HSbooster.eu
TRAINING ACADEMY

Beginner 1

Course 1

STANDARDISATION TRAINING ACADEMY

Topic:

WHY DO RESEARCHERS NEED STANDARDS?

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Module Objectives

After completing this module, you should be able to:

1. understand why researchers need standards;
2. understand why standardisation needs researchers;
3. understand that standards ensure the quality and interoperability of research processes;
4. understand that standards ensure the safety of research results;
5. understand that standards prevent researchers from ''reinventing the wheel'';
6. understand that standards ensure and promote common best-practice solutions;
7. understand that standardisation helps researchers to achieve common agreements leading to interoperability, compatibility, and terminology
8. understand that standardisation enhances scientific co-operation, networking, and learning;
9. understand that standardisation shapes practices that lead to innovation;
10. understand that standardisation can be a tool used to convert research results to innovative technologies, products, and services;
11. understand that standardisation ensures the commercialisation of research results;
12. understand that standardisation ensures the subsequent use of research results; and
13. understand that standardisation can be a tool used to support the regulatory framework.

About The Author

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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.

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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

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Ana Kicanovic is an Assistant Professor at the Faculty of Organisational Sciences, University of Belgrade, Serbia. She is working at the Department of Quality Management and Standardisation. She completed her Ph.D. Studies on thesis: *The Quality Maturity Model of Health Care Organisations based on Complexity Theory*. Her main research interests are quality management, standardisation, leadership, and corporate social responsibility. She has published over 30 research papers in specialised scientific journals and national and international conferences. She acted as a reviewer for several WOS indexed scientific journals.

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1 WHY DO RESEARCH NEED STANDARDS AND STANDARDISATION?

Many research projects' results did not reach their full potential in the industry, markets and society. The reasons for this are many. Standardisation as a knowledge transfer channel and tool for the valorisation and disseminating of research results must be addressed more adequately. Some research results are not suitable for standardisation, some have not been elaborated enough, and some projects did not have access to standardisation processes that would make their solutions available to interested parties and the industry. In such situations, everyone loses, including researchers whose results did not reach interested parties who would be interested in applying the developed solution. European standards organisations CEN and CENELEC developed steps for supporting researchers to enrol in standards development with their knowledge and research outcomes and to benefit from it. Further, European standards organisations help them access technology and knowledge regarding the market, technology, and policy changes that support their entry into the market, provide in-demand customer service and get their R&I research proposal accepted by including standardisation in their research proposal.[1] CEN and CENELEC developed steps for supporting innovators to enrol in standards development and promote their innovation through standards. CEN/CENELEC Guide 39 [2] gave concrete paths for innovators "to take advantage of standardisation". Similarly, innovators get help from CEN and CENELEC in **promoting and selling their inventions, complying with regulations and certifications, and growing their network of potential partners**. Accordingly, accessing technology and knowledge supports their entry into the market and enables interoperability and getting their R&I research proposal accepted by including standardisation in their research proposal. Further, they could get professional recognition by introducing their contributions to standards through participation in creating documents called 'CWAs', which are documents that form the basis for new standards developed by the CEN and CENELEC. Motives for integrating standardisation in R&I projects are listed in Figure 2.

The pathway for researchers to get involved in standards development is available at the following link:

- https://www.standardsplusinnovation.eu/researchers.

The pathway for innovators to get involved in standards development is available at the following link:

- https://www.standardsplusinnovation.eu/innovators.

[1] CEN/CENELEC. (2025). Get Involved: Research and Innovation, Accessed on 20.02.2025. Retrieved from: https://www.cencenelec.eu/get-involved/research-and-innovation.

[2] CEN/CENELEC (2022). CEN/CENELEC Guide 39 - The role of standards in support of Technology Transfer. Accessed on 20.02.2025. Retrieved from: https://www.cencenelec.eu/media/Guides/CEN-CLC/cenclcguide39.pdf, pp.11.

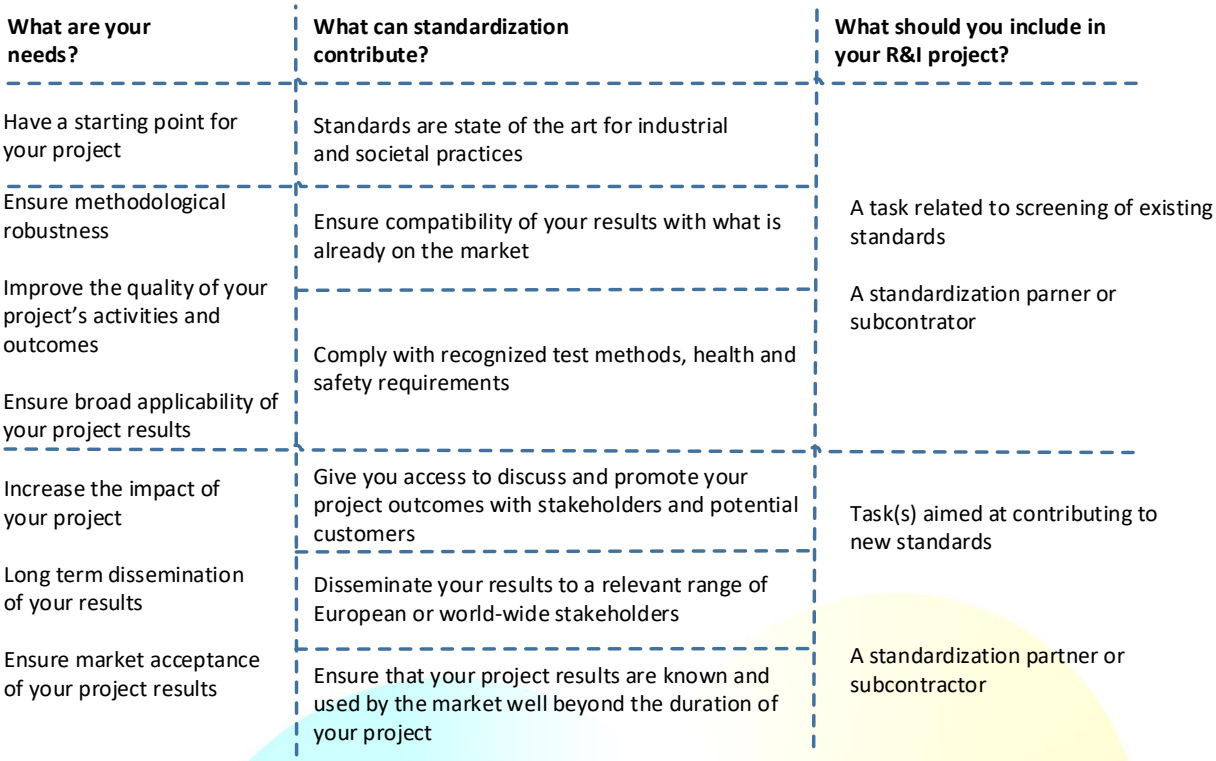

Fig. 2. STAIR: an integrated approach for standardisation, innovation, and research [3, 4]

