitimacy are central design principles. For the Netherlands, this means that implementation will primarily take place through NEN and existing academic networks, with CEN/CENELEC as a European catalyst and source of legitimacy.

Appendix S

Interview report – Claire d'Esclercs – ETSI

Interviewee: Claire d'Esclercs, Director of Education and Knowledge
Organisation: ETSI
Date: 14/01/2026

Urgency of education on standardisation

ETSI's involvement in education on standardisation dates from before the current European push, but has gained urgency due to demographic and cultural shifts in the standardisation ecosystem. Historically, standardisation knowledge was transferred informally: experienced delegates mentoring younger colleagues within committees. Younger generations have different expectations of careers, learning environments, and professional communities. Although people who become involved in standardisation often find it meaningful and motivating, the initial threshold has become the biggest bottleneck. Education must therefore do more than explain procedures: it must align with new learning styles and show why standardisation matters in practice.

Previous efforts by ETSI

ETSI has been active in education since 2018. A task group produced a comprehensive handbook on standardisation, later updated and made available under a free licence. D'Esclercs is honest about the limitations: a traditional 360-page handbook no longer fits how students learn, and ETSI lacked the resources to promote it systematically. Reach was fragmented and ad hoc. The main problem is not creating content, but reaching the right intermediaries. ETSI cannot reach students directly — the key players are universities, faculties, and lecturers. But many lecturers themselves have little or no background in standardisation, which creates a structural bottleneck.

Top-down versus bottom-up

D'Esclercs strongly emphasises that lasting change requires structure and co-ordination, preferably with a top-down element. Reaching individual students or motivated lecturers is useful, but perpetuates dependence on isolated champions. Real impact arises when ministries, universities, or programme directors explicitly signal that standardisation counts. At the same time, she recognises the political and practical limits of top-down steering across thousands of European universities.

The European Certificate: framework with flexibility

D'Esclercs sees the European Certificate as a valuable coordinating instrument, provided it is well designed: a clear framework based on agreed Intended Learning Outcomes, combined with flexibility in the way those learning outcomes are achieved. Existing national programmes must not be invalidated or replaced. A precondition for success is industry recognition: if the certificate carries no weight on a CV or in recruitment, students will not be motivated. In that sense, the certificate must be jointly owned by education *and* industry.

Role of ETSI and the ESOs

ETSI's role is defined within the broader ESO cooperation. Following recommendations from the High-Level Forum, CEN, CENELEC, and ETSI have received EU funding for education-related outputs, including the certificate. CEN is expected to take the lead, with ETSI contributing from its specific perspective. D'Esclercs expects the certificate to be issued at European level (and via national standards bodies), possibly supported by online learning and assessment, so that individuals can obtain it independently of their university. Integration through accredited university courses or NSB–university partnerships must also remain possible.

Promotion, industry involvement, and support for lecturers

ETSI sees promotion as a core responsibility. Through its industry member base, ETSI can disseminate messages via members, websites, and press channels. Through national standards bodies, this can be expanded to national industries. A core priority for d'Esclercs is the shift of focus to supporting lecturers, the 'middle layer' between policy and students. Toolkits, ready-made materials, and guidance for lecturers are in her judgement more effective than approaching students directly.

Implications for the research

The main obstacles to education on standardisation are structural and cultural in nature, not a lack of content. ETSI sees the certificate as a coordinating mechanism, not a rigid harmonisation tool, with the ESOs playing a central role in legitimacy, promotion, and industry engagement, while leaving room for national and institutional diversity.

Appendix T

Interview report – AFNOR

Interviewees: Christine Kertesz & Bernadette Ruetsch
Organisation: AFNOR
Date: 08/01/2026

Strategic focus

AFNOR primarily positions education as awareness-raising. The aim is not to train standardisation experts through higher education, but to provide basic knowledge to a broad audience — students, lecturers, companies, and public organisations — about the value of standardisation, its relationship with regulation, certification, and patents, and how the system works. Earlier attempts to create a dedicated diploma in standardisation failed due to low enrolments: the threshold is too high and the subject is not attractive enough as a stand-alone programme.

