SLOVENSKI STANDARD
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Krovni seznam e-usposobljenosti (e-CF) - Skupno evropsko okolje za strokovnjake na področju informacijske in komunikacijske tehnologije v vseh industrijskih sektorjih - 1. del: Krovni seznam

E-Competence Framework (e-CF) - A common European Framework for ICT Professionals in all industry sectors - Part 1: Framework

e-Kompetenz-Rahmen (e-CF) - Ein gemeinsamer europäischer Rahmen für IKT-Fach- und Führungskräfte in allen Branchen - Teil 1: Rahmenwerk

Référentiels de e-Compétences - Référentiel européen commun pour les professionnels des technologies de l'information et de la communication dans tous les secteurs d'activité - Partie 1 : Référentiel

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e-Competence Framework (e-CF) - A common European Framework for ICT Professionals in all industry sectors - Part 1: Framework

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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.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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

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prEN 16234-1:2019 (E)

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European foreword

This document (prEN 16234-1:2019) e-Competence Framework (e-CF) 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 document will supersede EN 16234-1:2016.

In comparison with the previous edition, the following technical modifications have been made:

- Review of terms and definitions

- Review of all existing competences in the light of latest business and technology trends

- Adding three new competences in the light of latest business and technology trends (A.10 User Experience, C.5 Systems Management, D.7 Data Science and Analytics)

- Merging three previously co-existing competences to one (D.5. Sales Development)

- Elaboration of a new e-Competences descriptions complementary transversal concept (aspects of cross-cutting relevance to any successful ICT professional competence performance in context)

- Adding in Annex B,

    o a report relating and/ or positioning this standard against other relevant structures and concepts in a similar field (EQF, ESCO, DigComp).

    o In addition P21 is referenced as one example for making behavioural skills explicit.

    o A report establishes relationships of this standard with SFIA.

    o A new relationship with the European ICT Professional Profiles (CWA 16458-1:2018) is provided: the competence content of each Professional Profile, including level assignment, has been aligned with this standard.

    o Relationships with relevant ISO standards have been systematically checked with regard to mutual consistency in structure, terminology and/or content.

This standard for ICT professional competence outlines the minimum requirements of competence (i.e. a threshold) in the workplace: it includes typical knowledge and skills examples that are not standardised but provided to support orientation and understanding. When applying the standard, this approach has to be recognised to clearly distinguish between which elements are mandatory and which are merely examples (represented by, shall versus should/may/can, etc.).

This European standard consists of three parts:

- Part 1: is the Framework of the e-CF published as an European Norm (EN).
- Part 2: is the User guide published as a CEN Technical Report (TR).
- Part 3: is the Methodology published as a CEN Technical Report (TR).

Part 1 is fully standalone, and part 2 and 3 rely on part 1.

Introduction

This standard was established as a tool to support mutual understanding and provide transparency of language through the articulation of competences required and deployed by Information and Communication Technology (ICT) professionals.

To support users and guide developers of applications to this standard, the following narrative provides an overview of the underpinning philosophy and principles adopted during the standard's construction and maintenance. This is also intended to provide guidance for successive updates to the standard.

The Guiding Principles:

This standard is an enabler; it is designed to be a tool to empower users, not to restrict them. This standard provides a structure and content for application by many types of users from organizations in the private and public sector, ICT user or ICT supply companies, educational institutions including higher education and private certification providers, social partners and individuals. In this broad application context, this standard is designed to support common understanding, not to mandate the use of each and every word used within it.

This standard expresses ICT competence using the following definition: 'Competence is a demonstrated ability to apply knowledge, skills and attitudes for achieving observable results'. This holistic concept directly relates to workplace activities and incorporates complex human attitudes and resultant behaviours. Behaviour and attitude are important influences that facilitate successful knowledge and skills application. Within each competence, embedded attitudes are reflected in behaviour and enable the successful integration of knowledge and skills.

Competence is a durable concept and although technology, jobs, marketing terminology and promotional concepts within the ICT environment change rapidly, this standard remains durable requiring maintenance approximately every three years to maintain relevance.

