HSbooster.eu
TRAINING ACADEMY

Beginner 1

Course 3

STANDARDISATION TRAINING ACADEMY

Topic:

WHO DEVELOPS STANDARDS?

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Authors:
Ivana Mijatovic, Biljana Tosic
University of Belgrade, Faculty of Organisational Sciences

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Module Objectives

After completing this module, you should be able to:

1. understand that many actors develop standards, influence their development, or contribute to the global world of standardisation;
2. understand that standards are developed by experts who represent their organisations in organisations for standardisation;
3. understand what national, regional, and international organisations for standardisation are and notice how they cooperate;
4. understand that the globalisation of industries has shifted standardisation efforts from national to regional and international levels, and the way to take part in the European and international standardisation process leads through national standards bodies (NSBs) and
5. understand that organisations that develop standards cooperate and create dynamic and complex networks.

Key Terms

formal standardisation, informal standardisation

About The Authors

Ivana Mijatovic

University of Belgrade in Serbia

Ivana Mijatovic is a full professor at the University of Belgrade, Faculty of Organisational Sciences. She has focused on standardisation and quality management for much of her academic career. She has developed standardisation courses at bachelor and master levels and is a passionate teacher of standardisation and ICT standardisation. She served as a vice president on the board of the European Academy for Standardisation EURAS (www.euras.org). In 2018/2019, she was the Chair of the International Cooperation for Education Board about Standardisation ICES (http://www.standards-education.org/). In 2017/2019, she was a member of a working group related to the EU Joint Initiative on Standardisation (JIS Action 3). Since 2015, she has been a member of the STARTed team (Team of Specialists on Standardisation and Regulatory Techniques – education on standardisation) of The United Nations Economic Commission for Europe (UNECE). She is a member of the national mirror committee KS I1/07 – Software Engineering, IT for Education and Internet, at the Institute for Standardisation of Serbia. The list of her publications can be found at the following link: https://www.researchgate.net/profile/Ivana_Mijatovic.

Biljana Tosic

University of Belgrade in Serbia

Biljana Tošić is a Teaching Assistant and a Research Assistant at the Faculty of Organisational Sciences, University of Belgrade. She earned a B.Sc. and M.Sc. in Quality Management and Standardisation and another M.Sc. in Human Resources Management at the same Faculty. She is currently a Ph.D. Candidate, working on a doctoral dissertation titled “The significance of the expertise in standardisation for the internationalisation of SMEs”. To date, she has been engaged in teaching several courses at the Faculty: Fundamentals of Quality, Standardisation 1, Metrology with the Fundamentals of Engineering, Normative Regulation of Quality, and Accreditation and Certification. She has been a member of the organisational board of the World Standards Cooperation Academic Day 2019 and the International Cooperation for Education about Standardisation (ICES) WorkShop 2019. She has been a member of the technical board of the International Symposium SymOrg 2020 titled “Business and Artificial Intelligence” and the SymOrg 2022 titled “Sustainable Business Management and Digital Transformation: Challenges and Opportunities in the post-COVID Era”. She has been engaged in project III 47003 “Infrastructure for technology-enhanced learning in Serbia”, supported by the Ministry of Education, Science, and Technological Development of the Republic of Serbia (2017-2020). She has been Editor in Chief of the Quality Media Station, the first media centre for quality established within the TEMPUS project titled “Enhancement of Quality Infrastructure in Western Balkan Countries (EQIWBC)” (2015-2017). She is

currently a member of the National Mirror Committee Conformity Assessment & Quality Management KS CASCO at the Institute for Standardisation of Serbia (National Technical Committee related to ISO/CASCO, ISO/TC 176, ISO/TC 176/SC 1, ISO/TC 176/SC 2, ISO/TC 176/SC 3, ISO/TC 283, CEN/SS F20, CEN/TC 279, CEN/TC 379, CEN/TC 381, CEN/TC 389, CEN/CLC/JTC 1, and CEN/CLC/JTC 4).

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1 WHO DEVELOPS STANDARDS?

Global business and the global market influence the development of an increasing number of standards and encourage the development of new ways and mechanisms of standardisation. Many actors develop standards, influence their development, or contribute to the global world of standardisation. Generally, standards are developed by experts who represent their organisations in national, regional, and international organisations for standardisation, professional and industrial associations, business associations, consortia, or fora. Organisations that develop standards cooperate and create a dynamic and complex network (Figure 1). A large majority of those organisations are member-driven. They provide a place and a specific framework (e.g. rules, process, project management) for actors to develop standards or other documents.