However, "researchers' awareness of and know-how about standardisation processes are frequently low, and the development of recognised performance indicators to track the success of technology transfer and valorisation activities is in their infancy." [5] In their scoping study, they recognise that one of the barriers for researchers to participate in standards development is "lack of recognition of standardisation work for researchers", namely this is not a factor considered in assessing their performance or career opportunities. [6]

There are many reasons why researchers need standards and standardisation and how they could benefit of using standards and from participating in standards development (via technical committees). However, symbiosis among research, industres, and standardisation is not well documented in many areas, sectors, or disciplines, especially since there are no empirical studies. What do we know so far about the benefits of the use of standards and from participating in standards development? Here, we offer you some answers –

Standards ensure the quality and interoperability of research processes

[3] CEN/CENELEC (2011). STAIR: an integrated approach for standardisation, innovation and research. Accessed on 20.02.2025. Retrieved from: https://www.iso.org/sites/edumaterials/STAIR.pdf.

[4] Radauer, A., Baronowski, S., Yeghyan, M., et al. (2022), Scoping study for supporting the development of a code of practice for researchers on standardisation: Final Report, Tardos, G. (Ed.), European Commission, Directorate-General for Research and Innovation, Publications Office of the European Union, https://data.europa.eu/doi/10.2777/567608.

[5] Ibid.

[6] Ibid.

Researchers use standards to ensure the quality and interoperability of research processes and research data. [7] Additionally, standards help manage efforts between researchers in different locations and enhance scientists' work by providing new ways to acquire, share, and communicate data from multiple sources.[8] For example, euroCRIS promotes interoperability of research information through the CERIF standard.[9] ORCID allows research organisations to quickly access and manage information about researchers and their results. The ORCID iD is an HTTPS URL with a 16-digit number compatible with ISO 27729, also known as the International Standard Name Identifier (ISNI). [10] The use of standards is crucial for research data to be findable, accessible, interoperable, and reusable [11], and the role of public policy is to ensure compatible and interoperable solutions. [12]

The euroCRIS is an international not-for-profit association founded in 2002 to bring together experts on research information in general and research information systems (CRIS). The mission of the euroCRIS is to foster cooperation and knowledge-sharing across the research information community and to promote interoperability of research information through the CERIF standard, the Common European Research Information Format. Additional areas of activity also cover the (worldwide) uptake of CRIS systems by various stakeholders, research information infrastructures on the institutional, regional, national, and international levels, best practices in system interoperability, and the use and implementation of standards in CRIS, such as identifiers, formats, semantics, vocabularies, etc. [13]

#HSbooster.eu Success Story

The Project: IDERHA

IDERHA (Integration of Heterogeneous Data and Evidence towards Regulatory and HTA Acceptance) is a European public-private partnership launched in April 2023. This pioneering project addresses the obstacles in accessing, integrating and analysing health data to maximize their value for patient care and medical research.

The Project Standardisation Needs

The IDERHA project, in collaboration with ASCAPE, iHELP, Bigpicture, EUCAIM, and HealthData@EU, formed a health project cluster to address shared standardisation challenges in health data. The cluster focused on

[7] Holmes, C., McDonald, F., Jones, M., Ozdemir, V., & Graham, J. E. (2010). Standardisation and omics science: Technical and social dimensions are inseparable and demand symmetrical study. OMICS A Journal of Integrative Biology, 14(3), 327–332, https://doi.org/10.1089/omi.2010.0022.

[8] Ibid.

[9] Baker, D., Simons, E., & Brown, J. (2014). The various aspects of Interoperability: A strategic partnership driving interoperability in research information through standards.

[10] Burland, T., & Grout, C. (2017). Standards and Interoperability: How Jisc's Work Supports Reporting, Communicating and Measuring Research in the UK. Procedia Computer Science, 106, 276-282.

[11] Hollmann, S., Kremer, A., Baebler, Š., Trefois, C., Gruden, K., Rudnicki, W. R., ... & D'Elia, D. (2020). The need for standardisation in life science research - an approach to excellence and trust. F1000Research, 9.

[12] Blind, K. (2013). The Impact of Standardisation and Standards on Innovation. Nesta Working Paper 13/15, 13(15).

[13] euroCRIS (2025). euroCRIS. Accessed on 20.02.2025. Retrieved from: https://eurocris.org.

harmonising data models, ontologies, and terminologies using key health standards such as HL7 FHIR, DICOM, OMOP, and ISO TC 215 Health Informatics. Their goal was to ensure interoperability and seamless data sharing across borders, particularly for cancer-related use cases. These efforts culminated in the publication of the paper "Synergies Among Health Data Projects with Cancer Use Cases Based on Health Standards" at the MIE 2024 conference. Additionally, the cluster is working on the European Health Data Space (EHDS) interoperability framework, aiming to facilitate cohesive data exchange and alignment with EU health policies. IDERHA developed an interoperability framework for the European Health Data Space by clustering with other health-focused projects. This framework supports harmonised data sharing practices across Europe, aligning with EU health policy goals.

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

https://www.iderha.org/

https://zenodo.org/records/14334189

Standards ensure the safety of research results

Researchers use standards to ensure the safety of research results. [14] New technologies, such as genomics, proteomics, and metabolomics, are accepted in the markets because of using existing safety standards.[15] Additionally, quality, health and safety standards are crucial "when risky nanotechnology products were introduced to the market". [16] For a product to enter the market, there is a need for compatibility standards that ensure interoperability and quality standards that guarantee that the product complies with minimum quality and safety requirements. [17] Accordingly, quality and safety standards are crucial for market introduction by overcoming barriers and reducing the risks of the new technologies. [18] Organisations use standards when developing new technologies and establish safety procedures to do so in a controlled manner. [19]

Standards prevent researchers from ''reinventing the wheel''

Researchers shall avoid "starting over with a clean slate". Rather, they shall use standards as a starting point to develop a solution to an existing problem. By using standards, researchers can start at the current

[14] Holmes, C., McDonald, F., Jones, M., Ozdemir, V., & Graham, J. E. (2010). Standardisation and omics science: Technical and social dimensions are inseparable and demand symmetrical study. OMICS A Journal of Integrative Biology, 14(3), 327–332, https://doi.org/10.1089/omi.2010.0022.

[15] Ibid.

[16] Blind, K. & Gauch, S. (2009). Research and standardisation in nanotechnology: Evidence from Germany. Journal of Technology Transfer, 34(3), 320–342, https://doi.org/10.1007/s10961-008-9089-8.

[17] Ibid.

