

CEN/TC 428 "ICT Professionalism and Digital Competences"

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CEN/TC 428 White paper - Artificial Intelligence (AI) and ICT Professionalism: Foundation for trustworthy and robust AI Ensuring a harmonised AI and ICT Professionalism standardisation (June 2023)

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Description

CEN/TC 428 White paper "Ensuring a harmonised AI and ICT Professionalism standardisation" (June 2023) supersedes the "CEN TC428 Positioning overview paper – August 2019 Artificial Intelligence (AI) and EN 16234-1 e-CF (e-Competence Framework).

CEN/TC 428 White paper

Artificial Intelligence (AI) and ICT Professionalism: Foundation for trustworthy and robust AI

Ensuring a harmonised AI and ICT Professionalism standardisation

(June 2023)

1. Objective of this document

Artificial Intelligence (AI) products and services are not supernatural constructs they are created and developed by Information and Communication Technology (ICT) professionals. AI is not a new dramatic technological discovery but is part of an ongoing continuum in computer programming that extends back to the mid-1950s. To ensure the viability, reliability and trustworthiness of AI, current and future AI regulations and standardisation initiatives must be aligned with ICT professionalism regulations and standards.

This positioning paper aims to explain how CEN/TC 428 and European ICT professionalism standards can operate to support European AI policies to embed ICT professional competence within AI systems development. This alignment is especially relevant to achieve coherence between future European AI policy and standards alongside the development of CEN/ TC 428 ICT professionalism based upon its four building blocks of: 1. Competences/ Skills/ Roles, 2. Body of Knowledge, 3. Education and 4. Ethics.

2. Scope of this document

The European Commission is fostering European AI regulation through the AI Act and the development of European guidelines and standards for AI systems.

In the process of shaping Europe's digital future, Ethical Guidelines for Trustworthy Artificial Intelligence were presented in 2019 [1]. Following this publication most documents that attempt to regulate AI, recognize the relevance of ethical principles that should govern decisions. According to those Guidelines, trustworthy AI should be:

- lawful – respecting all applicable laws and regulations,
- ethical – respecting ethical principles and values,
- robust – from a technical perspective while taking into account its social environment.

Trustworthy AI is dependent upon consistent and veracious application of these three underpinning principles from conception through to application. This emphasises the crucial role that ICT Professionals play in the AI eco-system as designers, developers, and maintainers of these systems from creation, to use, evolution and throughout the entire life cycle.

AI roles are specialisms within the ICT professional community having multiple and deep relationships with all other ICT disciplines. In consequence, the skills, competences and knowledge requirements including ethical principles of AI developers and AI dedicated roles are entirely consistent with the wider ICT professional community.

Harmonized regulation and standardization across the AI eco-system must include coherence with ICT professionalism standards to fulfil the requirement for a lawful, ethical and robust AI environment.

This paper offers a complementary contribution to EU and global publications in the AI field¹. It describes the relevance of existing CEN/TC 428 ICT professionalism standards and the potential for continuous alignment between current and future European strategic digital developments,

- by emphasizing the need to reinforce related ICT professionalism standards application to establish trustworthy AI, based upon (1) lawful (2) ethical and (3) robust technical application,
- by recognising and articulating the essential role played by ICT professionals engaged in AI design/development and their interaction and collaboration with other stakeholders deploying or using AI,
- by highlighting the value and relevance of CEN/TC 428 standards to ICT Professionalism and digital competences and the part they play in clarifying and articulating the skills, competences, roles, knowledge, education/training and ethical awareness required by ICT professionals within AI.
- by emphasising that existing ICT standards and technical specifications produced by CEN/TC 428 will be consistently aligned and directly related to AI standards.

The ISO/IEC 22989 standard on Artificial intelligence² defines AI being: “Research and development of mechanisms and applications of AI systems”. In this standard, an AI system is defined as an “engineered system that generates outputs such as content, forecasts, recommendations or decisions for a given set of human-defined objectives”. According to this standard, research and development can take place across any number of fields such as computer science, data science, humanities, mathematics and natural sciences. Additionally, the current draft of the European harmonized AI regulation (AI Act) defines an AI system as “software developed with a specific set of techniques and approaches that are included in its Annex 1”.