The scale problem and the chosen route

With more than 3,500 higher education institutions in France, direct reach is unrealistic. AFNOR approached federations and networks of universities, engineering schools, and management and business schools. The response was consistent: the importance is recognised, but curricula cannot be prescribed. AFNOR then approached the Ministry of Higher Education. That ministry too acknowledged the relevance, but stated that it could not impose the addition of standardisation to degrees. The practical advice: deliver a ready-made educational product that lecturers can adopt. This led to the development of a MOOC, which quickly exceeded two thousand enrolments from students, lecturers, *and* professionals. AFNOR sees this as evidence of demand for a short, free, and accessible entry-level course.

MOOC content and the badge as light certification

The MOOC takes around four hours and ends with a quiz. Participants with a passing score receive an open badge. The MOOC is structured in four modules:

- What a (voluntary) standard is and the benefits of standards.
- The relationship between standards, regulation, certification, and innovation/research.
- How standards are developed at national, European, and international level.
- How to read a standard and monitor relevant standards.

AFNOR uses didactic elements such as avatars, short expert videos, and interactive components. The badge is a first level of awareness about the role of standardisation. For higher levels of knowledge, AFNOR offers specialised training.

Training committee experts and guest lectures

Alongside awareness-raising, AFNOR has long been offering training for new experts entering national committees, positioned as the next step after awareness. Where universities make contact, AFNOR can also provide guest lectures of 2 to 10–12 hours, most frequently requested by engineering schools.

Access to standards

AFNOR emphasises an important catalyst instrument: Cobaz Education, a platform through which educational institutions gain access to French standards on favourable terms. Not all 3,500 institutions subscribe to it.

View on the European Certificate and the roles of ESOs versus NSBs

AFNOR would welcome the French MOOC and badge work eventually being recognised at European level, possibly as a level-1 awareness layer within a multi-layered certificate model. AFNOR is cautious about rapid adoption via accredited university courses, because in France there is currently little motivation at universities to implement this structurally. AFNOR's expectation of the ESOs (CEN/CENELEC/ETSI) is primarily political agenda-setting and legitimisation: the ESOs must provide the main topics that form the common basis for the European Certificate and allow national flexibility, not over-harmonisation of didactics or content.

Main concern: continuity and dependence on top-down support

AFNOR is concerned about continuity: without sustained support at European and national level, initiatives run the risk of fragmenting or fading. The core barrier is not a lack of tools, but finding motivated lecturers and securing sustained support. AFNOR emphasises: (1) large-scale awareness-raising through the MOOC, (2) involvement of companies as credible voices in education, and (3) political legitimisation to bring standardisation higher on the agenda.

Implications for the research

AFNOR's pragmatic approach: mass awareness first (MOOC/badge and access to standards), combined in parallel with deeper engagement through committee expert training and targeted guest lectures. For the European Certificate, AFNOR argues for a multi-layered approach and sees the ESOs primarily as a political lever, not as a strict harmonising authority.

Appendix U

Interview report – Amelie Leipprand – DIN

Interviewee: Amelie Leipprand, Project Coordinator DIN Young Professionals / Education & Outreach on Standardisation
Organisation: DIN
Date: 05/01/2026

Perspective on standardisation

Leipprand emphasises that standardisation is structurally absent from higher education, even in technical programmes. From her own background as a mechanical engineer, she notes that she only really understood what standardisation was after joining DIN: not rules that fall out of the sky, but a human, consensus-driven process in which stakeholders jointly shape technical rules. It is problematic that students and young professionals do not acquire this knowledge during their studies, because in doing so they unconsciously choose from the outset not to participate in standardisation processes. This lack of knowledge is not neutral but harmful: standardisation is confused with legislation, government, or imposed rules, which creates mistrust and makes the European self-regulation model vulnerable to political intervention.