[18] Blind, K. (2013). The Impact of Standardisation and Standards on Innovation. Nesta Working Paper 13/15, 13(15).

[19] Cihon, P. (2019). Standards for AI governance: international standards to enable global coordination in AI research & development. Future of Humanity Institute. University of Oxford.

good-practice solutions, avoid the duplication of efforts, solve today's problems, and develop tomorrow's advances. [20]

Standards ensure and promote common best-practice solutions

Standardisation and its results standards are used to ensure and promote common best-practice solutions within a specific area of expertise. There are plenty of examples of both formal and informal standards used by researchers in different fields to ensure and promote common best-practice solutions within a specific area of expertise.

The International Nursing Association for Clinical Simulation and Learning (INACSL) aims to develop evidence-based Standards of Best Practice (SoBP) for clinical methodologies. [21] By standardising clinical simulation methodologies through SoBPs, INACSL ensures "an effective framework to enhance communication and optimise consistency in education, clinical practice, research, publications, and simulation-related activities". [22] Additionally, the International Stem Cell Forum (ISCF) aims to create a common best-practice protocol for culturing/characterising cells. [23] The European Association for Forensic Entomology (EAFE) aims to develop a common best-practice protocol for forensic entomology. [24] Together with the terminological database, the common best-practice protocol contains an overview of the equipment used and methods applied to collect entomological evidence by a wide variety of professionals, such as pathologists, entomologists, and police officers. [25]

Several efforts aim at ensuring common best-practice solutions within the metabolomics community. There are plenty of examples of standards developed in the field of transcriptomics, RNA sequencing, and proteomics (e.g. Proteomics Standards Initiative), as well as by the MERIT project, which are meant to be used as best-practice solutions. [26] Additionally, the Extended Advisory Group on Molecular Screening and Toxicogenomics (EAGMST) has established an initiative to develop Omics Reporting Frameworks specifically for regulatory toxicology. These metabolomics guidelines within the MERIT are currently being developed with the OECD expert groups developing both the OECD Transcriptomics Reporting Framework and the Metabolomics Reporting Framework. [27]

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[20] Halpin, M. (2012). The Impact of Standards [Standards]. IEEE Industry Applications Magazine, 19(1), 104-105.
[21] Sittner, B. J., Aebersold, M. L., Paige, J. B., Graham, L. L., Schram, A. P., Decker, S. I., & Lioce, L. (2015). INACSL standards of best practice for simulation: past, present, and future. Nursing education perspectives, 36(5), 294-298.
[22] Ibid.
[23] Holmes, C., McDonald, F., Jones, M., Ozdemir, V., & Graham, J. E. (2010). Standardisation and omics science: Technical and social dimensions are inseparable and demand symmetrical study. OMICS A Journal of Integrative Biology, 14(3), 327–332, https://doi.org/10.1089/omi.2010.0022.
[24] Amendt, J., Campobasso, C. P., Gaudry, E., Reiter, C., LeBlanc, H. N., & Hall, M. J. (2007). Best practice in forensic entomology – standards and guidelines. International Journal of Legal Medicine, 121(2), 90-104, https://doi.org/10.1007/s00414-006-0086-x.
[25] Ibid.
[26] Viant, M. R., Ebbels, T. M. D., Beger, R. D., Ekman, D. R., Epps, D. J. T., Kamp, H., ... & Weber, R. (2019). Best practice and reporting standards for applications of metabolomics in regulatory toxicology. Nat. Commun., 10.
[27] Ibid.

- **Standardisation helps researchers to achieve common agreements, leading to interoperability, compatibility, and terminology**

Standards "serve as a handshake between various components of systems". [28] Standards may be seen as a tool to achieve joint agreements leading to interoperability, compatibility, terminology, etc. [29] Technology transfer requires terminology, measurement, testing, interface, compatibility, and quality standards. [30] The terminology standards are the first to consider when technology transfer is considered because they should resolve terminology questions at the beginning phases of the research. [31] Also, measurement and testing standards are needed in the later stages of research. Additionally, interface standards fill the gap between applied research and experimental development of new products by allowing process technology or components to be interoperable. [32] Finally, there is also a need for compatibility standards that ensure interoperability.

Within ICTs, many standards are developed to achieve interoperability.[33] To produce laptops, their manufacturers need over 250 technical interoperability standards. [34] Another example is the IEEE Standard for Intercloud Interoperability and Federation (SIIF), which aims to solve cloud interoperability and portability issues. [35] Within the Agricultural Model Intercomparison & Improvement Project (AgMIP), interoperability can be achieved across crop models by using "a standardised data exchange mechanism with variables defined by international standards". [36] Standard EN 16868:2019, "Ambient air – Sampling and analysis of airborne pollen grains and fungal spores for networks related to allergy - Volumetric Hirst method", enables interoperability around 400 pollen monitoring stations in 30 countries. [37] Additionally, by offering rules, protocols, guidelines, and suggestions, standards that support interoperability are crucial to overcoming barriers to IoT systems. Initially, Semantic Web Technologies, established by W3C, such as the Resource Description Framework (RDF), SPARQL, and Web Ontology Language (OWL), have been used to achieve interoperability across heterogenous environments in many different areas, including IoT. To date,

[28] Girard, M. (2020). We Need Standards for Digital Cooperation to Occur. IEEE Technology and Society Magazine, 39(2), 68-74, https://doi.org/10.1109/MTS.2020.2991501.
[29] Blind, K. & Gauch, S. (2009). Research and standardisation in nanotechnology: Evidence from Germany. Journal of Technology Transfer, 34(3), 320–342, https://doi.org/10.1007/s10961-008-9089-8.
[30] Ibid.
[31] Ibid.
[32] Ibid.
[33] Blind, K., Pohlisch, J., & Zi, A. (2018). Publishing, patenting, and standardisation: Motives and barriers of scientists. Research Policy, 47(7), 1185-1197, https://doi.org/10.1016/j.respol.2018.03.011.
[34] Biddle, B., White, A., & Woods, S. (2010). How many Standards in a Laptop? (and other empirical questions), in ITU-T Beyond the Internet? – Innovations for future networks and services Kaleidoscope Conference. Accessed on 20.02.2025. Retrieved from: https://papers.ssrn.com/sol3/Delivery.cfm/SSRN_ID1703470_code409697.pdf?abstractid=1619440&mirid=1.
[35] Di Martino, B. (2014). Applications Portability and Services Interoperability among Multiple Clouds, IEEE Cloud Computing, 1(1), 74–77, https://doi.org/10.1109/MCC.2014.1.
[36] Porter, C. H., Villalobos, C., Holzworth, D., Nelson, R., White, J. W., Athanasiadis, I. N., ... & Jones, J. W. (2014). Harmonization and translation of crop modelling data to ensure interoperability. Environmental Modelling & Software, 62, 495-508, https://doi.org/10.1016/j.envsoft.2014.09.004.
[37] CEN/CENELEC. (2025). Get Involved: Research and Innovation, Accessed on 20.02.2025. Retrieved from: https://www.cencenelec.eu/get-involved/research-and-innovation.

