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Krovni seznam e-usposobljenosti (e-CF) - Skupno evropsko okolje za poklicne strokovnjake v vseh industrijskih sektorjih - 3. del: Metodologija

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

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

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

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

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CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

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European foreword

This document (CEN/TR 16234-3:2017) has been prepared by Technical Committee CEN/TC 428 "Digital Competences and ICT Professionalism", the secretariat of which is held by UNI.

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This document supersedes CWA 16234-3:2014.

This Technical Report is the third part of the EN 16234 series, which is made up of the following three parts and which will replace CWA 16234-1:2014, CWA 16234-2:2014 and CWA 16234-3:2014:

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

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

— CEN/TR 16234-3, *e-Competence Framework (e-CF) - A common European Framework for ICT Professionals in all industry sectors - Part 3: Methodology*

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

A relationship with the European ICT Professional Profiles (CWA 16458:2012, original CWA updated by e-CF 3.0 competences and re-published in 2014) is established. A number of relevant e-Competences and their applying level(s), as defined by this standard, are assigned to each Profile.

CWA 16234:2014-4 composed by 15 case studies illustrating e-CF practical use from multiple sector perspectives remains published and can be downloaded for free from the internet (*Official e-CF website: www.ecompetences.eu*).

CEN/TR 16234-3:2017 (E)

Introduction

EN 16234-1 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.

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 is a holistic concept directly related to workplace activities and incorporating complex human behaviours expressed as embedded attitudes. Attitudes are the glue which keep knowledge and skills together. Soft skills are the attitudes' components that can be made explicit, trained and developed.

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 D.7. 'Sales Management' does not represent the complete content of a 'Sales Manager' 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 transversal competences are comprehensively articulated in other structures. Selecting competences for inclusion within this standard is therefore, not a scientific choice, but a pragmatic process engaging a broad cross-section of stakeholders who prioritize competence inclusion based upon industry knowledge and experience.

This standard is structured from four dimensions. e-Competences in Dimension 1 and 2 are presented from the organizational perspective as opposed to from an individual's perspective. Dimension 3 which defines e-Competence levels related to the European Qualifications Framework (EQF), is a bridge between organizational and individual competences. Dimension 4 provides samples 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 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 **proficiency** levels of this standard has been systematically developed to enable consistent interpretation of the EQF in the ICT workplace environment.

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 should recognize this requirement and provide for continuity enabling use of the existing version of this 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 Commission's Digital Agenda; it is designed for use by any organization and individual engaged in ICT Human Resources planning and competence development.

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1 Scope

This Technical Report describes the methodology grounding for the development of the e-Competence Framework published as EN 16234-1. It supports methodological understanding of the e-CF by all parties interested; and it seeks to particularly satisfy the needs of stakeholders from competence frameworks construction and research environment.

2 Normative reference

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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, *e-Competence Framework (e-CF) - A common European Framework for ICT Professionals in all industry sectors - Part 1: Framework*

3 Terms and definitions, symbols and abbreviated terms

For the purposes of this document, the terms and definitions, symbols and abbreviated terms given in EN 16234-1 apply.

e-CF: refer to e-Competence Framework defined by EN 16234-1.

4 General principles – executive overview

The aim of this Technical Report is to describe the methodology underpinning the development of EN 16234-1, European e-Competence Framework (e-CF). The e-CF expert team and European ICT stakeholders used this methodology, combined with their experience and industry knowledge, to inform decisions and choices.

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

At the e-CF development project outset, four basic aspects of the forthcoming framework were considered. The e-CF expert group, together with the European stakeholders, made clear decisions on:

a) overall framework structure in four dimensions;

b) competence, knowledge, skill and attitude definitions;

c) ICT business processes;

d) the possible relationship between the e-CF and the European Qualifications Framework (EQF), in particular between e-CF and EQF levels.