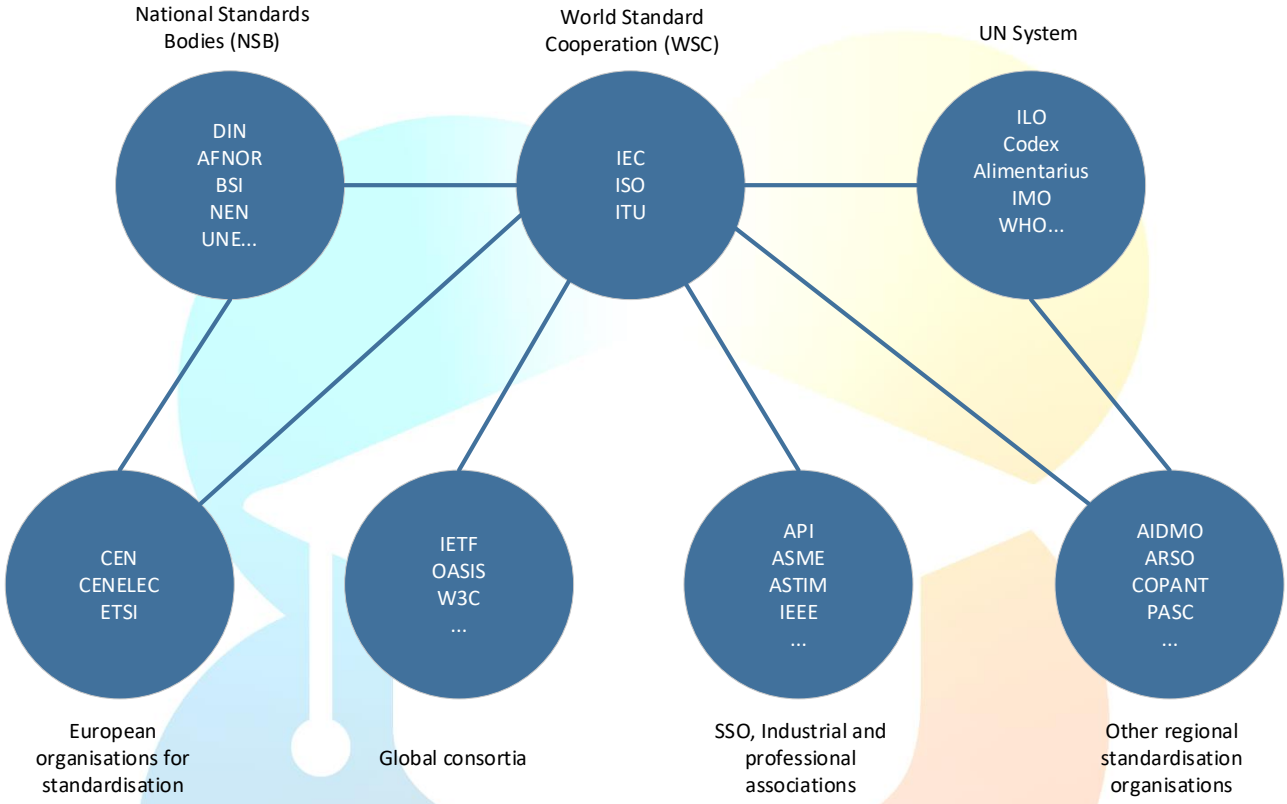

Fig. 1. Some organisations that develop or participate in standards development [1]

[1] Gerundino D., (2014). Voluntary consensus-based standards, International Organisation for Standardisation (ISO), Accessed on 25.02.2025. Retrieved from: http://www.iso.org/iso/home/about/training-technical-assistance/standards-in-education.html.

Formal organisations for standardisation or voluntary consensus-based organisations for standardisation are those in which standards are developed within a "consensus process, which means that the process is open and accessible for all parties interested, and all interests are attempted to be met through agreement."[2] Those organisations are often called Standards Development Organisations (SDOs)[3]. A political and regulatory entity recognises formal organisations for standardisation – some countries have standardisation laws in which they name international or regional organisations for standardisation. Regulation 1025/2012 of the European Parliament and Council lists an international (ISO, IEC, and ITU) and European organisation for standardisation (CEN, CENELEC, and ETSI). Informal organisations for standardisation are all other organisations except international, regional, or national organisations appointed or recognised by the governments.

International organisations for standardisation are:

- **International Electrotechnical Commission (IEC).** The IEC is a global, not-for-profit membership organisation that brings together more than 170 countries and coordinates the work of 20,000 experts globally. Founded in 1906, the IEC focuses on preparing and publishing international standards for all electrical, electronic, and related technologies (i.e., collectively known as "electrotechnology"). To learn more about the IEC, please visit the following link: https://www.iec.ch
- **International Organisation for Standardisation (ISO)**. The ISO is an independent, non-governmental international organisation with a membership of 167 national standards bodies (NSBs). **ISO International Standards** cover almost all aspects of technology and manufacturing. To learn more about the ISO, please visit the following link: https://www.iso.org
- **The International Telecommunication Union (ITU).** The ITU is the United Nations specialised agency for information and communication technologies (ICTs). Founded in 1865 to facilitate international connectivity in communications networks, the ITU-T develops technical standards that ensure networks and technologies seamlessly interconnect and strives to improve access to ICTs to underserved communities worldwide. **ITU's global membership includes 193 Member States and**

[2] Madelung, N., & Andersen, K. B. (2013). An Introduction to Formal Standardisation and the Work on ICT Standardisation in ISO/IEC – JTC1 Journal of ICT Standardisation, Vol. 1, 1–24, https://doi.org/10.13052/jicts2245-800X.121.

