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Krovni seznam e-usposobljenosti (e-CF) - Skupno evropsko okolje za strokovnjake na področju informacijske in komunikacijske tehnologije v vseh sektorjih - 3. del: Metodologija

e-Competence Framework (e-CF) - A common European Framework for ICT Professionals in all sectors - Part 3: Methodology

e-Kompetenz Rahmenwerk (e-CF) - Ein gemeinsamer europäischer Rahmen für IKT-Fach- und Führungskräfte in allen Branchen - Teil 3: Methodik

Référentiel des e-Compétences - Référentiel européen commun pour les professionnels des technologies de l'information et de la communication dans tous les secteurs d'activité - Partie 3 : Méthodologie

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European foreword

This document (CEN/TR 16234-3:2021) has been prepared by Technical Committee CEN/TC 428 “ICT Professionalism and Digital Competences”, the secretariat of which is held by UNI.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN shall not be held responsible for identifying any or all such patent rights.

This document supersedes CEN/TR 16234-3:2017.

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

— revision of the entire document in the light of the EN 16234-1:2019, latest ICT Professionalism developments, in Europe and globally, relating to this document and further multi-stakeholder sector feedback;

— the underpinning methodology of the standard has been maintained and complemented by a new element, named Transversal Aspects (TA);

— the main driver for the presentation of this document is the requirement to explain modifications made to the EN 16234-1 (e-CF), to meet a contemporary environment, whilst maintaining continuity with earlier versions.

This European standard is made up of four parts:

— EN 16234-1 e-Competence Framework (e-CF) - A common European Framework for ICT Professionals in all sectors - Part 1: Framework. It provides the e-Competence Framework (e-CF) published as a European standard - EN.

— CEN/TR 16234-2 e-Competence Framework (e-CF) - A common European Framework for ICT Professionals in all sectors - Part 2: User Guide. It provides the e-CF User guide published as a CEN Technical Report (TR).

— CEN/TR 16234-3 e-Competence Framework (e-CF) - A common European Framework for ICT Professionals in all sectors - Part 3: Methodology. It provides the e-CF Methodology published as a CEN Technical Report (TR).

— CEN/TR 16234-4 e-Competence Framework (e-CF) - A common European Framework for ICT Professionals in all sectors - Part 4: Case Studies. It provides a series of Case Studies illustrating e-CF practical use from multiple ICT sector perspectives published as a CEN Technical Report (TR).

Part 1 is fully standalone, and part 2, 3 and 4 rely on part 1.

Introduction

EN 1623-1 4 e-Competence Framework (e-CF) - A common European Framework for ICT Professionals in all sectors – Part1: Framework 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 EN 16234, the following narrative provides an overview of the underpinning philosophy and principles adopted during the standard's construction and maintenance. Understanding these guiding principles is equally vital for applying the EN 16234-1 (e-CF) in multiple environments concerned with ICT professionalism.

EN 16234-1 (e-CF) Guiding Principles:

EN 16234-1 (e-CF) is an enabler; it is designed to be a tool to empower users, not to restrict them. It provides structure and content for application by many users from organisations in the private and public sector, ICT user or ICT supply organisations, educational institutions including higher education and private certification providers, social partners and individuals. Across this broad application context, EN 16234-1 (e-CF) is designed to support common understanding, not to mandate the use of each and every word used within it.

EN 16234-1 (e-CF) 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, EN 16234-1 (e-CF) 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 Manager's' 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 EN 16234-1 (e-CF), they may be integrated as knowledge and skills examples in Dimension 4.

EN 16234-1 (e-CF) does not attempt to cover every possible competence deployed by an ICT professional nor are the included competences necessarily unique to ICT. EN 16234-1 (e-CF) 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, EN 16234-1 (e-CF) 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 EN 16234-1 (e-CF) 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.

EN 16234-1 (e-CF) is structured across four dimensions. e-Competences in Dimensions 1 and 2 are presented from the organisational perspective as opposed to an individual's perspective. Dimension 3 defines e-Competence levels and relates to the European Qualifications Framework (EQF), it provides a bridge between organisational and individual competences. Dimension 4 provides examples of knowledge and skills in the e-Competences of Dimension 2; they are not intended to be exhaustive but included for inspiration and orientation.

