SEEBLOCKS.eu
Supporting Europe's Effort in Blockchain Standardisation

Impact report on Blockchain and Distributed Ledger technologies from SEEBLOCKS.Eu Experts from the selection and engagement procedures

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DISCLAIMER

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About SEEBLOCKS.eu

The SEEBLOCKS.eu project is coordinated by Trust-IT Services Srl (Italy), supported by its partners from the Dublin City University (Ireland) and Fraunhofer in Berlin (Germany).

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Acknowledgements

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First, SEEBLOCKS.eu acknowledges the capable work of all experts who participated in the SEEBLOCKS.eu Selection and Engagement Procedures.

We extend our sincere thanks to Olga Nikolopoulou, SEEBLOCKS.eu Project Officer and Policy Officer from European Health and Digital Executive Agency (HaDEA), as well Pierre Marro, Policy Officer from DG CONNECT Digital Innovation and Blockchain Unit from the European Commission, for their leadership and guidance during the course of SEEBLOCKS.eu.

Special recognition goes to Fiona Delaney, SEEBLOCKS.eu Strategic Lead, for her unique and remarkable work in providing technical advice and networking skills that formed a strong foundational pillar for the project's accomplishments

The SEEBLOCKS.eu consortium is grateful to each Strategy Board (SB) member, who provided strategic direction, policy guidance, and support to research while consolidating our cross-sectoral network.

SEEBLOCKS.eu also thanks all members of the Technical Working Group (TWG) for their crucial contributions to the project, specifically for reviewing the landscape reports, providing feedback and valuable suggestions. The TWG will continue SEEBLOCKS work, the members are committed to continue the research on the Blockchain & DLT standardisation landscape and disseminate it in publications.

Our appreciation extends to all those involved in SEEBLOCKS.eu events across Europe (Ireland and Belgium), Asia (Japan), and North America (United States). We are also grateful to those who participated in the SEEBLOCKS.eu Webinars, and to the institutions and organisations SEEBLOCKS.eu partnered with to expand the work of SEEBLOCKS.eu and gather insights supporting future blockchain policy activities in Europe.

"Synergy - the bonus that is achieved when things work together harmoniously" – Mark Twain

Foreword

The European Union's interest in blockchain and Distributed Ledger Technologies (DLT) gained momentum around 2016, culminating in blockchain's formal recognition as a strategic priority in 2018 when it was included for the first time in the ICT Rolling Plan for Standardisation. That pivotal year witnessed the launch of several major public initiatives designed to promote blockchain solutions and analyze market opportunities across Europe, including the European Blockchain Partnership, the European Blockchain Observatory and Forum, and the European Blockchain Services Infrastructure.

This strategic commitment was further reinforced in subsequent years through significant legislative developments: the EU Data Act approved by the European Parliament in 2023, the Markets in Crypto-Assets (MiCA) regulation enacted that same year, and the European Digital Identity Wallet (eIDAS 2.0) approved in 2024. Blockchain's core capabilities are instrumental in implementing these legislative frameworks and advancing the EU Digital Strategy. Additionally, blockchain technology presents both opportunities and challenges for Green Deal objectives by enhancing transparency, efficiency, and sustainability monitoring across diverse sectors, from food supply chains to electric distribution networks.

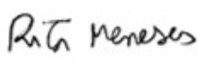
These developments represent a significant evolution in the European Union's approach to blockchain, acknowledging the necessity for common standards to ensure interoperability, security, and widespread adoption across various industries. European leadership in blockchain standardisation is essential for numerous reasons, including technological sovereignty, fair competition, regulatory influence, and alignment with fundamental EU values. These imperatives led directly to the creation of the SEEBLOCKS.eu initiative.

The Selection and Engagement Procedures (SEPs) established by SEEBLOCKS.eu provide a structured funding mechanism supporting European blockchain and DLT standardisation specialists. The SEEBLOCKS.eu programme has facilitated European expert participation in numerous Standards Development Organisations (SDOs) and technical committees, strengthening Europe's influence in global blockchain standardisation efforts. This work addresses key strategic domains including governance, smart contracts, security, privacy, identity, trust, and infrastructure.

The 20 fellows featured in this report, selected through SEEBLOCKS.eu, exemplify excellence and demonstrate significant impact through their contributions. They have successfully integrated European values and the latest EU policy priorities into standardisation activities across various bodies and have influenced the European Commission's Rolling Plan for ICT Standardisation, helping position Europe as a leader and innovator in blockchain technology.

I extend my sincere appreciation to all participating experts, the External Pool of Evaluators for their meticulous assessment of all applications received, and the External Advisory Group for their valuable insights provided throughout SEEBLOCKS.eu's duration. I also thank the SEEBLOCKS.eu partners—Dublin City University and Fraunhofer ISI—for their exceptional work in expert recruitment and monitoring. Special gratitude goes to the SEEBLOCKS.eu project office at the European Health and Digital Executive Agency and the DG CONNECT of the European Commission for their steadfast support since the inception of SEEBLOCKS.eu.

Rita Meneses



SEEBLOCKS.eu Coordinator & Project Manager at Trust-IT Services

Introduction

This SEEBLOCKS.eu booklet presents the most significant outcomes from 20 blockchain experts selected from across Europe through four comprehensive selection and engagement procedures. From a total of 33 applications, the publication highlights the experts' contributions to international blockchain standardisation discussions, which are crucial to European Information and Communication Technology (ICT) policies.

Standards are fundamental in driving systemic, scalable, and sustainable change in technology, industry, and society. Through the efforts of SEEBLOCKS.eu experts, Europe is advancing toward ensuring that emerging standards align with the European Union's Digital Decade goals and European Commission policy objectives for blockchain and Distributed Ledger Technologies (DLT), as outlined in the Rolling Plan for ICT Standardisation.

The experts addressed critical standardisation gaps related to trusted digital infrastructure, data sovereignty, governmental policies and robust digital economy. Some of these gaps were quite specific and technical (such as a standardised approach to the resolution of Digital IDs). But many "gaps" these experts addressed were more general, concerning the critical lack of harmonised terminology, formats, and usages that cause fragmentation and impede large-scale interoperability among implementations. The reader will see several examples of this type of work in this collection.

The presented work promises a positive impact, particularly for Small and Medium Enterprises but also for society at large. Numerous contributions not only address known issues of blockchain consensus protocols and sustainability, but also the opportunities for blockchain/DLT to help promote environmental sustainability in innovative ways, such as standards permitting trustworthy recording of carbon credits.

Additionally, the experts focused on the European Blockchain Services Infrastructure (EBSI) as a trust anchor management infrastructure and advocated for the recognition of DLTs as a trust service in compliance with eIDAS 1 & 2 requirements.

The SEEBLOCKS.eu experts investigated seven key blockchain domains of interest:

- **Promotion and Awareness of Blockchain/DLT**. The collection kicks off with a piece outlining the breadth and diversity of blockchain standardisation activities and efforts to reach the full range of stakeholders while creating an atmosphere of collaboration and knowledge sharing.
- **Sustainability**. Five experts describe activities utilising blockchain/DLT to support environmental sustainability, from carbon markets to smart contracts furthering the UN Sustainable Development Goals.
- **Security, Privacy, and Identity**. Seven contributions explore the intersection of identity with security and privacy, describing standardisation activities and best practices related to Personal Identifiable Information in blockchain systems.
- **Key enablers and infrastructure**. Six expert contributions report on key enabling standardisation activities such as the development of agreed vocabularies and taxonomic classifications, as well as efforts to create infrastructure supporting world-wide access control and decentralised directory services.
- **Governance**. Three experts address issues of governance of the innovative new possibilities offered through blockchain, such as Distributed Autonomous Organisations.
- **Identity and Trust**. Three contributions examine how blockchain can address the critical issue of trust, for example its use as a trust anchor and in the creation of trust native data spaces.
- **Innovation in Blockchain / DLT**. The collection wraps up with three contributions that showcase blockchain technology utilised in innovative new contexts such as robotics, and in niche areas like private debt enforcement that are critical to the successful introduction of the Digital Euro.

Overview of SEPs

The Selection and Engagement Procedures (SEPs) established by SEEBLOCKS.eu provided a structured funding mechanism aimed at supporting European blockchain and Distributed Ledger Technology (DLT) standardisation specialists, fostering their participation in global standardisation efforts. With a total budget of €300,000, the programme enabled experts to contribute to various Standards Development Organisations (SDOs) and technical committees, strengthening Europe's role in shaping blockchain standards. The initiative specifically targeted blockchain specialists residing in the European Member States and Associated Countries, with a focus on participants from SMEs, research organisations, and experts affiliated with the European Blockchain Services Infrastructure (EBSI) and the European Blockchain Observatory and Forum (EUBOF). The selection process was designed to ensure transparency and fairness, with each proposal undergoing an independent evaluation by three members of an External Pool of Evaluators (EPE), who were chosen through a dedicated call for evaluators. The four SEPs ran from 24 August 2023 to 22 July 2024. Throughout the programme, SEEBLOCKS.eu received 85 proposals and successfully funded 33 projects from 20 experts, allocating a total of €299,688, underscoring its commitment to advancing European leadership in blockchain standardisation.

Expert Profiles

SEEBLOCKS.eu is proud to highlight the diverse and accomplished group of experts funded through its four Selection and Engagement Procedures (SEPs) over the past two years. In total, 33 European experts from 12 different countries received financial support, amounting to nearly €300,000 distributed across the four SEPs. These experts actively contributed to various Standards Development Organisations (SDOs) and technical committees, reinforcing Europe's role in shaping blockchain and Distributed Ledger Technology (DLT) standards on a global scale.

The International Standards Organisation (ISO) emerged as the leading standards-developing organisation within the blockchain and DLT domain, with nearly half of the awarded contracts dedicated to ISO-related work. Other significant beneficiaries included CEN-CENELEC and IEEE, which also played crucial roles in the standardisation landscape.

A clear trend toward long-term engagements was observed, with the majority of funded experts opting for six-month contracts. Only four short-term, three-month applications were granted, underscoring the necessity for extended periods to effectively contribute to the complex and evolving nature of standards development.

Identity management surfaced as the most frequently addressed topic, reaffirming its fundamental role in the blockchain and DLT standardisation ecosystem. Experts tackled various aspects of this critical area, contributing to the advancement of secure, interoperable, and scalable digital identity frameworks.

Through the SEPs, SEEBLOCKS.eu successfully fostered a balanced distribution of expertise across key standardisation efforts, ensuring that European specialists had the necessary resources and time to influence the global blockchain landscape effectively.

