



ILNAS

TECHNICAL STANDARDIZATION

INFORMATION AND COMMUNICATION TECHNOLOGIES

ONE JOURNEY IN APPLYING AND SHAPING
ISO/IEC JTC 1 STANDARDS

Version 1.0 · October 2026

ISBN 978 99987 734 8 6





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Institut Luxembourgeois de la
Normalisation, de l'Accréditation, de la
Sécurité et qualité des produits et services

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Introduction

Information and communication technologies are advancing faster than ever, changing how companies work, how government provides services to citizens, how researchers innovate, and how individuals engage with the digital realm. While these developments open up new opportunities, they also bring numerous challenges for providing interoperability, security, reliability, sustainability, and trust within technological ecosystems.

In this context, technical standards play a key role, particularly at international level. The technical committee ISO/IEC JTC 1 “Information Technology” is one of the most important for providing standards covering various Information and Communication Technology (ICT) areas, such as artificial intelligence, cybersecurity, cloud computing, data management, biometrics, Internet of Things, brain-computer interfaces, and numerous other innovative technologies.

Engaging actively in these standardization efforts provides substantial advantages to organizations. It allows stakeholders to foresee technological advancements, share their knowledge in creating international standards, impact upcoming market rules, and obtain early awareness of evolving technical requirements.

In this frame, this document seeks to highlight the strategic importance of being involved in ICT standardization efforts and aims at increasing national stakeholders’ participation in standardization through imaginary interviews conducted by a fictive journalist writing an article about Luxembourg’s role in ICT standardization, with an emphasis on ISO/IEC JTC 1.

The organizations, individuals, positions, statements, opinions, experiences, and examples described throughout the interviews have been created solely for illustrative and educational purposes. While the sectors, types of organizations, and ISO/IEC JTC 1 information presented reflect real standardization activities, the interviews themselves do not represent actual testimonials, real participation cases, official positions, or existing projects unless explicitly stated otherwise.

This approach aims to offer readers practical examples on how various groups of Luxembourg stakeholders could benefit from being engaged in international ICT standardization efforts within ISO/IEC JTC 1. These interviews seek to demonstrate the range of motivations, opportunities, and impacts related to standardization participation by showcasing various viewpoints from public authorities, researchers, startups, small and medium-sized enterprises, and other organizations.

Indeed, even if many organizations apply standards in their business, they often miss knowledge about the standards development process and the possibility to participate in this global effort. Involvement in standardization is not limited to large companies, and, as illustrated in this document, many other types of organizations can significantly contribute to the development of future standards.

Through the different interviews, this document notably aims to illustrate that engagement in ISO/IEC JTC 1 can:

- Offer insight into technological trends and new innovations.
- Support strategic decision-making, notably in regard to regulatory compliance.
- Enhance interoperability and expand market access.
- Foster global cooperation and connections.
- Enable organizations in Luxembourg to participate directly in shaping international standards.

To conduct these interviews, we meet again with the imaginary tech journalist Ms. Gladys Nanncrelo, who already interviewed a cryptography engineering company in our previous report "[Cybersecurity: one-company's journey in applying and shaping technical standards](#)". She asks questions to representatives of the different organizations included in this report: Dr. Jean-Philippe Humbert (Deputy Director at ILNAS), Ms. Carole Nanjenn (Public Policy Consultant at a private consulting firm), Mr. Luis Corceca (Supply Chain Manager in a SME), Dr. Coralie Mkavitz (Senior Researcher in a research center) and Mr. Romeo Jederhlo (CEO of a Startup).

In addition, FACT BOXES are added in the text to provide additional factual and practical information related to the topic at hand in the interviews.

IMPORTANT DISCLAIMERS

The individuals and organizations presented in this publication are purely imaginary, except Dr. Jean-Philippe Humbert in the ILNAS interview. Any resemblance to real-world individuals or entities is purely accidental.

ILNAS – The Luxembourg's National Standards Body

Ms. Gladys Nanncrelo (GN, Interviewer): We appreciate you taking the time to talk with us today. Could you provide an overview of ILNAS and describe its missions related to standardization?

Dr. Jean-Philippe Humbert (JPH, Deputy Director): With pleasure. The *Institut luxembourgeois de normalisation, d'accréditation, de sécurité et de qualité des produits et services* (ILNAS) is a public administration under the authority of the Minister of the Economy, SME, Energy and Tourism. One of its legal missions, among others, is to serve as the National Standards Body of Luxembourg. In this context, we are implementing the [National Standardization Strategy 2024-2030](#) to enhance standardization efforts in Luxembourg. We notably represent Luxembourg in European and international standardization organizations and facilitate the participation of national experts in the development of standards. Standardization is a strategic tool that supports innovation, competitiveness, quality, safety, and trust across many sectors. In relation with the national strategy, we are currently focusing on three sectors and two transversal domains, namely Information and Communication Technologies (ICT), Construction, Aerospace, Conformity and Sustainability.

FACT BOX 1 – Standardization organizations

	General Standardization	Electrotechnical Standardization	Telecommunications Standardization
International	  INFORMATION TECHNOLOGY STANDARDS		
Europe			
National			

Standards-developing organizations recognized by the European Union (Regulation (EU) No 1025/2012) are: [ISO](#) (for general standardization), [IEC](#) (for electrotechnical standardization) and [ITU-T](#) (for telecommunications standardization) at the international level, while [CEN](#) (for general standardization), [CENELEC](#) (for electrotechnical standardization) and [ETSI](#) (for telecommunications standardization) are active at the European level. In addition, to prevent an overlap in standardization work related to information technology, ISO and IEC formed a Joint Technical Committee in 1987 known as [ISO/IEC JTC 1 Information technology](#). It has a leading role in ICT standardization with numerous working groups and technical subcommittees directly responsible for the development of ICT International Standards.

Each country also has one or more National Standards Bodies (NSBs) that represent that country in each of these organizations. For Luxembourg, the sole NSB is ILNAS. ILNAS' standardization department, the *Organisme luxembourgeois de normalisation*, or OLN, is the national market's gateway to standardization activities.

OLN can be contacted via email at normalisation@ilnas.etat.lu. More information can also be accessed on the [Portail-Qualité's standardization webpage](#).

GN: ICT is one of the sectors you are targeting through the current national strategy. ISO/IEC JTC 1 is frequently referenced in conversations regarding the standardization of digital technologies. What precisely is it?

JPH: ISO/IEC JTC 1 is a Joint Technical Committee established in 1987 by the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC), focusing on information technology. It is considered as one of the world's leading international committees for the development of ICT standards. It is composed of many subcommittees and working groups, covering a wide range of areas such as cybersecurity, artificial intelligence, cloud computing, data management, software engineering, biometrics, Internet of Things, digital twins, and many other digital technologies.

GN: What are the reasons for organizations and governments to focus on the efforts of ISO/IEC JTC 1?

JPH: Digital technologies inherently operate on a global scale. In the absence of universally accepted standards, systems would have difficulties communicating, secure data exchange would become more challenging, and innovation would be fragmented. ISO/IEC JTC 1 establishes a shared framework that facilitates interoperability, quality, security, and trust notably.

For instance, many world-acknowledged cybersecurity standards originate from ISO/IEC JTC 1/SC 27, which focuses on information security, cybersecurity, and privacy protection. These good practices assist organizations in managing risks, protecting information assets, and enhancing resilience to cyber threats.

GN: Could you elaborate on the specific benefits of participating in ISO/IEC JTC 1 for the Luxembourg's economy?