The decisions taken were as follows:

- **e-CF structure in four dimensions.** To determine the structure of the European e-Competence Framework, the experts analysed and evaluated other existing frameworks, and finally agreed on a four dimensional approach. This structure is based on competence areas (dimension 1) and competences (dimension 2), rather than job roles. Competence-based approaches are more flexible and facilitate local customization. Dimension 3 assigns levels from 1 to 5 to each competence as

appropriate. The number of the levels assigned to each competence varies and is dependent upon the nature and complexity of the competence. Dimension 4 provides brief, non-exhaustive samples of knowledge and skills associated with each competence.

- **Definitions of competence, skills, knowledge and attitude**. In accordance with the overall approach regarding ICT stakeholder competence requirements, the definitions focussed on organizational rather than individual competences. However, individual competences can be identified within dimension 3 of the e-CF where proficiency levels are defined and are strongly related to personal autonomy and attitudes. Therefore it can be said that that Dimension 3 provides a bridge between organizational and individual competences. These definitions are in line with the EQF general definitions of knowledge, skills and competence. However, it should be noted that the EQF is still under development, and competence descriptions continue to be improved.

- **Business Processes**. The combined team of e-CF experts and European stakeholders agreed to use, as a reference, a very general ICT process schema, compliant with most models provided by IT 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 phases. Within this document, a broad description of the adopted process model is illustrated. Its purpose is to identify and define competences, in a heuristic manner, and therefore should not be considered as a rigid definition of company business processes.

- **Levels**. The e-CF experts and European stakeholder teams extrapolated from the EQF the following level indicators: "context complexity", "autonomy" and "behaviour" to help position and rank competences. These indicators reflect organizational perspectives on competence. The EQF uses further criteria such as "responsibility", but stakeholders elected to omit this element to avoid confusion with organizational accountability, and erroneously link competence levels to organization hierarchical levels. Consequently, the e-CF defines proficiency levels from the companies' viewpoint. However, as explained later in this document it also provides a link to the EQF and its associated learning levels.

The decisions taken in order to construct the e-CF were backed by theoretical and literature references. Within this document the relationship between best industry practice and current state-of-the-art competence theory is explained. The overall methodology adopted was based on a step-by-step, bottom up approach focused upon stakeholders' experience and practical implementation requirements. Methodological experts contributed consistency in the definitions and working principles from the start of the project.

The methodological challenges were:

- Representing the expert views of contributing stakeholders

- Achieving consensus on approach

- Formalizing decisions

- Ensuring cohesion of framework elements into a well–structured result

The process was based on consensus building, raising awareness among stakeholders and finding common views to establish a common language, a European currency for e-Competences. Literature review and theoretical knowledge provided clarification, when consensus was difficult. However, the main approach taken was to make the e-CF consistent and complementary to the original definitions and also to the EQF.

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5 Building the e-CF: a combination of sound methodology and expert contribution

5.1 The four dimensions of the e-CF

The structure of the European e-Competence Framework (e-CF) consists of four dimensions. These dimensions reflect different aspects of business and human resource planning and are specified as follows:

Dimension 1: five e-Competence areas derived from the ICT business processes PLAN – BUILD – RUN – ENABLE – MANAGE. This area is instrumental in HR assessment and the determination of training needs, as well as the identification of e-Competences. It helps HR managers to communicate with business managers and make coherent decisions. In addition, it assists in the organization and navigation of e-Competences.

Dimension 2: A set of reference e-Competences with a generic description for each one. It provides the building blocks of the framework, its core, consisting of 40 competences. These are not business sector-specific, i.e. they do not address specific applications such as banks, health, transport, etc. They are generic e-Competences, customizable and applicable to any industry or business sector. In dimension 2, e-Competences refer to and represent organization needs

Dimension 3: For each e-Competence, suitable proficiency level specifications, ranging from e-1 to e-5, have been assigned and elaborated. They relate to EQF levels 3 to 8. This dimension involves behaviours and levels of autonomy, creating a bridge between organizational and individual competences. Note that organizational competences are generic and broad whilst individual competences are specific and customized.