Active responsibility of standardisation organisations

Leipprand argues explicitly that standardisation organisations such as DIN cannot remain passive. The idea that standardisation will spread by itself via role models or academic research is outdated. Her experience shows that this does not happen without active effort. Standardisation is not sexy and requires deliberate activation, particularly towards the education sector. She sees it as both legitimate and necessary for national standardisation organisations to take on an educational role, without steering the substantive direction of standards. Neutrality lies in explaining the system, not in silence. She considers government steering undesirable: standardisation is historically and fundamentally a privately organised democratic system.

Lecturers as the lever point: conference for standardisation lecturers

A central element of Leipprand's approach is her focus on lecturers as the main lever point. Many lecturers recognise the relevance of standardisation but do not know how to teach it or lack suitable materials. For several years, Leipprand has organised a European annual conference specifically for lecturers who teach standardisation, as an explicit *train-the-teacher* mechanism:

- It reassures lecturers that they are not alone and that standardisation can be approached from multiple disciplinary perspectives (engineering, business, law, governance).
- It facilitates the exchange of teaching formats, such as case studies, serious games, and interactive assignments.
- It stimulates cooperation that leads to joint educational innovations in later editions.

Practical approach: low-threshold, modular, and contextual

Leipprand argues for a basic level of standardisation knowledge for all students, regardless of discipline. This basic level does not have to be deeply technical, but must convey at least two insights: (1) standards do not come about on their own, and (2) everyone can and must take responsibility for contributing to them. Instead of new courses or heavy certification schemes, she focuses on small interventions: two to five minutes of explanation within existing lectures, guest lectures of 30–90 minutes, and explicitly naming the standardisation process when standards are used. She also develops innovative formats, such as publicly accessible technical committee sessions (modelled on BSI) and serious games.

Certificate

With respect to the Pan-European Certificate, Leipprand is clear: one in-depth certificate is not workable for broad application. She argues for a multi-layered model: a basic certificate for general standardisation knowledge (broadly applicable) and advanced levels for professionals and future experts. The certificate must focus on learning outcomes and core competencies, not on didactic implementation, which varies by context. European safeguarding through CEN/CENELEC and ETSI is essential for legitimacy and national implementation support.

Implications for the research

Effective education on standardisation depends on ecosystem building, not on top-down curriculum reform. Leipprand's emphasis on lecturer communities, low-threshold educational formats, and a layered certificate model offers a concrete and scalable path for embedding the Pan-European Certificate in European higher education.

Appendix V

Interview report – Nicolas Domenjoud – ILNAS (Luxembourg)

Interviewee: Nicolas Domenjoud, Responsible ICT and Technical Standardization
Organisation: ILNAS (Luxembourg National Standards Body, public administration)

From pilot initiative to structural education

ILNAS has developed standardisation education through a phased and strategic approach in cooperation with the University of Luxembourg. The starting point was a University Certificate of 18 ECTS for working professionals, used as evidence of demand and relevance for the labour market. The programme was then expanded to a full master's degree (started February 2021) focused on ICT, standardisation, and technopreneurship. The master's programme is designed for professionals already in work, with evening and weekend teaching in small cohorts. This choice is substantively motivated: standardisation is better understood when students already have organisational and practical context. The programme combines conceptual knowledge of standardisation processes with direct exposure to practice, including guest lecturers from industry and experts active in European and international standardisation committees.

Broadening awareness through other programmes

In addition to the master's programme, ILNAS promotes standardisation through short awareness sessions (typically 2–3 hours) embedded in other university programmes, such as space and civil engineering. The aim is for students to recognise where and how standardisation affects their own domain. Earlier experiences with more extensive teaching at bachelor level were less successful: students in initial education lack the professional reference points needed to appreciate the relevance of standardisation. Shorter and more targeted interventions are therefore more effective than substantial curriculum components.

Role of ILNAS and alignment with policy

ILNAS takes an active role in approaching universities, supported by its position as a public institution. Formal cooperation agreements with the University of Luxembourg make direct interaction with academic leadership possible, which facilitates dialogue on curriculum integration. Progress has depended on individual champions within ILNAS, particularly at senior management level.