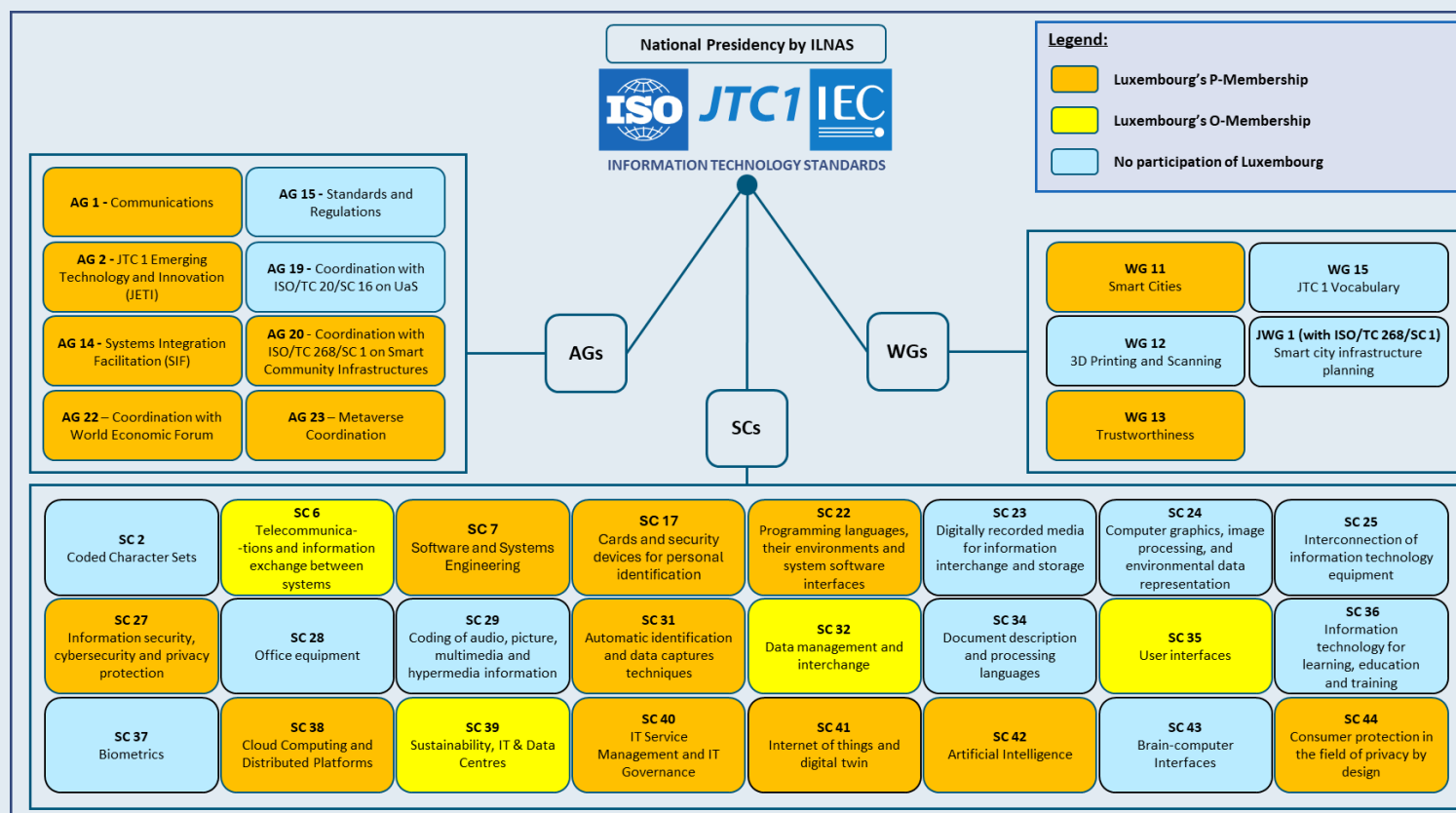
JPH: Luxembourg is recognized as a highly digital and internationally connected economy. Being part of ISO/IEC JTC 1 enables Luxembourg to remain up to date on new technological advancements and to actively participate in the development of upcoming international standards.

This engagement is especially crucial for key areas like financial services, cybersecurity, digital infrastructure, data-based innovation, and artificial intelligence. Through involvement in standardization efforts, experts from Luxembourg can contribute to defining the technical content of standards prior to their publication, allowing national interests and expertise to be taken into consideration.

GN: What about the role of standards in support to innovation? Can standardization really help to innovation?

JPH: Certainly! Some people have preconceived and erroneous ideas about standards, seeing them as barriers, but they often accelerate innovation. Standards offer a common language and technical basis that allow businesses and researchers to create compatible solutions and accelerate the introduction of new products on the market.

Concerning specifically the ICT sector, significant efforts are underway within ISO/IEC JTC 1 concerning recent and emerging technologies like metaverse applications, neuromorphic computing, digital twins... There is a specific Advisory Group (AG 2) on JTC 1 Emerging Technology and Innovation (JETI) for this purpose, which notably develops Technical Trend Reports (TTRs) aimed at identifying standardization needs for these new ICT areas. Such initiatives foster reliable environments where innovation can thrive.

FACT BOX 2 – ISO/IEC JTC 1 Structure and Luxembourg's memberships

[ISO/IEC JTC 1](#) is composed of 24 Subcommittees (SCs) and 5 Working Groups (WGs), in charge of developing standards for various ICT areas. Advisory Groups (AGs) are also created for specific needs, whether it is for the coordination of the standardization work or for transversal matters, like communication or identification of emerging technologies requiring further studies before being potentially included in JTC 1's program of work.

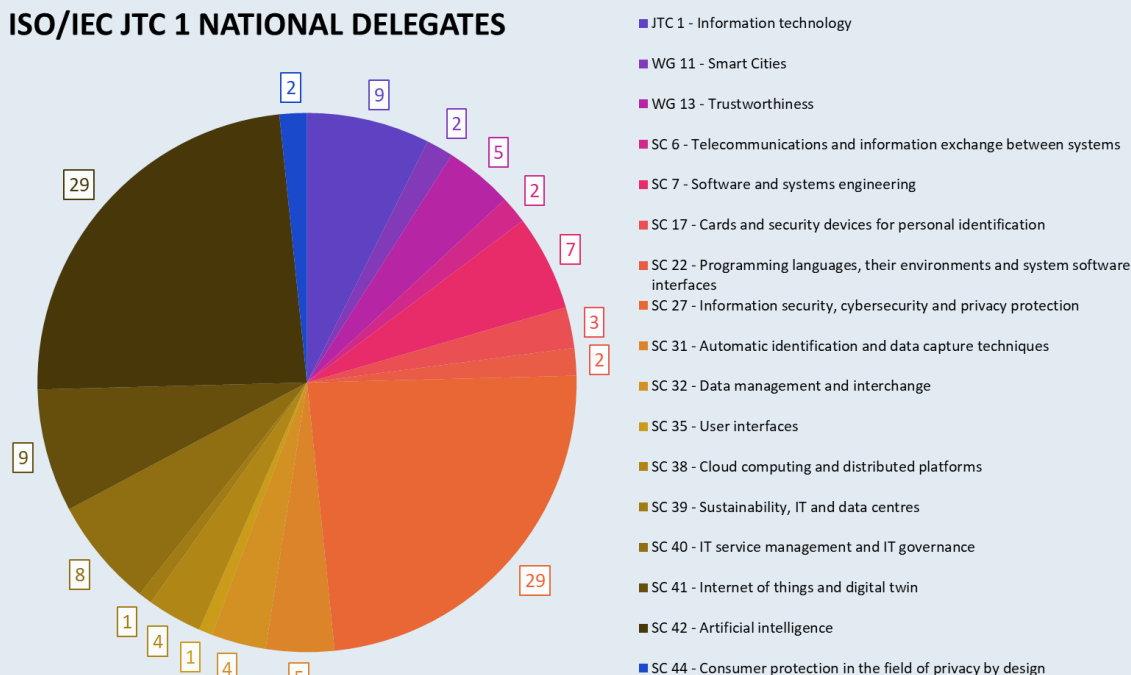
National Standards Bodies can become members of any SC, WG or AG, either as Participating-Members (P-Members) or Observing-Members (O-Members), reflecting their will to participate actively in the standardization work or to have more of a monitoring role. Luxembourg is currently a P-Member of ISO/IEC JTC 1, as well as in 10 of its SCs, while it is an O-Member of 4 SCs.

