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Foundational Body of Knowledge for the ICT Profession (ICT BoK) - Part 1: Body of Knowledge

Europäischer Grundwissensbestand für den IKT-Beruf (ICT BoK) - Teil 1: Der Wissensbestand

Corps de connaissance fondamental pour les professionnels des technologies de l'information et de la communication (ICT BoK) - Partie 1 : Corps de connaissance

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03.100.30	Vodenje ljudi	Management of human resources
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This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 428.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (prEN 17748-1:2021) has been prepared by the Technical Committee CEN/TC 428 “ICT professionalism and digital competences”, the secretariat of which is held by UNI.

This document is currently submitted to the CEN Enquiry.

This series consists of two parts:

— prEN 17748-1:2021 European Foundational Body of Knowledge for the ICT Profession - Part 1: The Body of Knowledge (ICT BoK) published as a European Norm (EN).

— prCEN/TR 17748-2:2021 European Foundational Body of Knowledge for the ICT Profession - Part 2: User Guide, Methodology, Case Studies published as a CEN Technical Report (TR).

Introduction

This document provides a tool to support mutual understanding and provide transparency of language through the articulation of **knowledge** required and deployed by Information and Communication Technology (ICT) professionals.

Complementary to the EN 16234-1 (e-CF), that provides a common European language for ICT professional competence, this document, prEN XXXXX (ICT BoK) makes an additional contribution to increasing transparency and maturity of the ICT Profession across Europe.

This document identifies knowledge and sub divides each knowledge unit into three elements:

a) **common knowledge** applicable to all ICT professionals regardless of speciality,

b) **base knowledge** that provides a foundation and underpins each of a range of different disciplines/ specialisms,

c) **specialised knowledge** pertaining to in-depth, very specific expert knowledge.

For c) specialised knowledge, where applicable, sources of further specialist knowledge are signposted as examples to relevant in-depth complementary sources.

To support users of this document, the following narrative provides an overview of the design philosophy and principles adopted during the standard's construction. In addition, these underpinning principles will provide guidance for future document updates.

The Guiding Principles:

This document is an enabler; it is designed to be a tool to empower users, not to restrict them. This document provides a structure and content for application by many types of users from organisations in the private and public sector, educational institutions, learning program and certification providers of all categories including Vocational and Educational Training (VET), Higher education (HE) and Continuous Professional Development (CPD) and ICT organisations from the demand and supply side, social partners, professional associations and individuals. In this broad application context, this document is designed to support common understanding, it is not intended to mandate the use of each and every word used in the document.

This document is an integrated component of the four building blocks of ICT professionalism for Europe and offers the identification of essential knowledge elements common to the ICT profession.

This document is neutral and intrinsically linked to the EN 16234-1 (e-CF). It does not follow the specific interests of a few major influencers; it has been developed and will be maintained through the CEN standards process.

This document expresses common, base and specialised knowledge of relevance to the ICT profession in the following context; knowledge, alongside skill and attitude, is an integrated component of competence as defined in the EN 16234-1 (e-CF).

Knowledge units are the core structure of this document; they are labelled to enable easy access from viewpoints relevant to the user. Flexibility of application is supported by tagging from four perspectives; the EN 16234-1 (e-CF) areas and competences, CWA 16458 (ICT Professional Role Profiles) and from traditional knowledge domains.

Knowledge units are articulated at a general level of granularity and each is further detailed by the provision of knowledge elements presented in a common template. Knowledge elements are accompanied by examples of the application of each.

1 Scope

This document provides a reference of 42 knowledge units as required and applied in the Information and Communication Technology (ICT) professional work environment that can be understood across Europe. An intrinsic link with the EN 16234-1 (e-CF) is an essential characteristic of this document.

The document is created for application by:

— educational institutions, learning programme and certification providers of all types including:

- Vocational and Educational Training (VET);
- Higher education (HE);
- Continuous Professional Development (CPD);

— ICT service, user and supply organisations,

— ICT professionals, managers and human resource (HR) departments,

— social partners (trade unions and employer associations), professional associations, accreditation, validation and assessment bodies,

— market analysts and policy makers,

and other organisations and stakeholders in public and private sectors.

This standard is provided as one fundamental building block of ICT Professionalism for Europe.

The prime objective of this document is to provide a significant contribution to the broad concept of ICT professionalism founded upon four building blocks, body of knowledge, e-CF competence, professional ethics and education and training. Complementary to the EN 16234-1 (e-CF) that provides an efficient and broadly accepted common European language about ICT professional competence, the European ICT Foundational Body of Knowledge (ICT BoK) makes an additional contribution to ICT professional knowledge, increasing transparency and maturity of the ICT Profession across Europe.