[3] The standardisation organisations in the United States of America are divided into traditional and non-traditional. There are hundreds of traditional organisations for standardisation and hundreds of "non-traditional" organisations. Traditional organisations for standardisation, with the 20 largest ones developing 90% of standards, are mostly scientific, professional, or industrial associations with long traditions. These organisations are called standards-developing organisations. Some of these organisations have a standardisation development process accredited by ANSI (National Standards Body of the USA), and they can develop national standards. On the other hand, business associations, consortia, and fora are considered "non-traditional". These organisations are considered non-traditional because the development of a consortium for standardisation was a novelty for the United States of America. Until 1988, the US Antitrust Act discouraged companies from developing technical specifications outside of a formal standardisation process – changes to this law have contributed to the standardisation boom within consortia. These organisations are also called standards-setting organisations.

some 900 companies, universities, and international and regional organisations. To learn more about the ITU, please visit the following link: https://www.itu.int

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The Project: HELIOS

HELIOS aims at developing and integrating innovative materials, designs, technologies and processes to create a new concept of smart, modular and scalable battery pack for a wide range of electric vehicles used in urban electromobility services, from mid-size full-electric vehicles to electric buses, with improved performance, energy density, safety and Levelized Cost of Storage (LCoS). This project aims at i) developing new technologies in the field of advanced materials, Li-ion batteries, thermal management, power electronics, sensors and ICTs, which combined allow to create a new concept of standardised, modular and scalable hybrid Liion battery pack for urban electromobility applications; ranging from mid-size vehicles to electric buses, with improved performance, autonomy, safety and LCoS, and minimum carbon footprint; ii) creating new eco-designs and processes, which facilitate its reuse in second life applications and further recycling at its EoL, contributing to a circular and integrated supply chain in the EU for the fabrication of battery packs, as well as effective and sustainable models for urban electromobility; ii) demonstrating the effectiveness of the solution in relevant use cases for urban electromobility, such as EV cars e-Bus fleets.

The Project Standardisation Needs

The EU Electric Vehicle (EV) industry faces aggressive global competition, and each car manufacturer invests significantly in developing their own solutions, leading to a lack of standardisation in the industry. HELIOS focuses on defining scenarios, procedures, and certification standards for validating its solution in car-sharing and e-bus applications. The project addresses standardisation of battery management system (BMS) technologies to maximise compatibility, safety, and quality for large EV battery packs. HELIOS deals with the lack of standards and data-sharing for the residual value of battery capacity, proposing standardised methodologies and protocols to extract useful data from EV battery cells. Overall, the project aims to foster standardisation in the automotive industry, enabling efficient and sustainable electromobility services while promoting compatibility and safety across various applications. HELIOS liaised with multiple technical committees to influence standards in battery management systems (BMS) and privacy management frameworks, including ISO 27701.

To learn more about the Project, please visit the following links:

https://www.helios-h2020project.eu/

https://zenodo.org/records/8383628

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The Project: SELFY

The SELFY project aims to address continuous assessments of the robustness and resilience of CCAM-enabled mobility solutions versus cyber-attacks, malfunction, misuse or system failure of the systems in use. To achieve this, the project develops a set of tools generating a distributed global solution, where protection, response and recovery decisions will be managed locally or globally, increasing the overall CCAM resilience. The innovative solutions proposed by the project will integrate technological and cybersecurity approaches, such as the fusion of data from heterogeneous sensors, intrusion and cyber-attack detection systems based on algorithms, and Artificial Intelligence, as well as information and knowledge sharing. SELFY's solution will promote an improvement of the effectiveness rate in the detection of vulnerable vehicles and security breaches, as well as an increment of the mitigation rate.

The Project Standardisation Needs

SELFY addresses the critical challenges of ensuring resilience and cybersecurity in Cooperative, Connected, and Automated Mobility (CCAM). By developing a comprehensive toolbox of collaborative solutions, SELFY seeks to enhance CCAM resilience, secure data privacy, and enable seamless data sharing across platforms and borders. Recognising the need for interoperability and standardisation to achieve its objectives, SELFY identified gaps in existing frameworks and sought guidance on navigating the complex standardisation landscape. The project's key challenges include establishing secure communication mechanisms, aligning with global standards, and fostering collaboration across diverse stakeholders. These challenges are compounded by the need for robust cybersecurity measures to protect against evolving threats, ensuring both the safety and trustworthiness of CCAM ecosystems. SELFY presented results to ISO/TC 204, advancing discussions on connected vehicles and intelligent transport systems.

To learn more about the Project, please visit the following links:

https://selfy-project.eu/

https://zenodo.org/records/14334027

2 EUROPEAN STANDARDS ORGANISATIONS (ESOs)

European standards organisations (ESOs), the European Committee for Standardisation (CEN), the European Committee for Electrotechnical Standardisation (CENELEC), and the European Telecommunications Standards Institute (ETSI) have been officially recognised by the European Union and the European Free Trade Association (EFTA) as responsible for developing voluntary standards at the European level. Only standards set by CEN, CENELEC, and ETSI are recognised as European Standards (ENs). CEN and CENELEC have established partnerships with **international, regional,** and **national standardisation bodies outside Europe.**

The European Committee for Standardisation (CEN). CEN is an association that brings together the National Standardisation Bodies (NSBs) of 34 European countries. CEN provides a platform for the development of European standards and other technical documents related to various kinds of products, materials, services, and processes. CEN has an agreement (the Vienna Agreement, signed in 1991) for

technical cooperation with the ISO, with the aim of preventing duplication of effort, reducing time when preparing standards, and the involvement of experts from TCs. As a result, new standards projects are jointly planned between CEN and ISO. Wherever appropriate, priority is given to cooperation with ISO, provided that international standards meet European legislative and market requirements and that non-European global players also implement these standards. To learn more about the CEN, please visit the link: https://www.cencenelec.eu/about-cen/.