This latest version of the standard incorporates a new element, transversal aspects; these recognize the relevance of a number of important cross-cutting aspects and provide additional generic ICT related descriptors for successful application of e-CF competences in the workplace. Accessibility, Ethics and Security are examples of transversal aspects that may be applied flexibly to match the application context.

EN 16234-1 (e-CF) has a sector specific relationship to the EQF; competence levels within EN 16234-1 (e-CF) 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 EN 16234-1 (e-CF) has been systematically established 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 the EQF and the e-CF, but relevant relationship information is provided.

Continuity of EN 16234-1 (e-CF) is imperative; following maintenance updates, it is essential that users are provided with a simple upgrade path. Users of EN 16234-1 (e-CF) invest considerable time and resources to align processes or procedures to it. Organisations deploying these downstream activities are reliant upon EN 16234-1 (e-CF) and need to be confident of the continued sustainability of their processes. Updates EN 16234-1 (e-CF) must respect this requirement and ensure continuity by enabling continued use of the existing standard until convenient to upgrade to the latest version.

EN 16234-1 (e-CF) 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. EN 16234-1 is a key component of the European Digital Agenda for ICT professionalism; it is designed for use by any organization or individual engaged in ICT Human Resource planning and competence development.

1 Scope

This document supports the methodology grounding for the development, implementation and maintenance of EN 16234 (all parts) e-Competence Framework (e-CF) - A common European Framework for ICT Professionals in all sectors which provides a common reference of 41 ICT professional competences as required and applied at the Information and Communication Technology (ICT) professional work environment, using a common language for competences, skills, knowledge and proficiency levels that can be understood across Europe.

This document supports methodological understanding of the e-CF by all parties interested and supports Information and Communication Technology (ICT) stakeholders dealing with ICT Professional competences from multiple perspectives, in particular:

— ICT service, demand and supply organisations;

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

— educational institutions, learning program and certification providers of all types including Vocational and Educational Training (VET), Higher Education (HE) and Continuous Professional Development (CPD);

— social partners (trade unions and employer associations);

— professional associations, accreditation, validation and assessment bodies;

— market analysts and policy makers;

— other organisations and stakeholders in public and private sectors across Europe; and

it seeks to particularly satisfy the needs of stakeholders from competence frameworks construction and research environment.

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*

CEN/TR 16234-2:2021, *e-Competence Framework (e-CF) — A common European Framework for ICT Professionals in all sectors — Part 2: User Guide*

CEN/TR 16234-4, *e-Competence Framework (e-CF) — A common European Framework for ICT Professionals in all sectors — Part 4: Case Studies*

3 Terms and definitions

For the purposes of this document the terms and definitions given in EN 16234-1 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 https://www.iso.org/obp

4 Main Principles

The aim of this document is to describe the methodology underpinning the development, implementation and maintenance of the EN 16234-1 (e-CF).

The objective of the EN 16234-1 is to provide a common, shared, European tool to support ICT organisations and educational institutions in the recruitment, assessment, competence needs analysis, learning programme development and career path design and development. It also aims to support policy makers to define policies related to digital skills development by education and in the workplace. As European stakeholders are the target audience for the EN 16234-1, the active involvement of multiple experts and stakeholders from this community provide an essential ingredient in making and keeping the e-CF, published as EN 16234-1, fit for purpose.

At the outset four base criteria for e-CF development were considered. Founded upon informed European stakeholder engagement, the following were considered:

1) a framework structure of four dimensions;

2) definitions of competence, knowledge, skill and attitude;

3) derivation from ICT business processes;

4) a relationship between the e-CF and the European Qualifications Framework (EQF), in particular between respective levels.