Specifically, the document provides a structured library of knowledge elements applicable to ICT professionals across a broad spectrum of disciplines. The knowledge elements are identified as either:

a) common knowledge applicable to all ICT professionals regardless of speciality;

b) base knowledge that provides a foundation and underpins each of a range of different disciplines/specialisms:

c) specialised knowledge pertaining to in-depth, very specific expert knowledge.

Although providing and adding value to all stakeholders, knowledge defined by this document, provides a particularly useful perspective and entry point for educational institutions seeking to participate in ICT professional competence development. As a natural extension to EN 16234-1 (e-CF) dimension 4 knowledge examples, this document further facilitates the use of the shared European language for ICT Professional competence. By expanding the knowledge content of the EN 16234-1 (e-CF), it adds value to its application alongside further connected references.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 16234-1:2019, e-Competence Framework (e-CF) - A common European Framework for ICT Professionals in all sectors - Part 1: Framework

CWA 16458 (all parts), European ICT Professional Role Profiles

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply. ISO and IEC maintain terminological databases for use in standardisation at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1

Information and Communication Technology

ICT

<technical> digital computers and internet (communication) systems, including software, hardware and networks

[SOURCE: EN 16234-1:2019, definition 3.1]

3.2

Information and Communication Technology

ICT

<economic and political> cross sector of enterprises, including manufacturers, product suppliers or service providers relating to the ICT field

[SOURCE: EN 16234-1:2019, definition 3.2]

3.3

ICT professional

person having the competence to plan, build, run, enable and/or manage Information and Communication Technology and having a professional ICT qualification and/or ICT occupational experience; they include both employees of ICT companies and ICT employees of organisations in all other sectors; they are in the scope of this document

[SOURCE: EN 16234-1:2019, definition 3.3]

3.4

ICT user

person having the competence to use devices, software and systems to support his/her private, educational, civic or work activities and normally having no professional ICT qualification or ICT occupational experience; they are not in the scope of this document

[SOURCE: EN 16234-1:2019, definition 3.4]

3.5

competence

demonstrated ability to apply knowledge, skills and attitudes for achieving observable results

[SOURCE: EN 16234-1:2019, definition 3.5]

3.6

knowledge

theoretical or practical understanding and awareness of phenomena such as facts, terminology, concepts, models or theories

Note 1 to entry: Knowledge as defined in the EN 16234-1 (e-CF) is rooted in competence and the work- based focus of the document itself. Building on this for the educational and training sector a revised definition of knowledge is provided to incorporate the more theoretical aspects of knowledge which are covered in education and to emphasise the importance of understanding.

3.7

common knowledge

knowledge shared by all ICT professionals

3.8

base knowledge

knowledge required for a particular area of ICT expertise as represented by CWA 16458 (all parts) (ICT Professional Role Profiles)

3.9

specialised knowledge

detailed knowledge required at a high level of proficiency for an area of ICT expertise as represented by CWA 16458 (all parts) (ICT Professional Role Profiles)

3.10

knowledge domain

high-level representation of an area of knowledge

3.11

knowledge unit

representation of a particular section of knowledge at a higher level of granularity than a knowledge domain

3.12

knowledge element

representation of a particle of knowledge at a higher level of granularity than a knowledge unit

3.13

knowledge example

specific instance of a knowledge element

3.14

knowledge item

any piece of knowledge that has a granularity level of a knowledge element (as described in 3.12) or knowledge example (as described in 3.13). Knowledge items can potentially be found in any ICT related knowledge source

3.15

body of knowledge

structured set of information including, terminology, concepts, models and theories which represent the accepted and agreed upon core knowledge base required by a particular profession. The aim is to foster a shared vision of the profession and a clear codification of the required expertise

3.16

skill

ability to carry out managerial or technical tasks, and they may be cognitive or practical (know how to do it)

[SOURCE: EN 16234-1:2019, definition 3.7]

3.17

attitude

representing the human element of an e-competence and reflecting the way an ICT professional integrates knowledge and skills and applies them in a contextually appropriate manner

[SOURCE: EN 16234-1:2019, definition 3.8]

3.18

transversal aspects

cross-cutting topics that are relevant to all competences defined by the EN 16234-1 (e-CF)