Whilst noting the breadth of AI involved stakeholders and roles, this paper explicitly focuses on the essential role played by ICT professionals engaged in AI systems design, development, and its entire lifecycle.

3. Key considerations

- AI is not a new technology but part of the field of informatics, from inception. This is relevant to both academic development and professional application.
- AI must be trustworthy (lawful, ethical, robust), with all parties aware of the risks of inappropriate application (see EU AI Act, EU-level agreed Ethical Guidelines for trustworthy AI, a. o.).
- AI embraces multiple professional disciplines, and its application is relevant to almost all stakeholder groups, across society. On the organisation level, AI involves various key stakeholder groups (see ISO/IEC 22989).
- ICT professionals, as AI systems makers, are key professionals in the creation of trustworthy AI applications. They are key actors in the planning, building, running, enabling and managing of AI technology.

¹ EU AI Act (EC, 2021), Ethics Guidelines for trustworthy AI (AI HLEG 2019), a.o. – see Annex 2 for full overview

² ISO/IEC 22989:2022 Information technology — Artificial intelligence — Artificial intelligence concepts and terminology. Available at: <https://www.iso.org/standard/74296.html>

- ICT incorporates many specialities including AI. The need for consistency when creating, new ICT roles within the AI field, with existing CEN/TC 428 standards is key. For example, AI designers, AI developers, AI architects, Data scientists, AI ethicists, AI strategists should be defined and constructed consistent with all already existing ICT Professional roles.
- CEN/TC 428 ICT Professionalism standards provide a sound platform to establish a foundation for trustworthy AI design and development. The standards provide a reliable starting point for identifying and expressing skills, competences, knowledge and roles requirements within the ICT professional discipline and hence AI specific activities. Furthermore, CEN/TC 428 standards enable the consistent application of AI imperatives of lawful, ethical and robust, and can be specified further in the detail for AI as successfully experienced by other ICT embedded disciplines (e.g., as ECSF for Cybersecurity, EDISON for Data Science).

4. Recommendations

CEN/TC 428 standards on ICT professionalism offer substantial support to key stakeholders and to European policy makers to influence AI or other ICT technology specialized fields (e.g. Cloud, Blockchain, Big Data,...) within a coherent Pan European ICT strategy.

European strategic stimulus for AI needs to apply coherently across the four building blocks of the ICT professionalism, which are; 1. Competences, Skills and Roles; 2. Body of Knowledge (BoK); 3. Education, training and validation and 4. Ethics. This can be applied in the revision of existing standards as necessary and also for new emerging roles and technologies. Therefore, close collaboration between European AI standardization Technical Committees and CEN/TC 428 is essential to mutually contribute for the following purposes:

- to develop an AI standardization roadmap coherent with ICT Professionalism standardization for the construction of new AI specific standards and for the revision of existing ICT standards to support or complement AI specific standards as required.
- to ensure that new AI standards will be consistent and embedded with ICT standards to reinforce sustainability and application across the ICT profession and related organisation structures.

Related actions and proposals should be developed in close collaboration to reinforce previous commitments from the European Commission, CEN-CENELEC, Annual European Rolling Plan on ICT standardization and stakeholders and programs in the scope of European ICT standardization.

5. Call for CEN/TC 428 – CEN/CENELEC JTC 21 combined action: Ensuring a harmonised AI and ICT Professionalism standardisation

The European Union is strongly promoting standardisation³ as a soft regulation tool in strategic activity fields such are ICT Professionalism as a whole and important ICT sectors such are cybersecurity, blockchain, AI, etc.

