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Kazalniki učinkovitosti e-usposobljenosti in skupne meritve

e-Competence performance indicators and common metrics

Leistungsindikatoren für E-Kompetenz und gemeinsame Metriken

e-Compétences : indicateurs de performance et métriques communes

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Leistungsindikatoren für E-Kompetenz und gemeinsame Metriken

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European foreword

This document (CEN/TR 17802:2022) has been prepared by Technical Committee CEN/TC 428 “ICT Professionalism and Digital Competences” the secretariat of which is held by UNI.

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Introduction

Recognition of competences is not a new field, many contributions have explored this topic and have developed assessment tools and methods to pursue clarity and precision, trying to be as unambiguous and non-judgmental as possible. There is an urgent need in the ICT field to find practical solutions related to the recognition and assessment of capabilities of ICT professionals whenever/wherever such competences have been acquired or developed.

This document is not intended as a general guideline as many valuable and authoritative papers already exist (e.g. from CEDEFOP and SFIA). This document is focused on providing guidance and a method for applying the EN 16234-1, *e-Competence Framework (e-CF) - A common European Framework for ICT Professionals in all industry sectors — Part 1: Framework and related documents to the process for competence assessment of ICT professionals*.

Therefore, this document provides guidance to e-CF users by supporting the use of indicators, metrics and criteria that support the assessment of an individual's e-competence at a specific level of proficiency as specified in EN 16234-1 (e-CF).

This document provides:

- a) Guidelines to derive indicators and metrics from the reference documents.

Most information, related to e-Competences, is described in EN 16234-1 (e-CF) its user guide and other associated documents such as CWA 16458-1 (ICT Profiles). Complementary to this information, e-CF users may seek the additional guidance and a methodology offered in this document to identify indicators and metrics in support of assessment.

The EN 16234-1 (e-CF) and the CWA 16458-1 (ICT Profiles) are references provided for all stakeholders and users in Europe and worldwide. They are flexible structures and are adaptable to meet requirements across a broad and in-depth ICT Professional environment. Therefore, it is impossible to create a complete and exhaustive catalogue of all possible indicators and metrics that are context specific across for all possible roles and competences. In support of this application flexibility, this document offers a range of examples which may be applied or used as inspiration for specific or unique requirements.

- b) Guidelines to generate a customized set of indicators, metrics, criteria and methods to collect pieces of evidence.

Once a satisfactory catalogue of indicators or metrics have been defined to start the assessment, the next task is to customize them for a specific use case. This customization usually entails the selection of methods for the collection of supporting evidence and indicators as well as the criteria used to determine the ICT professional's proficiency level for each situation. Depending on the use case (see a list of typical use cases in 5.3) the assessor or organization (e.g. an organization planning to recruit or address workforce development) may select and adapt:

- the methods used to collect information;
- the criteria used to evaluate if an individual is proficient at a specific e-CF competence level.

This adaptation process is assisted by the guidelines in this document. Furthermore, the document guides the process by highlighting the weaknesses and strengths of each option by providing examples of adaptation to specific situations.

- c) Awareness on the typical assessment process to evaluate the level of a candidate's e-Competences.

When all of the elements for an assessment are ready (indicators, metrics, criteria, methods for collecting pieces of evidence, etc.), the process of assessing e-Competences can start. The process may involve collection of information in the form of documents, samples, etc. or the collection of information through direct interaction with the ICT professional or other informed persons using interviews, forms, tests, exercises, observation, etc. An illustrative catalogue of methods for collecting information is described in Annex B. This document offers examples of pieces of evidence and the contribution they may provide. The assessor is offered guidelines to manage the assessment process and to generate a set of assessment results and this document shows examples of results to illustrate the process.

Finally, it is important to underline that the aim of deploying the e-CF as a competence assessment tool is to provide objectivity (i.e. unbiased, based on facts and not influenced by personal feelings, interpretations, or prejudice). This is naturally limited by the experience and capability of the individual assessor and this is the reasoning that has inspired the development of present document designed to offer pragmatic guidance and inspiration.

This document is structured by six Clauses.

Clauses 1, 2 and 3 describe the scope, the normative references and the relevant terms and definitions used.

Clause 4 analyses the content of EN 16234-1 (e-CF) from the perspective of the identification of elements useful in assessing e-competences and proficiency levels.

Clause 5 illustrates the importance of the context of an assessment and describes the factors that affect the methods, indicators and metrics to be used.

Clause 6 contains a description of a typical process for the assessment and a methodology to identify and consistently map the indicators.

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CEN/TR 17802:2022 (E)

1 Scope

The aim of this document is to enable unbiased and consistent use of indicators and measurements to enable verification of an individual's competence to the EN 16234-1 (e-CF) to facilitate its consistent application.

The document addresses the assessment of competence as articulated within the EN 16234-1 (e-CF), regardless of where, when and how the competence was attained or developed.

The aim is to provide guidance on the use of indicators and measurements to support the assessment and/or verification of an IT professional's competence.

Guidance is confined to possible indicators and how they can be applied to achieve consistency and transparency for the verification of an e-CF competence at a specific level (1-5).

This document guides readers through objective assessment of e-CF competence to avoid possible influence from personal feelings, interpretations or prejudice.

Finally, this document aims to offer, at least, examples of indicators and metrics for each of the e-competences listed in EN 16234-1 (e-CF).