GN: Can you say more about Luxembourg's involvement in ICT standardization efforts?

JPH: ILNAS holds the presidency of the national mirror committee for ISO/IEC JTC 1 and facilitates national organizations' involvement, notably in its subcommittees. We currently have around 100 national delegates involved in ICT standardization (including 65 in ISO/IEC JTC1), which represents a lot if we compare this figure with the delegations of larger countries involved in ISO/IEC JTC 1. Representatives from Luxembourg, including ILNAS delegates, regularly participate in international meetings and technical discussions of ISO/IEC JTC 1. This involvement allows Luxembourg to share knowledge, keep up with technological developments, and encourage the uptake of relevant standards.

FACT BOX 3 – Luxembourg's involvement in ISO/IEC JTC 1 and its subgroups

ISO/IEC JTC 1 NATIONAL DELEGATES



65 national delegates are currently representing Luxembourg in ISO/IEC JTC 1 and its SCs/WGs. Most of them are participating in multiple SCs/WGs. At the time of writing, the committees garnering the most national interest are ISO/IEC JTC 1/SC 27 "Information security, cybersecurity and privacy protection" and ISO/IEC JTC 1/SC 42 "Artificial intelligence", with both SCs gathering 29 national delegates.

In Luxembourg, one can register as a national standardization delegate in any technical committee or subcommittee under ISO, IEC, ISO/IEC, CEN or CENELEC through ILNAS. The essential requirement is that one needs to represent a market actor registered in the Trade and Companies Register ([RCS](#)). Key to the application is that one must be technically competent in the field covered by the registration request. Note that participating in ITU-T and ETSI requires direct registration with those entities; see their respective websites for more information.

In the case of ISO, IEC, CEN, and CENELEC, if one commits to actively participate in standardization activities, registration through ILNAS is free-of-charge. Active participation comes in the form of a wide range of activities and levels of commitment. In short, involvement can go from simply reading and commenting on one project of interest to a stronger involvement, such as participating in meetings, joining editing teams or taking responsibilities in committee management. There is also the possibility of registering as a simple observer, however this requires payment of a fee.

Concretely, in order to join, the [ILNAS/OLN F001a form](#) needs to be filled out, signed, and sent to OLN via email. Afterwards, ILNAS evaluates the application and provides a response. More information pertaining to becoming and holding the role of national standardization delegate can be accessed [here](#).

GN: What message would you like to share with Luxembourg's organizations and experts? Would you have examples of organizations we could interview to continue our investigation?

JPH: Standards have a concrete influence on the digital landscape in which we must evolve every day. ISO/IEC JTC 1 has a great importance for establishing and maintaining the interoperability, security and reliability of ICT worldwide. In this frame, we encourage national stakeholders to participate in standardization efforts. Involvement is not just a way to keep up with technological advancements, but also an opportunity to shape the future of international ICT standards, and to meet the related community.

We will provide you the contact of different national organizations already involved in ISO/IEC JTC 1 standardization, in order to better understand the stakes of standardization in different contexts.

Contacts:

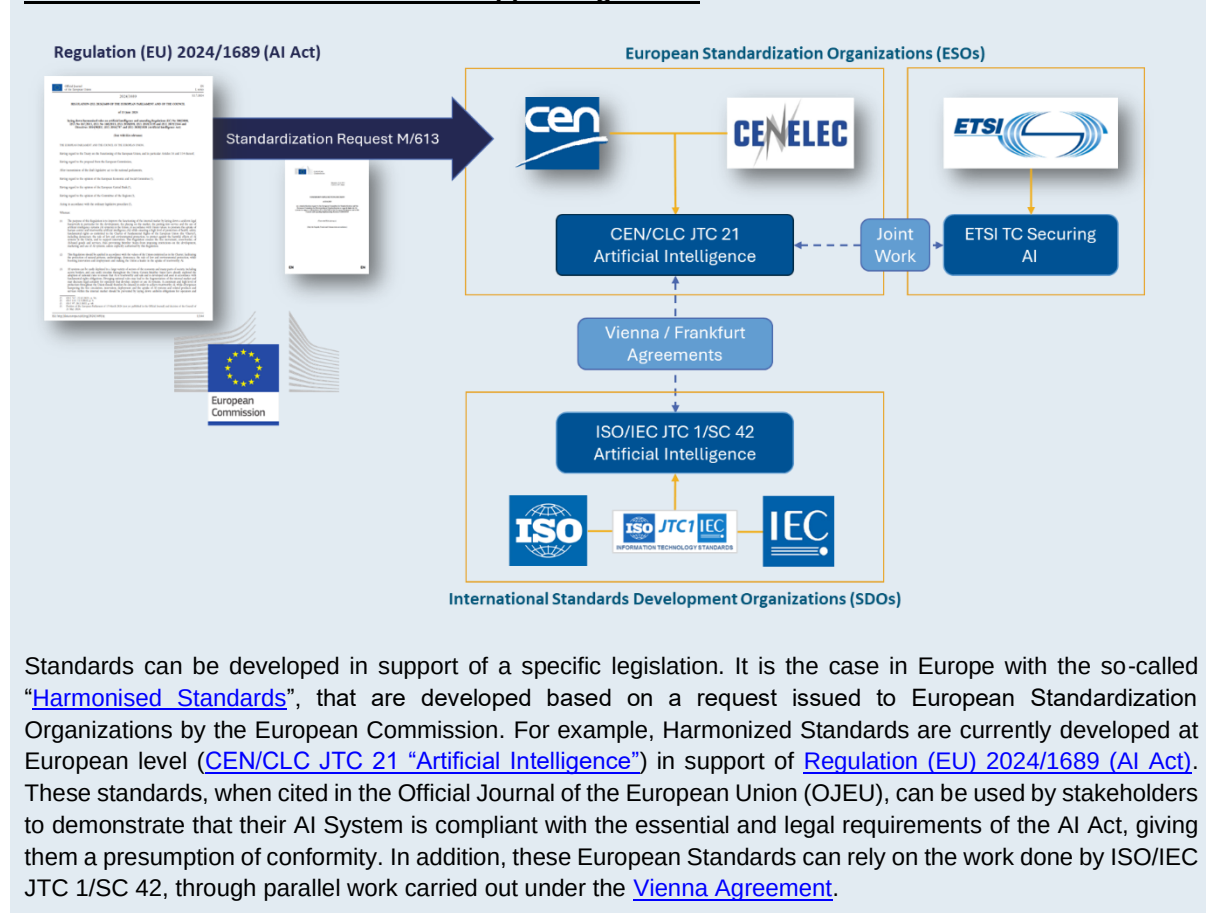
- Ms. Carole Nanjenn - Public Policy Consultant at a private consulting firm.
- Mr. Luis Corceca - Supply Chain Manager in a SME.
- Dr. Coralie Mkavittz - Senior Researcher in a research center.
- Mr. Romeo Jederhlo - CEO of a Startup.

Standardization as a strategic tool to support policymakers – Interview with a Public Policy consultant

Ms. Gladys Nanncrelo (GN, Interviewer): Thank you for welcoming us. You are a public policy consultant in a private consulting firm, closely working with the government for different ICT projects. I understand that you are specialized in standardization-related matters. Could you explain what exactly your role is?

Ms. Carole Nanjenn (CN, Public Policy Consultant): Yes, certainly. As you know, the fast advancement of digital technologies offers both opportunities and obstacles for public authorities. Regulators need to find a balance between encouraging innovation, safeguarding citizens, ensuring adherence to laws, and maintaining trust in digital services. I'm personally specialized in international standards, that play a crucial role in achieving this. I offer my advice to public authorities, so they can take informed decisions, in particular when it comes to technological choices. I also represent their interests in different technical committees.