several standards bodies, consortia, and alliances have developed standards to solve interoperability issues between IoT devices, networks, services, and data formats, such as Open Interconnect Consortium (OIC) (IoTivity20), AllSeen Alliance (AllJoyn), oneM2M21, OMA LWM2M22, ETSI M2M23.[38]

Within digital medicine, structured data exchange is supported by international SDOs such as Health Level Seven International (HL7) and Integrating the Healthcare Enterprise (IHE), which set IT standards across systems. [39] HL7 Fast Healthcare Interoperability Resources (FHIR) standard defines "around 140 common healthcare concepts, so-called resources, which can be accessed and exchanged using modern web technologies". [40] Another example is the openEHR standard which "allows medical professionals and IT experts to define clinical content using so-called archetypes and specifications of clinical concepts based on an underlying reference model". [41] Several terminology standards such as SNOMED CT, Logical Observation Identifiers Names and Codes (LOINC) for laboratory observations, the Identification of Medicinal Products (IDMP) for medicines, the nomenclature of the HUGO Gene Nomenclature Committee (HGNC) for genes, the Human Phenotype Ontology (HPO) for phenotypic abnormalities ensure the data exchange within digital medicine. [42]

Standardisation enhances scientific co-operation, networking, and learning

The standards development process provides chances for researchers to communicate with one another on specific issues. Participation in standards development strengthens the links with other research community members and monitors the activities of their colleagues working within the same field. [43] Several studies confirm that researchers who actively participate in standards development benefit through **knowledge acquiring and networking**. [44] [45] Also, participation in standards development has a reputational effect in recognition (being recognised as an expert in the field). [46] Standards for measurement are crucial

[38] Lee, E., Seo, Y. D., Oh, S. R., & Kim, Y. G. (2021). A Survey on Standards for Interoperability and Security in the Internet of Things. IEEE Communications Surveys & Tutorials, 23(2), 1020-1047.
[39] Lehne, M., Sass, J., Essenwanger, A., Schepers, J., & Thun, S. (2019). Why digital medicine depends on interoperability. NPJ digital medicine, 2(1), 1-5.
[40] Ibid.
[41] Ibid.
[42] Ibid.
[43] Blind, K. & Gauch, S. (2009). Research and standardisation in nanotechnology: Evidence from Germany. Journal of Technology Transfer, 34(3), 320–342, https://doi.org/10.1007/s10961-008-9089-8.
[44] Mijatovic, I., Horvat, A., & Krsmanovic, M. (2014). Academics' and Researchers' Participation in the National Technical Committees In Serbia. In Proceedings of 19th EURAS Annual Standardisation Conference Cooperation among standardisation organisations and the scientific and academic community (pp. 135–147). Belgrade, Serbia. ISBN: 978-3-86073-305-2.
[45] Radauer, A., Baronowski, S., Yeghyan, M., et al. (2022), Scoping study for supporting the development of a code of practice for researchers on standardisation: Final Report, Tardos, G. (Ed.), European Commission, Directorate-General for Research and Innovation, Publications Office of the European Union, https://data.europa.eu/doi/10.2777/567608.
[46] Ibid.

for communication or collaboration between researchers and the commercialisation of research results. [47] [48]

Additionally, developing "omics-related" standards enhanced scientific cooperation, such as standardising metagenomic publication records for data annotation, data exchange formats, and controlled vocabularies. [49]

Data standards may be used to achieve digital cooperation, and organisations of all sizes shall use standards to collect data via collaborative platforms to solve longstanding problems. [50] Technological standards enforce international collaboration and are the most useful when "cooperation is difficult to enforce and requires costly and lengthy domestic adjustments". [51] Similarly, several fuel efficiency and motor vehicle emission standards are necessary to enforce international cooperation and suggested that researchers and policymakers must participate in standards development to enhance scientific collaboration and enforce the greenest technologies worldwide. [52] To this end, technological standards may facilitate scientific cooperation, complementing international environmental agreements (IEA). [53] In artificial intelligence (AI), standards are means of communication among research labs and may encourage positive research results. [54]

Standardisation shapes practices that lead to innovation

Many think that standardisation stifles innovation, but innovative products or services need to meet numerous standards to reach the market. Standardisation is the basis for innovation that facilitate the introduction of innovative products by providing interoperability between new and existing products, services, and processes. [55] If innovative products and processes become successful, they should be brought

[47] Swann G.M.P., & Lambert R. (2017). Standards and innovation: A brief survey of empirical evidence and transmission mechanisms. In the Handbook of innovation and standards, Hawkins R., Blind K., & Page R. (Eds), pp. 24, Edward Elgar Publishing, Inc. Northampton Massachusetts, USA.

[48] Blind, K. & Gauch, S. (2009). Research and standardisation in nanotechnology: Evidence from Germany. Journal of Technology Transfer, 34(3), 320–342, https://doi.org/10.1007/s10961-008-9089-8.

[49] Taylor, C. F., Hermjakob, H., Julian Jr, R. K., Garavelli, J. S., Aebersold, R., & Apweiler, R. (2006). The work of the human proteome organisation's proteomics standards initiative (HUPO PSI). Omics: a journal of integrative biology, 10(2), 145-151, https://doi.org/10.1089/omi.2006.10.145.

[50] Girard, M. (2020). We Need Standards for Digital Cooperation to Occur. IEEE Technology and Society Magazine, 39(2), 68-74, https://doi.org/10.1109/MTS.2020.2991501.

[51] Urpelainen, J. (2010). Enforcing international environmental cooperation: Technological standards can help. The Review of International Organisations, 5(4), 475-496.

[52] An, F., Earley, R., & Green-Weiskel, L. (2011). Global overview on fuel efficiency and motor vehicle emission standards: policy options and perspectives for international cooperation. United Nations Background Paper 3, 3.

[53] Lessmann, K., & Edenhofer, O. (2011). Research cooperation and international standards in a model of coalition stability. Resource and Energy Economics, 33(1), 36-54.

[54] Cihon, P. (2019). Standards for AI governance: international standards to enable global coordination in AI research & development. Future of Humanity Institute. University of Oxford.