Standardisation education is embedded in a broader national strategy aligned with the Ministry of the Economy, with priority domains such as ICT, space, and sustainability reflecting national policy agendas, including AI and quantum technologies. Education is closely linked to research: ILNAS co-finances doctoral and postdoctoral research at the University of Luxembourg, with researchers actively participating in standardisation committees. This creates a two-way flow between research results and standardisation processes.

Perspective on the Pan-European Certificate

Domenjoud sees the Pan-European Certificate as a complementary instrument rather than a substitute for in-depth academic programmes. The primary value lies in offering a low-threshold, recognisable qualification that reaches target groups beyond the existing standardisation experts. Integration of the certificate into the current master's programme is considered logical and feasible, provided learning outcomes and assessment are aligned. For successful implementation, Domenjoud emphasises:

- Clarity on the European framework and expectations.
- Strong European visibility and legitimacy of the certificate.
- Effective coordination between the European Standardisation Organisations involved.

Implications for the research

The Luxembourg case shows that sustainable standardisation education depends on the alignment of policy, education, and research, supported by engaged institutional champions. A phased development approach lowers the entry threshold, professional education increases relevance, and a Pan-European Certificate can function as a catalyst rather than a stand-alone solution.

Appendix W

Interview report – Knut Blind – TU Berlin

Interviewee: Knut Blind, Professor
Organisation: Technische Universität Berlin
Date: 06/01/2026

Current practice in Berlin

Blind explains that TU Berlin has many years of experience with education on standardisation, developed in close cooperation with DIN. Within a dedicated course (e.g. Strategic Standardisation), students receive both academic credits *and* a DIN certificate, formally presented at a ceremony at the end of each semester. The course attracts students from a variety of backgrounds: engineers from various disciplines, industrial engineers, and students from innovation and management-oriented programmes. Through the Berlin University Alliance (TU Berlin, Humboldt University, Freie Universität, and Charité), the courses are also accessible to students from other Berlin institutions. Blind thereby does not strongly endorse the concern that a certificate would be too generic for specific disciplines: precisely the interdisciplinary design makes standardisation education effective. He notes that the labour market value of the certificate remains largely a black box: it is unclear whether employers explicitly reward it. He considers this secondary, however — the primary function of the certificate is as an incentive that draws students to the subject.

Standardisation as an interdisciplinary foundation

Blind frames standardisation as an inherently interdisciplinary subject that encompasses technical, legal, economic, management, and political perspectives. He therefore argues for a broad and generic basic certificate, possibly supplemented with more advanced layers at a later stage. He refers to a course Standardisation and Sustainability, in which each class explicitly links standardisation to one or more SDGs. This approach avoids superficial greenwashing of the subject by clearly explaining how standardisation relates to sustainability per

theme. According to Blind, this framing has proven effective in attracting students. Alongside sustainability, standardisation can also be positioned through geopolitical and competitiveness narratives, particularly in political science contexts.

Attracting students

Blind confirms that standardisation is often perceived as unattractive and that purely voluntary courses attract few students. Effective strategies in Berlin:

- Linking standardisation to more attractive themes such as innovation, entrepreneurship, and sustainability.
- Positioning the course as a compulsory-elective: students must choose a number of courses from a predefined list, which guarantees visibility without making the subject fully compulsory.
- Renaming courses and adjusting the content so that the relevance is immediately clear.

European certification

With respect to the Pan-European Certificate, Blind expects primarily low entry thresholds and minimal administrative burden, particularly in the early phase. The focus should be on rapid and broad roll-out; quality assurance can be tightened later. For TU Berlin, the European Certificate is not essential — the cooperation with DIN already functions well. But Blind sees the certificate as particularly valuable for other institutions: it can offer legitimacy and recognition to lecturers who want to introduce standardisation courses and need internal support. National standards bodies play an important role in translating European ambitions into educational practice.

Structural vulnerability: dependence on individuals

A recurring point is the dependence on individual champions. Blind gives several examples where standardisation education disappeared when an engaged professor retired or left. Even in established environments such as Berlin or Rotterdam, continuity is not guaranteed. Blind therefore argues not only for scaling up, but also for actively stabilising and protecting existing initiatives, for example by ensuring that succession profiles do not drop standardisation entirely.

