UNICEF Innocenti – Global Office
of Research and Foresight

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CASE STUDY

Industry Standards

Case study overview

Type of innovation in data governance: Industry standards

Key innovator(s) in focus:

- CEN-CENELEC
- International Organization for Standardization (ISO)
- Institute of Electrical and Electronics Engineers (IEEE)

Problem the innovation is trying to solve: Lack of practical guidance, for engineers and developers, on how to implement regulations or assess compliance with them.

About the innovation in data governance: Industry standards are often non-binding frameworks agreed by industry and other stakeholders to translate laws and regulations into practical guidance for developers, engineers and technical experts.

Countries or regions of operation: European Union (EU), Global

Time period: 2023–date

Problem the innovation in data governance is trying to solve

Laws, regulations and policies related to children's data governance often remain high level and open to interpretation. Although regulations may require companies to use effective, privacy-preserving age assurance tools, or a Children's Code may contain general requirements for age-appropriate design, the lack of specificity makes it is easy for technology companies to claim compliance without making substantial product changes.

One key purpose of technical or industry standards (Standards) is to translate these high-level legal or regulatory requirements into detailed, actionable technical guidance for engineers – starting at the design stage and continuing throughout the product lifecycle.

Standards for technology products have long played a foundational role in enabling today's interconnected digital environment, through widely adopted internet protocols and related Standards. Globally, some of the main standardization bodies include the International Organization for Standardization (ISO), the International Electrotechnical Commission (IEC) and the Institute of Electrical and Electronics Engineers (IEEE). In Europe, the European Committee for Standardization (CEN) and the European Electrotechnical Committee for Standardization (CENELEC), known together as CEN-CENELEC, are the key players. When CEN-CENELEC Standards are formally requested by the European Commission and published in the Official Journal of the European Union (EU), they become Harmonized Standards. These hold special status and can be used by companies as a presumption of conformity with applicable laws. Companies can use Harmonized Standards for certification or to self-declare compliance.

One key purpose of Standards is to translate high-level legal or regulatory requirements into detailed, actionable technical guidance for engineers

While Standards have traditionally been technical in nature and shaped primarily by engineers, IEEE has more recently pioneered a new generation of socio-technical Standards, which aim to bake in human rights and children's rights considerations alongside technical provisions. These emerging Standards are rapidly becoming essential tools in the children's data governance landscape and have the potential to meaningfully operationalize children's rights in practice.

Among the many global standardization bodies, this case study focuses on those actively contributing to the development of Standards relevant to data governance for children.

European Union: CEN-CENELEC Specification on age-appropriate design

The CEN-CENELEC Specification on age-appropriate design (CEN-CENELEC Specification) provides a framework for creating digital products and services that prioritize the safety, privacy and well-being of children based on age-appropriate design.

Origins and implementation

The Specification (similar to a Standard, but less authoritative) builds on a set of principles developed by the 5Rights Foundation, which aim to make the digital environment more respectful of children's rights. These principles formed the basis of the IEEE 2089-2021 Standard for an Age-Appropriate Digital Services Framework (AADSF), which the CEN-CENELEC Specification builds upon.

The CEN-CENELEC Specification outlines a set of processes to ensure that new technologies, apps and online services are adapted to the developmental stages and specific needs of children. Section 10 of the Standard on the "child-centred approach to data use" aims to ensure that products and services do not employ exploitative commercial practices, such as dark patterns, deceptive nudging or targeted advertising to children – or any other kind of profiling that is not in the best interests of the child. The Specification aligns with the aims of the EU's General Data Protection Regulation (GDPR) by emphasizing data minimization, and by setting minimum standards for the collection, processing and protection of children's personal data across digital platforms. It includes requirements for transparent, child-friendly communication to inform both children and their parents or guardians about how data are processed, as well as for companies to conduct a Child Rights Impact Assessment (CRIA).

It also outlines several key roles within the engineering project team to support age-appropriate design. These include:

- A top management champion – a C-suite leader responsible for establishing a corporate commitment to age-appropriate products and services
- A system expert, who is an engineer or analyst
- An age-appropriate lead, who serves as the subject matter expert on age-appropriate design
- A child rights advocate, responsible for embedding age-appropriate values and representing the interests of stakeholders, including children.