A competence can be a component of a job role, but it cannot be used as a substitute for similarly named job titles, for example; the competence, E.2. 'Project and Portfolio Management' does not represent the complete content of a 'Project Managers' job role. Competences can be aggregated, as required, to represent the essential content of a job role or profile. On the other hand, one single competence may be assigned to a number of different job profiles.

Competence is not to be confused with process or technology concepts such as, 'Cloud Computing' or 'Big Data'. These descriptions represent evolving technologies and in the context of this standard, they may be integrated as knowledge and skills examples in Dimension 4.

This standard does not attempt to cover every possible competence deployed by an ICT professional nor are the included competences necessarily unique to ICT. This standard articulates competences associated with ICT professional roles including some that may be found in other professions but are very important in an ICT context; examples include, C.4. 'Problem Management' or E.3. 'Risk Management'. However, to maintain an ICT focus, this standard avoids generic competences such as 'Communications' or 'General Management'. Although very applicable these generic competences are comprehensively articulated in other structures. Selecting competences for inclusion within this standard is therefore a pragmatic rather than an exhaustive process. The selection was based on engagement with a broad cross-section of stakeholders who prioritize competence inclusion based upon industry knowledge and experience.

This standard is structured across four dimensions. e-Competences in Dimensions 1 and 2 are presented from the organizational perspective as opposed to an individual's perspective. Dimension 3 defines e-Competence levels and relates to the European Qualifications Framework (EQF), it is a bridge between organizational and individual competences. Dimension 4 provides examples of knowledge and skills to the e-Competences in Dimension 2, they are not intended to be exhaustive but for inspiration and orientation only.

This latest version of the standard incorporates a new element, transversal aspects; it recognises the relevance of a number of cross-cutting aspects that are important and provide additional generic ICT related descriptors for successful application of e-CF competences in a workplace context. Examples of transversal aspects identified for context-specific and flexible application within this standard are Accessibility, Ethics and Security.

This standard has a sector specific relationship to the EQF; competence levels within this standard provide a consistent and rational relationship to levels defined within the EQF. The relativity between EQF learning levels and the e-competence work proficiency levels of this standard has been systematically developed to enable consistent interpretation of the EQF in the ICT workplace environment. It should be noted that an exact equivalency is not possible due to the different purposes and contexts of EQF and e-CF but relevant relationship information is provided.

Continuity of this standard is imperative; following maintenance updates it is essential that users are provided with a simple upgrade path. Users of this standard invest considerable time and resources to align processes or procedures with it. Organizations deploying these downstream activities are reliant upon this standard and need to be confident of the continued sustainability of their processes. Updates of this standard need to recognize this requirement and provide for continuity, enabling use of the existing version of the standard until it is convenient to upgrade to the latest version.

This standard is neutral; it does not follow the specific interests of a few major influencers, it is developed and maintained through an EU-wide balanced multi-stakeholder agreement process, under the umbrella of the European Committee for Standardization. This standard is a key component of the European Digital Agenda for ICT Professionalism; it is designed for use by any organisation or individual engaged in ICT Human Resource planning and competence development.

1 Scope

This document provides a reference of 41 competences as required and applied at the Information and Communication Technology (ICT) professional work environment, using a common language for competences, skills and proficiency levels that can be understood across Europe.

This document was created for application by:

- ICT service, user and supply companies,

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

- vocational education institutions and training bodies including higher education,

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

- market analysts and policy makers,

and other organizations and stakeholders in public and private sectors.

2 Normative references

There are no normative references in this document.