In the scope of ICT Professionalism standardisation CEN/TC 428 “ICT Professionalism and Digital Competences” is responsible for all aspects of standardisation related to ICT Professionalism in all sectors, public and private. This includes, at a minimum, activity related to four major building blocks of ICT Professionalism: 1. Competences/ Skills/ Roles, 2. Body of Knowledge, 3. Education and 4. Ethics. And as part of current work areas: Explore and define required competences, knowledge and professional ethics in existing and advanced technology domains, in the context of business adoption,

³ European Commission (2022) “Communication - An EU Strategy on Standardisation - Setting global standards in support of a resilient, green and digital EU single market”

e.g. artificial intelligence, autonomous systems, security, healthcare, fintech, cloud, blockchain etc., and consider strategies to align them with the core content of EN-16234-1.⁴

In the scope of Artificial Intelligence standardisation “CEN and CENELEC support the activities of ISO/IEC JTC 1 SC 42 and IEC SEG 10 by the establishment of CEN-CENELEC JTC 21 for Artificial intelligence (JTC 21). JTC 21 shall produce and adopt standardisation deliverables to address European market and societal needs and to underpin primarily EU legislation, policies, principles, and values. JTC 21 has already engaged in a constructive dialogue with the European Commission to identify and produce standards to underpin the anticipated European legislation on AI as proposed by the Commission on 21 April 2021. JTC 21 will also have an advisory role towards other CEN and CENELEC committees whose sector or activity is impacted by AI.”⁵

Continued AI and ICT Professionalism standardisation should be materialized in three ways:

1. Promoting CEN/TC 428 and CEN/CENELEC/JTC 21 collaboration in the development of new CEN/CENELEC/JTC21 standards in the aspects related to AI and ICT Professionalism.
2. Promoting CEN/TC 428 and CEN/CENELEC/JTC 21 collaboration in the development of new CEN/TC 428 standards in the aspects related to ICT Professionalism and AI.
3. Promoting CEN/TC 428 and CEN/CENELEC/JTC 21 collaboration in the updating of existing CEN/TC 428 standards to improve AI aspects.

ANNEXES

ANNEX 1: CEN/TC 428 standards deployment for a trustworthy AI making

Annex 1 provides a brief summary on CEN/TC 428 activity and shows in overview how CEN/TC 428 delivered standards provide, a current publication, foundational insight into which ICT Professional competences, skills, transversal aspects and roles are key influencers in AI technology implementation. These characteristics complement EU cultural and ethical values and AI related regulations in support of defined accountability.

The CEN/TC 428 standards include AI as one relevant technology and business domain. Each of these standards can be further specified in the detail for AI, as successfully achieved in other IT embedded disciplines (e.g., as ECSF for Cybersecurity, EDISON for Data Science).

ANNEX 2: Sources

Annex 2 lists the main references used for elaborating this document, published by EC, AI HLEG, STOA, ISO, CEN/TC 428.

⁴ CEN/TC 428 Business Plan <https://standards.cencenelec.eu/BPCEN/1218399.pdf>

⁵ CEN/CENELEC JTC 21 Business Plan <https://standards.cencenelec.eu/BPCEN/2916257>

ANNEX 1: CEN/TC428 standards deployment for a trustworthy and robust AI

Annex 1 provides a brief summary on CEN/TC428 activity and shows in overview how CEN/TC 428 delivered standards provide in current publication foundational insight on what ICT Professional competences, skills, transversal aspects and roles are of key influence to AI technology implementation and complement EU cultural and ethical values and AI related regulations in support of defined accountability.

The CEN/TC 428 standards include AI as one relevant technology and business domain. Each of these standards can be further specified in the detail for AI, as successfully experienced by other IT embedded disciplines (e.g., as ECSF for Cybersecurity, EDISON for Data Science).

1. About CEN/TC 428 Technical Committee 428 “ICT Professionalism and Digital Competences”

Technical Committee (TC) 428 within the European standardisation organisation CEN is responsible for all aspects of standardization related to ICT Professionalism in all sectors, public and private. This includes, at a minimum, activity related to four major building blocks of ICT Professionalism:¹

1. Competences (Skills and competences at professional workplace level)
2. Education, training, accreditation, assessment and certification
3. ICT Ethics
4. Body of Knowledge (BoK).

And as part of current work areas:

- Explore and define required competences, knowledge and professional ethics in existing and advanced technology domains, in the context of business adoption, e.g. artificial intelligence, autonomous systems, security, healthcare, fintech, cloud, blockchain etc., and consider strategies to align them with the core content of EN-16234-1.
- Actively promote awareness and use of TC 428 standards and technical specifications in European initiatives, especially at the European Commission and ICT sector level, as well as in other European or international standardisation initiatives related with ICT.