The Specification is currently in the process of being developed into a full CEN-CENELEC Standard, which would carry greater authority and trust – particularly among regulators.

Impact and benefits for children

The Specification provides guidance to tech companies operating in the EU on how to implement data protection by design and by default for children, as required under Article 25 of the General Data Protection Regulation (GDPR). Importantly, it also delineates key responsibilities within management and engineering teams, to ensure that the responsibility to implement age-appropriate design is embedded throughout the company structure, helping to ensure this is a design process and not just a compliance process. While Standards are not well-suited to address complex areas of children's rights that involve nuanced judgement, such as balancing competing rights, they can effectively provide guidance on many aspects of data protection and privacy-by-design that lend themselves to clear, technical implementation. The hope is that this Specification and the eventual Standard will contribute to the creation of a digital environment that is more respectful of child rights. It is available to the public free of charge, which is key to making it accessible to a wide range of stakeholders, including smaller developers, and providing transparency to children, parents and the public.

Global: Draft ISO/IEC DIS 27566-1 Age Assurance Systems Framework

The draft ISO Standard on Age Assurance Systems ISO/IEC FDIS 27566-1 (ISO Standard) aims to establish a set of guidelines to ensure that digital platforms and services can reliably verify the age of their users. Once completed, the ISO Standard will comprise three parts: Part 1 – Framework; Part 2 – Technical Approaches and Guidelines for Implementation; and Part 3 – Benchmarks for Benchmarking Analysis. It is expected that at least Part 1 will be published in 2025.

Origins and implementation

Regulators in many countries are increasingly requiring platforms accessible by children to implement robust age assurance measures. Even where regulations do not explicitly require age verification, in many cases data processing from children under a certain age is not permitted without parental consent, which implies that platforms, apps and online services need to know the age of their users in order to comply with the law. At the same time, regulations often require both data minimization and strict privacy controls for children's data. As a result, any age assurance method must strike a balance between being both sufficiently effective and preserving user privacy. Like other forms of safety tech, age assurance is itself an emerging industry. Both the engineers developing age assurance solutions and the

platforms seeking to procure them require detailed guidance to ensure these systems are accurate, secure, protective of data and respectful of human rights.

> While Standards are not well-suited to address complex areas of children's rights ... they can effectively provide guidance on many aspects of data protection and privacy-by-design

The first age assurance Standard was developed by the Age Verification Providers Association (AVPA) and published by the British Standards Institution (BSI) as PAS 1296 in 2018. This was followed by the IEEE Standard for Online Age Verification in 2024. The draft ISO Standard is based on a proposal from BSI, and ISO was chosen as the standardization body because it is considered to be the most recognized in the industry, globally. The draft ISO Standard details how age assurance providers should measure the accuracy of their products and requires privacy and security by design and by default. It also requires strict data minimization and disposal practices, as well as measures to avoid increasing the user's digital footprint. Additionally, according to the draft Standard, age assurance systems must be designed for inclusivity; for example, by applying universal design principles and supporting multiple languages relevant to the system's intended context. This approach can help address existing social inclusion risks for children, particularly in the Global South. The ISO standard-making process is not publicly open, and stakeholders must participate through their national standardization bodies, which often charge for membership and require a considerable commitment in terms of time and technical expertise. The current draft ISO Standard is not publicly available, and there will also be a fee payable to access the final Standard.

Impact and benefits for children

The draft ISO Standard has the potential to detail how age-assurance tools can be developed to ensure they are effective while also respecting broader human rights, thereby being more likely to lead to tools being deployed in a way that is in the best interests of the child. The ISO Standard could also set clear guidelines for the collection and use of training data in AI-driven age-assurance solutions, helping to reduce bias and support fairness for child users. The true impact for children of the ISO Standard will depend on its final content and the extent to which it incorporates comprehensive protections for children's rights and human rights principles more broadly, and how it is consequently implemented. If the ISO Standard is widely adopted, it could mean that the majority of age-assurance companies seek to certify against it. Where certifying bodies have sufficient expertise in children's rights and human rights, implementing the Standard could ensure a level of oversight over the child rights protections contained within it as a required baseline for the age-assurance market.