The European Committee for Electrotechnical Standardisation (CENELEC). The CENELEC is an association that brings together the National Electrotechnical Committees of 34 European countries. Some countries have separate national bodies representing them in CEN and CENELEC, and some have one NSB representing them in both CEN and CENELEC. The CENELEC prepares voluntary standards in the electrotechnical field, which help facilitate trade between countries, create new markets, cut compliance costs, and support the development of a Single European Market. The CENELEC closely cooperates with its international counterpart, the **International Electrotechnical Commission** (IEC), to facilitate a consensus-based process between European and international standards development activities in the electrical sector. The primary purpose of the CENELEC/IEC cooperation is to avoid the duplication of work and to reduce time when preparing standards. As a result, new electrical standards projects are jointly planned between the CENELEC and the IEC, and where possible, most are carried out at the international level. This means that the CENELEC will first offer a New Work Item (NWI) to its international counterpart. If accepted, the CENELEC will cease working on the NWI. If the IEC refuses, the CENELEC will work on the standards content development, keeping the IEC informed and allowing the IEC to comment at the public inquiry stage. During the standardisation process, both the CENELEC and the IEC vote in parallel (both organisations vote simultaneously). If the outcome of the parallel voting is positive, the CENELEC will ratify the European standard, and the IEC will publish the international standard. Nearly 80% of CENELEC standards are identical to or based on IEC publications. To learn more about the CENELEC, please visit the following link: https://www.cencenelec.eu/about-cenelec/

European Telecommunications Standards Institute (ETSI). The ETSI has over 900 member organisations from over 60 countries and five continents. Members comprise a diversified pool of large and small private companies, research entities, academia, government, and public organisations. The work of ETSI is focused on telecommunications, broadcasting, and other electronic communications networks and services. To learn more about the ETSI, please visit the following link: https://www.etsi.org/

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nanoMECommons

The Project: NanoMECommons

NanoMECommons will establish a transnational and multidisciplinary research and innovation network to tackle the problem of nanomechanical materials characterisation in multiple industries. The focus of NanoMECommons is to employ innovative nano-scale mechanical testing procedures in real industrial environments, by developing harmonised and widely accepted characterisation methods, with reduced measurement discrepancy, and improved interoperability and traceability of data. To achieve this goal, NanoMECommons will offer protocols for multi-technique, multi-scale characterisations of mechanical properties in a range of industrially relevant sectors, together with novel tools for data sharing and wider

applicability across NMBP domain: reference materials, specific ontologies and standardised data documentation.

The Project Standardisation Needs

The NanoMECommons project addresses a critical need for consistency and clarity in materials characterisation and terminology. By leading the revision of CWA 17815:2021, NanoMECommons aims to create a unified framework for documenting characterisation experiments and data processing. The integration of the Characterisation Methodology Ontology (CHAMEO) into this revision will provide a machine-readable reference for terminology and metadata, enhancing the accessibility and utility of the standard across disciplines. The project aims to establish a standardised approach to data documentation, ensuring better interoperability, data sharing, and innovation, as well as transparency and market efficiency. Insights from NanoMECommons are shaping the updated CWA to reflect modern workflows and the needs of interdisciplinary communities. Nanomecommons is preparing a CEN Workshop Agreement (CWA) to establish a unified terminology and metadata framework for materials science, enhancing interdisciplinary collaboration.

To learn more about the Project, please visit the following links:

https://www.nanomecommons.net/

https://zenodo.org/records/14380494

3 WHAT IS A NATIONAL STANDARDISATION BODY (NSB)?

Generally, one country can have many organisations that develop or participate in standards development. However, only one organisation can represent a national interest in regional and international organisations for standardisation. That organisation is the **National Standardisation Body (NSB)**. As countries' industries are not at the same level of development, some countries have one national organisation for standardisation that performs all formal standardisation tasks. In contrast, others have several organisations that develop standards. Some NSBs set many national standards yearly, and some do not develop them all. However, NSBs provide a channel to most regional and international standardisation activities. The best way to participate in the European and international standardisation process is through NSBs.

The globalisation of industries has shifted standardisation efforts from national to regional and international levels. In the EU, over the past 30 years, the adoption of the single standard model has reduced the number of national standards from an estimated 160,000 to around 20,000 European standards today. Adopting the single standard model acted as a catalyst for trade: providing a common

language for business and reducing trade barriers, saving organisations time and money.[4] All NSBs, members of CEN and CENELEC, are called on to vote on European standards, in particular at the inquiry and final voting stages. Active engagement in that process is expected, given the obligation for all members to identically adopt national-level standards adopted at the European level. However, there is no concept of mandatory voting in CEN and CENELEC. Respective Members can either vote "yes", "no", "abstain", or not vote at all.

4 SHOWCASE: HOW SDOs COOPERATE AT DIFFERENT LEVELS?

As an NSB, the DIN represents German interests within non-governmental organisations for standardisation, ISO and CEN. In a subordinate exchange of correspondence regarding the standardisation agreement, it was determined that the DKE would assume these tasks in electrical and electronics engineering and ICTs as the German member of the IEC and CENELEC.