Dimension 4: Knowledge and skills embedded within e-Competences are made explicit in Dimension 4. They are not intended to be exhaustive but are examples[1] of knowledge and skills that may be required to successfully perform specific e-Competences. These examples are useful in defining specific and precise outcomes to be assessed within an organization's competence assessment programmes. In addition, they provide inputs for training institutions[2] to help define learning outcomes and design training initiatives. Dimension 4 components refer to Dimension 2 but are not related to specific competence levels in dimension 3. However, Dimension 3 has been used to verify the applicability of knowledge and skills identified.

In Figure 1, an example of how the four e-CF dimensions can be applied to organizations is shown (see also Figure 1 of CEN/TR 16234-2).

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[1] Choices related to skills and knowledge development provide a competitive key to address business success and vary widely in application across industry and education institutions. Hence knowledge and skills described in the e-CF are provided as examples and for contextual background. (see also "e-CF in action" Interim report 2009, chapter 5)

[2] Even though, Dimension 4 is constructed from an employer's perspective, Education and training institutions will be able to work with these short but precise e-competence components to revise or build curricula, syllabi, or learning programmes. However, it is not intended to restrict educational style or content solely to these descriptors, on the contrary, education providers are encouraged to produce materials complimentary to their culture. In consequence, the e-CF dimension 4 is deliberately confined to a set of key items acting as guidance but not limiting educational institutions to a rigid or narrow content. (see also "e-CF in action" Interim report 2009, chapter 5)
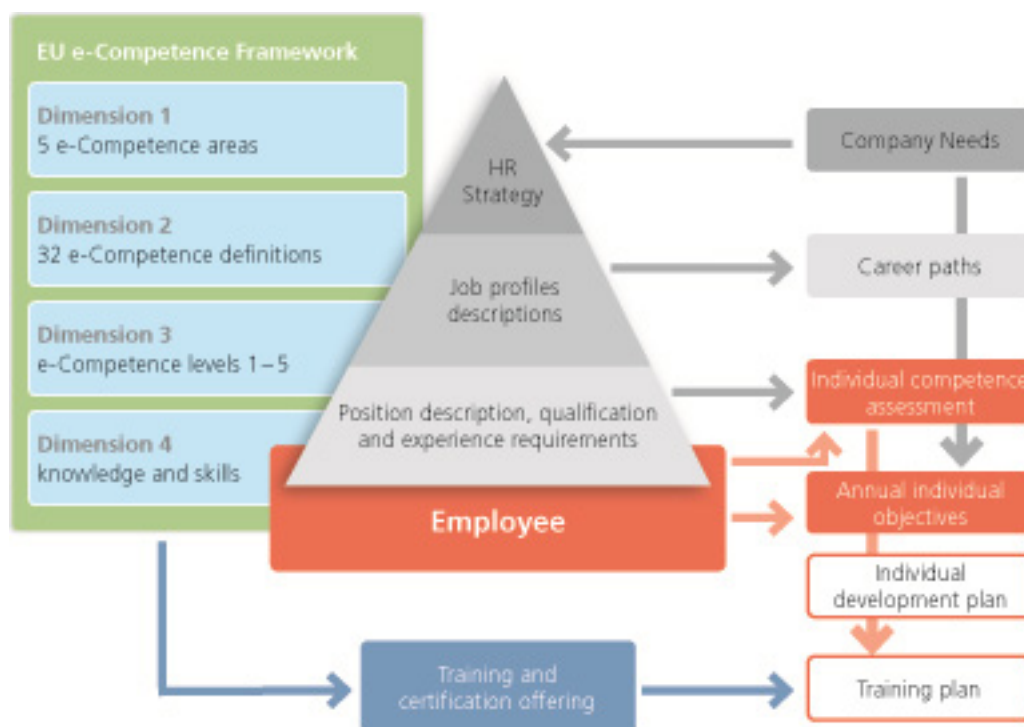
Figure 1 — Examples of e-CF 4 Dimensions implementation into companies

- Organizations may use dimension 2 – the generic e-competence descriptions – to build job profiles.