[55] Stroyan, J., & Brown, N. (2012). Using standards to support growth, competitiveness and innovation: A smart guide on promoting and facilitating SME competitiveness through the development and use of standards with the help of EU structural funds. In Guidebook Series: How to Support SME Policy from Structural Funds. Office for

to a standardised format. [56] Also, including innovation and research outcomes into standards can significantly impact the use of those outcomes by the industry by making it clear how to implement them, ensuring compatibility and interoperability with existing technologies and processes. [57] Furthermore, integrating research and innovation outcomes to develop new standards can "facilitate market acceptance of innovative products while increasing their relevance." [58] Also, policymakers are interested in how their countries may benefit from technological advancement through participation in standards development. [59] In business, a well-known fact is that companies capable of developing a vast network of partners, customers or even their competitors, and can establish industry standards, could be more successful than companies with the best technology. The dominant standard on the market determines whether one technology has more potential than others. [60] The variety of reduction standards helps in the pioneer phase of technology development because the presence of standards can avoid waste of investments in further research of new technology directions. [61] When a core technology standard is developed, it determines the pathway of technological advancement for some time in the future.

To read the interview with three company standardisation experts, please visit the following link:

- https://www.sony-semicon.com/en/feature/2022031801.html

Accumulation of standardisation knowledge mediates the relationships between R&D novelty and administrative and technical innovation performances, [62] and process standards positively affect technological innovation in the environmental instrument industry. [63] Standards impact the diffusion of innovations in different sectors, such as ICT, photovoltaics technology, public procurement, nanotechnology, pharmaceuticals, and the defence industry sector. [64] Suppose producers and consumers want to change the product with a particular standard. In that case, they face the cost of switching to the new network, which could lead to consumers or producers choosing inferior technology. Here, standards

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Official Publications of the European Union, Luxembourg, European Union, https://doi.org/10.2769/42198, pp. 14.

[56] Auer, A., & Jarmai, K. (2017). Implementing responsible research and innovation practices in SMEs: Insights into drivers and barriers from the Austrian medical device sector. Sustainability, 10(1), 17, https://doi.org/10.3390/su10010017.

[57] CEN/CENELEC. (2025). Get Involved: Research and Innovation, Accessed on 20.02.2025. Retrieved from: https://www.cencenelec.eu/get-involved/research-and-innovation.

[58] Ibid.

[59] Jiang, H., Zhao, S., Yuan, Y., Zhang, L., Duan, L., & Zhang, W. (2018). The coupling relationship between standard development and technology advancement: A game theoretical perspective. Technological Forecasting and Social Change, 135, 169-177, https://doi.org/10.1016/j.techfore.2017.11.018.

[60] Ibid.

[61] Hung, P. T. (2010). Economic Aspects of Standardisation. In Hesser W., Feilzer A., de Vries H. (Eds.), Standardisation in Companies and Markets (3rd Ed.), Helmut Schmidt University, ISBN: 978-3-940385-97-0, pp. 88.

[62] Zhou, X., Shan, M., & Li, J. (2018). R&D Strategy and Innovation Performance: The role of Standardisation. Technology Analysis & Strategic Management, 30(7), 778-792.

[63] Yu, K., Qian, C., & Chen, J. (2022). How does intelligent manufacturing reconcile the conflict between process standards and technological innovation?. Journal of Engineering and Technology Management, 65, 101698.

[64] Bahrami, S., Atkin, B., & Landin, A. (2019). Innovation diffusion through standardisation: A study of building ventilation products. Journal of engineering and technology management, 54, 56-66.

are vital for technology diffusion. [65] Standard EN 50342-6:2015/A1:2018 "Secondary cells and batteries" applies to so-called "starter batteries" with a nominal voltage of 12 V which are meant to be used mainly as the power source for starting the Internal Combustion Engines (ICE), lighting, as well as the auxiliary equipment. [66] These batteries are mainly used within the Start-Stop vehicles: vehicles in which the ICE can be switched off during stopping or even idling without the need to support the vehicle movement by the ICE. [67] Accordingly, if the system "allows an increase in energy efficiency, it requires special types of batteries, as they are stressed in a completely different way compared to classical starter batteries". [68]

#HSbooster.eu Success Story

The Project: SNS OPS

The European Smart Networks and Services Joint Undertaking (SNS JU) is a Public-Private Partnership that aims to facilitate and develop industrial leadership in Europe in 5G and 6G networks and services. The SNS JU funds projects that shape a solid research and innovation (R&I) roadmap and deployment agenda by engaging a critical mass of European stakeholders and facilitating international cooperation on various 6G initiatives.

The Project Standardisation Needs

The SNS OPS project supports the operations of the SNS Joint Undertaking (JU), facilitating the European SNS Initiative as outlined in its contractual partnership. Its work focuses on coordinating Smart Networks and Services (SNS) projects, aligning them with the 6G Infrastructure Association and EU strategic policies. Key activities include fostering collaboration across projects on critical issues like standardisation and spectrum, promoting European leadership in 6G, and ensuring impactful exploitation of SNS results. Additionally, the project organises strategic actions to capture the European perspective on 6G advancements, monitor their impact, and plan for future efforts to sustain Europe's momentum and leadership in the global 6G landscape. SNS OPS sought guidance to gather inputs and restructure the Standards Tracker platform. This platform helps stakeholders navigate the evolving landscape, through reports profiling stakeholder engagement across sectors, roles, and regions. SNS-OPS developed a standards tracker for 6G technologies, providing a comprehensive resource to guide pre-standardisation efforts.

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

https://smart-networks.europa.eu/

https://zenodo.org/records/14330281

[65] Hung, P. T. (2010). Economic Aspects of Standardisation. In Hesser W., Feilzer A., de Vries H. (Eds.), Standardisation in Companies and Markets (3rd Ed.), Helmut Schmidt University, ISBN: 978-3-940385-97-0, pp. 88.
[66] CEN/CENELEC. (2025). Get Involved: Research and Innovation, Accessed on 20.02.2025. Retrieved from: https://www.cencenelec.eu/get-involved/research-and-innovation.
[67] Ibid.
[68] Ibid.

Standardisation can be a tool used to convert research results to innovative technologies, products, and services

Standards are a means of sharing knowledge and technology transfer, especially standards that are generated through a voluntary consensus-based process. [69] Standardisation shall be seen as a knowledge-sharing and even a knowledge-creating process, as it gathers actors from different sectors and educational backgrounds to work around the same goal. [70] Standardisation codifies existing knowledge within standards, exchanges and creates new knowledge. [71] This knowledge is often tacit and linked to individual members of the research community. [72] Successful standardisation (e.g., codifying existing knowledge within standards) is mostly based on researchers' participation in the standardisation process and depends on the involvement of researchers in the standardisation process in terms of incorporating relevant and up-to-date knowledge into a standard. [73] [74] To conclude, a successful standardisation process is needed to develop a close connection between researchers and the technical committees that develop standards. [75] Standardisation may serve as a platform for converting research results to innovative technologies, products, and services that may eventually contribute to human well-being. [76]