	General	Electrotechnical	Telecommunication
International	ISO	IEC	ITU
European (regional)	cen	CENELEC	ETSI World Class Standard
German (national)	DIN	DKE	DKE

The results of the DKE's electrotechnical standardisation work are documented within DIN standards which are incorporated into the German body of standards as German standards and, if they contain safety-related specifications, are also incorporated into the VDE (German Association for Electrical, Electronic & Information Technologies) body of requirements as VDE regulations.

Of the approximately 9,000 experts who currently cooperate with CENELEC, IEC, and ETSI, around 1,250 experts active in the IEC and 550 in the CENELEC are coming from the DKE. The DKE provides a leading number of chairpersons and secretaries within these organisations; 25% of all sitting IEC chairpersons and

[4] BSI. (2017). What Brexit means for industry standards?. Accessed on 25.02.2025. Retrieved from: https://www.bsigroup.com/Documents/about-bsi/Brexit%20papers/bsi_what-brexit-means-for-industry-standards_march-2017.pdf.

19% of all secretaries are from the DKE. Also, the share of the CENELEC chairpersons from the DKE is as high as 28%. Around 36% of the experts fill the role of a secretary.

5 OTHER REGIONAL STANDARDS ORGANISATIONS

Regional standardisation organisations are established to promote regional interest in international standardisation, support regional trade development, harmonise regional standards and facilitate the adoption of international (or other) standards. Some regional standardisation organisations are the African Organisation for Standardisation (ARSO) and the Pacific Area Standards Congress (PASC). The Pan American Standards Commission (COPANT). The Standardisation Organisation for the Cooperation Council for the Arab States of the Gulf (GSO).

African Organisation for Standardisation (ARSO). The ARSO is Africa's intergovernmental standards body, formed by the African Union (AU) and the UNECA in 1977 in Accra, Ghana. *Currently, 35 African countries are members of the ARSO. The main tasks of the ARSO are the* harmonisation of national and/or RECs standards (the Regional Economic Communities - RECs), coordination of the development of African Standards (ARS), facilitation of adoption of international standards by member bodies, and representation of the views of its members at the ISO, IEC, OIML, and the CODEX Alimentarius. Africa is moving toward increased regional integration through the **African Continental Free Trade Agreement (ACFTA) and Digital Single Market,** and this also highlights the need for robust standardisation. The IEEE SA helped define Africa's 4th industrial revolution standardisation strategy (2021–2025). [5] Memorandum of Understanding (MoU) of ARSO and CEN CENELEC, signed in 2005, among others, has a goal to perform and promote, directly or indirectly, regional standardisation to facilitate the exchange of goods and services between the EU/EFTA and ARSO member countries. [6] To learn more about the ARSO, please visit the following link: https://www.arso-oran.org/

The Pacific Area Standards Congress (PASC). The PASC, *established in 1972,* is an independent and voluntary organisation of the NSBs from 25 member countries. The PASC does not develop regional standards, and its primary role is to support the region's engagement in the international standardisation system to advance economic, societal, and environmental well-being. Knowing that *over 60% of the world's population with the highest level of growth belongs to the Asia-Pacific region, international standards are essential for this region to facilitate trade, spread knowledge, disseminate innovative technological advances and improve market access to goods and services.* To learn more about the PASC, please visit the following link: https://pascnet.org/

[5] IEEE. (2021). IEEE SA Industry Connections Africa 4th Industrial Revolution Standardisation Strategy (2021–2025), Accessed on 25.02.2025. Retrieved from: https://catalog.princeton.edu/catalog/99125300431006421.

[6] CEN/CENELEC. (2005). Memorandum of Understanding between CEN and ARSO. Accessed on 25.02.2025. Retrieved from: https://www.cencenelec.eu/media/CEN-CENELEC/European%20Standardization/Documents/IC/MoUs/mou_cen-arso.pdf.

The Pan American Standards Commission (COPANT). The COPANT is a non-profit association of NSBs of the Americas (32 active & 10 adherent members). The COPANT does not develop standards, and their activities are focused on collaboration (with each other and with peer organisations); active participation and cooperation in international and regional standardisation; promotion of effective and relevant national standardisation activities, results, and benefits; promotion of the use of International practices of Conformity Assessment Services; and implementing strategies that promote the innovation based on standardisation. European originations for standardisation CEN, CENELEC, ETSI, and COPANT signed a MoU to promote international standardisation and facilitate the exchange of goods and services, thereby improving marketing access. [7] To learn more about the COPANT, please visit the following link: http://www.copant.org/

The Standardisation Organisation for the Cooperation Council for the Arab States of the Gulf (GSO). The GSO is a regional organisation for standardisation established in 2001. Members are governments of The State of the United Arab Emirates, The Kingdom of Bahrain, The Kingdom of Saudi Arabia, The Sultanate of Oman, The State of Qatar, The State of Kuwait, and the Republic of Yemen (joined in 2010). The GSO aims to unify the various standardisation activities and follow up on their implementation and commitment to them in cooperation and coordination with the NSBs in the member states. The GSO works with its Members to develop and define GSO Standards in response to specific needs that businesses and other standards users have identified. The GSO standards are developed by teams of experts in TCs who have particular knowledge of the specific sector or topic being addressed and who are nominated by the NSBs. Each NSB member in the GSO must adopt each GSO Standard as a national standard and make it available to users. They also have to withdraw any existing national standard that conflicts with the new GSO Standard. Therefore, one GSO Standard becomes the national standard in all 7 countries. Moreover, many GSO Standards are adopted as identical international standards. At least 80% of GSO standards are international standards. CEN and CENELEC established a partnership with the GSO. To learn more about the GSO, please visit the following link: https://www.gso.org.sa/en/.