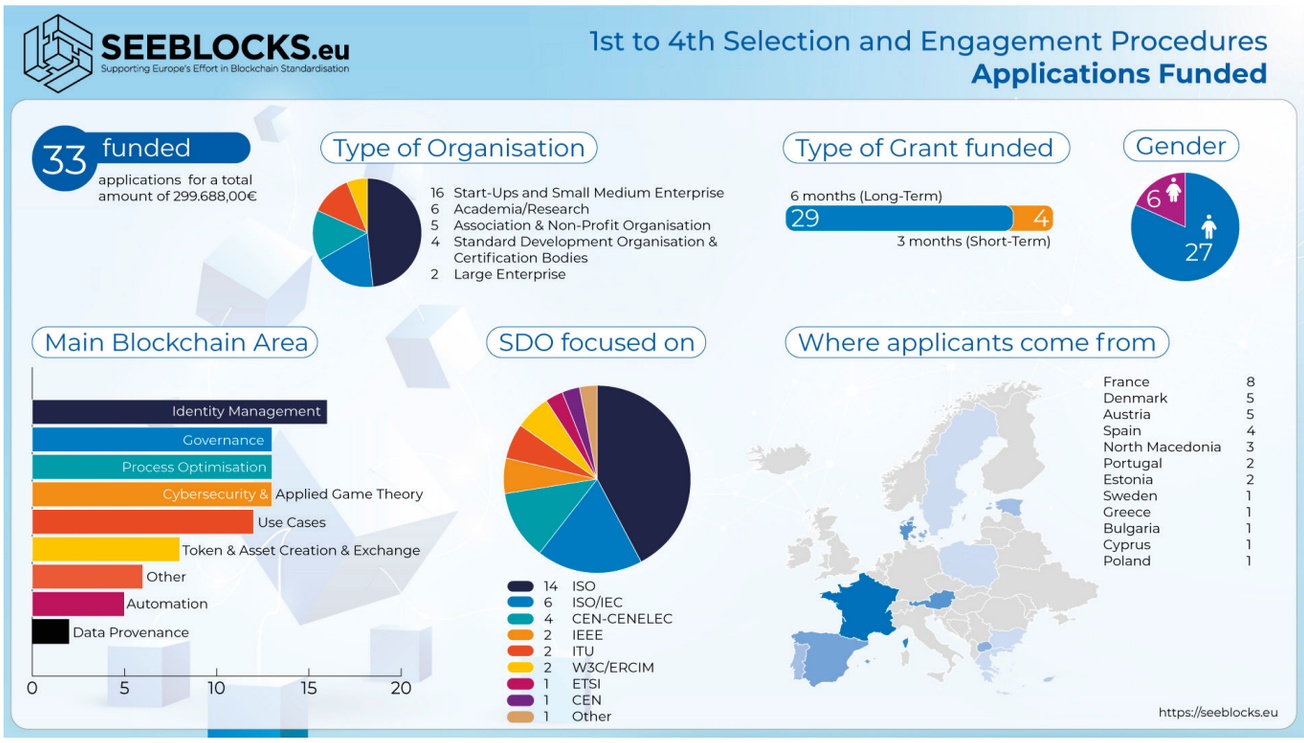


Figure 1 - Overview of the SEPs key results and insights

Engaged SDOs

SEEBLOCKS.eu's Selection and Engagement Procedures (SEPs) successfully enabled European blockchain and DLT specialists to contribute to global standardisation efforts across key Standards Development Organisations (SDOs). Experts from 12 countries engaged in major international bodies, with ISO/TC 307 emerging as the focal point. Within ISO, they contributed to working groups such as WG1 (Foundations), WG3 (Smart Contracts), WG5 (Governance), WG6 (Use Cases), and WG7 (Interoperability Framework). Additionally, experts participated in CEN/CENELEC JTC 19/WG2 (Environmental Sustainability) and JWG4 (Privacy & Security), IEEE's WG 1872.3 (Robotics & Blockchain Integration), and ITU-T's SG13 and SG20 (Trustworthy Data Infrastructure & IoT). The ECB was also engaged in efforts on Digital Euro standardisation.

Key contributions included governance frameworks, smart contract security, blockchain-based digital identity, interoperability, and sustainability standards. Several proposals directly influenced the development of ISO TS 23353 (Auditing), TS 23535 (Governance), and TS 23516 (Interoperability Framework). These efforts reinforced Europe's leadership in shaping blockchain standards, ensuring alignment with EU priorities such as GDPR compliance, digital finance, and sustainability.

Sustainability

Belen Suarez: Environmental Sustainability for Blockchain and Distributed Ledger Technologies

Name & Surname Belen Suarez

Job title CEO

Organisation Go To Innovation Intelligence

Country Spain

Engaged SDOs, WGs and TCs

ISO TC 307 – Governance and

CEN/CLC JTC 19 WG2 Environmental Sustainability

Role within SDOs

Convenor

Addressed EU standardisation priorities and gaps

This fellowship contributed to the ITC Rolling Plan 2024 and the European Security Market Authority (ESMA) call for technical standards to measure the energy consumption of Blockchain and DLTs. The work supports the definition of a harmonised approach for an Environmental and sustainability classification methodology of consensus mechanisms of Blockchain and DLTs.

On the other hand, providing a harmonised methodology to measure energy consumption would allow service providers to create trust through reliable sustainability reporting and customers to make informed decisions based on reliable, trustworthy, transparent information based on evidence.

Concerned ICT Standards and contribution to the related landscape

The methodology is aligned with the ISO 14000 series on Environmental Management.

This alignment ensures quality, efficiency and effectiveness of standardisation efforts, through:

» **Quality**, when standards are informed by the proven methodologies validated by the market and supported by scientific research;
» **Efficiency**, avoiding duplicate effort;
» **Effectiveness**, solving concrete European market needs, allowing Blockchain and DLT application reporting to their main stakeholders with accurate, reliable, and transparent information on the negative impact of DLT solutions.

Impact on SMEs

In the pre-commercial and commercial stage of applications of Blockchain and Distributed Ledger Technologies, one of the main bottlenecks is stakeholder engagement and adoption. Guiding the applications in providing environmental sustainability information and easier compliance with the new EU legislation will allow the attraction of investment and stakeholder adoption. It also promotes trust and interoperability, comparability and integrability of applications, and contributes to the Digital Single Market.

Impact on Society

The deliverable supports the achievement of the Green Deal objectives and the SDGs. It promotes improvement in the efficiency of services with the use of trusted applications and technologies that contribute to sustainable development. It can help improve the efficient use of energy resources, save costs for EU consumers, and provide reliable information to make informed decisions about safe, secure, and sustainable solutions.

Has your project directly involved or led to a specific recommendation or proposal for developing new or revised standards?

The work supports the project CEN/CENELEC JT019003 Environmental and sustainability classification methodology of consensus mechanisms of Blockchain and DLTs and informs additional standards in the field.

Have the standardisation activities in your project led to specific deliverables?

The activities contribute to the preliminary stage of CEN/CENELEC JT019003 project, by facilitating stakeholder engagement, quality of preliminary information, and project performance and efficiency.

What future efforts or activities are still necessary for your area of application?

To properly inform main stakeholders of the environmental impact of Blockchain and DLT applications and to provide sufficient information on the real contributions needed to consider additional environmental criteria affecting climate change, but also assess the value proposition on concrete use cases.

Online references related to the fellowship work

- Innovation and Social Networks For Creating Social Value. DOI: 10.21272/sec.6(2).94-105.2022
- Innovation Management, from Materiality Assessment to Sustainability Reporting, opening the Social Impact Black Box. DOI: 10.21272/sec.5(1).13-27.2021
- Blockchain, Artificial Intelligence, Internet of Things to Improve Governance, Financial Management and Control of Crisis: Case Study COVID-19 DOI: 10.21272/sec.4(2).78-89.2020
- Blockchain Technology Facing Socioeconomic Challenges. Promise versus Probability DOI: 10.21272/sec.3(4).13-24.2019

Shakira Bedoya: Blockchain for Carbon Markets

Name & Surname Shakira Bedoya

Job title Sustainable & Nature Finance Advisor

Organisation During the time of the fellowship Danske Bank

Country Denmark

Engaged SDOs, WGs and TCs

Danish Standards and ISO TC 207 (Environmental management/Carbon)

TC 322 (Sustainable finance)

Role within SDOs

Appointed expert

Addressed EU standardisation priorities and gaps

According to the European rolling plan for standardisation, blockchain has the potential to transform several industries, specifically in the private sector: trading, contracting and supply chain management. Blockchain can provide regulators with the same data as the companies they are regulating therefore reducing fraud, compliance costs and improving auditing. However, the use of blockchain is "hindered by a lack of harmonisation and interoperability that constitute obstacles to cross border and cross sector transactions".

Concerned ICT Standards and contribution to the related landscape

Physical layer of the DLT Carbon markets ecosystem:

ISO/CD 32212

ISO 14060

Impact on SMEs

N/A

Impact on Society

The impact relates to focusing on the financial aspects of the use of blockchain in carbon markets by engaging in three specific standardisation activities: carbon calculation, carbon methodologies and quality assurance.

Has your project directly involved or led to a specific recommendation or proposal for developing new or revised standards?

ISO/CD 32212

ISO 14060

Have the standardisation activities in your project led to specific deliverables?

Plenary meeting in Cyprus in April 2024 of the Sustainable Finance. FinTech in Carbon Markets Committee (ISO/TC 322 AH G3) and COP 16 on Biodiversity Finance/Carbon Markets.

What future efforts or activities are still necessary for your area of application?

There is a strong need to involve more ICT experts in the area of sustainable finance.

Online references related to the fellowship work

- "Human Rights and ICT Standardisation: examples across diverse SDOs, current challenges and recommendations" https://zenodo.org/records/13769418

Paul Ferris: Sustainability strategy for TC307 Planning & Standards in Blockchain & DLT

Name & Surname Paul Ferris

Job title Chair

Organisation European Distributed Computing Association

Country Greece

Engaged SDOs, WGs and TCs

ISO, CEN, BSI

Role within SDOs

Convenor, Expert

Addressed EU standardisation priorities and gaps

TC307 must encompass a strategy for its work that 'lockfits' with ISO's own strategy, in particular in sustainability. TC307 has many experts in this area but they have lacked the forum for discussion, development and consensus on the next steps in this regard and the function of forward planning for the work.

Last year, a European Union initiative regarding the energy use of some distributed systems threatened to block some important systems from the EU.

Concerned ICT Standards and contribution to the related landscape

» - ISO/AWI 20435 Representing Physical Assets using Non-Fungible Tokens
» - ISO/PWI 24875 Secure Smart Contracts - ISO/AWI TS 23353 on Auditing guidelines
» - ISO/WD TS 23516 on Interoperability Framework
» - ISO/WD TR 24332 on authoritative records, records systems, and records management
» - ISO/AWI PAS 24874 on Use of Smart Contracts in Contributing to the Sustainable Development Goals

The work is principally directed by: ISO/IEC Directives, Part 1 (clauses 1.5.5, 1.8.2, 2.1.2, 2.2.1, Annex C, Annex K, Annex SC3 in particular and Annex SK.1) and the new ISO TC business planning processes being rolled out at this time.

Impact on SMEs

Positive security is often cited as a justification for the use of DLT/blockchain systems but without quantifying or fully justified reasons. It may be the case that positive security impacts are only available where diverse organisations are aiming to share the same system. Alternatively, it may be that such systems would be more secure if they applied more traditional or alternative approaches to achieve similar ends. There is a confusing range of possibilities that SMEs are unlikely to be equipped to assess without a set of dependable standards to guide them. The criteria for such decisions need examination. The approach & comparative measurement needs standards to be effective. This project links the SMEs operating in the business arena and standards development to support their operations. Sustainability standards often have conflicting objectives, so a specific plan to develop appropriate standards for the benefit of the EU does affect the global community.

Impact on Society

DLT/Blockchain technology is often referred to as 'the technology of trust'. This features in my work at ISO/TC 307 and AG1 and explains the societal impacts of trust across finance, supply chains, digital trust, data provenance, energy trading, records management, anti-counterfeit pharma and food safety

and provenance.

ISO Innovation/ Blockchain's technology of trust (https://www.iso.org/news/isofocus_142-5.html). The new format SBP includes a comprehensive account of societal impacts of TC 307 (including a separate rationale on 'Sustainability'.

Has your project directly involved or led to a specific recommendation or proposal for developing new or revised standards?

This new draft strategic plan (not yet published) contains proposals for four new standards within the remit of TC 307, and the development of new standards through collaboration with three other ISO committees.

Have the standardisation activities in your project led to specific deliverables?

A working draft of a new strategic business plan for TC 307. This contains specific reference to new standards work in sustainability, the circular economy, and the SDGs.

What future efforts or activities are still necessary for your area of application?

Completion of the SBP and rolling the TC 307 roadmap out to direct resources over the next four years.