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 standardization 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)

ICT stands for Information and Communication Technology. It is used in many different contexts and from a technical point of view ICT relates to digital computers and internet (communication) systems, including software, hardware and networks. From an economic and political standpoint, ICT relates to a cross sector of enterprises, including manufacturers, product suppliers or service providers relating to the ICT field

3.2
ICT professional

ICT professionals have the competence to plan, build, run, enable and/or manage Information and Communication Technology. They have 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 standard

3.3
ICT user

ICT users have the competence to use devices, software and systems to support their private, educational, civic or work activities. Normally, they have no professional ICT qualification or ICT occupational experience. They are not in the scope of this standard

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3.4

competence

competence is defined as a demonstrated ability to apply knowledge, skills and attitudes for achieving observable results

3.5

knowledge

knowledge represents a body of facts which can be applied in a field of work or study. (Know what to do)

3.6

skill

skills represent abilities to carry out managerial or technical tasks. Skills may be cognitive or practical (Know how to do it)

3.7

attitude

attitudes represent the human element of an e-competence. They reflect the way an ICT professional integrates knowledge and skills and applies them in a contextually appropriate manner

3.8

transversal aspects

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transversal aspects represent cross-cutting topics that are relevant to all competences defined by this standard. Each transversal aspect is provided by a title and a generic description that may be applied, dependant upon context by, 'being aware of' or 'behaving proactively' with regard to the transversal aspect description. Awareness and proactivity influence attitude (3.7) linking with knowledge (3.5) and skills (3.6) as applied in the definition of competence (3.4) in this standard

3.9

behavioural skills

behavioural skills are the interactive skills used to successfully engage with situations in the workplace, they may refer to work quality, social interaction or emotion. Examples include, communication, empathy, attention to detail and integrity

3.10

proficiency level

proficiency levels indicate the degree of mastery that allows an ICT professional to meet requirements in the performance of a competence. Proficiency levels in the 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. This standard incorporates proficiency levels e-1 through to e-5

3.11

learning level

learning levels indicate 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 memorizing, applying, interpreting). Learning levels have a relationship with proficiency levels but they are not explicitly within the scope of this standard

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4   Symbols and abbreviated terms

AI	Artificial Intelligence
BYOD	Bring Your Own Device
CMMI	Capability Maturity Model Integration
COBIT	Control Objectives for Information and related Technology
CPD	Continuing Professional Development
CSR	Corporate Social Responsibility
DBMS	Data Base Management Systems
DMP	Data Management Plan
DSS	Data Storage Server
DVD	Digital Versatile Disc
GDPR	EU General Data Protection Regulation
HCI	Human-Computer-Interaction
IaaS	Infrastructure as a Service
ICT	Information and Communication Technology
IoT	Internet of Things
IPR	Intellectual Property Rights
IS	Information Systems (in the broad understanding of including software, hardware, data, people, procedures and business processes)
ISO	International Standardization Organization
ITIL	Information Technology Infrastructure Library
KPI	Key Performance Indicator
LAN	Local Area Network
OER	Open Educational Resources
PaaS	Platform as a Service
PDCA	Plan - Do - Check – Act / Plan – Do – Check - Adjust
PPC	Pay per click
SaaS	Software as a Service
SEM	Search Engine Marketing
SEO	Search Engine Optimization
SLA	Service Level Agreement
SWOT	Strengths, Weaknesses, Opportunities and Threats [Analysis]
TCO	Total Cost of Ownership
VAR	Value-Added Resellers
WLAN	Wireless Local Area Network

5 Main principles

5.1 General

This standard is structured across four dimensions. The dimensions reflect areas of business and human resource planning and incorporate job and work proficiency guidelines specified as follows.

In addition, this standard adds a transversal component which provides basic generic ICT descriptors for successful application of e-CF competences in a workplace context.

5.2 Dimension 1: Five e-Competence areas

Five e-Competence areas were derived from the ICT main business processes PLAN – BUILD – RUN – ENABLE – MANAGE in order to identify sets of e-Competences expressing the abilities of planning (conceiving, designing, deciding, etc.), building (developing and implementing), running (delivering, supporting, maintaining, etc.), enabling (creating the proper conditions), and managing (conducting, ensuring, etc). They are named identically:

A. PLAN

B. BUILD

C. RUN

D. ENABLE

E. MANAGE

Assigning an e-Competence to a specific process, such as PLAN or MANAGE, is not an exact science and is open to interpretation influenced by context and judgement. The main function of Dimension 1, in this standard, is to serve as a navigation and entry point to the e-Competences articulated in Dimensions 2, 3 and 4.