6 SPECIALISED AGENCIES OF THE UNITED NATIONS (UN)

The original network of late nineteenth-century intergovernmental organisations, especially in Europe, who work on standardisation of network technologies (e.g. railway, telegraph, and electricity) and complementing intergovernmental work on weights and measures, money, banking transactions, and various areas were predecessors of specialised agencies of the United Nations (UN), were – and sometimes still are referred to as standard development agencies.

Standardisation is one of the important activities for harmonising the activities of nations to achieve the goals of the United Nations. Specialised agencies of the United Nations and other organisations that were once established and still operate under the auspices of the United Nations develop standards (aside from

[7] Ibid.

other deliverables) that strongly influence the development of international, sectoral, national, and other standards.

The International Maritime Organisation (IMO) is the global standard-setting authority for the safety, security, and environmental performance of international shipping. Shipping is a truly international industry, and it can only operate effectively if the regulations and standards are agreed upon, adopted, and implemented internationally. The IMO is the forum where standards are developed, agreed upon, and published.

The International Civil Aviation Organisation (ICAO) works on the establishment and maintenance of International Standards and Recommended Practices (SARPs), as well as Procedures for Air Navigation (PANS). Today, the ICAO manages over 12,000 SARPs across the 19 Annexes and six PANS to the Convention, many of which are constantly evolving in concert with the latest developments and innovations. Representatives of many specialised agencies of the United Nations serve as liaisons in ISO's TCs (e.g. IMO, ILO, WHO, and ICAO).

7 CASE STUDY: GS1 SYSTEM OF STANDARDS

Walk into any store, and you can see barcodes on almost every product, the main goal of which is to enable automatic product identification. What are barcodes? Barcodes are two-dimensional graphical marks that use a simple coding system based on different thicknesses of bars and spaces between them and a combination of numbers and letters intended to uniquely identify entities for machine reading purposes [8] (Figure 2). On June 26 1974, a packet of chewing gum became the first barcoded product scanned in a store. [9]

Fig. 2. An example of a barcode symbol [10]

[8] Lehtinen, U. (2011). Traceability in Agrifood Chains. In Intelligent Agrifood Chains and Networks (pp. 151-166). Wiley-Blackwell Oxford, UK., pp. 160.

[9] GS1. (2025c). How we got here?. Accessed on 25.02.2025. Retrieved from: https://www.gs1.org/about/how-we-got-here.

[10] GS1. (2025a). Check Digital Calculator. Accessed on 25.02.2025. Retrieved from: https://www.gs1au.org/resources/check-digit-calculator/.

Within the global supply chain, marking and automatic identification of various products, goods, packages, pallets, and containers enable a more effortless flow of goods. It is practically a prerequisite for global trade (Figure 3). Some people think that GS1 is a company that only sells barcode numbers. The GS1 is an international non-profit association comprised of member organisations from over 100 countries. It was established in 2005 to unify the North American, European, and Japanese standards for uniform marking of goods on the market and connect the work of several associations of companies that have developed standards in this area: Uniform Code Council (UCC) formed by companies from North America and European Article Number (EAN) formed by European organisations in 1974. The GS1 develops and encourages the use of the GS1 system of standards, the most widely used standards within the supply chain around the world. The GS1 defines standards as "agreements based on which any activity or industry is structured and regulated. They can be rules or guidelines that everyone applies in the same way. They can be an agreed and unique way of measuring, describing or classifying products or services". [11] The GS1 system of standards includes data and application standards for bar codes, electronic business messaging standards, secure and continuous data synchronisation, standards for using the Electronic Product Code with radio frequency identification (RFID) technology, and more. [12]

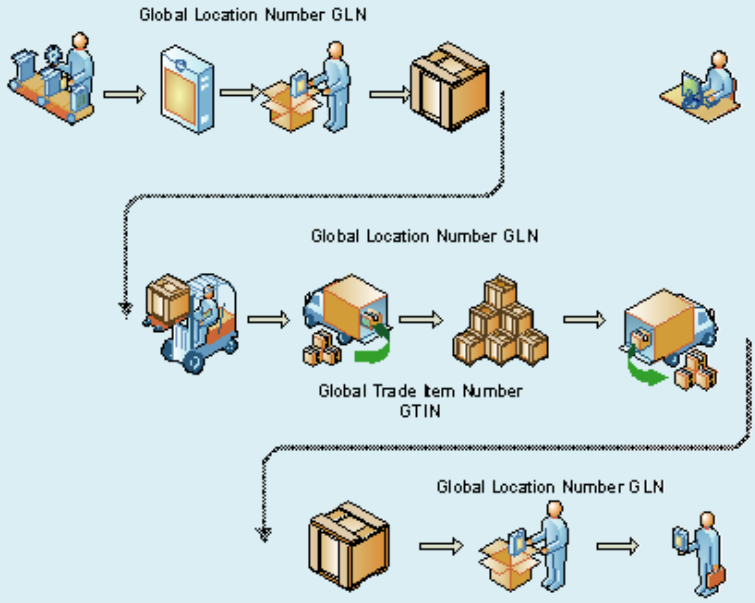

Fig. 3. Global system of identification of goods, packages, and pallets in a supply chain [13]