Thus, CEN/TC 428 ICT professional standards focus on competences, knowledge, skills, roles, education-training, and ethics as required and applied in the ICT professional exercise and workplace, covering the full ICT domain and including AI as one relevant business and technology field.

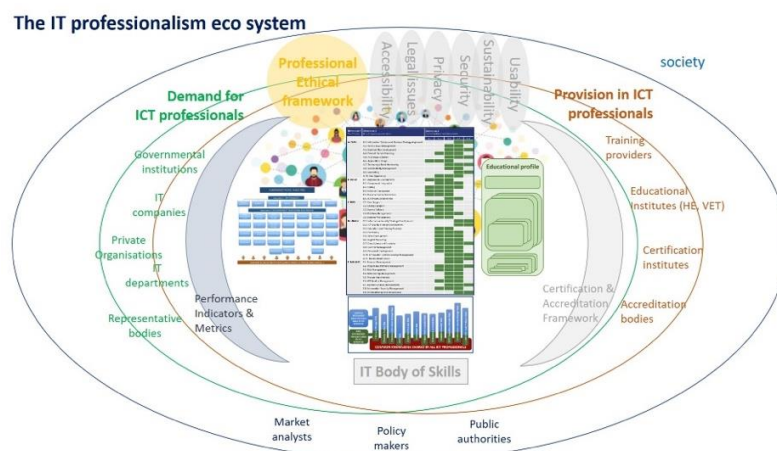


Figure 1: CEN/TC 428 standards for the ICT Professional eco-system

¹ CEN/TC428 Business Plan - <https://standards.cencenelec.eu/BPCEN/1218399.pdf>

Elaborated in the current EU and global context of AI as outlined above, the CEN/TC 428 standards and technical reports provide guidance on specific ICT professional competences, knowledge, skills, roles, ethics and other transversal aspects that have significant relevance to the IT Professionals active in AI development and implementation.

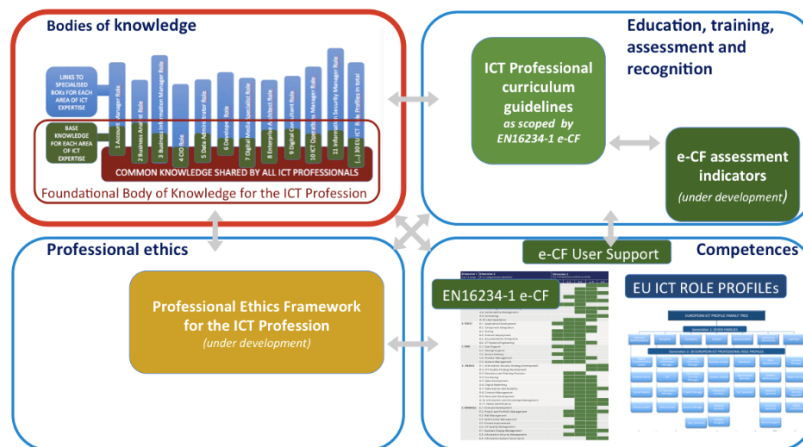


Figure 2: CEN/TC 428 standards on the four building blocks of ICT Professionalism

In particular, Transversal Aspects, cross-cutting all competences in EN 16234-1 (e-CF), incorporate significant characteristics that uphold the integrity of AI deployment. These aspects, include T1 Accessibility, T2 Ethics, T3 ICT legal issues, T4 Privacy, T5 Security, T6 Sustainability and T7 Usability that are relevant in any IT professional work context, and in particular in AI.

The combination of clearly articulated competences, roles, skills and Transversal Aspects provide the basis for the development of existing or new AI roles and specifically related skills, and the training, education and assessments systems necessary to facilitate a trustworthy and robust AI environment. More detail is provided in the following section 2.

2. CEN/TC 428 standards applied in AI

EN 16234-1 e-Competence Framework (e-CF) – articulating competences, skills, transversal aspects.