Standardisation ensures the commercialisation of research results

Standards are seen as a channel for the valorisation and commercialisation of research outcomes and an essential factor contributing to innovation. [77] Researchers use standardisation as a tool to commercialise research results and ensure future funding by companies. [78] The economic efficiency of publicly funded research programs is commercialisation if publicly funded research results are commercialised via standards. [79] Originally, commercialisation included patenting and licensing of research results, but it has

[69] Blind, K. (2013). The Impact of Standardisation and Standards on Innovation. Nesta Working Paper 13/15, 13(15).
[70] Ibid.
[71] Ibid.
[72] Blind, K. & Gauch, S. (2009). Research and standardisation in nanotechnology: Evidence from Germany. Journal of Technology Transfer, 34(3), 320–342, https://doi.org/10.1007/s10961-008-9089-8.
[73] Ibid.
[74] Ibid.
[75] Radauer, A., Baronowski, S., Yeghyan, M., et al. (2022), Scoping study for supporting the development of a code of practice for researchers on standardisation: Final Report, Tardos, G. (Ed.), European Commission, Directorate-General for Research and Innovation, Publications Office of the European Union, https://data.europa.eu/doi/10.2777/567608.
[76] Blind, K. (2013). The Impact of Standardisation and Standards on Innovation. Nesta Working Paper 13/15, 13(15).
[77] Radauer, A., Baronowski, S., Yeghyan, M., et al. (2022), Scoping study for supporting the development of a code of practice for researchers on standardisation: Final Report, Tardos, G. (Ed.), European Commission, Directorate-General for Research and Innovation, Publications Office of the European Union, https://data.europa.eu/doi/10.2777/567608.
[78] Blind, K. & Gauch, S. (2009). Research and standardisation in nanotechnology: Evidence from Germany. Journal of Technology Transfer, 34(3), 320–342, https://doi.org/10.1007/s10961-008-9089-8.
[79] Blind, K. (2013). The Impact of Standardisation and Standards on Innovation. Nesta Working Paper 13/15, 13(15).

recently shifted to participation in the standardisation process and standards it leads to. [80] Standards are available to everyone at a low cost compared to patents and are more likely to be used because a consensus has been reached on their requirements. [81] This is especially true for emergent fields like nanotechnology in which technical committees and working groups may anticipate the evolution of technology and support its expeditious development and market entrance. [82] Other examples are standards and technologies that will accelerate 5G commercialisation [83] or standards for the emerging biomedical field of microfluidics. [84]

#HSbooster.eu Success Story

The Project: ROMSOC

ROMSOC is a European Industrial Doctorate (EID) project that will run for four years bringing together 15 international academic institutions and 11 industry partners. It supports the recruitment of eleven Early Stage Researchers (ESRs) working on individual research projects. In order to train the eleven young researchers for the challenges of multi-disciplinary and international co-operation, their scientific work is embedded in a jointly organized doctoral program, in which lectures and workshops address both scientific content and soft skills. The researchers are supervised by expert tandems, each consisting of an academic and an industrial representative. They spend at least half the time in a company, the rest in a research facility.

The Project Standardisation Needs

ROMSOC's subproject ESR2 is focused on designing, implementing, and deploying accurate digital twins of any process of interest to achieve the best performance of mathematical modelling, simulation, and optimisation techniques. The objectives of this research project are the mathematical modelling and numerical simulation of acoustic coupled systems. The numerical results will play a key role in designing novel windscreens to mitigate the flow effects on the measures of acoustic probes. The project identified three specific needs: A) how to use standardisation procedures for any stage regarding digital twins in non-destructive frameworks, B) how to transform the classical standards focused on real-world measurements into a digital twin scenario, and C) how to certify the digital twin predictions of non-destructive testing using standardisation. ROMSOC Consortium applied for the Standardisation Booster service to get valuable guidance in achieving these three goals. ROMSOC aligned an acoustic device model with standards, contributing to advancements in digital twins and mathematical modelling.

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

[80] Blind, K., Pohlisch, J., & Zi, A. (2018). Publishing, patenting, and standardisation: Motives and barriers of scientists. Research Policy, 47(7), 1185-1197, https://doi.org/10.1016/j.respol.2018.03.011.
[81] Blind, K. (2013). The Impact of Standardisation and Standards on Innovation. Nesta Working Paper 13/15, 13(15).
[82] Rashba, E., & Gamota, D. (2003). Anticipatory standards and the commercialisation of nanotechnology. Journal of Nanoparticle Research, 5(3), 401-407.
[83] Khan, A., Minokuchi, A., Tsubouchi, K., Kunito, G., & Iwashina, S. (2019). Technology and standards accelerating 5G commercialisation. IEICE Transactions on Communications, 102(3), 410-417.
[84] Reyes, D. R., van Heeren, H., Guha, S., Herbertson, L., Tzannis, A. P., Ducrée, J., ... & Becker, H. (2021). Accelerating innovation and commercialisation through standardisation of microfluidic-based medical devices. Lab on a Chip, 21(1), 9-21.

https://www.romsoc.eu/

https://zenodo.org/records/11367322

- **Standardisation ensures the subsequent use of research results**

Researchers may choose to convert their research results to standards to ensure the subsequent use of these results and use the chance to explain not only what the results are but also how to use them. [85] Although all research results cannot be converted to standards, they can always offer some valuable support to the new or existing set of standards (e.g., through the validation of test methods). [86] Suppose you have developed a specific procedure or a protocol to overcome constraints as a result of your research. In that case, you may have set a basis for a standard. If you are mainly using existing procedures (e.g. to describe a new material), it seems unlikely that you have developed anything that may be used a basis for a standard. [87] Although you have developed a specific procedure or a protocol, it does not necessarily mean that such a standard does not already exist. There is a significant gap between the academic and the standardisation community, so the first step might be to search for the existing standard relevant to the specific subject. If despite tremendous efforts, you still can not find the relevant standard(s), the solution might be to develop them alone or in cooperation with other parties. [88] It may be challenging to create a comprehensive list of research results suitable for standardisation. If you have developed a repeatable procedure or a protocol (for preparing, characterising, identifying, manipulating, verifying, etc.), or if you have updated an existing procedure or a protocol to allow its use at a different length scale or under an extended set of conditions, your results could likely be used as a basis for a standard. [89] Contrary, results that are not suitable for standardisation are data to be used within one particular system (although it may be used for a case study to be included in the standard); methods, processes, and protocols that mostly depend on the use of patented equipment or that you are currently aiming to patent, that have not yet been validated, or you have research results for which there is no general interest in the standardisation community. [90]

To learn more about converting your research results to standards and other standardisation deliverables, please visit the following link:

- https://www.youtube.com/watch?v=9vAJtM23UTc

[85] Hatto, P. (2013). Standards and standardisation: A practical guide for researchers. Luxembourg: European Commission, Publications Office of the European Union (EU).
[86] Ibid.
[87] Ibid.
[88] Ibid.
[89] Ibid.
[90] Ibid.