Dimension 1 reflects a traditional process perspective based upon the waterfall approach. However, this standard is equally relevant to the steps applied in agile process structures such as Agile/ DevOps lifecycles.

5.3 Dimension 2: e-Competences

This dimension encompasses a set of reference e-Competences for each e-Competence area. Each e-Competence is specified by a title and a generic description of the competence. A total of 41 e-Competences have been identified; they provide the generic reference definitions of this standard.

The e-Competences defined within the standard are not exhaustive; nonetheless they provide a basic, clear and sound orientation for individuals and organisations making decisions about recruitment, career paths, training, assessment, etc. and also for understanding an organisations ICT Professional competence needs. The comprehensive descriptions articulated in Dimension 2 provide primary e-competence reference points for application of the framework.

5.4 Dimension 3: Five work proficiency levels

In Dimension 3, specific proficiency levels are assigned for each e-Competence described in Dimension 2. The level specifications of this standard encompass e-Competence levels e-1 to e-5. These levels define proficiency criteria and describe the degree of mastery required by an ICT professional to meet different levels of performance in each competence. The levels are characterized by a combination of

levels of influence within a community, context complexity, autonomy, and typical behaviour expressed by examples of action verbs. See Annex A providing the level Parameters of this standard.

These work proficiency levels have a sector specific, consistent and rational relationship to the European Qualification Framework (EQF) learning levels 3 – 8. However, the relationship between both frameworks is not one of equivalence but rather is meant to indicate a reference relationship adding depth and context to e-CF levels and providing a consistent bridge and shared language between ICT Professional competence demand and ICT qualification supply. An overview of this relationship is provided and explained in detail in Annex B.2.

5.5 Dimension 4: Knowledge and skills

Examples of knowledge and skills relate to the e-Competences in Dimension 2. They are provided to add value to the competence descriptor and are not intended to be exhaustive but to offer inspiration and orientation for the identification of further context specific knowledge and skills assignment.

5.6 Transversal Aspects

This standard incorporates an additional concept by introducing the notion of transversal aspects that apply across the entire framework. Transversal aspects recognise the relevance of a number of cross-cutting aspects that are important in the ICT workplace. They are complementary to competence descriptions and provide additional descriptors that vary in their relevance to each competence ranging from the need for awareness to proactive engagement. The transversal aspects identified as relevant are:

- – T1 Accessibility,
- – T2 Ethics,
- – T3 ICT legal issues,
- – T4 Privacy,
- – T5 Security,
- – T6 Sustainability,
- – T7 Usability.

T1 – T7 transversal aspects are relevant to each of the 41 competences within this standard. They can be applied at the framework users' discretion by applying emphasis dependent upon granularity requirements. Each may be prioritised to highlight the most important aspects for the application and each offer the possibility for users to enhance the detail of the descriptor. Alternatively, transversal aspects may be applied with equal importance and with no description enhancements.

5.7 Embedded in Dimension 2, 3, 4 and in transversal aspects: Attitudes

Competence definitions are explicitly assigned to Dimensions 2 and 3 and knowledge and skills appear in Dimension 4 of the framework. Attitude is however, embedded in all three dimensions and also within transversal aspects. Attitudes represent the individual human element of an e-competence. They reflect the way an ICT professional integrates knowledge and skills and applies them in a contextually appropriate manner. Owing to the wide range of possible and valid human responses that may be incorporated within a competence, attitudes are not explicitly described but are implied within overall statements. There are numerous examples throughout the framework and here are three examples; 'act systematically' (C.6. level 3) implies being methodical or 'identify project risks' (E.2. skill example) implies being cautious and 'Provides leadership' (E.9. level 4) implies being responsible.

6   Objective

The prime objective of this standard is to provide a common European language for ICT workplace-related competences, skills and proficiency levels as required and applied by organisations and professionals. In this way, all sector stakeholders, including public and private sector and individuals, have access to a shared reference.

In particular, this standard supports the articulation, definition and description of:

- jobs, role profiles, recruitment offers and needs and other types of competence specifications,

- training courses, qualifications, certifications and higher education curricula,

- career paths and professional development needs,

- formal and non-formal learning paths,

- competence gaps analysis at the individual, team or organizational level,

- education and training needs at the individual, team or organizational level,

- criteria for competence assessment and market-trend analysis, etc.