Global: Draft IEEE P3462 Recommended Practice for Using Safety by Design in Generative Models to Prioritize Child Safety

In 2024, Thorn, a non-profit company based in the United States of America and working on child online protection, and All Tech is Human, another non-profit in the United States, published a white paper on Safety by Design for Generative AI: Preventing Child Sexual Abuse. This paper inspired the development of the IEEE P3462 Recommended Practice for Using Safety by Design in Generative Models to Prioritize Child Safety (referred to hereafter as the 'Generative Models Recommended Practice'), which aims to prevent generative AI models from producing outputs related to child sexual abuse materials (CSAM).

Origins and implementation

In their white paper, Thorn and All Tech is Human emphasized that, just as the internet has accelerated online and offline sexual harm against children, the misuse of generative AI poses serious risks to child safety, including in such areas as victim identification, re-victimization, prevention and the spread of abuse materials. Given that such misuse and its associated harms are already occurring, the Generative Models Recommended Practice aims to mitigate further risks by embedding safety-by-design principles into generative AI models.

Data are critical to developing AI systems, especially systems that will potentially impact children. A robust data strategy is essential to help ensure that both training and evaluation data align with child safety and privacy standards. An IEEE Recommended Practice does not contain mandatory requirements like a Standard does, but it offers preferred procedures and positions endorsed by IEEE which serve as guidance for the tech sector. The Generative Models Recommended Practice will provide guidance to developers on how to responsibly source training data sets, including how to detect, remove and report CSAM content. While addressing a range of issues beyond data governance, it places particular emphasis on data handling. It calls for clearly defined, privacy-respecting processes that respect children's privacy and comply with international standards. It also requires that all children's data be anonymized or de-identified to prevent misuse or unintended exposure. Additional recommendations include assessing data bias and fairness, implementing data-access controls, managing data throughout the lifecycle, and clearly defining data provenance – an area that is especially critical in distinguishing between real and synthetic content, which is key for resource allocation in CSAM investigations.

Impact and benefits for children

According to National Center for Missing and Exploited Children (NCMEC) statistics, approximately 5,000 reports of CSAM or other sexually exploitative content related to generative AI were received by the CyberTipline in 2023. Although this currently represents

a small percentage of the overall number of CSAM reports, there are growing concerns that the number could increase significantly. This underscores the urgent need for developers to implement safety-by-design measures from the earliest stages of development. Once published, the Generative Models Recommended Practice could fill a critical gap by offering guidance for generative AI developers on reducing the proliferation of CSAM. Its widespread adoption is more likely if regulators recognize compliance with this Recommended Practice as evidence of a company's best efforts to implement safety by design.

Lessons learned

Some of the common experiences and lessons learned about industry standards (Standards) include:

Practical guidance on implementation of higher-level laws and regulations: Standards can guide tech developers on how to implement and comply with data governance frameworks, offering a level of detail that laws and regulations often lack. They have the potential to drive the widespread development of technologies that effectively enhance and enable the exercise of children's rights. However, companies should still seek local legal advice and conduct ongoing human rights due diligence, including child rights impact and risk assessments, to ensure full compliance with applicable laws and international children's rights standards.

Incentivization for tech companies: In the EU, compliance with Harmonized Standards provides a legal presumption for compliance with the law. This presumption incentivizes tech providers to follow Harmonized Standards as part of their risk-management process. However, even when Standards do not carry this special legal status, following these Standards can still demonstrate a company's commitment to implement safety and privacy-by-design practices and deploy safe, state-of-the-art technologies.

Risk of regulatory capture: Currently, technical Standards are primarily drafted by working groups composed of industry representatives who contribute as part of their professional roles. This can lead to Standards being shaped in ways that favour their employer's interests, while the process often lacks the input of dedicated human rights experts. As Standards increasingly take on a quasi-regulatory role in the technology sector, their development process carries a significant risk of regulatory capture.

Costs of creating and accessing Standards: Participating in the creation of Standards requires a considerable time commitment, often including attendance at multiple consecutive meetings to ensure that contributions are adopted – an especially challenging task if adequate funding is lacking. Additionally, there may be significant financial costs, with some Standards committees charging membership fees exceeding US$1,000. Finally, digital access to completed Standards is often restricted behind paywalls, typically costing around US$100, making it unlikely that members of the public will be able to read them.