The outcomes were as follows:

— **e-CF structure in four dimensions.** The structure of existing frameworks was analysed and evaluated; final agreement was made for a four-dimensional approach. The structure is constructed from competence areas (dimension 1) and competences (dimension 2), as distinct from job roles. The competence-based approach offers more flexibility and facilitates local customisation. Levels from 1 to 5, form dimension 3 and are assigned to each competence as appropriate. The number of the levels assigned to each competence varies, dependent upon the nature and complexity of the competence. Knowledge and skills examples form dimension 4 and provide brief, non-exhaustive samples associated with each competence.

— **Definitions of competence, skills, knowledge and attitude**. Applying a consistent approach to ICT stakeholder competence requirements, the definitions focus on organisational rather than individual competences. However, individual competences can be identified within dimension 3 of the e-CF where proficiency levels are defined and incorporate personal autonomy and behaviour. It can be said that Dimension 3 provides a bridge between organisational and individual competence. The e-CF level table provides a definition for each performance level and if required can be used as a basis for establishing level relationships other relevant frameworks.

— **Business Processes**. From the outset European stakeholders agreed to use, as a reference, a general ICT process schema, compliant with many models provided by ICT certification institutions (e.g. Exin, Cobit). The model presents five process phases, Plan, Build, Run, Enable and Manage, where Enable and Manage are cross-cutting themes. This initial reference to processes, provided the basis for dimension 1 of the framework. It was established as an entry point and navigation aid to access competence descriptors and it is still relevant today within agile process models, including the devOps lifecycle.

— **Levels**. To provide a logical relationship to the EQF, some EQF indicators were extrapolated; “context complexity”, “autonomy” and “behaviour” to help formulate e-CF level differentiators. These indicators reflect organisational perspectives on competence. However, the EQF also incorporates further criteria including “responsibility”, but this element was omitted to avoid confusion with organisational accountability, which is not relevant to the definition of competence (e-CF competence is independent of hierarchical structures). The e-CF, as a competence framework, defines proficiency levels from an organisational perspective but it shares some level criteria with the EQF, as an education framework. This positions the e-CF to offer a consistent link between competence and learning levels.

Further development of the e-CF has provided an additional key component to the original structure:

— **Transversal Aspects (new)**. In the latest version the e-CF a new element has been introduced; transversal aspects which recognize the relevance of a number of cross-cutting aspects that are important to an ICT Professional’s performance, independent of competence area. Transversal aspects provide additional generic descriptors contributing to the successful application of e-CF competences in the workplace. Transversal aspects such as, accessibility, ethics and security provide the opportunity to enhance competence descriptions through context-specific and flexible application.

The criteria applied during construction, implementation and maintenance of the e-CF to make it fit for purpose are backed by sound academic foundations. Within this document relationships between best ICT practice, qualification approaches and state-of-the-art competence application are explained. The original methodology adopted for e-CF development remains relevant and was incorporated in the creation of the latest version. The revision was predicated upon a step-by-step, bottom up approach, focused upon stakeholders’ experience, practical e-CF implementation and dynamic ICT business related requirements. The application of a sound methodological backbone supported by consistent definitions and e-CF founding principles have permeated all framework updating lifecycles.

A summary of methodological success factors:

— Representation of expert views from stakeholders;

— Achievement of consensus on structural approach;

— Formalization of decisions;

— Achievement of combining framework elements into a structured result;

— Ensuring continuous improvement and stability whilst responding to an evolving environment.

From initiation, e-CF development was based on gathering informed input. It involved synthesizing trends, structuring solutions, consensus building, raising awareness among stakeholders and finding common views. This has led to the establishment and maintenance of a common European language for ICT professional competence, knowledge, skills, and capability levels. When consensus was difficult, reference to academic research and current management thinking and knowledge has offered clarification. However, the driving force for e-CF maintenance was to keep it up-to-date and in line with latest ICT business trends and needs, consistent and complementary to the original definitions.

5 Essentials of the EN 16234-1 (e-Competence Framework - e-CF): Four dimensions and the transversal aspects

5.1 Introductive overview

The EN 16234-1 (e-CF) provides 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, the e-CF 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 organisational level;

— education and training needs at the individual, team or organisational 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 EN 16234-1 (e-CF) is structured across four dimensions. The dimensions reflect areas of business and human resource planning and incorporate job and work proficiency guidelines. Additionally, transversal aspects recognize the relevance of a number of cross-cutting aspects, for example, security or accessibility that are important in the ICT workplace. e-CF transversal aspects apply across the entire framework.