FACT BOX 4 – How standards can support regulation



Standards can be developed in support of a specific legislation. It is the case in Europe with the so-called “[Harmonised Standards](#)”, that are developed based on a request issued to European Standardization Organizations by the European Commission. For example, Harmonized Standards are currently developed at European level ([CEN/CLC JTC 21 “Artificial Intelligence”](#)) in support of [Regulation \(EU\) 2024/1689 \(AI Act\)](#). These standards, when cited in the Official Journal of the European Union (OJEU), can be used by stakeholders to demonstrate that their AI System is compliant with the essential and legal requirements of the AI Act, giving them a presumption of conformity. In addition, these European Standards can rely on the work done by ISO/IEC JTC 1/SC 42, through parallel work carried out under the [Vienna Agreement](#).

GN: You explained to me that you are directly involved in the standardization efforts of ISO/IEC JTC 1/SC 42 related to Artificial Intelligence and that you are considering a participation in ISO/IEC JTC 1/SC 37 focusing on Biometrics. Why are these standardization activities important from a regulatory perspective?

CN: By engaging in international standardization committees, we obtain direct insights into technical knowledge, new trends, and effective practices globally. This allows us to better understand how

technologies evolve and how regulatory frameworks can make use of standards for ensuring compliance. ISO/IEC JTC 1 offers an excellent platform for this kind of question.

GN: Okay, so if we begin with artificial intelligence: What makes involvement in ISO/IEC JTC 1/SC 42 so significant for regulators?

CN: Artificial intelligence is currently transforming almost all sectors, including the public sector. Regulators are facing more questions regarding trust, transparency, accountability, risk management, data quality, and human oversight.

ISO/IEC JTC 1/SC 42 is the international subcommittee dedicated to AI standardization, and its activities encompass fundamental principles, oversight, risk assessment, reliability, data integrity, and industry-specific advice. Involvement allows regulators to better understand the technical implementation of AI systems and the practical impact of future standards on organizations and citizens.

From a regulatory perspective, standards can offer useful tools to assist with legal obligations. Furthermore, with the ongoing global evolution of AI governance frameworks, regulators require understanding of the technical strategies that organizations might employ to show compliance, manage risks, and adopt responsible AI practices.

FACT BOX 5 – ISO/IEC JTC 1/SC 42



SC 42 “Artificial Intelligence”

Scope:

Standardization in the area of Artificial Intelligence

- ☐ Serve as the focus and proponent for JTC 1's standardization program on Artificial Intelligence
- ☐ Provide guidance to JTC 1, IEC, and ISO committees developing Artificial Intelligence applications

Structure:

- ☐ WG 1 - Foundational standards
- ☐ WG 2 - Data
- ☐ WG 3 - Trustworthiness
- ☐ WG 4 - Use cases and applications
- ☐ WG 5 - Computational approaches and computational characteristics of AI systems
- ☐ JAG - AI and sustainability
- ☐ JWG 2 - Testing of AI-based systems
- ☐ JWG 3 - AI enabled health informatics
- ☐ JWG 4 - Functional safety and AI systems
- ☐ JWG 5 - Natural language processing systems
- ☐ JWG 6 - Conformity assessment schemes for AI systems
- ☐ JWG 7 - Artificial intelligence (Financial Services)



44 standards published

49 projects



Luxembourg's involvement:

- ☐ P-Membership
- ☐ 29 national delegates

More information: <https://www.iso.org/committee/6794475.html>

GN: You told me before the interview that you are also studying the possibility to participate in ISO/IEC JTC 1/SC 37 activities regarding Biometrics. What drives this interest?

CN: Biometrics is becoming more linked to numerous applications that utilize artificial intelligence. Facial recognition, voice recognition, behavioral biometrics, identity verification solutions, border control systems, and digital identity services are increasingly advanced and more broadly implemented.

As these technologies merge into digital ecosystems, policymakers require a more comprehensive understanding not just of AI systems, but also of the biometric technologies that underpin them.

ISO/IEC JTC 1/SC 37 oversees international standards concerning biometric technologies, which notably encompass biometric performance evaluation, interoperability, data formats and security aspects. These standards offer the technical basis for the creation and evaluation of reliable biometric systems.

FACT BOX 6 – ISO/IEC JTC 1/SC 37



JTC1



SC 37 “Biometrics”

Scope (extract):

Standardization of generic biometric technologies pertaining to human beings to support interoperability and data interchange among applications and systems.

Structure:

- ☐ WG 1 - Harmonized biometric vocabulary
- ☐ WG 2 - Biometric technical interfaces
- ☐ WG 3 - Biometric data interchange formats
- ☐ WG 4 - Technical Implementation of Biometric Systems
- ☐ WG 5 - Biometric testing and reporting
- ☐ WG 6 - Cross-Jurisdictional and Societal Aspects of Biometrics
- ☐ JWG 7 - Cybersecurity testing and evaluation of biometrics



142 standards published

28 projects



Luxembourg’s involvement:

- ☐ Not yet member

More information: <https://www.iso.org/committee/313770.html>

GN: If I understand correctly, AI and biometrics are becoming more intertwined?

CN: Oh, definitely. Nowadays, numerous biometric systems depend on sophisticated AI methods. For instance, facial recognition systems frequently utilize machine learning models to recognize and authenticate people. Similarly, voice recognition and behavioral biometrics technologies increasingly depend on AI algorithms.

Due to this convergence, regulators require insight into both areas. Engagement in SC 42 offers knowledge about AI governance and reliable AI systems, whereas involvement in SC 37 delivers expertise on biometric performance, interoperability, accuracy evaluation, and security standards.

When combined, these two domains offer a broader perspective on the developing digital identity and authentication landscapes.

GN: Digital trust is frequently mentioned as a key challenge. How can standards help in this context?

CN: Trust is indeed crucial for the effective integration and acceptance of new technologies. Citizens need to be assured that systems are secure, transparent, fair and that they are safeguarding their rights. International standards help in reaching this goal by offering shared technical methods for assessing performance, managing risks, enhancing interoperability, and addressing security and privacy issues. In this frame we are notably monitoring the work of two subcommittees, namely ISO/IEC JTC 1/SC 27 “Information security, cybersecurity and privacy protection” and ISO/IEC JTC 1/SC 44 “Consumer protection in the field of privacy by design”. The last one was created in 2025 and offers an interesting perspective with the development of consumer-centric standards for privacy.

From a regulatory point of view, international standards also help in establishing a common language among policymakers, technology providers, conformity assessment bodies, and users. It facilitates the understanding between all the parties and promote consistency across jurisdictions, reducing uncertainty for both citizens and organizations.

FACT BOX 7 – ISO/IEC JTC 1/SC 44



JTC1



SC 44 “Consumer protection in the field of privacy by design”

Scope:

Standardization of consumer protection in the field of privacy by design for products, goods and services, including their data lifecycles.

Structure:

- ☐ AG 2 - Communication group
- ☐ CAG - Advisory group
- ☐ WG 1 - High level requirements and foundational concepts



2 standards published
3 projects



Luxembourg’s involvement:

- ☐ P-Membership
- ☐ 2 national delegates

More information: <https://www.iso.org/committee/10778243.html>

GN: Could you give us examples of benefits this involvement offers to Luxembourg?

CN: Luxembourg is a highly digitalized economy with strong ambitions in digital innovation, cybersecurity, digital trust, and data-driven services. International interoperability is critical for a country that is deeply integrated into European and international markets.

Instead of just implementing international standards once they are released, Luxembourg can participate in their preparation. This ensures that our national viewpoints, regulatory focuses, and practical experiences are considered throughout the development process.