- Dimension 2 competences can be combined with dimension 3 proficiency levels to describe career paths.

- Knowledge and skills from dimension 4 provide an opportunity to link competence and training programs.

As the schematic above demonstrates, the e-CF has a multi-dimensional structure. It is competence-based and flexible in application. Alternative, job-profile approaches are less flexible, making local adaptation difficult. However, combining competences from different competence areas and using them as building blocks can create flexible job-profiles. This enables the derived job-profiles to be easily updated by substituting or deleting competences without the need to restructure the entire profile.

5.2 Dimension 1: e-Competence areas

5.2.1 General

A common language for competences is valuable as a 'vocabulary', but it also needs to be structured to support collection and classification of content. A European language of competence must be translatable into other concepts. This includes job profiles and descriptions and structures for learning or certification or frameworks such as the EQF. The e-CF needs to meet multiple demands by providing user-friendly orientation and by being open and flexible.

5.2.2 Processes and e-Competence Areas

If competence can be linked to an individual's workplace capability, then a structure of competences can be derived from exploring the workplace. Work and business processes bring together individual and business demands, challenges, tasks, activities, results and outputs.

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A business process is "a bundle of activities which needs one or more different inputs and which generates a value outcome for the customer" (Hammer, Champy 1994, p. 52, see also Hammer 2007 and Gaitanides 2007).

A work process is "a bundle of typical activities from a person or a team, mostly characterized by chronological sequence" (see Binner 2004, Berben 2006, Buch, Frieling 2006).

Every work process is a part of a business process (in special cases work and business process are identical). So the relationship between business and work processes is always valid and constant (see Gaitanides 2007).

Using processes as a base provides the following:

• models for flexible orientation;

• description of activities from different perspectives, e.g. individual or teamwork processes, department or enterprise business processes. Additional processes can be used to describe relationships and dependencies between activities, e.g. sub-processes, simultaneous processes or dependencies from the results of previous processes;

• descriptions of different kinds of activities, e.g. software development, customer service or administration;

• comparisons across organisations (Enterprise or SME's) within the same business sector, because processes are patterns. Processes give the opportunity to describe activities and reduce reliance upon company specifics such as organizational charts.

Based on these characteristics, processes are ideally suited as a shared basic reference for collecting and classifying competences, mediated by categorizing requirements.[3]

In the context of the e-CF development, it was also necessary to substantiate the process-model and the relationship between different kinds of processes, workplace requirements and ICT (or knowledge) areas. Based on the general business and work process model, as described above, different kinds of general and ICT specific process models were analysed and compared, searching for typical activities and processes. The models were based upon product life cycle management, systems and/or software life cycles, systems or software engineering/development, IT process improvement and quality, IT infrastructures and ICT working processes (see amongst others Stark 2004, Rogalla 2002, PLM, SPiCE, CMMI, ITIL). The comparison revealed:

1. In the majority of cases, the structure of processes used in the models are similar. Consequently, two ICT specific models, CMMI and ITIL, were studied as a basis for developing and maintaining the e-CF.

2. The main components of the ICT business process are Plan, Build, Run, Enable and Manage. Build and Run are core areas whilst Enable and Manage are cross-cutting themes, referring and relating to the former. Plan and Enable represent strategic areas, within companies that conceive, decide, design

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[3] From a methodological, social psychological perspective, work and business processes can be named and used as boundary objects: "Boundary objects are objects which are both pliable enough to adapt to local needs and the constraints of multiple parties employing them, yet robust enough to maintain a common identity across sites. They are weakly structured in common use, and become strongly structured in individual site use. These objects may be abstract or concrete. They have different meanings in different social worlds but their structure is common enough to more than one world to make them recognizable, a means of translation." (Star, Griesemer 1999, p. 509; see also Star 1996 and Brown, Duguid 1998 for business processes as boundary objects). A boundary object renders co-operation between different people and organizations possible by allowing to maintain and to cross boundaries at the same time.