GS1 standards are developed by the Global Standards Management Process Team (GSMPT), which consists of 73 experts from 18 countries. The GSMPT consists of representatives of companies: BASF, Carrefour,

[11] GS1. (2025e). The Value and Benefits of the GS1 System of Standards. Accessed on 25.02.2025. Retrieved from: https://www.gs1hk.org/sites/default/files/publications/20041201_gs1_system_of_standards.pdf.
[12] GS1. (2025b). GS1 and ISO: Partnering for Standards. Accessed on 25.02.2025. Retrieved from: https://www.gs1gt.org/servicios/publicaciones/descargas/gs1_iso.pdf.
[13] GS1. (2025e). The Value and Benefits of the GS1 System of Standards. Accessed on 25.02.2025. Retrieved from: https://www.gs1hk.org/sites/default/files/publications/20041201_gs1_system_of_standards.pdf.

Dole, GMA, John Deere Food Origins, Nestlé, P&G, Target, and Wal-Mart, among others. [14] The Global Standards Management Process (GSMP) is "a community-based global forum of users who have business needs that require the use of specific standards based on a solution that makes the supply chain efficient" (you can find more information at the link: https://www.youtube.com/watch?v=XoGBc5cA4OY). [15] The GSMP offers a comprehensive set of methods and rules that enable the GS1 community and specific groups to communicate their business needs and participate in creating globally harmonised standards and guidelines. Pre-paid GS1 members can only use this process. GS1 strives to develop standards free of charge to the best of its ability.

In 1999, the symbols of the GS1 Data Bar family became the standard of the Association for Automatic Identification and Mobility (AIM). The AIM is the industry association of manufacturers of solutions for automatic identification and mobile technologies. In many cases, AIM standards can become ISO standards through the American National Standards Institute (ANSI).[16] Thereby, the GS1 symbology entered the ISO/IEC 24724:2011. [17] The GS1 and GS1 Member Organisations have been actively engaged in the United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT).

[14] Bennet, G. S. (2008). Identity Preservation & Traceability: The State of the Art – From a Grain Perspective. Iowa State University, pp. 427.

[15] GS1. (2025d). Standards Development. Accessed on 25.02.2025. Retrieved from: https://www.gs1.org/standards/development.

[16] AIM. (2025). AIM Standards Development. Accessed on 25.02.2025. Retrieved from: https://www.aimglobal.org/aim-standards.html#:~:text=AIM%20standards%20are%20the%20result,Technical%20Report.

[17] The full title of this standard is ISO/IEC 24724:2011 (en) Information technology – Automatic identification and data capture techniques – GS1 DataBar bar code symbology specification. Accessed on 25.02.2025. Retrieved from: https://www.iso.org/obp/ui/#iso:std:iso-iec:24724:ed-2:v1:en.

GS1 standards recognised by ISO and other standard bodies	
GS1 component	**External standard**
GTIN (Global Trade Item Number)	ISO/IEC 15459-6
SGTIN (Serialised Global Trade Item Number)	ISO/IEC 15459-4
GLN (Global Location Number)	ISO/IEC 6523
SSCC (Serial Shipping Container Code)	ISO/IEC 15459-1
GIAI (Global Individual Asset Identifier)	ISO/IEC 15459-4 & 5
GRAI (Global Returnable Asset Identifier)	ISO/IEC 15459-5
GSRN (Global Service Relationship Number)	ISO/IEC 15418
GDTI (Global Document Type Identifier)	ISO/IEC 15418
GINC (Global Identification Number for Consignments)	ISO/IEC 15418
GSIN (Global Shipment Identification Number)	ISO/IEC 15459-6
GCN (Global Coupon Number)	ISO/IEC 15418
CPID (Component / Part Identifier)	ISO/IEC 15418
Application Identifiers	ISO/IEC 15418
Global Product Classification (GPC)	ISO 22274
EPC URI Syntax	IETF RFC 3986
EANCOM syntax	ISO 9735
EANCOM content	UN/CEFACT UNSMs
GS1 XML syntax	W3C XML
GS1 XML content	W3C XML
Symbology Identifiers	ISO/IEC 15424
EAN/UPC	ISO/IEC 15420
ITF-14	ISO/IEC 16390

Fig. 4. GS1 standards recognised by ISO and other standards bodies [18]

The GS1 is a European Committee for Standardisation (CEN) member as an organisation with special ties that enable it to participate in the work of technical committees and subcommittees actively. GS1 has a long and fruitful working relationship with the ISO. Also, the GS1 is a partner organisation of the ISO, status A, which means that it is an organisation that effectively contributes to the work of technical committees and subcommittees.

[18] GS1. (2025b). GS1 and ISO: Partnering for Standards. Accessed on 25.02.2025. Retrieved from: https://www.gs1gt.org/servicios/publicaciones/descargas/gs1_iso.pdf.