Lessons from Edu4Standards

As a central figure in Edu4Standards, Blind finds that the project has performed well in the initial phase, but that the main challenge now lies in roll-out and adoption. Pilot programmes have therefore been opened up to a wide range of contexts. He emphasises that a three-year project is insufficient to fundamentally change the European education landscape. Structural impact requires continuation, possibly through follow-up initiatives supported by DG GROW.

Policy lever: indirect incentives via KPIs

Blind points to policy approaches in countries such as Austria and Spain, where standardisation activities are indirectly stimulated through KPIs or statutory frameworks for universities. Governments do not prescribe curricula, but such mechanisms create a strong reason to teach standardisation early in academic careers. Germany lacks this lever due to its federal education system.

Relevance for the research

A European certificate functions primarily as an enabling and legitimising instrument for institutions and lecturers. Successful implementation depends on: (1) low entry thresholds, (2) a broad, interdisciplinary basic approach with optional deepening, (3) effective framing (innovation, sustainability, geopolitics), and (4) strategies to mitigate the vulnerability caused by dependence on individual champions.

Appendix X

Interview report – University of Graz

Interviewees: Elisabeth Staudegger (Professor ICT Law & Legal Informatics), Barbara Reiter (Lecturer in philosophy and ethics)
Organisation: University of Graz
Date: 19/01/2026

Context and interviewees

This interview was conducted with Elisabeth Staudegger and Barbara Reiter. Both are closely involved in the EU Horizon project EDU4Standards and contribute to education on standardisation in line with European values and interests ('Stand-EUVI').

View on standardisation and education

Staudegger frames standardisation as a key mechanism for translating legislation and regulation into practice: the EU legislator sets requirements, while harmonised European standards specify how these requirements can be met. From this perspective, education on standardisation is not a narrow technical subject, but part of how European governance and societal objectives are put into operation. Both interviewees emphasise the interdisciplinary character: their Graz team brings together lawyers, philosophers, economists, sociologists, and educational specialists.

Intended Learning Outcomes

A central contribution from Graz to Edu4Standards is the development of intended learning outcomes (ILOs) across education levels, linked to ISCED levels and aligned with the labour-market-oriented EQF framework. Their approach distinguishes knowledge, skills, and attitudes, resulting in competences. Attitudes — focused on autonomy and responsibility, inclusivity, sustainability awareness — are the hardest to assess, but also the most decisive for how people remain engaged with standardisation in the long term.

Training lecturers as a scaling strategy

Graz organised a summer school originally planned as a PhD colloquium, but developed it into training for lecturers who could integrate standardisation into their own teaching. The model combined online preparation with an intensive face-to-face week. An important development was the expansion to additional target groups: researchers who wanted to understand how they can translate research results into standards, and technology transfer offices (TTOs) whose remit is expanding from IP/patents to also include standardisation engagement. The summer school thereby grew into a multi-track capacity programme.

National policy context as a driver

An important driver in Austria is the national standardisation strategy of June 2024, which explicitly calls on universities to strengthen standardisation education. Although academic freedom remains protected, the interviewees describe a practical mechanism: universities depend on public funding and respond to government ambitions through budgeting and performance agreements. There are also signs of institutional incentives for standardisation engagement being included in university–ministry agreements.

Relationship with the national standards body

The relationship with Austrian Standards is described as very active and supportive. Personal networks and long-term cooperation play a significant role, and the national standards body contributed directly through guest lectures, training participation, and support for community-building events.

Reflections on the European Certificate

The interviewees see value in an EU-level certificate, but emphasise that the first iteration must be at awareness level, given the current low baseline of knowledge. They signal a recurring tension: universities may resist the outsourcing of the certification of academic learning to external organisations, because academic assessment is embedded in university rules and legitimacy. An EU certificate can be a useful supplementary signal, but must not undermine or replace academic assessment and quality assurance.