Online references related to the fellowship work

- https://www.iso.org/committee/6266604/x/catalog ue/p/0/u/1/w/0/d/0
- ISO/TR 3242:2022 - Use cases (being updated: https://www.iso.org/standard/79543.html) ISO/AWI TS 23353 on Auditing guidelines - https://www.iso.org/standard/87416.html
- ISO/AWI PAS 24874 on Use of Smart Contracts in Contributing to the Sustainable Development Goals - https://www.iso.org/standard/88312.html ISO/AWI TR 24878 on DLT/Blockchain Use Cases - https://www.iso.org/standard/88315.html At ISO/TC 307 website https://www.iso.org/committee/6266604.html
- Landscape of Trusted Information Standards (https://zenodo.org/records/5926395#.YgP0uJaZ M2w)

Alastair Marke: Smart Contracts for Sustainable Development Goals (SDGs): A proposed guidance handbook

Name & Surname Alastair Marke

Job title Director-General

Organisation Blockchain and Climate Institute

Country Estonia

Engaged SDOs, WGs and TCs

ISO/TC 307/WG3 – Smart Contracts and Their Applications

ISO/TC 307/WG6 – DLT Use Cases

Role within SDOs

Project Leader

Addressed EU standardisation priorities and gaps

The Smart Contracts for Sustainable Development Goals (SDGs) – Proposed Guidance Handbook identifies key EU standardisation priorities and gaps in integrating smart contracts and distributed ledger technology (DLT) with sustainability initiatives.

EU Standardisation Priorities:

1. ISO & EU Alignment: Emphasises ISO standards like ISO 22739 (blockchain vocabulary) and ISO 23257 (DLT reference architecture) to ensure interoperability.
2. DLT Governance & Compliance: Highlights governance frameworks (ISO/TS 23635) for DLT system implementation.
3. Interoperability & Benchmarking: Proposes structured benchmarking for smart contract-enabled SDG applications.
4. Regulatory Clarity: Focuses on GDPR compliance and legal recognition of smart contracts.

Gaps Identified:

1. Fragmented Regulatory Landscape: Lack of uniform EU-wide legal recognition for smart contracts and DAOs.
2. Interoperability Issues: Need for cross-chain standards and trusted oracles.
3. Energy Efficiency Considerations: Absence of clear sustainability guidelines for DLT energy consumption.

The handbook advocates EU-wide harmonisation efforts, ensuring that smart contracts contribute effectively to SDG implementation.

Concerned ICT Standards and contribution to the related landscape

The Smart Contracts for SDGs – Proposed Guidance Handbook highlights key ICT standards shaping the blockchain and smart contract landscape, ensuring interoperability, security, and sustainability.

Concerned ICT Standards:

1. ISO 22739 – Blockchain and DLT vocabulary for standardised terminology.
2. ISO 23257 – DLT reference architecture for interoperability.
3. ISO/TS 23635 – Guidelines for governance in DLT systems.

4. ISO/TR 6277 – Data flow models for blockchain use cases.
5. GDPR & EU AI Act – Ensuring data privacy and responsible automation.

Contribution to the Landscape:

» Facilitates trust and interoperability in smart contract-enabled SDG applications.
» Strengthens regulatory compliance, ensuring GDPR adherence.
» Encourages energy-efficient DLT infrastructure.
» Bridges standardisation gaps, supporting cross-chain solutions and SDG-oriented blockchain governance.

Impact on SMEs

The Smart Contracts for SDGs – Proposed Guidance Handbook highlights significant impacts on SMEs by improving efficiency, transparency, and market access. Key benefits include cost reduction through automation, enhanced trust in transactions, and easier regulatory compliance via standardised frameworks. However, challenges remain, such as high implementation costs, lack of interoperability, and regulatory uncertainty in smart contract adoption. Addressing these gaps through EU-wide standards can empower SMEs to leverage DLT-based solutions, improving financial inclusion, sustainability tracking, and supply chain efficiency in alignment with SDGs.

Impact on Society

The Smart Contracts for SDGs – Proposed Guidance Handbook outlines a transformative impact on society by enhancing transparency, efficiency, and trust in digital transactions. Smart contracts automate sustainability initiatives, improve financial inclusion, and ensure secure, tamper-proof records for social programs. They support climate action by enabling carbon tracking and supply chain traceability. However, risks like data privacy concerns, regulatory gaps, and energy consumption must be addressed. Standardised frameworks can drive equitable access to blockchain technology, fostering economic empowerment and environmental sustainability in alignment with the UN SDGs.

Has your project directly involved or led to a specific recommendation or proposal for developing new or revised standards?

The Smart Contracts for SDGs – Proposed Guidance Handbook directly led to recommendations for developing new or revised standards, particularly in smart contract interoperability, governance, benchmarking, and sustainability metrics. It proposes enhancements to ISO 22739, ISO 23257, and ISO/TS 23635, addressing cross-chain interoperability, legal recognition, and energy efficiency in blockchain applications for sustainable development.

Have the standardisation activities in your project led to specific deliverables?

The Smart Contracts for SDGs – Proposed Guidance Handbook resulted in specific deliverables, including a benchmarking framework for smart contracts, governance guidelines for DLT systems, and interoperability recommendations. These contribute to ISO standardisation efforts (ISO 22739, ISO 23257, ISO/TS 23635) and support EU regulatory frameworks for sustainable and legally compliant blockchain applications.

What future efforts or activities are still necessary for your area of application?

Future efforts should focus on harmonising global smart contract standards, enhancing cross-chain interoperability, and ensuring regulatory clarity for legally enforceable smart contracts. Further research on energy-efficient DLT solutions and privacy-preserving mechanisms is needed. Strengthening ISO and EU frameworks will facilitate scalability, trust, and widespread adoption of blockchain for sustainable development and SDGs implementation.

Online references related to the fellowship work

ISO. (2024). Blockchain and Distributed Ledger Technology — Interoperability Framework. https://www.iso.org/standard/82098.html.

ISO23257:2022-02. (2022). ISO 23257:2022-02 Blockchain and distributed ledger technologies - Reference architecture. In ISO 23257.
ISO/DIS 22739 Blockchain and distributed ledger technologies - Terminology. (2024). https://www.iso.org/obp/ui/es/#iso:std:iso:22739:dis:ed-1:v1:en:sec:3.6.
ISO/DTR3242. (2022). ISO/DTR 3242 Blockchain and distributed ledger technologies - Use cases Summary Report. https://www.iso.org/standard/79543.html.
ISO/TR 6277 Blockchain and distributed ledger technologies - Data flow models. (2024). https://www.iso.org/standard/82158.html.
ISO/TS23635. (2022). ISO/TS 23635 Blockchain and distributed ledger technologies - Governance framework. https://www.iso.org/standard/76480.html.

Grzegorz Cenkier: Efficient and secure blockchain and DLT for the sustainability of the environment

Name & Surname

Grzegorz Cenkier

Job title

Board Member

Organisation

ISSA Polska

Country

Poland

Engaged SDOs, WGs and TCs

Polish Standardisation Committee Technical Committee 333 - Blockchain and Distributed Ledger Technology

ISO/TC 307/WG 7 Blockchain and Distributed Ledger Technology - Interoperability Framework

ISO/TC 307/WG 5 Blockchain and distributed ledger technologies - Guidelines for governance

CEN/CLC/JTC 19/WG 02 Environmental Sustainability

CEN/CLC/JTC 24/WG 3 Digital Product Passport.

Role within SDOs

Expert

Addressed EU standardisation priorities and gaps

The proposal digitalises the EU's energy system, saving money and integrating renewable energy. It aligns with the UN Sustainable Development Goals and new EU sustainability reporting legislation. At the European level, CEN and CENELEC consider the green transition a priority. They have identified the digital and green twin transition as a key part of their joint 2030 strategy. Standards are vital for the solutions needed for the Green Deal transition.This proposal aligns with the European Green Deal, the REPowerEU plan, the Sustainable Finance Agenda and the European Digital Single Market Strategy. Blockchain and distributed ledger technologies have the potential to support use cases enhancing the economy's sustainability, but they also consume almost as much power as small states and, as the network grows, more per transaction. Alternative consensus mechanisms are more sustainable, but no methodology exists to rank them according to their environmental footprint.

Concerned ICT Standards and contribution to the related landscape

This proposal will complement the standards and technical reports already underway by providing information on the carbon footprint created by consensus algorithms. Blockchain and distributed ledger technologies are digital enabling technologies with great potential to support use cases that enhance the sustainability of the economy. However, these technologies also raise serious concerns. They consume almost as much energy as small states, and as the network grows, the energy consumption per transaction increases. Consequently, there is a pressing need for the exploration of alternative consensus mechanisms that are more sustainable, a subject that, however, has not been adequately addressed in current standardisation work.

Impact on SMEs

It may be beneficial for SMEs to advocate for the consideration of blockchain as a safe IT tool, while simultaneously emphasising the selection of consensus algorithms that are energy-efficient and minimise carbon footprints. Blockchain is an IT tool that is straightforward to implement and can be utilised in various domains, organisational frameworks, methodologies and data services.

Impact on Society

This proposal aligns with key policies, such as the London Declaration (Sept 2021). It emphasises the commitment to achieve the objectives outlined in the Paris Agreement and the United Nations Sustainable Development Goals (SDGs), in line with the Climate Agenda. The OECD encourages responsible blockchain innovation and adoption.The EU, CEN and CENELEC are focusing on the green transition and the digital transformation as key to their 2030 strategy. They recognise the importance of standards in developing solutions to the Green Deal.

Has your project directly involved or led to a specific recommendation or proposal for developing new or revised standards?

ISO TS 23516 Blockchain and Distributed Ledger Technology — Interoperability Framework,

ISO TS 23353 Blockchain and distributed ledger technologies — Auditing guidelines,

ISO TS 23535-2022 Blockchain and distributed ledger technologies — Guidelines for governance

Technical Report on Environmental Sustainability - CEN/CLC/JTC 19/WG 02.

Have the standardisation activities in your project led to specific deliverables?

The preparation of new Standards ISO TS 23516 Blockchain and Distributed Ledger Technology — Interoperability Framework is underway, with the expectation of approval at the ISO TC/307

Plenary meeting scheduled for April 2025.

We are working to finish the last three projects by the end of 2025 and release them. The standards we are working on: - ISO TS 23353: Blockchain and distributed ledger technologies – Auditing guidelines - TS 23535-2022: Blockchain and distributed ledger technologies – Guidelines for governance - TR on environmental sustainability (CEN/CLC/JTC 19/WG 02)

What future efforts or activities are still necessary for your area of application?

ISO TC/307 WG Interoperability: review submitted comments, considering legitimacy. A ballot should be conducted on the three remaining projects (ISO TS 23353, TS 23535-2022, and TR CEN/CLC/JTC 19/WG 02) to obtain feedback from relevant stakeholders, facilitating standard-setting and the issuance of finalised standards and reports.

Online references related to the fellowship work

- link to the CEN/CLC/JTC 19/WG 02 - Environmental Sustainability meetings: https://sd.cen.eu/documents/ui/#!/browse/cen/cen-clc-jtc-19/cen-clc-jtc-19-wg-02
- link to the ISO/TC 307/WG 5 Governance meetings: https://sd.cen.eu/documents/ui/#!/browse/iso/iso-tc-307/iso-tc-307-wg-5/library/3
- link to the ISO/TC 307/WG 7 Blockchain and Distributed Ledger Technology - Interoperability Framework meetings: https://sd.cen.eu/documents/ui/#!/browse/iso/iso-tc-307/iso-tc-307-wg-7
- I had the privilege of delivering a presentation at a recent Seeblocks.eu webinar, which took place on the 7th of November 2024. The title of the webinar was 'Blockchain andDLT as game changer for sustainability and a better future'. Link to the presentation: https://www.youtube.com/watch?v=_gV_Sntwvfg

Security, Privacy and Identity

Julien Bringer: Global blockchain and DLT standards on Security, Privacy and Identity

Name & Surname Julien Bringer

Job title CEO

Organisation Kallistech & Simeon

Country France

Engaged SDOs, WGs and TCs

ISO/TC 307

ISO/IEC JTC 1/SC 27

CEN/CENELEC JTC 19

ISO/TC 307/JWG 4

Role within SDOs

Co-Convenor of ISO/TC 307/JWG 4 and expert/delegate in the other groups/committees

Addressed EU standardisation priorities and gaps

This project addresses the identification and analysis of existing gaps (Action 1 of Rolling Plan), identifies use cases (Action 2), and on a continuous basis supports the standardisation process and collaboration between the different SDOs and other stakeholders (Action 5, Action 6, ...). It also leads the preparation of standards in the key priorities of security, privacy and identity.