- a shared reference to gather and present ICT professional competence need information, e.g. at national or large corporation level.

The opportunities for improving the efficiency and effectiveness of European ICT HR-related processes by adopting this standard are significant. It provides a link between jobs, competences and qualification. This means in more detail:

a) This standard describes competence and can be used in a broad variety of applications where consistency of competence language is required. These include job descriptions, role profiles, competence specifications and the articulation of professional development needs.

b) This standard identifies proficiency at five e-Competence levels and can be used to provide detailed profiling where various competence combinations are involved. This can be used for Career path planning to assist professionals to identify their competences and to develop the competences they need for future desired roles.

c) This standard supports assessment of competence from a job role perspective, enabling targeted and efficient recruitment, contracting, sourcing and hiring.

d) This standard makes it possible to measure competence gaps at the individual, team or organizational level. It enables short and long-term planning by HR management or by individuals to assess and budget for education and training needs.

e) This standard supports curriculum and ICT qualification and certification development and/ or communication in a broad variety of public and private contexts (e.g. higher education, vocational education and training, industry programs). This standard is a tool which facilitates the development of new national and international offers of education/qualification including higher education programs. In addition, it may support the development of employer focused certification.

f) This standard is also an enabler, making it possible for students and job seekers to better understand the possibilities offered by ICT jobs and to identify future career opportunities.

7 e-Competence Framework overview

Table 1 – Overview of e-Competences identified by this standard

Dimension 1: 5 e-CF areas (A – E)	Dimension 2: 41 e-Competences identified	Dimension 3: e-Competence proficiency levels e-1 to e-5				
		e-1	e-2	e-3	e-4	e-5
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		■	■	■	
	C.5. Systems Management		■	■		
D. ENABLE						
	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			■	■	■
	D.11. Needs Identification			■	■	■
E. MANAGE						
	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				■	■

8   e-Competence Framework full description

8.1 Transversal Aspects of the e-Competence Framework

Transversal aspects may be applied as e-Competences complementary components in ICT professional work context, by using the phrase, 'Being aware of and if applicable, behaving proactively in':

T1 Accessibility
Accessibility is applicable to the design of products, devices, services or environments to ensure that they are usable by all, irrespective of their personal capacities. It is relevant to the extent to which products, systems, services, environments and facilities can be used by people from a population with the widest range of characteristics and capabilities to achieve a specified goal**.** For example**,** web accessibility allows people with visual impairment to gain access to online content such as webpages, electronic documents, and multimedia. Accessibility is also relevant, for example, when working in adverse conditions (such as noisy or badly illuminated environments) or stressful situations.

T2 Ethics
Ethics in ICT deal with the procedures, values and practices that govern ICT and its related disciplines without damaging or violating the integrity, moral values or beliefs of any individual, organization or humanity. In practice it is a part of a practical philosophy concerned with how IT professionals and IT management should make decisions regarding professional conduct. These decisions can be influenced by the individual's personal code and also an informal or formal ethical conduct that exists in the work place or across the wider profession.

T3 ICT Legal Issues
There are many laws either directly or indirectly relevant to the ICT industry and consequently applicable to all professionals within the sector. A prominent recent example is the GDPR which aims primarily to give control to individuals over their personal data and to simplify the regulatory environment. Further typical examples of legislation include copyright design and patent compliance, plagiarism and intellectual property protection.

T4 Privacy
Data privacy, also known as information privacy, is the ability an organization or individual has to determine what data can be shared with third parties. The importance of protecting data privacy is underlined by the introduction of the European General Data Protection Regulation (GDPR) law on data protection and privacy for all individuals**.**

T5 Security
This topic incorporates information security which is the practice of defending information from unauthorised access, use, disclosure, disruption, modification, perusal, inspection, recording or destruction. It also encompasses IT security designed to prevent unauthorised access to computers, networks and data. The overarching goal of IT security is to control access and maintain the integrity and confidentiality of sensitive information without inhibiting access by authorised users.