3.19

transversal knowledge

knowledge that is coupled to one of the transversal aspects as defined in EN 16234-1 (e-CF): T1 Accessibility, T2 Ethics, T3 ICT legal issues, T4 Privacy, T5 Security, T6 Sustainability and T7 Usability

3.20

behavioural skills

interactive skills used to successfully engage with situations in the workplace, and may refer to work quality, social interaction or emotion; examples include, communication, empathy, attention to detail, reliability and integrity

[SOURCE: EN 16234-1:2019, definition 3.10]

3.21

behavioural knowledge

non-technical knowledge that is in support of behavioural skills on how to successfully engage with situations in the workplace and may refer to social interaction and methodological thinking; examples include, theory related to communication, cooperation and problem solving

3.22

proficiency level

level indicating the degree of mastery that allows an ICT professional to meet requirements in the performance of a competence; proficiency levels in the EN 16234-1 (e-CF) are characterised by a combination of levels of influence within a community, context complexity, autonomy, and typical behaviour expressed by examples of action verbs; the EN 16234-1 (e-CF) incorporates proficiency levels e-1 through to e-5

[SOURCE: EN 16234-1:2019, definition 3.11]

3.23

learning level

level indicating a grading and may be represented by a formal qualification; they generally derive from an education system or indicate a grading in a taxonomy of intellectual or learning behaviours (like memorising, applying, interpreting) and have a relationship with proficiency levels but are to be distinguished from these

[SOURCE: EN 16234-1:2019, definition 3.]

4 Symbols and abbreviated terms

ADSL	Asymmetric Digital Subscriber Line
ACC	[ICT BoK KU] Accessibility [T1]
AI	Artificial Intelligence
ALU	Arithmetic Logic Unit
API	Application Programming Interface
APS	[ICT BoK KU] Application Software
AR	Augmented Reality
ARQ	Automatic Repeat Request
BIOS	Basic Input/Output System
BK	Behavioural Knowledge
BoK	Body of Knowledge
BPMN	Business Process Model and Notation
BUS	[ICT BoK KU] Business Processes
COAX	Coaxial Cable
COL	[ICT BoK KU] Collaboration
COM	[ICT BoK KU] Communication
CPD	Continuous Professional Development
CPU	Central Processing Unit
CSR	Corporate Social Responsibility
CU	Control Unit
DAN	[ICT BoK KU] Data Analytics
DAP	Daily Agreed Procedures
DCO	[ICT BoK KU] Data Communication
DevOps	Development and Operations
DIG	[ICT BoK KU] Digitalisation
DMA	[ICT BoK KU] Data Management
DOC	[ICT BoK KU] Documentation
DRY	Do not Repeat Yourself
DSDM	Dynamic systems development method
DSS	Data Security Standard
e-CF	e-Competence Framework

ENA	[ICT BoK KU] Enterprise Architecture
ESG	Environmental, Social, and Corporate Governance
ETH	[ICT BoK KU] Ethics [T2]
FAIR	Findability, Accessibility, Interoperability, Reusability
FinTech	Financial Technology
FPU	Floating Point Unit
FSNP	Forming-Storming-Norming-Performing
FTP	File Transfer Protocol
GOV	[ICT BoK KU] ICT Governance
HE	Higher Education
HR	Human Resources
HRW	[ICT BoK KU] Hardware
HTML	hypertext mark-up language
HTTP	Hypertext Transfer Protocol
IaaS	Infrastructure as a Service
IAM	Identity and Access Management
ICT	Information and Communication Technology
ICT BoK	Foundational Body of Knowledge for the ICT Profession
IEC	International Electrotechnical Commission
IFR	[ICT BoK KU] ICT Infrastructure
IMAP	Internet Message Access Protocol
INM	[ICT BoK KU] Information Management
IOR	[ICT BoK KU] ICT in Organisations
IoT	Internet of Things
IP	Internet Protocol
IS	Information Systems
ISD	[ICT BoK KU] Information Systems Development
ISDN	Integrated Services Digital Network
ISO	International Organisation for Standardisation
KM	Knowledge Management
KNM	[ICT BoK KU] Knowledge Management
KU	Knowledge Unit
LAN	Local Area Network
LEA	[ICT BoK KU] Leadership
LEG	[ICT BoK KU] ICT Legal Issues [T3]
MR	Mixed Reality
NET	[ICT BoK KU] Networks and Network Services
OLA	Operational Level Agreement
ORD	[ICT BoK KU] Organisation Design
OSI	Open Systems Interconnection
PaaS	Platform as a Service
PERT	Programme Evaluation and Review Technique
POP	Post Office Protocol
PRI	[ICT BoK KU] Privacy [T4]
PRM	[ICT BoK KU] ICT Project Management
PRO	[ICT BoK KU] Programming
PSO	[ICT BoK KU] Problem Solving
QUA	[ICT BoK KU] ICT Quality
RAD	Rapid Application Development
RAM	Random Access Memory
RAS	[ICT BoK KU] Requirements Analysis and Specifications
RegTech	Regulatory Technology
RIS	[ICT BoK KU] ICT Risk Management