SUMMARY

Many actors develop standards, influence their development, or contribute to the global world of standardisation. Organisations for standardisation provide a platform for representatives of different actors (e.g. companies, universities, research institutes, representatives of consumers, etc.) to join their efforts to develop standards. In standardisation, representatives of organisations who need to have expert knowledge are called experts. Standards are not necessarily an expression of the highest expertise or the highest requirements but rather an expression of what the parties involved could agree upon". [19] The people who work in organisations for standardisation are often called standardisation professionals. Standardisation professionals do not participate in developing solutions, but they provide the framework for experts to work following rules, and they manage the standards development processes. From a general point of view, all organisations that develop standards can be classified as – formal and informal. The political or governmental body recognises formal organisations as international, regional, and national organisations for standardisation. Formal standardisation is often called voluntary consensus-based standardisation, meaning that standards are developed and used voluntarily within a "consensus process, which means that the process is open and accessible for all parties interested, and all interests are attempted to be met through agreement. Informal organisations for standardisation are all other organisations for standardisation except international, regional, or national organisations that are appointed or recognised by the governments. However, this point might be blurred because many professional or industrial associations (e.g. IEEE, ASTM, ASME, etc.) are considered informal even though their predecessors participated in establishing international organisations for standardisation. Organisations that develop standards create a dynamic and complex network. Formal and informal organisations for standardisations collaborate. The case of GS1 standards shows that it takes many organisations to agree upon one solution to become international standards. In this case, market acceptance of simple but unique solutions (bar codes) and technologies for machine identification was substantial when the solution became an international standard.

[19] Madelung, N., & Andersen, K. B. (2013). An Introduction to Formal Standardisation and the Work on ICT Standardisation in ISO/IEC – JTC1 Journal of ICT Standardisation, Vol. 1, 1–24, https://doi.org/10.13052/jicts2245-800X.121.

GLOSSARY

formal standardisation

Formal standardisation is often called voluntary consensus-based standardisation meaning that standards are developed and used voluntarily within a "consensus process which means that the process is open and accessible for all parties interested, and all interests are attempted to be met through agreement. Standards are in other words not necessarily an expression of the highest expertise or the highest requirements but rather an expression of what the parties involved could agree upon". [20]

informal standardisation

From the European point of view, informal organisations for standardisation are all other organisations for standardisation except international, regional, or national organisations that are appointed or recognised by the government. However, this point might be blurred by the fact that many professional or industrial associations (e.g. IEEE, ASTM, ASME, etc.) are considered informal even though they were established years before the first European NSB, BSI.

[20] Ibid.

BIBLIOGRAPHY

AIM. (2025). AIM Standards Development. Accessed on 25.02.2025. Retrieved from: https://www.aimglobal.org/aim-standards.html#:~:text=AIM%20standards%20are%20the%20result,Technical%20Report.

Bennet, G. S. (2008). Identity Preservation & Traceability: The State of the Art – From a Grain Perspective. Iowa State University.

BSI. (2017). What Brexit means for industry standards?. Accessed on 25.02.2025. Retrieved from: https://www.bsigroup.com/Documents/about-bsi/Brexit%20papers/bsi_what-brexit-means-for-industry-standards_march-2017.pdf.

CEN/CENELEC. (2005). Memorandum of Understanding between CEN and ARSO. Accessed on 25.02.2025. Retrieved from: https://www.cencenelec.eu/media/CEN-CENELEC/European%20Standardization/Documents/IC/MoUs/mou_cen-arso.pdf.

Gerundino D., (2014). Voluntary consensus-based standards, International Organisation for Standardisation (ISO), Accessed on 25.02.2025. Retrieved from: http://www.iso.org/iso/home/about/training-technical-assistance/standards-in-education.html.

GS1. (2025a). Check Digital Calculator. Accessed on 25.02.2025. Retrieved from: https://www.gs1au.org/resources/check-digit-calculator/.

GS1. (2025b). GS1 and ISO: Partnering for Standards. Accessed on 25.02.2025. Retrieved from: https://www.gs1gt.org/servicios/publicaciones/descargas/gs1_iso.pdf.

GS1. (2025c). How we got here?. Accessed on 25.02.2025. Retrieved from: https://www.gs1.org/about/how-we-got-here.

GS1. (2025d). Standards Development. Accessed on 25.02.2025. Retrieved from: https://www.gs1.org/standards/development.

GS1. (2025e). The Value and Benefits of the GS1 System of Standards. Accessed on 25.02.2025. Retrieved from: https://www.gs1hk.org/sites/default/files/publications/20041201_gs1_system_of_standards.pdf.

IEEE. (2021). IEEE SA Industry Connections Africa 4th Industrial Revolution Standardisation Strategy (2021–2025), Accessed on 25.02.2025. Retrieved from: https://catalog.princeton.edu/catalog/99125300431006421.

Lehtinen, U. (2011). Traceability in Agrifood Chains. In Intelligent Agrifood Chains and Networks (pp. 151-166). Wiley-Blackwell Oxford, UK.

Madelung, N., & Andersen, K. B. (2013). An Introduction to Formal Standardisation and the Work on ICT Standardisation in ISO/IEC – JTC1 Journal of ICT Standardisation, Vol. 1, 1–24, https://doi.org/10.13052/jicts2245-800X.121.

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