Concerned ICT Standards and contribution to the related landscape

ISO/TC 307/JWG 4 is leading the development of the needed standards in Blockchain and DLT area (ISO/TC 307) connected to the existing landscape of security, privacy and identity standards (ISO/IEC JTC 1/SC 27) and useful for both international and regional markets, in particular in cybersecurity assurance, management of identities, and privacy-sensitive applications. There are more and more expectations for standards in that space to support the development of sustainable solutions and to support regulatory trends. The project started with one standard under development (ISO 24946 *Requirements and guidance for improving, preserving, and assessing the privacy capability of DLT systems*) and several preliminary work items. Now four standards are under development and future potential additional ones are under discussion.

Impact on SMEs

Blockchain and Distributed Ledger technologies are developed directly in a global environment and thus the activity impacts the EU and SMEs in the EU, since EU specificities and regulations are taken into account as early as possible. Many SMEs in the EU are positioned around decentralized identity and a future standard on this subject could be key for procurement.

Impact on Society

The topics of JWG4 have a direct impact on society and citizens as they aim to enable a trustworthy digital journey and trusted relationships, while still preserving privacy, autonomy and safety (to some extent, lack of security can also have an impact).

Has your project directly involved or led to a specific recommendation or proposal for developing new or revised standards?

There are now three new standards under development:

» ISO 25126 Information security controls based on ISO/IEC 27002 for distributed ledger services

» ISO 23042 Reference architecture for DLT-based decentralized identity systems
» ISO 24876 Privacy protection when involving trust anchors in DLT-based identity management

Have the standardisation activities in your project led to specific deliverables?

Several drafts for the four active international standard projects have been delivered in the group, but there is still a need to progress through the ISO standard development track before releasing them as standards.

What future efforts or activities are still necessary for your area of application?

The support of the group, the project leaders and coordination with other stakeholders and initiatives needs to be pursued. Additional experts are invited to join to strengthen and expand the impact. The ecosystem remains quite young and thus there are still many gaps to be addressed, such as:

» security of smart contracts;
» cybersecurity sharing, vulnerability management and incident response for blockchain and web3 applications;
» resilience of wallets and users.

Online references related to the fellowship work

https://www.iso.org/committee/6266604.html
https://docbox.etsi.org/ESI/Open/workshops/202409_CEN_ETSI_Workshop/DAY3-7%20New%20trust%20service%20%26%20complimentary%20activities/DAY3-7-46%20ISO%20TC307%20JWG4_CEN%20ETSI%20workshop%20Sep%202024%20Julien%20Bringer.pdf

Christian Grafenauer: Privacy and Data Protection in Blockchain and DLT

Name & Surname

Christian Grafenauer

Job title

Blockchain, AI & Privacy Standardisation Expert

Organisation

DIN Verbraucherrat e.V (Deutsches Institut für Normung)

Country

Germany

Engaged SDOs, WGs and TCs

CEN/CENELEC JTC 19/WG 3 – Personal Identifiable Information (PII) in Blockchain and DLT

ISO/TC 307/JWG 4 – Security, Privacy, and Identity for Blockchain and DLT

Role within SDOs

» Convener of CEN/CENELEC JTC19/WG 3
» Project Leader for EN XXX – Guidelines on processing PII using blockchain and DLT
» Active Contributor in ISO TC307/JWG 4 and other privacy-related working groups

Addressed EU standardisation priorities and gaps

Blockchain technology presents unique challenges for data protection, GDPR compliance, and privacy due to its immutable and decentralised nature. Currently, no European standard exists to provide guidelines for processing personal identifiable information (PII) using blockchain and DLT systems in compliance with the GDPR and other applicable European regulations. The CEN/CLC JTC 19/WG 3 working group was established to fill this gap, with the new European standard providing technical and organisational measures to align blockchain applications with European privacy regulations. By harmonising efforts with ISO TC307/JWG4, this initiative ensures that blockchain privacy standards reflect European regulatory requirements while remaining globally interoperable. This work supports the European Commission Rolling Plan for ICT Standardisation, particularly in data governance, privacy, and cybersecurity, enabling trustworthy blockchain adoption for businesses, regulators, and consumers.

Concerned ICT Standards and contribution to the related landscape

This project contributes directly to developing CEN/CENELEC JTC19 WG3's first standard: EN XXX – Guidelines on processing PII using blockchain and DLT. This work builds on DIN SPEC 4997 and aims aligns with relevant ICT standards, including:

» ISO/IEC 27555 – Guidelines on Identification and De-identification
» ISO/IEC 27001 – Information Security Management Systems
» ISO TC307 – Blockchain and DLT governance and privacy

By bridging the gap between blockchain's decentralised nature and EU data protection laws, this standard will ensure privacy compliance, legal clarity, and interoperability. It will also support European regulators, businesses, and policymakers in adopting secure, privacy-preserving blockchain applications.

Impact on SMEs

SMEs often struggle with GDPR compliance in blockchain, leading to high costs and legal uncertainty. This standard will provide clear technical guidelines, reducing compliance burdens and fostering trust in blockchain-based identity, finance, and data management solutions.

By ensuring interoperability and legal certainty, SMEs can confidently integrate blockchain into cross-border business operations, benefiting from a harmonised European regulatory framework. The project also helps lower entry barriers, enabling SMEs to innovate, compete, and expand securely within the EU Digital Single Market.

Impact on Society

The standard enhances data protection and privacy rights by ensuring blockchain aligns with European legal frameworks. Citizens will gain greater control over their personal data, promoting secure digital identity solutions and trustworthy blockchain applications.

The project also aims to mitigate risks such as data misuse, re-identification, and surveillance concerns. By setting a privacy-by-design approach, blockchain technology can serve societal interests ethically and transparently. This fosters public trust in digital services, strengthening Europe's leadership in responsible blockchain governance.

Has your project directly involved or led to a specific recommendation or proposal for developing new or revised standards?

My project directly led to the approval of the NWIP for "Guidelines on processing PII using blockchain and DLT" under CEN/CENELEC JTC19 WG3. This standard will establish GDPR-compliant privacy frameworks and support interoperable, legally sound blockchain applications across Europe.

Have the standardisation activities in your project led to specific deliverables?

The New Work Item Proposal (NWIP) for EN XXX – Guidelines on processing PII using blockchain and DLT has been approved, marking the first step toward a European privacy standard for blockchain. This initiative will lead to technical and organisational measures to ensure secure and privacy-preserving blockchain solutions.

What future efforts or activities are still necessary for your area of application?

» Organising the first CEN/CENELEC JTC19 WG3 group meeting.
» Developing and finalising EN XXX, ensuring it aligns with GDPR and EU policies.
» Strengthening alignment with ISO TC307 to promote global blockchain privacy standards.
» Engaging SMEs, regulators, and industry stakeholders for broad adoption.

Online references related to the fellowship work

https://www.dinmedia.de/en/technical-rule/din-spec-4997/321277504

Christophe Ozcan: Smart Contract Security – Code Review

Name & Surname CHRISTOPHE OZCAN

Job title CEO

Organisation Crypto4All

Country France

Engaged SDOs, WGs and TCs

ISO/TC307

Role within SDOs

Technical expert

Addressed EU standardisation priorities and gaps

The development of ICT standards for Smart Contracts Security within ISO/TC307 JWG4 is crucial for Europe, addressing the challenges of evolving blockchain technology.

Europe, a leader in technological innovation, is increasingly integrating blockchain solutions across various sectors. However, Smart Contract adoption is hindered by the lack of standardised security measures.

The objective is to establish a Technical Standard dedicated to Smart Contract security, providing a comprehensive framework to enhance their reliability. This initiative brings:

» Increased market confidence and innovation
» Regulatory compliance
» Cross-border interoperability
» Consumer protection
» Global competitive advantage
» Blockchain ecosystem growth
» Training opportunities

This standardisation is essential for shaping the future of blockchain while ensuring alignment with European regulatory frameworks.

Concerned ICT Standards and contribution to the related landscape

The development of ICT standards for Smart Contracts within ISO/TC307 WG3 addresses critical security gaps in blockchain technology. This initiative contributes to existing standards like ISO 22739:2022 (Blockchain Vocabulary) and ISO 23257:2022 (Reference Architecture), while focusing specifically on Smart Contract security frameworks.

Impact on SMEs

This standardisation enables SMEs to compete effectively in the blockchain space while minimising technical debt and security vulnerabilities. It offers a practical roadmap for secure Smart Contract implementation, making blockchain technology more accessible and safer for smaller businesses

Impact on Society

This initiative contributes to a more secure and inclusive digital economy, ensuring that blockchain technology serves society's needs while protecting public interests and promoting sustainable technological advancement.

Has your project directly involved or led to a specific recommendation or proposal for developing new or revised standards?

We are working through the PWI 24875 Secure Smart Contract to create a multipart technical standard.

Have the standardisation activities in your project led to specific deliverables?

The deliverables are related to the PWI 24875 Secure Smart Contract topic

What future efforts or activities are still necessary for your area of application?

Future efforts must prioritise continuous standard updates, automated compliance tools, auditor certification programs, and regulatory alignment while fostering international collaboration to ensure that Smart Contract security standards remain effective and relevant.

Online references related to the fellowship work

- https://www.researchgate.net/publication/379838925_Security_Guidance_of_auditing_smart_contract_on_Blockchain_and_Distributed_Ledger_system

Ljupcho Antovski: Contribution to Joint ISO/TC 307 - ISO/IEC JTC 1/SC 27 JWG4 - project ISO/AWI 24946

Name & Surname Ljupcho Antovski

Job title Professor of Software Engineering

Organisation FINKI, University Ss. Cyril and Methodius in Skopje

Country Macedonia

Engaged SDOs, WGs and TCs

Joint ISO/TC 307 - ISO/IEC JTC 1/SC 27 JWG4

Role within SDOs

Member

Addressed EU standardisation priorities and gaps

This project directly addresses the EU's ICT standardisation priorities by actively engaging in Blockchain and Distributed Ledger Technologies, as outlined in The European Commission Rolling Plan. It tackles the fragmentation of global standards by contributing to comprehensive, internationally recognised standards. This addresses critical gaps in interoperability, security, and innovation across European markets, reducing compliance burdens and enabling seamless cross-border data flow. By participating in the Joint ISO/TC 307 - ISO/IEC JTC 1/SC 27 WG 4, this project bolsters Europe's representation and influence in shaping global standards, aligning with the European Commission's liaison with ISO TC 307.

Concerned ICT Standards and contribution to the related landscape

The project focuses on working projects aiming to improve, preserve, and assess the privacy capability of DLT systems. By contributing to the Joint ISO/TC 307 - ISO/IEC JTC 1/SC 27 WG 4, the project actively shapes the standardisation landscape for blockchain technologies. It promotes interoperability, security, and consistency across different DLT platforms.

Impact on SMEs

Standardisation in blockchain technologies reduces complexity and uncertainty for SMEs. This project's contribution to clear, internationally recognised standards lowers barriers to entry, promotes innovation, and enhances competitiveness. SMEs benefit from increased interoperability and reduced compliance costs, enabling them to leverage blockchain technologies more effectively and participate in the digital economy.

Impact on Society

By focusing on privacy and security in DLT systems, this project enhances trust and confidence in blockchain technologies. Standardised approaches to data protection and identity management foster responsible innovation and promote the ethical use of blockchain. This contributes to a more secure, transparent, and equitable digital society, empowering individuals and communities.

Has your project directly involved or led to a specific recommendation or proposal for developing new or revised standards?

No.

Have the standardisation activities in your project led to specific deliverables?

Joint ISO/TC 307 - ISO/IEC JTC 1/SC 27 WG 4 directly contributes to proposals for refining and developing standards in the area.