Dimension 1 e-CF Area	Dimension 2 e-Competences identified	Dimension 3 e-Competence Proficiency Levels				
		e1	e2	e3	e4	e5
A. PLAN	A.1. Information Systems and Business Strategy Alignment					
	A.2. Service Level Management					
	A.3. Business Plan Development					
	A.4. Product/Service Planning					
	A.5. Architecture Design					
	A.6. Application Design					
	A.7. Technology Trend Monitoring					
	A.8. Sustainability Management					
	A.9. Innovating					
	A.10. User Experience					
B. BUILD	B.1. Application Development					
	B.2. Component Integration					
	B.3. Testing					
	B.4. Solution Deployment					
	B.5. Documentation Production					
	B.6. ICT Systems Engineering					
C. RUN	C.1. User Support					
	C.2. Change Support					
	C.3. Service Delivery					
	C.4. Problem Management					
D. ENABLE	C.5. Systems Management					
	D.1. Information Security Strategy Development					
	D.2. ICT Quality Strategy Development					
	D.3. Education and Training Provision					
	D.4. Purchasing					
	D.5. Sales Development					
	D.6. Digital Marketing					
	D.7. Data Science and Analytics					
	D.8. Contract Management					
	D.9. Personnel Development					
D.10. Information and Knowledge Management						
E. MANAGE	D.11. Needs Identification					
	E.1. Forecast Development					
	E.2. Project and Portfolio Management					
	E.3. Risk Management					
	E.4. Relationship Management					
	E.5. Process Improvement					
	E.6. ICT Quality Management					
	E.7. Business Change Management					
	E.8. Information Security Management					
E.9. Information Systems Governance						

e-CF competences with key influence on AI

A.6. Application Design

A.9. Innovating

A.10. User Experience

B.1. Application Development

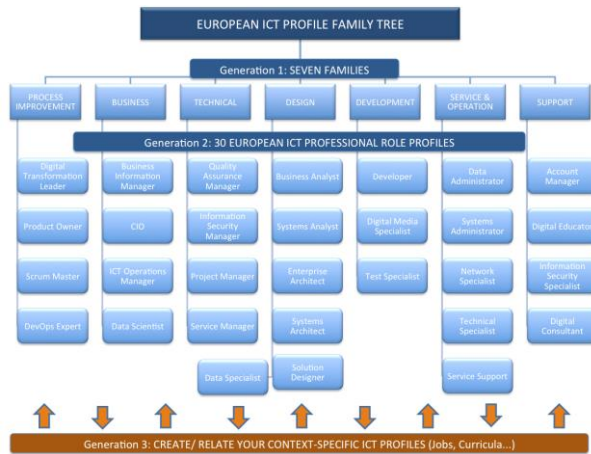
D.7. Data Science & Analytics

E.3. Risk Management

E.8. IS Security Management

Transversal Aspects that are relevant in any IT professional work context, and in particular in AI: T1 Accessibility, T2 Ethics, T3 ICT legal issues, T4 Privacy, T5 Security, T6 Sustainability and T7 Usability.

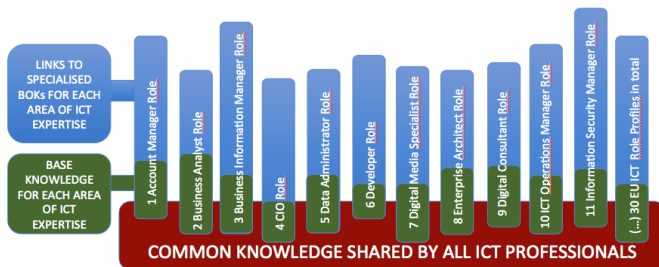
CWA 16458 European ICT Professional Role Profiles – describing 30 representative ICT Profiles from generic organisation perspective



ICT Profiles with key influence on AI

- 4. CIO
- 6. Developer
- 20. Systems Analyst
- 21. Systems Architect
- 24. Solution Designer
- 26. Devops Expert
- 27. Data Scientist

EN 17748-1 Foundational Body of Knowledge for the ICT Profession (ICT BoK) – structured in 42 Knowledge Units



ICT BoK knowledge units with key influence on AI

- APS Application Software
- DIG Digitalisation
- ETH Ethics*
- ISD Information Systems Development
- LEG ICT Legal Issues
- PRG Programming
- PRI Privacy*

***All Transversal Aspects** are relevant in any AI related IT professional work context: T1 Accessibility, T2 Ethics, T3 ICT legal issues, T4 Privacy, T5 Security, T6 Sustainability and T7 Usability.