In our view, one of the greatest opportunities consists in strengthening the link between innovation, standardization, and regulation. For example, if we consider the ongoing advancement of AI and biometric technologies, which is currently my main focus, it is crucial for policymakers to guarantee that innovation progresses in a way that is safe, reliable, and in accordance with societal norms. International standardization offers a unique platform for governments, researchers, industry professionals, and civil society to work together toward this objective.

How standardization strengthens supply chain management – Interview with a Luxembourg SME

Ms. Gladys Nanncrelo (GN, Interviewer): We greatly appreciate the opportunity to discuss with you today! Could you please begin by presenting your company and explaining the significance of standardization for your business?

Mr. Luis Corceca (LC, Supply Chain Manager): Of course! Thank you for visiting us. We are a team of 74 people engaged in supply chain and logistics management, where effective tracking, traceability, and visibility of products are essential. For us, standardization is not an abstract idea. It directly influences our everyday activities, ranging from inventory control and supplier collaboration to product monitoring and customer support.

Using globally accepted standards allows us to guarantee that our systems can communicate efficiently with suppliers, partners and customers. This reduces complexity, enhances efficiency, and helps us in staying competitive in global markets.

GN: Many people associate standards only with compliance. What is your perspective and what value do they bring to your company?

LC: While compliance is indeed one element, the advantages extend far beyond that. Standards establish common technical specifications and shared good practices that minimize confusion and integration expenses.

Resources are frequently constrained for SMEs. We cannot bear the expense of creating tailored solutions for each customer or supplier. Standardized methods enable us to create scalable systems that function across various organizations and countries.

This is especially crucial in supply chain management, where information needs to transfer smoothly among various stakeholders. Standards facilitate the consistent identification, tracking, and exchange of products, assets, and data across the value chain.

GN: Your organization participates in ISO/IEC JTC 1/SC 31. Could you clarify the role of this subcommittee?

LC: ISO/IEC JTC 1/SC 31 is dedicated to Automatic Identification and Data Capture (AIDC) technologies, such as barcodes, RFID, real-time location systems, and various identification technologies applied across supply chains. These technologies establish the basis for monitoring products, assets, and deliveries throughout intricate logistics systems.

These standards are essential for a supply chain company. They allow products to be recognized and monitored consistently, no matter the country, supplier, warehouse, or logistics provider involved.

By being involved, we obtain early insights into emerging trends and can offer valuable operational expertise to international standardization efforts.

FACT BOX 8 – ISO/IEC JTC 1/SC 31**JTC1****SC 31 “Automatic identification and data capture techniques”****Scope:**

Standardization of data formats, data syntax, data structures, data encoding, and technologies for the process of automatic identification and data capture and of associated devices utilized in inter-industry applications and international business interchanges and for mobile applications.

Structure:

- ☐ WG 1 - Data carrier
- ☐ WG 2 - Data and structure
- ☐ WG 4 - Radio communications
- ☐ WG 8 - Application of AIDC standards



141 standards published
15 projects

**Luxembourg's involvement:**

- ☐ P-Membership
- ☐ 5 national delegates

More information: <https://www.iso.org/committee/45332.html>

GN: In what ways do these standards impact your daily operations?

LC: The effect is significant. Standardized identification technologies assist us in many ways, like the enhancement of the products' traceability, the minimization of human error, as well as the improvement of customer satisfaction by providing better shipment visibility.

When all stakeholders utilize compatible standards for product identification and data sharing, operational efficiency is significantly enhanced. Rather than allocating resources to address interoperability issues, we can concentrate on innovation and service quality.

GN: Your organization also participates in ISO/IEC JTC 1/SC 41. What is the purpose of this subcommittee and why does this matter?

LC: ISO/IEC JTC 1/SC 41 oversees the standardization of technologies related to the Internet of Things (IoT) and Digital Twin. The committee establishes guidelines that facilitate interconnected devices, sensor networks, intelligent monitoring systems, and digital models of tangible assets.

With the growing digitalization of supply chains, simple identification is no longer sufficient. Companies seek immediate data on product placement, environmental factors, equipment functionality, and shipping conditions. IoT technologies enable this by linking physical assets with digital systems.

FACT BOX 9 – ISO/IEC JTC 1/SC 41**JTC1****SC 41 “Internet of Things and Digital Twin”****Scope:**

Standardization in the area of Internet of Things and Digital Twin, including their related technologies.

- ☐ Serve as the focus and proponent for JTC 1's standardization programme on the Internet of Things and Digital Twin, including their related technologies.
- ☐ Provide guidance to JTC 1, IEC, ISO and other entities developing Internet of Things and Digital Twin related applications.

Structure:

- ☐ WG 3 - IoT Foundational Standards
- ☐ WG 4 - IoT Interoperability
- ☐ WG 5 - IoT Applications
- ☐ WG 6 - Digital Twin
- ☐ WG 7 - Maritime, underwater IoT and Digital Twin applications
- ☐ JWG 17 - System interface between industrial facilities and the smart grid
- ☐ JWG 24 - IIoT applications in power systems management
- ☐ JWG 29 - Industrial Automation Product Data
- ☐ JWG 32 - Maritime and Underwater IoT Effects on Environment and Ecology
- ☐ JWG 33 - Embodied IoT Systems linked to SyC BDC



57 standards published

44 projects

**Luxembourg's involvement:**

- ☐ P-Membership
- ☐ 9 national delegates

More information: https://www.iec.ch/dyn/www/f?p=103:7:0::::FSP_ORG_ID,FSP_LANG_ID:20486,25

GN: In what ways do the functions of SC 31 and SC 41 enhance or complement one another?

LC: They complement each other very well. SC 31 assists in addressing the inquiry: "What product are we monitoring?" when SC 41 assists in providing answers to: "What is going on with that item at the moment?".

A product might be recognized via a standardized RFID tag created within the framework endorsed by SC 31 standards. SC 41's IoT sensors and digital twin technologies can deliver real-time data regarding location, temperature, humidity, vibration, or handling conditions during transportation.

Together, these standards provide a comprehensive visibility throughout increasingly complex supply chains.

GN: The resilience of supply chains has emerged as a significant issue. In what ways can standards be beneficial?

LC: Recent worldwide disruptions have highlighted the significance of transparency and robustness across supply chains. Standardized identification and IoT solutions allow organizations to track assets more efficiently, detect bottlenecks more swiftly, and react more quickly to unexpected events. Moreover, improved monitoring and data gathering aid in achieving sustainability goals. Businesses can enhance transportation paths, minimize waste, maximize resource efficiency, and track environmental performance with greater precision. Standards offer the essential framework required for exchanging dependable information throughout entire value chains.

GN: Certain SMEs might believe that participation in standardization only offers a return of investment to big companies. What would you tell them?

LC: That is a widespread misunderstanding. Indeed, SMEs frequently gain significant advantages from engaging in standardization. Standardization offers an open and widely recognized technical frameworks that limit market fragmentation.