What future efforts or activities are still necessary for your area of application?

Continued engagement in standardisation, further research on privacy-enhancing technologies, and broader industry collaboration are essential for future progress.

Online references related to the fellowship work

https://www.iso.org/committee/6266604.html

Christian Grafenauer: Privacy and Data Protection in Blockchain and DLT

Name & Surname Christian Grafenauer

Job title Blockchain, AI & Privacy Standardisation Expert

Organisation DIN Verbraucherrat e.V (Deutsches Institut für Normung)

Country Germany

Engaged SDOs, WGs and TCs

CEN/CENELEC JTC 19/WG 3 – Personal Identifiable Information (PII) in Blockchain and DLT

ISO/TC 307/JWG 4 – Security, Privacy, and Identity for Blockchain and DLT

Role within SDOs

» Convener of CEN/CENELEC JTC19/WG 3
» Project Leader for EN XXX – Guidelines on processing PII using blockchain and DLT
» Active Contributor in ISO TC307/JWG 4 and other privacy-related working groups

Addressed EU standardisation priorities and gaps

Blockchain technology presents unique challenges for data protection, GDPR compliance, and privacy due to its immutable and decentralised nature. Currently, no European standard exists to provide guidelines for processing personal identifiable information (PII) using blockchain and DLT systems in compliance with the GDPR and other applicable European regulations. The CEN/CLC JTC 19/WG 3 working group was established to fill this gap, with the new european standard providing technical and organisational measures to align blockchain applications with European privacy regulations. By harmonising efforts with ISO TC307/JWG4, this initiative ensures that blockchain privacy standards reflect European regulatory requirements while remaining globally interoperable. This work supports the European Commission Rolling Plan for ICT Standardisation, particularly in data governance, privacy, and cybersecurity, enabling trustworthy blockchain adoption for businesses, regulators, and consumers.

Concerned ICT Standards and contribution to the related landscape

This project contributes directly to developing CEN/CENELEC JTC19 WG3's first standard: EN XXX – Guidelines on processing PII using blockchain and DLT. This work builds on DIN SPEC 4997 and aims aligns with relevant ICT standards, including:

» ISO/IEC 27555 – Guidelines on Identification and De-identification
» ISO/IEC 27001 – Information Security Management Systems
» ISO TC307 – Blockchain and DLT governance and privacy

By bridging the gap between blockchain's decentralised nature and EU data protection laws, this standard will ensure privacy compliance, legal clarity, and interoperability. It will also support European regulators, businesses, and policymakers in adopting secure, privacy-preserving blockchain applications.

Impact on SMEs

SMEs often struggle with GDPR compliance in blockchain, leading to high costs and legal uncertainty. This standard will provide clear technical guidelines, reducing compliance burdens and fostering trust in blockchain-based identity, finance, and data management solutions.

By ensuring interoperability and legal certainty, SMEs can confidently integrate blockchain into cross-border business operations, benefiting from a harmonised European regulatory framework. The project also helps lower entry barriers, enabling SMEs to innovate, compete, and expand securely within the EU Digital Single Market.

Impact on Society

The standard enhances data protection and privacy rights by ensuring blockchain aligns with European legal frameworks. Citizens will gain greater control over their personal data, promoting secure digital identity solutions and trustworthy blockchain applications.

The project also aims to mitigate risks such as data misuse, re-identification, and surveillance concerns. By setting a privacy-by-design approach, blockchain technology can serve societal interests ethically and transparently. This fosters public trust in digital services, strengthening Europe's leadership in responsible blockchain governance.

Has your project directly involved or led to a specific recommendation or proposal for developing new or revised standards?

My project directly led to the approval of the NWIP for "Guidelines on processing PII using blockchain and DLT" under CEN/CENELEC JTC19 WG3. This standard will establish GDPR-compliant privacy frameworks and support interoperable, legally sound blockchain applications across Europe.

Have the standardisation activities in your project led to specific deliverables?

The New Work Item Proposal (NWIP) for EN XXX – Guidelines on processing PII using blockchain and DLT has been approved, marking the first step toward a European privacy standard for blockchain. This initiative will lead to technical and organisational measures to ensure secure and privacy-preserving blockchain solutions.

What future efforts or activities are still necessary for your area of application?

» Organising the first CEN/CENELEC JTC19 WG3 group meeting.
» Developing and finalising EN XXX, ensuring it aligns with GDPR and EU policies.
» Strengthening alignment with ISO TC307 to promote global blockchain privacy standards.
» Engaging SMEs, regulators, and industry stakeholders for broad adoption.

Online references related to the fellowship work

https://www.dinmedia.de/en/technical-rule/din-spec-4997/321277504

Soumya Kanti Datta: Secure and Interoperable Tracing for Digital Product Passport (SECTRACE)

Name & Surname Soumya Kanti Datta

Job title CEO and Standardisation Manager

Organisation Digiotouch

Country France

Engaged SDOs, WGs and TCs

W3C Distributed Tracing Working Group

Role within SDOs

Participant

Addressed EU standardisation priorities and gaps

Digital Product Passports (DPP) aim to promote sustainability, traceability, and circular economy goals by capturing key information across product lifecycles. However, multiple standardisation gaps hinder their effective adoption. Current data standards, ranging from GS1 barcodes to blockchain-based solutions, lack harmonisation, impeding cross-platform interoperability. Data security and privacy pose additional challenges, as stakeholders struggle to balance transparency with GDPR compliance. Blockchain's immutability complicates updates and corrections, demanding governance frameworks. Fragmented sector-specific certifications limit universal applicability, while scalability and performance issues undermine real-time data exchange in high-volume supply chains. Addressing these gaps require a standardised interoperability tool for seamlessly sharing product data, secure encryption and access protocols, and flexible, decentralised governance. Cross-sector certifications can help unify the European market, ensuring consistent ESG compliance. Ultimately, bridging these standardisation barriers will reinforce trust, reduce fragmentation, and accelerate Europe's transition towards sustainable, transparent product ecosystems. Europe's future competitiveness relies on robust DPP standards.

Concerned ICT Standards and contribution to the related landscape

My project developed a harmonised, interoperability mechanism to propagate vendor-specific tracing information across tiers instrumented with different tracing tools used in DPPs for W3C Distributed Tracing Working Group.

Impact on SMEs

European SMEs benefit significantly from interoperable DPP solutions. By standardising data formats, security protocols, and governance frameworks, SECTRACE lowers barriers to adoption, cuts integration costs, and levels the playing field with larger enterprises. SMEs gain enhanced supply chain transparency, enabling them to meet ESG standards and consumer expectations for sustainability. Ultimately, this fosters innovation, competitiveness, and growth opportunities, opening new markets, and rapidly accelerating Europe's digital and circular economic transition.

Impact on Society

My project SECTRACE will strengthen transparency and empower European citizens with trustworthy information on products they purchase. By harmonising digital product passports, it enhances resource efficiency, propels the circular economy, and reduces environmental harm. Consumers benefit from more informed choices, while manufacturers and retailers gain efficiency through standardised data sharing. This fosters job creation in emerging green technologies and digital innovations. Overall, SECTRACE significantly contributes to a resilient, sustainable society that strongly values accountability and collective well-being.

Has your project directly involved or led to a specific recommendation or proposal for developing new or revised standards?

It directly involved the distributed tracing mechanism as a part of the reference architecture developed in this work.

Have the standardisation activities in your project led to specific deliverables?

Yes, an open access scientific article has been published.

Datta, S. K. (2024, December 17). Gap Analysis on Interoperability of Blockchain Enabled Traceability Tools for Digital Product Passports. The 4th International Conference on Intelligent Cybernetics Technology & Applications 2024 (ICICyTA 2024), Bali, Indonesia.

What future efforts or activities are still necessary for your area of application?

Significant efforts remain in establishing cross-industry certification schemes, refining blockchain governance frameworks, and integrating advanced data protection rules. Wider stakeholder cooperation is crucial to harmonise standards and protocols. Expanding real-world DPP pilots, measuring adoption rates, and continuously updating regulations will further embed interoperability, security, and trust in European supply chains.

Online references related to the fellowship work

DOI - https://doi.org/10.5281/zenodo.14290810

Key enablers and infrastructure

Erik Andersen: Decentralised Public-Key Infrastructure (DPKI)Cybersecurity

Name & Surname Erik Andersen

Job title Independent expert

Organisation Andersen's L-Service

Country Denmark

Engaged SDOs, WGs and TCs

Collaborative work between:

ITU-T Study Group 17 Security &

ISO/IEC JTC 1/SC 6 Telecommunications and information exchange between systems

Role within SDOs

Main contributor and project editor

Addressed EU standardisation priorities and gaps

The DPKI covers several of the subjects listed in the EU Rolling Plan of ICT standardisation:

Concerned ICT Standards and contribution to the related landscape

EU Rolling Plan:

Foundational drivers - Network and information security and e-privacy: DPKI is all about security and provides facilities for protecting privacy.

Key enablers - A DPKI gives basic security services, it provides services to 5G/6G, cloud computing, Internet of Things, e-signatures.

Societal challenges: E-health, e-government, pandemic preparedness (the WHO vaccination certificates)

Innovation for the digital single market: Blockchain and distributed digital ledger technologies.

The DPKI covers the standardisation requests 6, 7, 16 and 24 specified by the EU in relation to the Cyber Resilience Act (CRA). These requests are on confidentiality, integrity, and access control, and most important, request 24 is on PKI making DPKI an important supporter of CRA.

Impact on SMEs

The project has no special impact on SMEs. The impact is the same for all government and private organisations

Impact on Society

Rec. ITU-T X.509 | ISO/IEC 9594-8 has a major impact on how we design secure systems as it is the framework for public-key infrastructure (PKI). PKI is used for online banking. E-government, E-health, power sector, mobile communication. DPKI will expand the scope of PKI to cover larger geographical areas, e.g., support the EU single market

Has your project directly involved or led to a specific recommendation or proposal for developing new or revised standards?

The project will result in an international standard called Rec. ITU-T X.507 | ISO/IEC 9594-13 and will be seen as an extension to Rec. ITU-T X.509 | ISO/IEC 9594-8.

Have the standardisation activities in your project led to specific deliverables?

So far, thirteen drafts have been produced.

What future efforts or activities are still necessary for your area of application?

There is still substantial work to be done.

Online references related to the fellowship work

Decentralised Public-Key Infrastructure (DPKI)

Christian Grafenauer: Standardisation of Digital Currency Terminology

Name & Surname Christian Grafenauer

Job title

Blockchain, AI & Privacy Standardisation Expert

Organisation

DIN Verbraucherrat e.V (Deutsches Institut für Normung)

Country

Germany

Engaged SDOs, WGs and TCs

ISO TC68 (Financial Services) / TC307 (Blockchain & DLT) Joint Working Group (JWG1) "Digital Currency: Vocabulary"

Role within SDOs

» Project Leader, ISO TC68/JWG1
» Contributor to standardisation efforts within ISO TC307
» Editorial support for terminology development

Addressed EU standardisation priorities and gaps

The project addresses the critical gap in standardised terminology for digital currencies, ensuring consistency across financial and blockchain ecosystems. By creating a harmonised vocabulary, it aligns with European priorities for financial innovation, interoperability, and regulatory clarity. This work supports the Digital Single Market Strategy by enhancing cross-border transactions, compliance, and financial transparency. Additionally, it contributes to the Rolling Plan for ICT Standardisation, aligning digital currency standards with EU regulations such as MiCA (Markets in Crypto-Assets Regulation). The lack of a unified terminology has hindered adoption, legal certainty, and cross-sector communication. This initiative strengthens Europe's role in global digital finance and blockchain governance, supporting financial institutions, policymakers, and businesses in adopting secure, interoperable, and legally sound digital currency solutions.