(Note: The relationships of each one of these elements in the above tables with AI can be described to underpin the table. The table then serves as an illustration/summary.)

CEN/TS 17834 European Professional Ethics Framework for the ICT Profession

Ethics is a key aspect of professionalism, but it is not easy at all put it in practice in a valuable and viable way at the professional and enterprise level.

EU ICT Ethics is the first standardisation deliverable in the scope of ICT practice with the objective to provide a complete framework to include ethics in the lifecycle of ICT products and services. Several key aspects about CEN/TS 17834 European Professional Ethics Framework for the ICT Profession (EU ICT Ethics):

- **ICT Ethics for professionals and organisations:** EU ICT Ethics contains basic information and fundamental considerations on embedding European values in ICT, in particular in AI Systems lifecycle. It provides guidance, from theory to practice, on how to frame relevant values and translate them into an ethical management process, that both organisations (specially enterprises) and ICT professionals can apply in their daily procedures and tasks.
- **ICT Ethics in practice for digital society:** EU ICT Ethics provides an Ethics Framework aligned with the principles in the Berlin Declaration on Digital Society and shows how these principles can apply to specific areas of ICT professional practice, including AI Systems lifecycle. A method to assist organisations in developing a transversal plan to embed ethics in their processes is provided, with guidance on the necessary tools, such as a code of ethics, as well as case studies for inspiration.
- **Ethics management for digital innovation:** EU ICT Ethics applies for companies and organizations in general, not only related to ICT existing technologies, but specially in advanced technology domains and digital innovation in the context of business adoption, e.g. artificial intelligence.
- **Ethics culture for digital society:** Beneficiaries and users of EU ICT Ethics include educational institutions embracing universities and VET, public and private, certification providers, industry, including HR departments, large companies and SMEs, and the ICT professional community. In the emerging European AI ecosystem the construction of ethical culture for AI trustworthiness is a differential factor of European AI approach.
- **CEN/TS 17834 - EU ICT Ethics for a shared European language for digital society:** EU ICT Ethics is closely connected with EN 16234-1 (e-CF) and the other deliverables and references for a shared European language for ICT professional development as essential element for digital society.
- **CEN/TS 17834 - EU ICT Ethics first step in the way of ICT Ethics standardisation:** The publication of CEN/TS 17834 EU ICT Ethics in July 2022 has been a key milestone in European ICT Ethics culture construction. But will be the real feedback of its use in European society and in concrete ICT fields such is Artificial Intelligence that will show the way to consolidate the standardisation of a practical, viable and valuable European ICT ethics culture and practice in ICT products and services lifecycle, and in particular in AI systems lifecycle.

All current CEN/TC428 standardization deliverables in overview:

Publication	Date
EN 16234-1:2019 e-Competence Framework (e-CF) - A common European Framework for ICT Professionals in all sectors - Part 1: Framework [superseding 2016]	12/2019
CEN/TR 16234-2:2021 Part 2: User Guide and Methodology	02/2021
CEN/TR 16234-3:2021 Part 3: Methodology	02/2021
CEN/TR 16234-4:2021 Part 4: Case Studies	02/2021
CWA 16458-1:2018 CEN Workshop Agreement (CWA) – European ICT Professional Role Profiles version 2 – Part 1 Full descriptions	2018
EN 17748-1:2022 Foundational Body of Knowledge for the ICT Profession (ICT BoK) - Part 1: Body of Knowledge	04/2022
CEN/TR 17748-2:2022 Part 2: User Guide and Methodology	02/2022
CEN/TS 17699:2022 Guidelines for developing ICT Professional Curricula as scoped by EN16234-1 (e-CF)	03/2022

CEN/TR 17802:2022 e-Competence performance indicators and common metrics	04/2022
CEN/TS 17834 European Professional Ethics Framework for the ICT Profession (EU ICT Ethics)	07/2022
CEN/TR 17884 ICT accessibility competences - Guidelines for a more inclusive ICT development	09/2022

All current CEN/TC428 standardization deliverables in overview



Figure 3: All current CEN/TC428 standardization deliverables in overview

ANNEX 2 – Sources

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