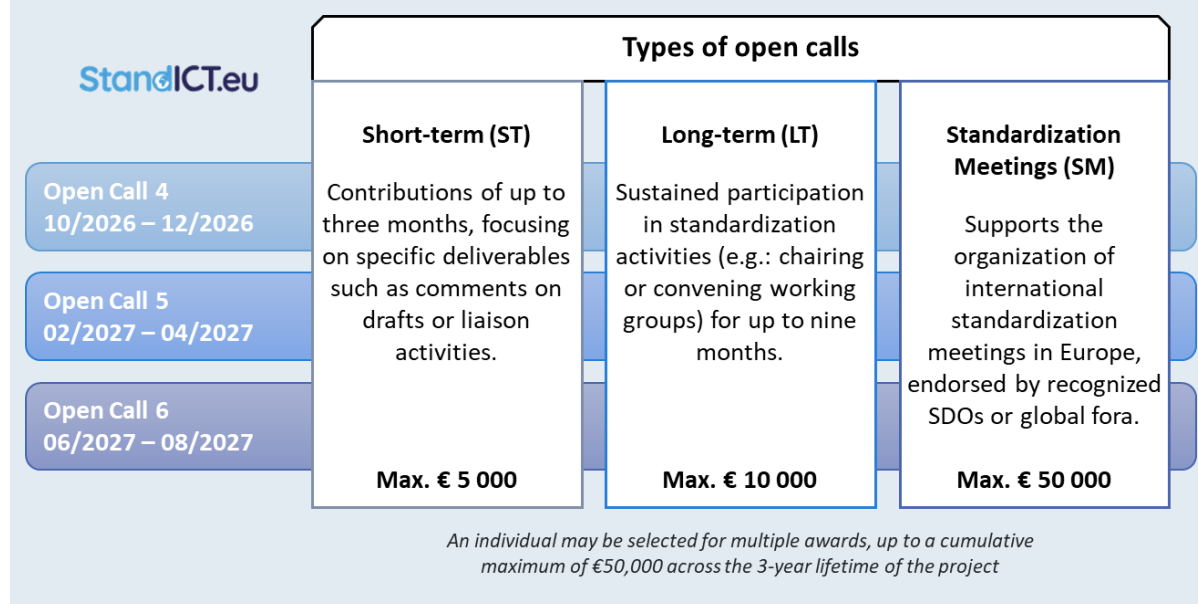
Involvement also offers important entry to worldwide networks of specialists, clients, vendors, authorities, and technology providers. It enables SMEs to anticipate upcoming market trends and impact standards that could directly relate to their operations. When participating, organizations can influence the content of standards from the beginning and ensure their business is in line with the upcoming publications instead of having to adapt their practices after they have been delivered.

Moreover, we benefit from European funding, allowing some of our engineers to participate in international meetings and allocate time for contributing to standards projects. This represents a good opportunity for SMEs, which do not always have resources for being actively involved in standardization.

FACT BOX 10 – Funding for participation in standardization

Participation in standardization is free of charge in Luxembourg. However, active involvement necessitates time and can require a regular participation in meetings all around the world. In this frame, various initiatives have been launched at European level to encourage and facilitate the participation of experts in international standardization. It is notably the case through different projects under the umbrella of the Horizon Europe funding program.

One of the most important projects for ICT standardization is [StandICT.eu 2029](#), which proposes three types of open calls to support European standardization experts and reinforces EU's role in ICT standardization. In total, StandICT.eu 2029 will organize 6 funding cycles (3 of them still to be run).



GN: From your SME perspective, can you tell me how does participation in international standardization benefit to you?

LC: The economy of Luxembourg is very global, which makes cross-border collaboration and interoperability especially vital. Being part of international subcommittees like ISO/IEC JTC 1/SC 31 and ISO/IEC JTC 1/SC 41 allows Luxembourg businesses to influence globally acknowledged standards and stay updated with the latest advancements in supply chain technologies. It represents a great opportunity to enhance competitiveness while strengthening Luxembourg's position and influence in global digital and logistics networks.

GN: To conclude, what would be your main takeaway, based on your standardization experience?

LC: Standardization should be considered as a strategic business asset instead of a constraint. In supply chain management, standards established by ISO/IEC JTC 1/SC 31 and ISO/IEC JTC 1/SC 41 contribute to set up interoperable, efficient, resilient, and intelligent supply networks. By being engaged in these activities, SMEs can directly have an impact on the technologies that will influence the future of logistics and digital supply chains.

Advancing Brain-Computer Interface innovation through standardization – Interview with a Luxembourg Researcher

Ms. Gladys Nanncrelo (GN, Interviewer): Thank you so much for receiving us today! Could you share a bit about your research and provide details on the projects you're participating in?

Dr. Coralie Mkavittz (CM, Senior Researcher): I appreciate the invitation. I work as a researcher in Luxembourg, focusing on brain-computer interfaces (BCIs) within a Horizon Europe research project. Our consortium regroups universities, research institutions, healthcare organizations, and industrial collaborators from throughout Europe to create advanced BCI technologies aimed at improving communication, rehabilitation, human-machine interaction, and accessibility.

Brain-computer interfaces are systems that facilitate direct interaction between the human brain and external devices through the interpretation of neural signals. They represent, in our opinion, one of the most promising fields of emerging digital technology, with many potential use cases going from assistive devices for individuals with disabilities to sophisticated industrial and healthcare solutions.

GN: How do you explain the high level of interest in BCIs at present?

CM: Numerous technological developments have come together in recent years. Advancements in neuroscience, artificial intelligence, signal processing, wearable sensors, and computational capabilities have greatly contributed to BCI progression. What was primarily restricted to research labs is gradually transitioning to practical applications. There is an increasing interest in healthcare, neurorehabilitation, education, gaming, and many other areas. With the advancement of these technologies, it becomes more crucial to guarantee interoperability, reliability, safety, and trust. This is the point at which standardization plays a crucial role.

GN: Indeed, you told me you are involved in the subcommittee ISO/IEC JTC 1/SC 43. Can you provide more details about the activities of the SC?

CM: ISO/IEC JTC 1/SC 43 is focused on Brain-Computer Interfaces and acts as the primary global platform for creating standards in this new area. It covers subjects like terminology, architectures, interoperability, performance assessment, data sharing, and various technical principles essential for the consistent and reliable advancement of BCI technologies. The subcommittee gathers specialists from academia, industry, government, and global research institutions to create shared frameworks that facilitate innovation and implementation.

FACT BOX 11 – ISO/IEC JTC 1/SC 43**JTC1****SC 43 “Brain-computer interfaces”****Scope:**

Standardization in the area of Brain-computer Interfaces for information technology to enable communication and interaction between brain and computers that are applicable across application areas.

- ☐ Serve as the focus and proponent for JTC 1's standardization program on Brain-computer Interfaces, including the development of foundational standards;
- ☐ Provide guidance on Brain-computer Interfaces to JTC 1, IEC, ISO, and other entities developing applications of BCI.

Excluded: standards for human implants and medical applications.

Structure:

- ☐ WG 1 - Foundational standards
- ☐ WG 2 - Applications
- ☐ WG 5 - BCI Data
- ☐ WG 9 - Ethics and Trustworthiness
- ☐ WG 11 - Responsible use of BCI



4 standards published

17 projects

**Luxembourg's involvement:**

- ☐ Not yet member

More information: https://www.iec.ch/dyn/www/f?p=103:7:0:::FSP_ORG_ID,FSP_LANG_ID:28794,25