Concerned ICT Standards and contribution to the related landscape

The project directly contributes to the ISO TC68/JWG1 "Digital Currency: Vocabulary" standard, which is essential for global financial and blockchain standardisation. By defining and structuring key terms, it ensures clarity for financial institutions, regulators, and technology providers working with digital currencies. This work aligns with ISO/TC 68/JWG 1 efforts on Blockchain and DLT and fostering interoperability between traditional financial systems and emerging digital assets. The vocabulary provides a foundation for further technical and regulatory standards, reducing ambiguity in smart contracts, cross-border payments, and digital asset classification. The outcome strengthens EU standardisation strategies, ensuring that Europe remains at the forefront of digital financial infrastructure while reinforcing global competitiveness in blockchain and DLT innovation.

Impact on SMEs

SMEs benefit from this project by gaining clear, standardised terminology that simplifies access to blockchain and digital finance. Many SMEs struggle with the complexity of digital assets and regulatory compliance—this vocabulary enables them to navigate these challenges more effectively. By reducing legal uncertainty and ensuring interoperability, it lowers entry barriers for startups and fintech companies innovating in digital payments, tokenization, and DeFi (Decentralised Finance). The

standardised terminology fosters a more inclusive, accessible financial ecosystem, allowing SMEs to adopt blockchain solutions with greater confidence and security.

Impact on Society

A standardised vocabulary for digital currencies enhances transparency, security, and trust in blockchain-based financial transactions. This benefits consumers, businesses, and regulators by ensuring clear, unambiguous definitions of digital financial instruments. The project supports financial inclusion by making digital assets more accessible and understandable, particularly for new users and underserved populations. It also helps in consumer protection, aligning terminology with EU regulatory frameworks to prevent fraud and misinformation. Ultimately, it contributes to the safe, responsible, and sustainable adoption of digital currencies in Europe and beyond.

Has your project directly involved or led to a specific recommendation or proposal for developing new or revised standards?

The project contributed to the formation of ISO TC68/JWG1 "Digital Currency: Vocabulary", which will serve as a foundation for future digital currency and financial standards. It also informs ongoing discussions in ISO TC307 on Blockchain and DLT, ensuring alignment between financial regulations and emerging digital asset technologies.

Have the standardisation activities in your project led to specific deliverables?

The project has already contributed 200 defined terms for the Digital Currency Vocabulary standard, structured to align with financial regulations and blockchain terminology. Additionally, a filtered list of relevant terms was prepared and approved by JWG1 for inclusion in the standard. The first working drafts have been structured based on these contributions.

What future efforts or activities are still necessary for your area of application?

Further refinement of definitions is needed, alongside alignment with regulatory frameworks (e.g., MiCA) and global financial standards. The next steps include expanding industry engagement, refining the standard through expert contributions, and ensuring that financial institutions and blockchain developers adopt the terminology in practical applications. Continued cross-sector collaboration will be key to its long-term impact.

Online references related to the fellowship work

https://www.iso.org/standard/88729.html

Gerome Pons: Bridging ISO/TC307 Standards on Smart Contract Classification, Taxonomy and Ontology

Name & Surname Jerome PONS

Job title Founder & CEO / Blockchain Standardisation Manager

Organisation Music won't stop

Country France

Engaged SDOs, WGs and TCs

AFNOR/CN Blockchain

ISO/TC307/WG3

ISO/TC307/AHG5

ISO/TC307/WG1

Role within SDOs

» Lead of "Architecture & Modelling" group at AFNOR/CN Blockchain
» Contributor to "Smart Contract Taxonomy" at ISO/TC307/WG3 and ISO/TC307/AHG5
» Co-editor of "Taxonomy & Ontology" at ISO/TC307/WG1

Addressed EU standardisation priorities and gaps

From the standardisation point of view, this contribution is a first step to finalise and update two ISO/TC307 standards, thus bringing perfectly harmonised standards in a second step. These standards will address the gap between worldwide Blockchain / DLT standards in the fields of smart contract classification and European specificities (in particular the European regulation e.g. MiCA, Data Act, DSM, Copyright)

Concerned ICT Standards and contribution to the related landscape

» ISO/CD TS 18126 Smart Contract Classification and Taxonomy under development at ISO/TC307/WG3
» ISO/TS 23258:2021 Blockchain and DLT - Taxonomy and Ontology developed by ISO/TC307/WG1 and published in 2021

Impact on SMEs

The European experts contribution to ISO standards gives European SMEs a competitive advantage, through the first knowledge and quality of standard, thus reinforcing the European footprint and sovereignty on blockchain standardisation effort.

Impact on Society

The European experts' contribution to the European ICT Rolling Plan and European standards benefits all European citizens.

In particular, this contribution highlighted the need of standardisation of the classification of smart contracts at ISO/TC307/WG3 as well as the classification of assets, including physical assets (e.g. physical products in relation with the EU Digital Product Passport) and digital assets at ISO/TC307/WG8, that should be reflected in ISO/TS 23258 standard at ISO/TC307/WG1. This illustrates the link between ISO standardisation and the European regulations (i.e. DPP).

Has your project directly involved or led to a specific recommendation or proposal for developing new or revised standards?

From a European standardisation point of view, this contribution helped to harmonise different working groups within ISO/TC307 (i.e. WG3, AHG5 and WG1) and standards (i.e. ISO/CD TS 18126 and ISO/TS 23258:2021).

Have the standardisation activities in your project led to specific deliverables?

On Nov. 6th 2024, the contribution "Harmonisation of Smart Contract Taxonomy between ISO/CD TS 18126 and ISO/TS 23258:2021" was shared with ISO/TC307/WG3, AHG5 and WG1

What future efforts or activities are still necessary for your area of application?

Beyond feeding into ISO/CD TS 18126, the output of this contribution will also weigh for triggering the revision of ISO/TS 23258:2021 at ISO/TC307/AHG5. In particular, a revision of ISO/TS 23258:2021 will bring both a harmonised smart contract taxonomy, asset taxonomy and decentralised identifier / identity taxonomy. The latter will further feed into the European standardisation at CEN-CENELEC/JTC19/WG1 (Decentralised Identity).

This illustrates the link between ISO standardisation and European standardisation (at CEN-CENELEC).

Online references related to the fellowship work

- "ISO/TS 23258:2021(en) Blockchain and distributed ledger technologies — Taxonomy and Ontology", ISO/TC307, November 2021, https://www.iso.org/obp/ui/en/#iso:std:iso:ts:23258:ed-1:v1:en

Christiana Aristidou: Contribution to ISO/WD TS18126 Taxonomy and classification for smart contracts as WG3 Project Leader

Name & Surname Christiana Aristidou

Job title CEO, Managing Partner

Organisation The Hybrid LawTech Firm

Country Cyprus

Engaged SDOs, WGs and TCs

ISO/TC 307 – WG3, Smart contract taxonomy and classification

Role within SDOs

Head of the National Delegation to ISO/TC 307 and one of the two Project Leaders for ISO/CD 18126

Addressed EU standardisation priorities and gaps

My activity addressed European activities, gaps, and challenges related to blockchain and DLT as anticipated. My work leading the standard on the taxonomy and classification for smart contracts aligns with European priorities. The standard aims to advance harmonisation and address fragmentation in blockchain and distributed ledger technologies. This effort provides a structured framework to facilitate wide adoption for smart contracts while addressing regulatory and interoperability challenges within Europe. The development of the TS supports the European emphasis on standardisation as a tool to enable and operationalise legislation and policy implementation. In my application, I identified Articles 35(5) and (6) of the EU Data Act as provisions requiring European Standardisation Organisations to develop harmonised standards or, in their absence, the adoption of common specifications by the European Commission. The TS I worked on will guide these organisations, providing a foundational standard for smart contracts, enhancing regulatory harmonisation, and reducing legal uncertainty

Concerned ICT Standards and contribution to the related landscape

My contribution to this standard ensured continuous improvement in the EU blockchain standardisation landscape, particularly due to the foundational value of the TS concerned. This standard is bound to influence the work of other committees and working groups, such as the Joint Working Group of AG5 of TC/68 and AG3 of TC/307 established as the former's initiative to develop the vocabulary of digital currencies, the PWI on tokenization methods for creating digital representations of multiple commodities and asset classes and the PWI on Representing Non-Financial Digital Assets using Tokens on DLTs exploring how digital assets, such as images, movies, animations, music, and games, not purely financial digital assets like bitcoin, stablecoins, or CBDC, are represented by tokens both concerning the framework in TS AWI 20435 "Representing physical assets with tokens".

Impact on SMEs

For SMEs, my proposed activity offers the development of a clear framework that encourages the use of smart contracts, driving further innovation and trust in DLT applications and solutions. In particular, this taxonomy will facilitate the integration of SME-developed smart contract solutions with larger platforms and networks, thus reducing technical barriers and enhancing interoperability. In addition, the clarity provided by this framework will enable SMEs to better understand and navigate the complex regulatory and legal frameworks that exist, minimising their compliance risks.

Impact on Society

This standard supports the EU's Digital Decade objectives by enabling broader adoption of blockchain technologies and their respective solutions across public and private sectors, enhancing digital literacy and infrastructure across society. At the same time, this taxonomy advances climate action and the UN SDGs; smart contracts can support sustainable initiatives, like transparent carbon credit tracking, and renewable energy trading. On a European level, this taxonomy facilitated the efficient and secure automation of sustainable business practices, reducing resource waste and promoting greener digital infrastructures, in line with the EU Green Deal.

Has your project directly involved or led to a specific recommendation or proposal for developing new or revised standards?

My contribution, as a co-project leader, is instrumental in creating an ISO technical standard on taxonomy and classification for smart contracts. This will be the first standard published by ISO/TC 307, WG3 on smart contracts, laying the foundation for further standardisation activities on smart contracts, blockchain and distributed ledger technologies.

Have the standardisation activities in your project led to specific deliverables?

My standardisation activities have led to specific deliverables. These include leading the comment resolution process and producing a comment resolution report regarding comments received during ballot related to ISO/CD TS 18126. Additionally, as a co-project leader, I have also led the development of ISO/CD 18126.2 that is currently for a second committee ballot, aiming at a robust and comprehensive standard.

What future efforts or activities are still necessary for your area of application?

As ISO/TS 18126 is currently at the CD2 stage, several efforts are necessary to ensure its successful adoption and evolution. For instance, continuous input from various stakeholders is vital to ensure that the standard addresses real-world needs and use cases. Additionally, given the currently evolving regulatory framework, there should be ongoing monitoring and integration of all relevant evolving legal frameworks.

Online references related to the fellowship work

- https://www.iso.org/standard/85175.html
- https://standards.iteh.ai/catalog/tc/iso/e902cce7-5656-4955-a166-59254ce52add/iso-tc-307-wg-3?srsltid=AfmBOop7GcmJ29tD3awn7POWhzCywH2xjKejj-nkdiB7gcKISUVeHeOq

Identity and Trust

Peter Lee Altmann: Fostering eIDAS 2 relevant standardization and the use of DLT as a trust anchor

Name & Surname

Peter Lee Altmann

Job title

IT specialist digital identity and privacy preservation

Organisation

Leeman Consulting AB

Country

Sweden

Engaged SDOs, WGs and TCs

ETSI TR 119476, CEN/TC 224 WG20

Role within SDOs

Active participation in CEN/TC 224 WG20, member of ETSI TC ESI, co-editor of ETSI TS 119476

Addressed EU standardisation priorities and gaps

While the legal framework of eIDAS 2 provides a clear mandate, there is a notable absence of standardised profiles for essential formats such as Selective Disclosure JSON Web Tokens Verifiable Credentials (SD-JWT VC) and mdoc-MSO (Mobile Driver's License). The convergence of various elements, including the Attestation Reference Framework (ARF) development and the intricate requirements of the large-scale pilot projects, demands a coherent and standardised approach and significant know-how and expertise in the various areas involved.