The e-CF is a competence-based structure facilitating both flexibility and standardization. This is enabled through a framework structured in four dimensions. These dimensions support e-CF understanding by all stakeholders and enable connections to other frameworks (like EQF) or ICT technical models and standards (like CMMI or DevOps):

1. The five e-Competence areas PLAN – BUILD – RUN – ENABLE – MANAGE from dimension 1, are presented from the organizational perspective. The areas correspond to the ICT business processes that form the core of the traditional waterfall model, Agile project or DevOps environment lifecycles. Dimension 1 assists in the organization and navigation of e-Competences. Furthermore, it is instrumental in HR assessment and training needs identification as well as classification of e-Competences. It helps HR managers communicate with ICT and business managers and make coherent decisions.

2. A set of 41 e-Competences with a generic description of each forms Dimension 2, which is also presented from the organizational perspective. Dimension 2 provides the core building blocks of the framework. e-Competences such as A.3 Business Plan Development or D.7 Data Science and Analytics are generic, customizable and applicable to any industry or business sector. Within this structure, the e-Competence descriptors refer to and represent organizational needs.

3. Dimension 3 of the e-CF provides defined proficiency levels specified individually for each e-Competence articulated within dimension 2. Proficiency levels indicate the degree of mastery required of an ICT professional to meet requirements in the performance of a competence. Proficiency levels range from e-1 to e-5 and relate to EQF levels 3 to 8. Proficiency level specifications incorporate behaviours and levels of autonomy and build a bridge between organizational and individual competences.

4. Knowledge and skills embedded within e-Competences are explicitly expressed in Dimension 4. They are not exhaustive but only provided for inspiration and orientation. These examples are useful in defining specific and precise outcomes for measurement within an organization's competence assessment program. In addition, they offer inputs for training institutions to help in defining learning outcomes and to design training initiatives.

5. From 2019 the e-CF incorporates transversal aspects that recognize the relevance of a number of important cross-cutting aspects. They provide additional generic ICT related descriptors to support application of e-CF competences in the workplace. Examples of transversal aspects identified for context-specific and flexible application are accessibility, ethics and security. They build a further bridge between the organizational context and that of the individual.

Figure 1 provides the example A.2. Service Level Management.

Dimension 1 e-Comp. area	**A. PLAN**				
Dimension 2 e-Competence: Title + generic description	**A.2. Service Level Management** Defines, validates and makes applicable service level agreements (SLAs) and underpinning contracts tailored to services offered. Negotiates service performance levels taking into account the needs and capacity of stakeholders and business.				
Dimension 3 e-Competence proficiency levels e-1 to e-5	**Level 1**	**Level 2**	**Level 3**	**Level 4**	**Level 5**
	–	–	Ensures the content of the SLA.	Negotiates revision of SLAs, in accordance with the overall objectives. Ensures the achievement of planned results.	–
Dimension 4 Knowledge examples *Knows/ aware of/ familiar with*	K1 SLA documentation K2 how to compare and interpret management data K3 elements forming the metrics of service level agreements K4 how service delivery infrastructures work K5 impact of service level non-compliance on business performance				
Skills examples *Is able to*	S1 analyse service provision records S2 evaluate service provision against SLA S3 negotiate realistic service level targets S4 use relevant quality management techniques S5 anticipate and mitigate against potential service disruptions				

Figure 1 — EN 16234-1 (e-CF) e-Competence example A.2. Service Level Management

Figure 2 shows the transversal aspects applying across the entire framework.

Figure 2 — Transversal Aspects applying across the entire framework

Table 1 provides the EN 16234-1 (e-CF) overview.

Table 1 — EN 16234-1 (e-CF) table overview

DIMENSION 1 5 e-CF areas	DIMENSION 2 41 e-Competences identified	DIMENSION 3 5 e-Competence proficiency levels				
		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				■	■