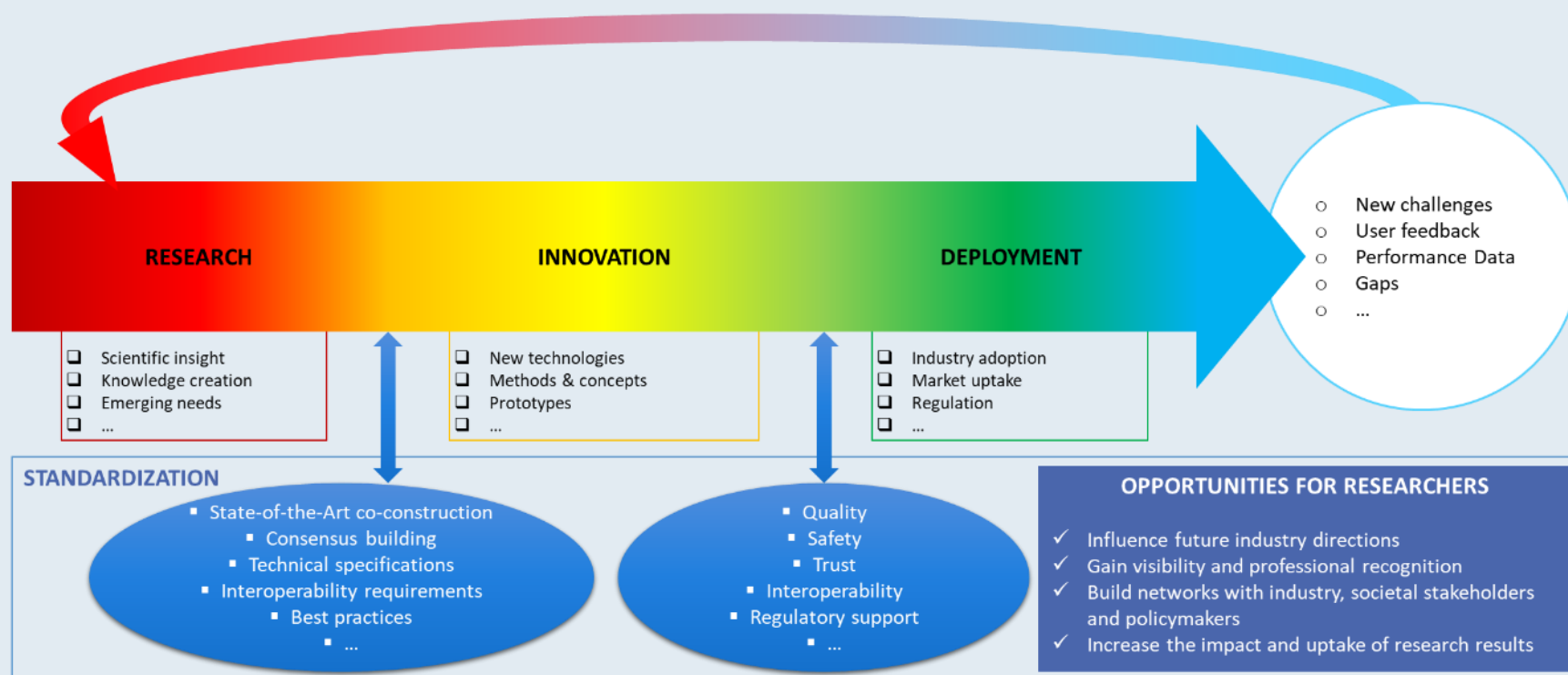
GN: Many people believe that standardization primarily serves the industrial sector. Why is it important for you, as a researcher, to be involved in this work?

CM: Research and standardization can benefit from each other. Researchers frequently lead the way in recognizing new challenges, technological constraints, and potential opportunities ahead. By engaging in standardization activities, we can disseminate scientific knowledge and guarantee that upcoming standards represent the current state of the art.

In parallel, standardization helps researchers in gaining a clearer insight into the practical requirements of industries, healthcare providers, regulatory bodies, and end users. This establishes an important feedback cycle between theoretical research and real-life implementations. Moreover, involvement in standardization enables research results to extend their influence beyond academic papers.

FACT BOX 12 – Links between research, innovation and standardization

Research and standardization mutually benefit from each other. From fundamental research activities to the deployment of new technologies, standardization can help in multiple ways. For example, it will help in codifying the knowledge created by research, accelerating the transformation of research outputs into market and societal impact, while ensuring quality, safety, interoperability or trust in upcoming new technologies. Standardization activities also highly benefit from research results since they rely on scientific evidence and emerging technological developments.



ISO/IEC JTC 1 gathers many researchers, notably in emerging ICT fields like Brain-Computer Interfaces, and participation in standardization notably offers them the opportunity to influence future industry directions or to gain visibility and recognition broader than the research community. Researchers can also benefit from ILNAS services for the identification of standardization activities relevant to their field and their research projects involving standardization (e.g.: Horizon Europe projects).

OLN can be contacted via email at normalisation@ilnas.etat.lu. More information can also be accessed on the [Portail-Qualité](#).

GN: In what way does your Horizon Europe project add to SC 43 efforts?

CM: Our project produces substantial insights into neural signal capture, data processing techniques, human factors, usability, and system effectiveness. Within SC 43, we provide scientific proof and practical insights obtained from extensive experimental efforts. These findings can aid conversations regarding performance metrics, evaluation methods, interoperability needs, and terminology standardization. By disseminating insights gained from our European research projects, we assist in guaranteeing that upcoming international standards are grounded in solid scientific principles.

GN: In conclusion, what message do you wish to share with other researchers who are not yet participating in standardization?

CM: I would urge researchers to consider standardization as an enhancement of their scientific efforts. Engaging in committees like ISO/IEC JTC 1/SC 43 provides an additional chance to turn research findings into real-world benefits for society. Through involvement in standards, researchers can influence the future technologies while fostering innovation, trust, and global cooperation.

Why international standardization matters for data management innovation – Interview with the CEO of a Luxembourg Startup

Ms. Gladys Nanncrelo (GN, Interviewer): We appreciate you taking the time to talk with us today. Could you please present your company and describe the importance of data management in your operations?

Mr. Romeo Jederhlo (RJ, CEO): Thank you. We are a Luxembourg-based startup creating data management solutions for organizations that require collecting, organizing, governing, securing, and creating value from substantial amounts of data. Our clients work in areas like finance, industry, logistics, and public administration, where data has turned into a strategic resource.

As a startup, we innovate quickly, yet we also understand that sustained success relies on interoperability, trust, security, and scalability. This is the reason why we decided to participate in international standardization from the very beginning of our business. It helps in guaranteeing that the solutions we create can fit with worldwide digital networks.

GN: Your organization participates actively in multiple ISO/IEC JTC 1 subcommittees. Why do you allocate time and resources to standardization?

RJ: Because standards frequently influence upcoming markets. For technology companies, particularly startups, engaging in standardization goes beyond applying technical specifications. It involves understanding the direction of technology, offering hands-on innovation expertise, and assisting in the development of shared frameworks that will enable the future generation of digital services.

By engaging in diverse ISO/IEC JTC 1 subcommittees, we notably work with specialists from leading technology companies, research organizations and government bodies. This offers important perspectives that directly shape our product strategy and research focus. ISO/IEC JTC 1 is the foremost international committee for information technology standardization, gathering expertise in many ICT areas.

FACT BOX 13 – ISO/IEC JTC 1/SC 32



SC 32 “Data management and interchange”

Scope (extract):

Standards for data management within and among local and distributed information systems environments. SC 32 provides enabling technologies to promote harmonization of data management facilities across sector-specific areas.

Structure:

- ☐ WG 1 - eBusiness
- ☐ WG 2 - MetaData
- ☐ WG 3 - Database language
- ☐ WG 6 - Data usage



130 standards published
31 projects



Luxembourg's involvement:

- ☐ O-Member
- ☐ 4 national delegates

More information: <https://www.iso.org/committee/45342.html>

GN: We can begin with ISO/IEC JTC 1/SC 32 “Data management and interchange”. Why is it especially significant to your business?

RJ: ISO/IEC JTC 1/SC 32 concentrates on managing and exchanging data, while ensuring their interoperability. For a business like ours, this is central to all our activities. SC 32 creates standards that assist organizations in consistently managing data across various systems, platforms, and organizations.

Our clients generally manage complex IT ecosystems that encompass various applications, databases, and data sources. Standards created by SC 32 promote common methods for data governance, metadata management, semantic interoperability, and information sharing. Engagement enables us to share practical knowledge from the field while keeping our solutions in line with international good practices.

GN: Contemporary data solutions are progressively hosted in the cloud. How is ISO/IEC JTC 1/SC 38 “Cloud computing and distributed platforms” relevant to your work?

RJ: Cloud infrastructure has turned into a key facilitator of digital transformation. ISO/IEC JTC 1/SC 38 creates standards concerning cloud computing and distributed systems. These standards focus on aspects like interoperability, portability, cloud frameworks, governance, and service administration.