Concerned ICT Standards and contribution to the related landscape

Primarily ETSI TS 119472, and CEN/TC 224 WG20 on PID onboarding.The privacy objective aimed to develop ETSI TR 119 476 and integrate it with ETSI TS 119 472. This was achieved with the previous update of ETSI TR 119 476. A new version, published in May 2025, offers clearer privacy preservation recommendations and a laddered approach for issuers:

- Issue SD-JWT Attestations Without Disclosures: Minimal changes for issuers, with attestations limited to verifier-requested attributes.
- Add Salted Hash Digest Disclosures: Enables multi-show presentations, allowing users to selectively disclose attributes.
- Implement Batch Issuance with One-Time Keys: Ensures single-use, unlinkable attestations, even for colluding verifiers.
- Integrate a ZKP Layer: The most advanced option, using zero-knowledge proofs for maximum privacy.

Impact on SMEs

SMEs are among the most active actors (cf. the expert's own activity) in the area of identity management and privacy preservation. The closing of standardisation gaps will result in increased opportunities for them to bring innovative, interoperable products to the market.

Impact on Society

Europe has set itself the strategic goal of offering digitalised services to all citizens of the Member States. Foundational technology in this respect is interoperable, privacy preserving, trustworthy digital

identity management.

Has your project directly involved or led to a specific recommendation or proposal for developing new or revised standards?

The work in ETSI TR 119476 will act as privacy basis for ETSI TS 119472. The work in IETF ARKG will provide the details required for key binding as required in CEN/TC 224. The work with hierarchical deterministic key derivation is currently a profile under ARKG but is planned for IETF.

Have the standardisation activities in your project led to specific deliverables?

The publication and subsequent revisions of ETSI TR 119 476.

What future efforts or activities are still necessary for your area of application?

Work with trust anchors is still ongoing. While it is clear how to express trust information in an attestation, the details of relying on a federation and/or DLT are not yet fully understood. This work is ongoing.

Online references related to the fellowship work

https://www.etsi.org/deliver/etsi_tr/119400_119499/119476/01.02.01_60/tr_119476v010201p.pdf
https://standards.iteh.ai/catalog/tc/cen/1a6fc8ab-0f49-47f9-9859-b7cafca214a6/cen-tc-224-wg-20

Markus Sabadello: Next steps in standardization of W3C DID

Name & Surname Markus Sabadello

Job title Founder

Organisation Danube Tech GmbH

Country Austria

Engaged SDOs, WGs and TCs

W3C DID Core, W3C DID Resolution

Role within SDOs

Member of Working Groups, member of the Steering Committee at the Decentralized Identity Foundation

Addressed EU standardisation priorities and gaps

Decentralized identifiers (DIDs) are a core component of numerous initiatives in European digital policy. But there are current gaps in standardisation that hinder their take-up. An important example is a standardised approach to the resolution of Digital IDs. To date, the lack of a a standardised approach has led to fragmentation in implementation approaches, hindering interoperability, which is necessary for full European-wide deployment capability.

Concerned ICT Standards and contribution to the related landscape

W3C DID Core, W3C DID Resolution are the concerned standards. Direct and ongoing contributions to the DID Core and DID Resolution specifications, via issues and PRs on relevant Github repos, participation and leadership in conference calls, and various other community interactions. The expert is Editor of the DID Core and DID Resolution specifications, as well as contributor to multiple DID method specifications.

Impact on SMEs

SMEs are leaders in the creation of DID related products, as exemplified by the company founded by the expert.

Impact on Society

Decentralised Digital Identity is foundational in the creation of a Digital Europe. All of European society will benefit from the successful deployment of DID technology throughout the Member States.

Has your project directly involved or led to a specific recommendation or proposal for developing new or revised standards?

The project has led to the establishment of a new DID method working group.

Have the standardisation activities in your project led to specific deliverables?

The specifications DID Core 1.1 and DID Resolution 1.0 are now well underway.

What future efforts or activities are still necessary for your area of application?

Completion of DID Core 1.1 and DID Resolution 1.0 is fundamental at this point.

Online references related to the fellowship work

- https://www.w3.org/TR/did-resolution/
- https://www.w3.org/TR/did-1.0/

Gyu Myoung Lee: Trust Native Data Spaces with DLT for User Centric Decentralized Web Era

Name & Surname

Gyu Myoung Lee

Job title

Professor

Organisation

Telecom SudParis, France (and Liverpool John Moores University)

Country

France, (United Kingdom)

Engaged SDOs, WGs and TCs

ITU-T SG13 and SG20

Role within SDOs

Web3 Adhoc Convenor, Rapporteur of Q16/13 and Q4/20

Q16/13: Future networks: Trustworthy and quantum enhanced networking and services

Q4/20: Data analytics, sharing, processing and management, including big data aspects, of Internet of Things (IoT) and smart sustainable cities and communities (SSC&C)

Addressed EU standardisation priorities and gaps

One of the main focuses was to support digital asset trading in a decentralised trust-based data ecosystem. In order to successfully build a user-centric data infrastructure, data governance is very important from an EU perspective. In this context, the project activity addressed the following issues 1) digital rights to enable individuals to access, use, create and publish digital media (assets) or to access and use computers, other electronic devices and telecommunication networks, 2) data sovereignty to support the right to control and store data with the emergence of new distributed cloud technologies, 3) data ownership as the act of having legal rights and full control over a single piece or set of data elements, and 4) data stewardship to ensure the quality and fitness for purpose of the organisation's data assets, including the metadata associated with those data assets.

Concerned ICT Standards and contribution to the related landscape

As Web 3.0 evolves, ICT standards are essential to ensure interoperability, security, scalability and trust in decentralised systems. These standards help create a cohesive and sustainable ecosystem by addressing key technical and regulatory challenges. They enable secure identity management, decentralised storage, smart contracts and financial transactions, and ensure seamless integration with existing digital infrastructure. ICT standards also play a critical role in maintaining user trust, privacy and regulatory compliance. Their development and adoption will shape the success of Web 3.0 and foster a more secure, transparent and efficient digital future.

Impact on SMEs

With emerging Web 3.0 standards, SMEs can access decentralised data marketplaces, allowing them to buy and sell data without intermediaries. Decentralised identity and self-sovereign identity allow SMEs to authenticate users without relying on giant centralised identity providers. Smart contracts automate transactions, reducing operational costs and tokenization allows SMEs to raise funds via community-driven crowdfunding.

So, SMEs stand to benefit significantly from Web 3.0 and decentralised data infrastructures, especially in terms of cost reduction, security, and new revenue models.

Impact on Society

Web 3.0 standards empower individuals with greater control, security, and economic opportunities while promoting inclusion and digital trust. However, challenges like regulatory uncertainty, accessibility barriers, and security risks must be addressed for widespread benefits. Its societal impact depends on how governments, businesses, and communities adapt. Individuals must take responsibility and stay informed to navigate this decentralised digital world safely. The extent of Web 3.0's influence will hinge on adaptability and evolving regulations shaping its future.

Has your project directly involved or led to a specific recommendation or proposal for developing new or revised standards?

The project focused on pre-standardisation activities and stimulating future standardisation with a clear identification of potential work items to support trust-native data spaces with blockchain/DLT for the user-centric decentralised Web (Web 3.0) era. The project's Web 3.0 will contribute to the realisation of a data-driven economy based on data spaces with blockchain/DLT.

Have the standardisation activities in your project led to specific deliverables?

The Web3 ad hoc activities in ITU-T resulted in two technical reports, "Trustworthy Data Infrastructure for Web 3.0" and "Network enhancement for supporting Web 3.0 technologies". Based on these results, several new work items have been identified to develop new standards, in particular to support ICT ecosystems related to digital assets.

What future efforts or activities are still necessary for your area of application?

Based on the Web3 *ad hoc* activities, ITU-T is planning to create several new work items. In particular, the Web 3.0 for supporting trust-native data spaces with blockchain/DLT for the user-centric decentralised ecosystem needs to create a harmonised view on future standardisation among stakeholders by exchanging information and opinions on emerging issues and preparing the future of the Internet.

Online references related to the fellowship work

- ITU-T: https://www.itu.int/ifa/t/2025/sg13/temp/Web3-adhoc/ (only ITU-T members can access this site)
- Other expert's blog: https://dnsrf.org/blog/web-3-0-and-standards/index.html

Innovation in Blockchain

Paulo Gonçalves: Blockchain technology for the robotics domain: current challenges

Name & Surname Paulo Gonçalves

Job title Professor

Organisation Polytechnic Institute of Castelo Branco

Country Portugal

Engaged SDOs, WGs and TCs

IEEE working group 1872.3

Role within SDOs

Chair of working group 1872.3

Addressed EU standardisation priorities and gaps

The gap/challenge identified as the focus of the proposed fellowship was to pursue a standard way to apply blockchain concepts to the robotics domain. Such a standard does not exist, and the obvious first step is the multi-robot scenario, where robots work within a network. The fellowship involved performing the first study to develop a standard for "Blockchainized Robotics".

The first step was to identify a common vocabulary between the robotics and blockchain communities and achieve a proper and formally defined interoperability amongst robotic agents. This is needed to properly register the interaction events, and more importantly, to be able to demonstrate that they are correct - i.e., they follow the task's specifications. Moreover, and since the knowledge is within the blockchain network, robotic agents can access validated global information. Validated interactions amongst multiple robots and humans are crucial for secure and ethical interactions. These procedures are the key to properly deploying robotic and autonomous systems in each mission.

Concerned ICT Standards and contribution to the related landscape

The fellowship was related to the *IEEE Robotics and Automation, Standard Ontologies* series,1872 - specifically to the multi robot scenarios, where the application of blockchain technologies is a promising application area (due to its specific needs, the area correlates well with blockchain technology).

Key concepts and definitions were identified to enable a common vocabulary for the integration of robotics, AI based systems, and blockchain technology.

Potential use cases to demonstrate blockchain technology in real scenarios were identified. These use cases create smart contracts that use information acquired in the environment by different robots to trigger actions based on the contracts stored and verified in the blockchain. As a final step, a review of applications of blockchain technology to the multi-robot scenario was carried out.

Impact on SMEs

The fellowship contributed to the envisioned long-term impact of a standard that includes blockchain technology in robotics, e.g., to obtain validated environment information obtained from multiple robots.

The scope of the activity was related to the multi-robot scenario for the robotics and autonomous systems domain. It is very important to formally define concepts that comprise, e.g., interactions, communications, reasoning, for robots, teams of robots and autonomous systems. Those concepts were identified and constitute a first step toward standardising common blockchain and robotics frameworks to be used by SMEs.

Impact on Society

Using the proper vocabulary (concepts and definitions) enables the joint work of robots, autonomous systems, industry 4.0 and 5.0 devices, healthcare devices and the needed artificial intelligence applications (with humans in the loop) that run on and for them using blockchain technology. This is critical to the *interoperability* of these systems, which is aligned with European interests.

Has your project directly involved or led to a specific recommendation or proposal for developing new or revised standards?

The fellowship contributed to the future IEEE 1872.3 *Standard for Ontology Reasoning on Multiple Robots*. It proposed key concepts that are aligned to the multi-robot scenario and the use/integration of blockchain technology. The concepts will be integrated into the standard, with specific references to blockchain technologies.

Have the standardisation activities in your project led to specific deliverables?

The project activities led to the following deliverables:

» concepts and their definitions identified as essential to align the vocabulary for the robotics domain (multiple robots) and blockchain technology
» potential use cases to be included in the standard, aligned with cloud robotics (multi-robot scenario)
» a working paper with a review of challenges on blockchain for robotics

What future efforts or activities are still necessary for your area of application?

The efforts needed in the near future are:

1) a formal ontology definition for a common vocabulary for blockchain and robotics, to be aligned with existing robotic ontological standards

2) a use case implementation to validate the standard ontology that intersects those domains

Online references related to the fellowship work

https://www.ieee-ras.org/industry-government/standards/active-projects/p1872-3-ontology-reasoning-for-multiple-autonomous-robots
https://standards.ieee.org/ieee/1872.3/11037/

Paulo Gonçalves: Blockchain technology for multi robot scenarios: sharing ontology based knowledge and reasoning

Name & Surname Paulo Gonçalves

Job title Professor

Organisation Polytechnic Institute of Castelo Branco

Country Portugal

Engaged SDOs, WGs and TCs

IEEE working group 1872.3

Role within SDOs

Chair of working group 1872.3

Addressed EU standardisation priorities and gaps

The work done in this fellowship started from the concepts identified in the first SEEBLOCKS.eu SEP and on the IEEE standard 1872-2015, from a robotics perspective, to develop key concepts for the use of blockchain with multiple robots. The work addressed EU standardisation priorities related to interoperability between robotics and autonomous systems standards, e.g., existing IEEE specifications.