RPA	Robotic Process Automation
SaaS	Software as a Service
SAD	[ICT BoK KU] Systems Administration
SDE	[ICT BoK KU] Software Design
SDG	Sustainable Development Goals
SDS	[ICT BoK KU] Service Delivery and Support
SEC	[ICT BoK KU] Security [T5]
SLA	Service Level Agreement
SMS	Service Management System
SMTP	Simple Mail Transfer Protocol
SNMP	Simple Network Management Protocol
SOC	[ICT BoK KU] ICT and Society
SOLID	Single Responsibility, Open-Closed
SOU	[ICT BoK KU] Sourcing
SSO	[ICT BoK KU] Systems Software
STP	Shielded Twisted Pair
STR	[ICT BoK KU] ICT Strategy
SUS	[ICT BoK KU] Sustainability [T6]
SWOT	Strengths, Weaknesses, Opportunities, and Threats
T1-T7	EN 16234-1 (e-CF) Transversal Aspect 1 - 7
TCP	Transmission Control Protocol/
TCP/IP	Transmission Control Protocol/ Internet Protocol
TES	[ICT BoK KU] Testing
TK	Transversal Knowledge
TQM	Total Quality Management
UC	Underpinning Contract
UDP	User Datagram Protocol
UID	[ICT BoK KU] User Interface and Web Design
URL	Uniform Resource Locator
USA	[ICT BoK KU] Usability [T7]
UTP	Unshielded Twisted Pair
VR	Virtual Reality
WAMDIA	We All Make Digital Information Accessible
WAN	Wide Area Network
WAP	Wireless Application Protocol
WCAG	Web Content Accessibility Guidelines
WiFi	Wireless Fidelity
WLAN	Wireless Local Area Network
xHF	Extra High Frequency
XML	extensible mark-up Language
XP	Experience Points
XR	Extended Reality
YAGNI	You Aren't Gonna Need It

5 Main Principle

5.1 General

This document, providing a Foundational Body of Knowledge for the ICT Profession, is not and cannot be an exhaustive and complete representation of all ICT knowledge. The wider Body of Knowledge is the universe of knowledge of all articles, books, papers, presentations, statements, etc., that are subject to continuous change and update.

This document is a useful guide to the world of ICT knowledge.

From this viewpoint, this document provides a snapshot of the wider non-exhaustive universe of knowledge. It is intended to provide a useful picture or map of ICT knowledge and to provide navigational guidance through the map. In this way, this document and its ICT BoK map provide a simplified guide through a complex landscape with information on routes and points of interest.

As an analogy, in a geographic map the level of detail must be appropriate to the expected use of the map, a mountaineer needs more detail than a motorway driver, and each user will accept different trade-offs for ease of use and detail.

Likewise, lists of knowledge elements in this document (common, base and specialised) are not exhaustive. This document presents a general overview of the knowledge in the ICT field, grouped in general domains and then further detailed in associated Knowledge Units. Organisation of knowledge into domains and knowledge units provides a snapshot from a particular perspective and therefore is not necessarily a universally accepted categorisation.

In this document the level of granularity chosen is a compromise between ease of use and the level of detail that is fit for purpose. For example, if a higher level of granularity had been chosen it would have led to more Knowledge Units, but at the expense of a manageable overview.

This document is composed of 42 Knowledge Units relevant to ICT professionals. The knowledge unit content is provided at three levels of detail and application defined as common, base and specialised as further described in 6.3. This document follows a systematic knowledge identification approach and complements the knowledge examples incorporated within the EN 16234-1 (e-CF).

Access to each Knowledge Unit is facilitated through a flexible tagging system that assists users to find appropriate Knowledge Units regardless of their environment or perspective. Users familiar with either the EN 16234-1:2019 (e-CF) or CWA 16458:2018 (ICT Professional Role Profiles) are provided with links to knowledge units and additionally a traditional domain index has been structured to offer a further access path.