Standardisation can be a tool used to support the regulatory framework

Standardisation and standards can also be seen as a tool to support the regulatory framework. Scientific activities are bound by the policy and regulatory frameworks that determine priorities, facilitate the allocation of resources, enforce the regulations about the research processes, and determine the parameters for the subsequent use of research results. [91] Innovative technologies (and the standards they are based upon) must ultimately engage the regulatory practices at the national level to ensure the quality and safety of new products and services, especially those evolving through omics sciences. [92] Accordingly, there are plenty of examples of standards engaging the regulatory practices within omics science. For example, meta-data standards can be used to capture the needs of those working in environmental omics, especially if these experiments are to be used in regulation and policy (e.g. chemicals management). [93] Additionally, there are plenty of examples of standards for metabolomic and metabonomic studies, thereby addressing the significance of standards for policymakers, scientific agencies, regulatory agencies, and funding agencies. [94]

Through the New Approach, standardisation becomes a part of the regulatory framework. There are plenty of Directives that specify essential requirements for products to be allowed to the EU market but where the technical specifications are described via related harmonised standards; the essential requirements typically address several aspects, such as occupational health and safety, information security, environmental/consumer protection, etc. [95]

To learn more about the New Approach, please see the following link:

- https://single-market-economy.ec.europa.eu/single-market/goods/new-legislative-framework_en

[91] Holmes, C., McDonald, F., Jones, M., Ozdemir, V., & Graham, J. E. (2010). Standardisation and omics science: Technical and social dimensions are inseparable and demand symmetrical study. OMICS A Journal of Integrative Biology, 14(3), 327–332, https://doi.org/10.1089/omi.2010.0022.

[92] Ibid.

[93] Morrison, N., Wood, A. J., Hancock, D., Shah, S., Hakes, L., Gray, T., ... & Field, D. (2006). Standard annotation of environmental OMICS data: application to the transcriptomics domain. Omics: a journal of integrative biology, 10(2), 172-178.

[94] Fiehn, O., Kristal, B., Ommen, B. V., Sumner, L. W., Sansone, S. A., Taylor, C., ... & Kaddurah-Daouk, R. (2006). Establishing reporting standards for metabolomic and metabonomic studies: a call for participation. Omics: a journal of integrative biology, 10(2), 158-163.

[95] CEN/CENELEC. (2025). Get Involved: Research and Innovation, Accessed on 20.02.2025. Retrieved from: https://www.cencenelec.eu/get-involved/research-and-innovation.

SUMMARY

There are many reasons why researchers need standards and standardisation and how they could benefit of using standards and from participating in standards development (via technical committees). However, symbiosis among research, industres, and standardisation is not well documented in many areas, sectors, or disciplines, especially since there are no empirical studies. What do we know so far about the benefits of the use of standards and from participating in standards development? Here, we offer you some answers –

- standards ensure the quality and interoperability of research processes;
- standards ensure the safety of research results;
- standards prevent researchers from ''reinventing the wheel'';
- standards ensure and promote common best-practice solutions;
- standardisation helps researchers to achieve common agreements leading to interoperability, compatibility, and terminology
- standardisation enhances scientific co-operation, networking, and learning;
- standardisation shapes practices that lead to innovation;
- standardisation can be a tool used to convert research results to innovative technologies, products, and services;
- standardisation ensures the commercialisation of research results;
- standardisation ensures the subsequent use of research results; and
- standardisation can be a tool used to support the regulatory framework.

BIBLIOGRAPHY

Amendt, J., Campobasso, C. P., Gaudry, E., Reiter, C., LeBlanc, H. N., & Hall, M. J. (2007). Best practice in forensic entomology – standards and guidelines. International Journal of Legal Medicine, 121(2), 90-104, https://doi.org/10.1007/s00414-006-0086-x.

An, F., Earley, R., & Green-Weiskel, L. (2011). Global overview on fuel efficiency and motor vehicle emission standards: policy options and perspectives for international cooperation. United Nations Background Paper 3, 3.

Auer, A., & Jarmai, K. (2017). Implementing responsible research and innovation practices in SMEs: Insights into drivers and barriers from the Austrian medical device sector. Sustainability, 10(1), 17, https://doi.org/10.3390/su10010017.

Bahrami, S., Atkin, B., & Landin, A. (2019). Innovation diffusion through standardisation: A study of building ventilation products. Journal of engineering and technology management, 54, 56-66.

Baker, D., Simons, E., & Brown, J. (2014). The various aspects of Interoperability: A strategic partnership driving interoperability in research information through standards.

Biddle, B., White, A., & Woods, S. (2010). How many Standards in a Laptop? (and other empirical questions), in ITU-T Beyond the Internet? – Innovations for future networks and services Kaleidoscope Conference. Accessed on 20.02.2025. Retrieved from: https://papers.ssrn.com/sol3/Delivery.cfm/SSRN_ID1703470_code409697.pdf?abstractid=1619440&mirid=1.

Blind, K. (2013). The Impact of Standardisation and Standards on Innovation. Nesta Working Paper 13/15, 13(15).

Blind, K. & Gauch, S. (2009). Research and standardisation in nanotechnology: Evidence from Germany. Journal of Technology Transfer, 34(3), 320–342, https://doi.org/10.1007/s10961-008-9089-8.

Blind, K., Pohlisch, J., & Zi, A. (2018). Publishing, patenting, and standardisation: Motives and barriers of scientists. Research Policy, 47(7), 1185-1197, https://doi.org/10.1016/j.respol.2018.03.011.

Burland, T., & Grout, C. (2017). Standards and Interoperability: How Jisc's Work Supports Reporting, Communicating and Measuring Research in the UK. Procedia Computer Science, 106, 276-282.

CEN/CENELEC. (2025). Get Involved: Research and Innovation, Accessed on 20.02.2025. Retrieved from: https://www.cencenelec.eu/get-involved/research-and-innovation.

CEN/CENELEC (2022). CEN/CENELEC Guide 39 - The role of standards in support of Technology Transfer, Accessed on 20.02.2025. Retrieved from: https://www.cencenelec.eu/media/Guides/CEN-CLC/cenclcguide39.pdf.

CEN/CENELEC (2011). STAIR: an integrated approach for standardisation, innovation and research. Accessed on 20.02.2025. Retrieved from: https://www.iso.org/sites/edumaterials/STAIR.pdf.

Cihon, P. (2019). Standards for AI governance: international standards to enable global coordination in AI research & development. Future of Humanity Institute. University of Oxford.

Di Martino, B. (2014). Applications Portability and Services Interoperability among Multiple Clouds, IEEE Cloud Computing, 1(1), 74–77, https://doi.org/10.1109/MCC.2014.1.

euroCRIS (2025). euroCRIS. Accessed on 20.02.2025. Retrieved from: https://eurocris.org.