Multi-stakeholder participation: To broaden engagement, greater awareness is needed among children's rights organizations about the growing importance of Standards. These groups also need guidance on how to get involved and where to access public funding to support participation. Beyond contributing to the drafting process, civil society organizations could build coalitions and advocate for improvements by producing background papers and engaging with working group leads within standardization bodies.

Risk of out-sourcing regulatory duties: Under the United Nations Guiding Principles on Business and Human Rights (UNGPs), States have a duty to ensure that tech companies respect children's rights. Governments can fulfil this duty by enacting rights-based laws and regulations that undergo parliamentary scrutiny as part of a democratic process, and by issuing secondary legislation or guidance to clarify how those laws should be implemented. Although Standards are becoming increasingly important, they should not be viewed as a substitute for formal secondary legislation or regulatory guidance developed by lawmakers.

To broaden engagement, greater awareness is needed among children's rights organizations about the growing importance of Standards.

Global applicability and ownership: Most existing Standards originate from high-income countries, such as China, Japan, the Republic of Korea and the United States, as well as countries in Europe or from the EU. Although it is technically possible for standardization bodies (or in some cases individuals) from any country to propose a Standard, participation from the Global South, especially from countries in Africa and Latin America, remains limited. This may be partly due to local regulators not recognizing these Standards, thereby reducing their perceived relevance. Nonetheless, engaging in global standardization initiatives could allow stakeholders in the Global South to shape the rules impacting multinational companies operating globally. IEEE, in particular, allows anyone to propose a new Standard and could therefore be a valuable entry point for new contributors.

Conclusion

While Standards should not replace legislation, they can play a significant role in the implementation of children's data governance by translating rights-based principles into actionable measures. Standards could also support regulators by enabling private conformity assessment bodies to audit organizations against defined benchmarks, freeing up public resources for higher-risk areas. However, this approach will only be effective if civil society and human rights experts gain meaningful access to the Standards development processes, which will require structural changes in funding, participation, selection of contributing experts and transparency.

About this case study

This case study is part of the UNICEF Innocenti – Global Office of Research and Foresight Data Governance for Children project, which aims to work with policymakers, industry, civil society and children, to inform better data governance for children. This case study was written by Emma Day and Laura Berton, under the guidance of Jasmina Byrne, and was reviewed by Melanie Penagos. We are grateful to the following individuals for their invaluable contributions and comments: Jean-Philippe Faure, Chair, CEN-CENELEC Workshop on Age Appropriate Digital Services Framework; Michael Simpson, IEEE; and David Sullivan, Digital Trust & Safety Partnership. This project is made possible by funding and support from the Ministry for Foreign Affairs of Finland. We are grateful for their continued partnership and commitment to child rights.

In 2021, UNICEF published the Manifesto on the Case for Better Governance of Children's Data, which contains recommendations and principles for governments and industry to create laws, policies and practices regarding child-centred data. One of the Manifesto's key recommendations was for stakeholders to initiate more policy innovations in data governance for children. This case study forms part of a collection of case studies detailing examples of such policy innovations for children in a diverse range of contexts. The approaches taken, lessons learned and insights gathered will be one contribution to the global effort towards better data governance for children. View all the case studies on the UNICEF website.

About us

UNICEF works in the world's toughest places to reach the most disadvantaged children and adolescents and to protect the rights of every child, everywhere. Across 190 countries and territories, we do whatever it takes to help children survive, thrive and fulfil their potential, from early childhood through adolescence.

And we never give up.

UNICEF Innocenti – Global Office of Research and Foresight tackles the current and emerging questions of greatest importance for children. It drives change through research and foresight on a wide range of child rights issues, sparking global discourse and actively engaging young people in its work.

UNICEF Innocenti equips thought leaders and decision-makers with the evidence they need to build a better, safer world for children. The office undertakes research on unresolved and emerging issues, using primary and secondary data that represent the voices of children and families themselves. It uses foresight to set the agenda for children, including horizon scanning, trends analysis and scenario development.

The office produces a diverse and dynamic library of high-level reports, analyses and policy papers, and provides a platform for debate and advocacy on a wide range of child rights issues.

UNICEF Innocenti provides, for every child, answers to their most pressing concerns.

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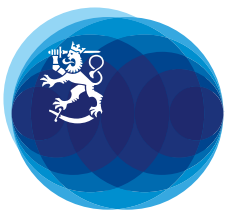

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