Implications for the research

The Graz case suggests: (1) A low-threshold, awareness-oriented certificate is a pragmatic starting point. (2) Scaling up works well through teaching-the-teachers and structured lecturer programmes. (3) National policy frameworks and funding signals can influence adoption. (4) Standardisation education benefits from explicitly integrating values, societal impact, and responsibility, not only procedural knowledge.

Appendix Y

Interview report – Ivana Mijatović – University of Belgrade

Interviewee: Ivana Mijatović, Full Professor
Organisation: University of Belgrade
Date: 19/12/2025

Context and position of standardisation in the curriculum

Ivana Mijatović explains that she has been active in standardisation for a long time: starting from a technical background with industry experience — product development for the European market, corporate standardisation, and project management — followed by nearly twenty years in academia. She fully redesigned her Standardisation course in 2011 and now teaches it from a business/organisational perspective: not only formal standardisation, but also consortium standardisation and the relationship with strategy, market access, innovation, and governance. Within her faculty, standardisation is now compulsory teaching within the Management & Organisation programme. In 2024, the course was expanded to the full cohort of a newly accredited programme, which led to a sharp increase in size (around 440 students in 2025). The decision to make standardisation compulsory was substantively driven: colleagues sought a macro-level subject to complement the predominantly micro- and business-oriented curriculum.

Experiences with large-scale delivery and didactics

Scaling up to large cohorts brings considerable implementation pressure. The course requires substantial guidance and didactic quality. Mijatović finds that standardisation resonates better with older students, while the current cohorts (around 20 years old) are still strongly focused on marketing, finance, or project management. To align better with (late) Gen Z and Gen Alpha, she is developing an approach with hybrid teaching, a Moodle environment with activities and choice paths, gamification, and AI tools (e.g. writing scripts and making short

videos on why investing in standardisation pays off). Mijatović emphasises that successful teaching on standardisation requires not only knowledge transfer but also energy and didactic skill. Good lecturers are scarce and hard to recruit.

Substantive approach: from industry analysis to standards

Her teaching philosophy is strongly case-based and practice-oriented. The course starts with industry analysis and then uses standards as a lens through which to understand problems, actors, and governance within that sector. Students are placed in the position of consultants for an imaginary company. A recurring message is: avoid reinventing the wheel, and understand the economic logic behind compatibility and interoperability. She explicitly addresses the tension and synergy between standardisation and innovation.

Role of networks, government, and international cooperation

Mijatović sees the main driving force for standardisation education not in funding, but in networks and international connectedness. EU programmes (Erasmus+, Horizon/COST) and professional networks help to maintain knowledge and momentum. Government support in Serbia is variable and sometimes ad hoc. At the same time, she emphasises that universities themselves can do a great deal through autonomy and academic freedom, but that amplifiers are needed: individuals who continue to promote the subject and take colleagues along.

View on the Pan-European Certificate and implementation

Mijatović takes a positive view of the certificate and sees it as a concrete instrument for motivation and visibility among students. She has already held discussions with the Institute for Standardization of Serbia (ISS) and is ready to start, provided it is clear whether the certificate also applies to non-EU countries (EU candidate countries). She sees opportunities, in cooperation with ISS, to act as a regional amplifier and to roll out the certificate more broadly.

Bottlenecks: capacity and access to standards

The main barriers: (1) Staff capacity — large cohorts, limited staff, and difficulty in attracting additional lecturers. (2) Access to standards — standards are expensive; one standard can cost more than textbooks. She argues for a structural arrangement whereby universities and students gain access through the national standards body. (3) Supporting infrastructure — research managers,

technology transfer officers, and research administration often lack knowledge of standardisation; there is a need for a network that can guide these groups without requiring everyone to become an expert.

Implications for the research

Standardisation education in Serbia can already be well embedded, but scaling up immediately creates bottlenecks around didactic capacity and access to standards. The certificate is seen as a promising incentive for students and as a means of building support, provided participation is also possible for non-EU countries. International networks and cooperation with the national standards body are the key factors for further dissemination.