Fiehn, O., Kristal, B., Ommen, B. V., Sumner, L. W., Sansone, S. A., Taylor, C., ... & Kaddurah-Daouk, R. (2006). Establishing reporting standards for metabolomic and metabonomic studies: a call for participation. Omics: a journal of integrative biology, 10(2), 158-163.

Girard, M. (2020). We Need Standards for Digital Cooperation to Occur. IEEE Technology and Society Magazine, 39(2), 68-74, https://doi.org/10.1109/MTS.2020.2991501.

Halpin, M. (2012). The Impact of Standards [Standards]. IEEE Industry Applications Magazine, 19(1), 104-105.

Hatto, P. (2013). Standards and standardisation: A practical guide for researchers. Luxembourg: European Commission, Publications Office of the European Union (EU).

Hollmann, S., Kremer, A., Baebler, Š., Trefois, C., Gruden, K., Rudnicki, W. R., ... & D'Elia, D. (2020). The need for standardisation in life science research - an approach to excellence and trust. F1000Research, 9.

Holmes, C., McDonald, F., Jones, M., Ozdemir, V., & Graham, J. E. (2010). Standardisation and omics science: Technical and social dimensions are inseparable and demand symmetrical study. OMICS A Journal of Integrative Biology, 14(3), 327–332, https://doi.org/10.1089/omi.2010.0022.

Hung, P. T. (2010). Economic Aspects of Standardisation. In Hesser W., Feilzer A., de Vries H. (Eds.), Standardisation in Companies and Markets (3rd Ed.), Helmut Schmidt University, ISBN: 978-3-940385-97-0, pp. 88.

Jiang, H., Zhao, S., Yuan, Y., Zhang, L., Duan, L., & Zhang, W. (2018). The coupling relationship between standard development and technology advancement: A game theoretical perspective. Technological Forecasting and Social Change, 135, 169-177, https://doi.org/10.1016/j.techfore.2017.11.018.

Khan, A., Minokuchi, A., Tsubouchi, K., Kunito, G., & Iwashina, S. (2019). Technology and standards accelerating 5G commercialisation. IEICE Transactions on Communications, 102(3), 410-417.

Lee, E., Seo, Y. D., Oh, S. R., & Kim, Y. G. (2021). A Survey on Standards for Interoperability and Security in the Internet of Things. IEEE Communications Surveys & Tutorials, 23(2), 1020-1047.

Lehne, M., Sass, J., Essenwanger, A., Schepers, J., & Thun, S. (2019). Why digital medicine depends on interoperability. NPJ digital medicine, 2(1), 1-5.

Lessmann, K., & Edenhofer, O. (2011). Research cooperation and international standards in a model of coalition stability. Resource and Energy Economics, 33(1), 36-54.

Mijatovic, I., Horvat, A., & Krsmanovic, M. (2014). Academics' and Researchers' Participation in the National Technical Committees In Serbia. In Proceedings of 19th EURAS Annual Standardisation Conference Cooperation among standardisation organisations and the scientific and academic community (pp. 135–147). Belgrade, Serbia. ISBN: 978-3-86073-305-2.

Morrison, N., Wood, A. J., Hancock, D., Shah, S., Hakes, L., Gray, T., ... & Field, D. (2006). Standard annotation of environmental OMICS data: application to the transcriptomics domain. Omics: a journal of integrative biology, 10(2), 172-178.

National Technical Committees In Serbia. In Proceedings of 19th EURAS Annual Standardisation Conference Cooperation among standardisation organisations and the scientific and academic community (pp. 135–147). Belgrade, Serbia. ISBN: 978-3-86073-305-2.

Porter, C. H., Villalobos, C., Holzworth, D., Nelson, R., White, J. W., Athanasiadis, I. N., ... & Jones, J. W. (2014). Harmonization and translation of crop modelling data to ensure interoperability. Environmental Modelling & Software, 62, 495-508, https://doi.org/10.1016/j.envsoft.2014.09.004.

Radauer, A., Baronowski, S., Yeghyan, M., et al. (2022), Scoping study for supporting the development of a code of practice for researchers on standardisation: Final Report, Tardos, G. (Ed.), European Commission, Directorate-General for Research and Innovation, Publications Office of the European Union, https://data.europa.eu/doi/10.2777/567608.

Rashba, E., & Gamota, D. (2003). Anticipatory standards and the commercialisation of nanotechnology. Journal of Nanoparticle Research, 5(3), 401-407.

Reyes, D. R., van Heeren, H., Guha, S., Herbertson, L., Tzannis, A. P., Ducrée, J., ... & Becker, H. (2021). Accelerating innovation and commercialisation through standardisation of microfluidic-based medical devices. Lab on a Chip, 21(1), 9-21.

Sittner, B. J., Aebersold, M. L., Paige, J. B., Graham, L. L., Schram, A. P., Decker, S. I., & Lioce, L. (2015). INACSL standards of best practice for simulation: past, present, and future. Nursing education perspectives, 36(5), 294-298.

Stroyan, J., & Brown, N. (2012). Using standards to support growth, competitiveness and innovation: A smart guide on promoting and facilitating SME competitiveness through the development and use of standards with the help of EU structural funds. In Guidebook Series: How to Support SME Policy from Structural Funds. Office for Official Publications of the European Union, Luxembourg, European Union, https://doi.org/10.2769/42198.

Swann G.M.P., & Lambert R. (2017). Standards and innovation: A brief survey of empirical evidence and transmission mechanisms. In the Handbook of innovation and standards, Hawkins R., Blind K., & Page R. (Eds), pp. 24, Edward Elgar Publishing, Inc. Northampton Massachusetts, USA.

Taylor, C. F., Hermjakob, H., Julian Jr, R. K., Garavelli, J. S., Aebersold, R., & Apweiler, R. (2006). The work of the human proteome organisation's proteomics standards initiative (HUPO PSI). Omics: a journal of integrative biology, 10(2), 145-151, https://doi.org/10.1089/omi.2006.10.145.

Urpelainen, J. (2010). Enforcing international environmental cooperation: Technological standards can help. The Review of International Organisations, 5(4), 475-496.

Viant, M. R., Ebbels, T. M. D., Beger, R. D., Ekman, D. R., Epps, D. J. T., Kamp, H., ... & Weber, R. (2019). Best practice and reporting standards for applications of metabolomics in regulatory toxicology. Nat. Commun., 10.

Yu, K., Qian, C., & Chen, J. (2022). How does intelligent manufacturing reconcile the conflict between process standards and technological innovation?. Journal of Engineering and Technology Management, 65, 101698.

Zhou, X., Shan, M., & Li, J. (2018). R&D Strategy and Innovation Performance: The role of Standardisation. Technology Analysis & Strategic Management, 30(7), 778-792.

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