This document is an integrated component of the four ICT professionalism building blocks for Europe. Figure 1 positions this document with regard to the foundations required for a European ICT Profession. It illustrates the connectivity between the four key elements; e-Competences from the EN 16234-1 (e-CF), professional Ethics and this document, and education, training, assessment and recognition processes.

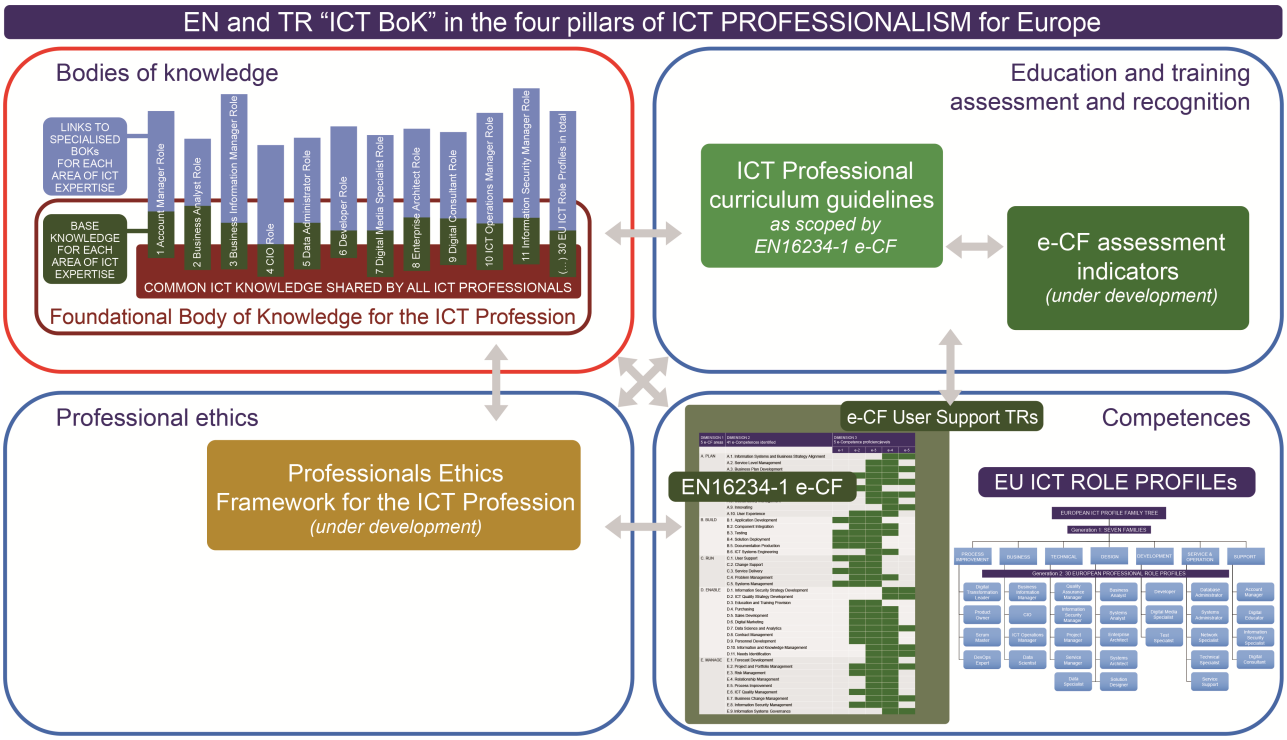

Figure 1 — The ICT BoK and connections with other ICT Professionalism building blocks for Europe

5.2 Body of Knowledge index (views)

5.2.1 General

This document can be accessed through different entry points. This provides access to the Foundational Body of Knowledge from the different perspectives offered by compatible structures: EN 16234-1 (e-CF) and its different dimensions, CWA 16458 (ICT Professional Role Profiles), and additionally from ICT knowledge domain viewpoints as described in the following clauses. The overview tables in Clause 6 illustrate the Knowledge Units mapping for each particular view.

These different entry points support different user perspectives and assist in navigation across the Body of Knowledge as illustrated in Figure 2.

The entry points are referred to as tags and each Knowledge Unit lists four tag category views. The tags from Knowledge Domain, e-CF areas, e-CF competences and Professional Role Profiles are limited to the most relevant links. It is possible to include numerous tagged associations between specific Knowledge Units, however, only the most relevant have been listed to aid navigation. As is the case for competence, knowledge is context sensitive and the environment in which knowledge is applied influences the strength of relationship between the Knowledge Unit and tag category.