Most of our solutions operate within hybrid or multi-cloud settings. Clients want the ability to transfer workloads and data without relying on just one provider.

The efforts undertaken in SC 38 contribute to this objective by promoting shared frameworks that enhance interoperability and reduce dependency to specific vendors. For pioneering startups, such standards foster the development of more transparent and competitive markets.

FACT BOX 14 – ISO/IEC JTC 1/SC 38



SC 38 “Cloud computing and distributed platforms”

Scope (extract):

Standardization in the areas of Cloud Computing and Distributed Platforms including:

- ☐ Foundational concepts and technologies,
- ☐ Operational issues, and
- ☐ Interactions among Cloud Computing systems and with other distributed systems

Structure:

- ☐ CG 1 - Liaison coordination group for JTC 1/SC 27
- ☐ CG 2 - Liaison coordination group for JTC 1/SC 41
- ☐ CG 3 - Liaison coordination group for JTC 1/SC 42
- ☐ CG 4 - Liaison coordination group for JTC 1/SC 7
- ☐ CG 5 - Liaison coordination group for JTC 1/WG 13
- ☐ WG 3 - Fundamentals
- ☐ WG 5 - Stakeholders considerations
- ☐ WG 6 - Data, interoperability and portability



33 standards published

18 projects



Luxembourg’s involvement:

- ☐ P-Membership
- ☐ 7 national delegates

More information: <https://www.iso.org/committee/601355.html>

GN: Data management is being transformed by artificial intelligence. What drives your involvement in ISO/IEC JTC 1/SC 42 “Artificial Intelligence”?

RJ: AI and data cannot be separated. AI systems rely on high-quality, well-managed data. In parallel, AI is helping in data classification, analysis, governance, automation, and decision-making.

ISO/IEC JTC 1/SC 42 serves as a primary place for the standardization of AI. It establishes standards related to terminology, governance, reliability, risk management, and technical aspects for AI systems.

Participation, for us, ensures that our AI-driven solutions conform with evolving international standards related to transparency, accountability, and the responsible application of AI. It also offers insight into upcoming trends that could impact our future activities.

GN: Sustainability has turned into a significant issue for businesses. What is the significance of ISO/IEC JTC 1/SC 39 “Sustainability, IT and data centres” for your startup?

RJ: Technology companies must shift their attention beyond just performance and functionality. Sustainability is increasingly becoming a crucial necessity for customers, investors, regulators, and the community.

ISO/IEC JTC 1/SC 39 focuses on the environmental aspects of data centers, digital services and ICT more generally. Recent efforts have also broadened into resource-saving software and eco-friendly design strategies for digital services.

As a supplier of data management platforms, we are being asked more frequently about the environmental impact of our solutions. Engaging in SC 39 helps us in understanding how to create software architectures that enhance resource use, minimize energy use, and promote sustainability goals across the data lifecycle.

FACT BOX 15 – ISO/IEC JTC 1/SC 39



JTC1



SC 39 “Sustainability, IT and data centres”

Scope (extract):

Standardization of assessment methods, design practices, operation and management aspects to support resource efficiency, resilience and environmental sustainability for and by information technology, data centres and other facilities and infrastructure necessary for service provisioning.

Structure:

- ☐ WG 1 - Resource Efficient Data Centres
- ☐ WG 3 - Sustainable facilities and infrastructures
- ☐ WG 4 - Digital Services and Software Sustainability



33 standards published
10 projects



Luxembourg’s involvement:

- ☐ O-Membership
- ☐ 1 national delegates

More information: <https://www.iso.org/committee/654019.html>

GN: Managing data inherently brings up security concerns. What importance does ISO/IEC JTC 1/SC 27 “Information security, cybersecurity and privacy protection” hold for your work?

RJ: It is absolutely essential! Reliability is the cornerstone of every data-driven business approach. Organizations will share and process data solely when they have confidence in the security and privacy measures in place.

Our clients work in regulated industries where security is paramount. By participating in SC 27, we enhance our comprehension of emerging threats and effective practices while offering practical insights from the perspective of a technology provider.

FACT BOX 16 – ISO/IEC JTC 1/SC 27



JTC1



SC 27 “Information security, cybersecurity and privacy protection”

Scope (extract):

The development of standards for the protection of information and ICT. This includes generic methods, techniques and guidelines to address both security and privacy aspects

Structure:

- ☐ WG 1 - Information security management systems
- ☐ WG 2 - Cryptography and security mechanisms
- ☐ WG 3 - Security evaluation, testing and specification
- ☐ WG 4 - Security controls and services
- ☐ WG 5 - Identity management and privacy technologies
- ☐ JWG 4 - Security, privacy and identity for Blockchain and DLT
- ☐ JWG 7 - Cybersecurity testing and evaluation of biometrics



258 standards published
71 projects



Luxembourg’s involvement:

- ☐ P-Membership
- ☐ 29 national delegates

More information: <https://www.iso.org/committee/45306.html>

GN: What benefits are associated with being part of all five of these subcommittees instead of only one?

RJ: The most fascinating breakthroughs happen where different fields converge. A contemporary data platform involves more than just data management. It integrates data management, cloud systems, AI technologies, sustainability factors, and cybersecurity needs.

SC 32 assists us in organizing and managing data, SC 38 focuses on the management of data within cloud environments, SC 42 provides sophisticated insights powered by AI, SC 39 assists us in reducing environmental consequences, and SC 27 guarantees safety and confidentiality across the whole ecosystem. Collectively, these committees offer an extensive perspective on the upcoming digital environment.

GN: What advantages does this involvement offer to a startup in Luxembourg?

RJ: For startups, obtaining global knowledge and international connections is crucial. Being part of ISO/IEC JTC 1 standardization enables us to connect directly with recognized experts globally. It provides us with early insight into technological trends, enhances our credibility with customers and investors, and allows us to contribute to standards that could shape future markets.

Conclusion

To conclude, we hope that this publication has given you a deeper understanding of ICT standardization, its strategic importance, and the many opportunities that participation in standardization activities can offer, regardless of your field of activity or the type of organization to which you belong.

Acting as a key technical committee in the ICT sector, ISO/IEC JTC 1 brings together thousands of experts from around the world who actively collaborate in the development of international standards that shape the future of information and communication technologies. We hope this publication has inspired you to join this international community and to contribute, in your own way, to the development of the standards of tomorrow.

Your involvement can not only strengthen your organization's innovation and competitiveness but also contribute to enhancing Luxembourg's international recognition and supporting its continuous development on the global scene.

ILNAS remains at the disposal of all market actors to facilitate their discovery of the domain or help them in taking more expert's roles in standardization. For more information, do not hesitate to contact us at normalisation@ilnas.etat.lu, and visit the [Portail-Qualité's standardization page](#).

FURTHER DETAILS ON ICT TECHNICAL STANDARDIZATION



The Standards Analysis "ICT Sector - Luxembourg" reflects the main standardization activities of recognized Standards Development Organizations (SDOs) within the ICT landscape. This analysis serves as a practical tool dedicated to national organizations, allowing them to identify technical standardization activities supporting their business.

It covers the overall landscape of ICT related technologies, from more seasoned topics such as software engineering and programming languages to more recent ones such as the Internet of Things, Cloud Computing, Artificial Intelligence (AI) or Quantum Technologies.

With this panoramic view of the technical committees working in the domain, national stakeholders, whether providers or users of ICT, can easily identify standards and committees relevant to their core business and needs.

Download: <https://gd.lu/8nKCgh>





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Institut Luxembourgeois de la
Normalisation, de l'Accréditation, de la
Sécurité et qualité des produits et services

Southlane Tower I · 1, avenue du Swing · L-4367 Belvaux · Tel. : (+352) 24 77 43 -40 · Fax : (+352) 24 79 43 -40 · E-mail : normalisation@ilnas.etat.lu

www.portail-qualite.lu