For example, interactions / communications and reasoning should be validated, trustworthy, and interoperable. Blockchain technology plays a crucial role in achieving these outcomes.

The project addresses the identified gaps above by pursuing an ontologically standardised way to apply blockchain concepts to the robotics domain. The work involved ontology development for the use of blockchain for multi-robot knowledge representation and reasoning (within WG 1872.3) in several robotic domains, such as trust for autonomous robotics and multiple autonomous robots.

Concerned ICT Standards and contribution to the related landscape

The fellowship was related to the *IEEE Robotics and Automation, Standard Ontologies* series,1872, specifically the multi robot scenarios, where the application of blockchain technologies is promising due to its specific needs that correlate well with blockchain technology.

The main contribution was the development of an ontology that covers key concepts and definitions of robotics, AI based systems, and blockchain technology. The ontology proposed was written in OWL and was aligned to the IEEE RAS 1872 Standard series and the top level ontology, DOLCE, recently standardised. A second key contribution was the use case implementation to validate the proposed ontology.

Impact on SMEs

The long-term envisioned impact on industry, in particular SMEs, is to have a standard based on blockchain technology to achieve, e.g., validated environment information obtained from multiple robots, as well as validated local or shared reasoning, within IEEE RAS standards and others developed worldwide. Moreover, it will also impact interoperability, e.g., by validating interactions between robotic agents, IoT devices and generic ICT infrastructure systems.

Impact on Society

The project also impacts society because it relates to Industry 4.0/5.0. The robots present today in numerous working scenarios (e.g., industrial, healthcare) can also be tele-operated and collaborative, with direct intervention of humans in their control. Again, validated interactions and communication with humans and robotic AI agents will have a significant impact on society as a whole.

Has your project directly involved or led to a specific recommendation or proposal for developing new or revised standards?

The fellowship contributed to the future IEEE 1872.3 *Standard for Ontology Reasoning on Multiple Robots*. It proposed an ontology that relates blockchain technology in multi-robot scenarios, and provided a use case.

Have the standardisation activities in your project led to specific deliverables?

The project activities led to the following deliverables:

» an ontology based on the concepts and relationships of blockchain technologies applied to robotics
» application of the ontology developed, to a use case for sharing knowledge and reasoning (validated by the blockchain) within a team of robots with shared goals and tasks

What future efforts or activities are still necessary for your area of application?

The efforts needed in the near future are: to further refine the proposed ontology; to apply the proposed standard ontology to different use cases; to use and apply the proposed work in different blockchains.

Online references related to the fellowship work

https://www.ieee-ras.org/industry-government/standards/active-projects/p1872-3-ontology-reasoning-for-multiple-autonomous-robots
https://standards.ieee.org/ieee/1872.3/11037/

Dimitar Kyosev: Blueprint for Voluntary Standardisation of Collection of Debts in the Digital Euro

Name & Surname Dimitar Kyosev

Job title Legal lead

Organisation Alis Grave Nil

Country Bulgaria

Engaged SDOs, WGs and TCs

ECB

Role within SDOs

n/a

Addressed EU standardisation priorities and gaps

Private debt is the bloodline of the economy, where creditors need to be able to collect their dues, while debtors should be protected from abusive practices. Currently, both on national and EU level a complex web of checks and balances facilitates private debt collection. The Digital Euro will change the backend of the payment infrastructure. As such, collection of private debts would need to be adapted in a standardised manner to create a fair economy, where creditors and debtors will have fair protections for their legitimate interests. The vision is a unified protocol for Payment Service Providers (PSPs) using Digital Euros for the steps, processes and guarantees extended to their customers in case of private debt collection against their customers.

Concerned ICT Standards and contribution to the related landscape

The purpose of the blueprint is to outline the issues that a PSP system design should take under consideration when developing its DLT solution. The procedures discussed in the report are not detailed, as the upcoming legislation is likely to shape them in more detail. However, the functionalities of a DLT system servicing debt collection in Digital Euros would need to allow for those procedures to be executed. In other words, the purpose of the Blueprint is to support the technical development of private party solutions in a manner that will allow maximum utilisation of the technical capabilities provided by blockchain technology, while safeguarding the citizen's fundamental rights and dignity.

Impact on SMEs

As the most flexible and innovative segment of the economy, SMEs are in a unique position to drive the Digital Transition by taking advantage of the Digital Euro. To do so effectively, credit (including deferred payments or invoice credit) should flow in a seamless manner. By supporting a clear, reasonable, and predictable cross-border collection process, this proposal lays the groundwork for robust SME growth.

Impact on Society

The social impact of fast and transparent debt collection across the Euro area is indirect, but substantial. By virtue of its clarity and reliability in compliance with citizen's rights and dignity, the debt collection mechanism elaborated in the project will reinforce EU values and ideals.

Has your project directly involved or led to a specific recommendation or proposal for developing new or revised standards?

Debt collection is intertwined in the fabric of the economy and is therefore subject to a multitude of forces, including those generated by emerging technologies. This project aims to provide a short overview on the possible issues (e.g., AI, Metaverse/ER, IoT/Micropayments) that a designer of a PSP

blockchain solution should consider when designing the functionalities of the software.

Have the standardisation activities in your project led to specific deliverables?

The project aims to create a Blueprint for Voluntary Standardisation in the Collection of Debts in the Digital Euro. As such it has achieved its initial goal.

What future efforts or activities are still necessary for your area of application?

Voluntary standardisation requires considerable effort from a multitude of stakeholders and software developers. However, given the importance of the issue, I am convinced that the work undertaken in this project will be used and expanded upon in the coming years by many of those stakeholders.

Online references related to the fellowship work

https://www.ecb.europa.eu/euro/digital_euro/html/index.en.html ECB Digital Euro webpage

Governance

Maria-Luisa Marsal Llacuna: EUDI-conformant & EBSI-compliant incentives framework to improve DGA's data

Name & Surname Maria-Luisa Marsal Llacuna

Job title Independent Consultant and researcher on the "twin transition"

Organisation

Country Spain

Engaged SDOs, WGs and TCs

ISO/TC 307/JWG 4, ISO/TC 307/WG 3, ISO/TC 307/WG 8, ISO/TC 307/WG 2

Role within SDOs

Member

Addressed EU standardisation priorities and gaps

The European Data Governance Act (DGA), introduced in May 2022 and in force since August 2023, aims at establishing mechanisms to reutilise certain categories of protected data within the public sector through a new model based on the principles of transparency and confidence. The DGA is as ambitious as necessary but might fail due to the lack of incentives for the involved parties to perform and deliver on its purpose since it is easier not to reutilise rather than abide by the sharing mechanisms it outlines.

Concerned ICT Standards and contribution to the related landscape

ISO/TC 307/JWG 4: ISO/TR 23244:2020, ISO/TR 23249:2022, ISO/TR 23644:2023

ETSI GS PDL 011, ISO/TC 307/WG 3: ISO/TR 23455:2019, ISO/TC 307/WG 8:ISO/CD 20435, ISO/TC 307/WG 2: ISO/TR 23576:2020. The contribution has been to produce a blockchain model inspired on the incentives framework for network maintenance of public blockchains, to next transpose it and adapt it for its use in the reimagining of data governance solutions, to improve its current low adoption and uptake in both public and private implementations.

Impact on SMEs

SMEs are generally resource-poor, and because of this are often among the first to renounce the use of facilities such as the sharing mechanisms of the DGA. The incentives framework elaborated in this work can contribute to increased adoption of the DGA's mechanisms by SMEs with the associated benefits.

Impact on Society

Increased adoption of the DGA means more protection, privacy, and trust in public data, an overall good for society.

Has your project directly involved or led to a specific recommendation or proposal for developing new or revised standards?

The expert has initiated contact with the standard's

expert leader of the ISO AWI 24878 to have the framework developed included as one of the use cases. Works developed within the first Chapter/WG of the fellowship are relevant to CEN/CLC/JTC 19/WG 01 Decentralised identity management and could feed into the on-going standardisation works prCEN/CLC/TS XXXX (WI=JT019002) Decentralised Identity Management Model based on Blockchain and other Distributed Ledgers Technologies. – Part 1: Generic Reference Framework.

Have the standardisation activities in your project led to specific deliverables?

Contribution reports, corresponding to WP1/Chapter1 and WP2/Chapter 2 of the grant, have been delivered by the expert.

What future efforts or activities are still necessary for your area of application?

The incentives framework must now be taken up and implemented so that concrete adoption of the DGA is more widely facilitated in order for its benefits to be realised as broadly as possible throughout the European area.

Online references related to the fellowship work

- ISO/TR 23644:2023 - Blockchain and distributed ledger technologies (DLTs) — Overview of trust anchors for DLT-based identity management

Ismael Arribas: Guidelines of governance for DAOs (Smart Contracts perspective)

Name & Surname Ismael Arribas

Job title CEO

Organisation KUNFUD

Country Spain

Engaged SDOs, WGs and TCs

ISO/TS 23635/:2022; ISO/TS 23258:2021 and ETSI standards

Role within SDOs

Member of ISO TC 307, Convenor for WG3 Smart Contracts and its applications, Co-chair of the Standards Committee of INATBA. Liaison officer for ITU-T FG MV.

Addressed EU standardisation priorities and gaps (160 words max)

While digitalization is growing, the needs for some challenges are focusing on decentralization and multi-jurisdictional governance models which make a new wave of decision-making for collective communities based on smart contracts and its applications to processes.There are currently more than 13000 DAOs which represent a new form and challenge for conventional corporate business models. The work analyzed the market reality with Decentralized Autonomous Organizations, identifying commonalities in governance aspects and categorizing the variety of smart contracts for the common inception, developing and potential recommendations for termination.

Concerned ICT Standards and contribution to the related landscape (130 words max)

ISO/TS 23635/:2022; ISO/TS 23258:2021 and ETSI standards are directly concerned. The work specifically has impact on ISO TC307 in the WG5 and WG7 (Governance and interoperability) respectively, among others. It would be also be of interest of the WG6 Use cases and definitely with the scope of the Smart Contracts perspective focuses on areas for a set of guidelines of governance for DAOs.

Impact on SMEs

SMEs are key beneficiaries of the new forms of organisations represented by DAOs. Thus, a well-defined governance for DAOs will place them on a solid organisational and legal footing that will enable SMEs to confidently participate in DAOs.

Impact on Society

The impact of DAOs on society is not yet known, but there is the promise of lightweight, efficient, sovereign organisational structures that reflect European values. This work represents a step toward realising the vision of DAOs.

Has your project directly involved or led to a specific recommendation or proposal for developing new or revised standards?

The proposal was very well received at ISO TC 307 and is an ongoing project PWIP (Preliminary Work Item for) in WG5 Governance at ISO TC 307.

Have the standardisation activities in your project led to specific deliverables?

The above-mentioned proposal was the deliverable of the work.

What future efforts or activities are still necessary for your area of pplication?

The work executed in this grant will be disseminated in ad hoc meetings presentation to “de iure” and “de facto” standards organizations for further discussions and publications, with prospective broader take-up throughout the standards ecosystem.

Online references related to the fellowship work (insert links)

- https://www.iso.org/committee/6266604.html
- https://standards.iteh.ai/catalog/tc/iso/fedb3cce-0bff-475b-b009-bfc3b88e36f7/iso-tc-307-wg-5?srsltid=AfmBOor8k3kTL1DBlUNNnY574WTr3nA6pcOkb-PRXcN0AXQT-gz9Rt67

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