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 (all parts), *e-Competence Framework (e-CF) - A common European Framework for ICT Professionals in all industry sectors* (standards.iteh.ai)

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 16234 (all parts) and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <https://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1 indicator

observable aspect or characteristic of an e-Competence that indicates its presence in an individual at a particular proficiency level

Note 1 to entry: The observation or measurement of an indicator results in one or several qualitative or quantitative values.

3.2 metric

total or partial value of an indicator where the measured entity is a person (ICT professional), the attribute is mainly an e-Competence at a competence level and is determined according to well-defined rules

Note 1 to entry: A metric could be qualitative or quantitative, objective or subjective, and direct or indirect. It may express value in a range of ways from very basic scales like a classification (e.g. classify an entity according to a mere type) to sophisticated quantitative metrics (like number of years).

3.3 criterion

principle used to decide if an ICT professional has acquired an e-Competence at an e-CF level of proficiency

Note 1 to entry: It can be determined by a value such as the threshold of a metric or of an indicator or possibly a combination of values such as absolute numbers, percentages, etc.

4 Using EN 16234-1 for recognition and validation of e-Competences

4.1 e-Competences from EN 16234-1 (e-CF): abilities of ICT professionals

EN 16234-1 (e-CF) has established a common language for e-Competences that is independent of education systems and qualification structures. In order to effectively use the e-CF for e-competence assessment, a crucial factor is the users comprehensive and holistic understanding of the concept of competence in e-CF: “*Competence is a demonstrated ability to apply knowledge, skills and attitudes for achieving observable results*” (see EN 16234-1:2019, 3.5). For organizations deploying ICT professionals these “abilities” which are articulated as 41 e-competences within EN 16234-1 are key from the following three perspectives. They are:

- **Formulated from an organizational perspective** within Dimension 2. In this way, the relationship between the competences and the capabilities and processes of enterprises are self-evident and obvious on one hand. On the other hand, however, if we take for example two ICT professionals but working in different organizations, with the e-Competence A.2 “Service Level Management” they are likely to perform different tasks. In our example, one ICT professional works in the service department of a large telecommunication provider alongside many colleagues and another is solely responsible for service management in a games app start-up company. The activities they perform will differ significantly as a result of their organizational environment however, it is conceivable that both possess the competence A.2.
- **Comprehensive descriptions of capability** which include attitudes, reflecting the way ICT professionals act in a contextually appropriate manner, and behavioural skills, which are used to successfully engage with situations in the workplace. Behavioural skills may refer to work quality, social interaction or emotion (for details, see CEN/TR 16234-3). Furthermore, they reflect the experience of the ICT professional. Experience enables them to act in varied, complex situations, in a team and with customers, in a goal-oriented but also flexible manner and to behave appropriately. Especially at higher proficiency levels, competence related experience enables ICT professionals to deal with challenging unknown problems, to find completely new solutions and approaches and to independently evaluate the results. Therefore, for example, “Ensures the achievement of planned results” (**Competence A.2 level 4**) can result in very different actions from different ICT professionals; one may focus on motivating employees by addressing them personally, whilst another may prefer to improve the overall process. The same competence may be acquired and achieved in many different ways.
- **Dynamic and ever changing** are characteristics of the ICT professional environment. Focusing on competence facilitates organizational changes making them as feasible as personnel and individual development. Owing to rapid evolution, ICT organizations often place less importance on the current knowledge of their ICT professionals than on their ability to learn and to further develop specific e-Competences. A design feature of EN 16234-1 (e-CF) is that competence, composed of many variable elements is flexible yet has an enduring structure; this is an essential advantage of the 41 e-Competences. So for an ICT professional it is part of being e-competent in “ensuring the achievement of planned results” (A.2 “Service Level Management”, level 4) to learn, in which environments it is appropriate to improve the process and in which situation it is appropriate to motivate the employees and in which situation other actions are required to reach the goal.

CEN/TR 17802:2022 (E)

The comprehensive and holistic concept of competence in EN 16234-1 (e-CF) is one of the most important characteristics of the e-CF and ensures its flexibility and adaptability. However, these features create challenges for the identification and validation of e-Competences. The next clause is devoted to showing how the content of EN 16234-1 may be explored to reveal and enable recognition and validation of e-Competences.

4.2 Recognition and validation of e-Competences

EN 16234-1 (e-CF) competence is defined as a demonstrated ability to apply knowledge, skills and attitudes for achieving observable results (see EN 16234-1:2019, 3.5).

This definition of e-Competence can be broken down and used as the starting point to identify the key elements that enable the recognition and validation of e-Competences. Three aspects can support the analysis of EN 16234-1 (e-CF):

1. **The “ability to apply”**, can be related to activities and experience. The definition implies a focus on actions described in the EN 16234-1 (e-CF) either explicitly or indirectly mentioned as verbs. References to actions can be found in dimension 2 e-Competences descriptions, in dimension 3 proficiency levels and also in dimension 4, examples of knowledge and skills.
2. **“Knowledge and skills”** are elements explicitly listed in dimension 4 of the e-CF. The content includes examples but they are not exhaustive, consequently there are many knowledge and skills items that may be relevant to this e-CF dimension. In particular, EN 17748-1 (ICT BoK) articulates knowledge required and deployed by ICT professionals and is designed to enhance the e-CF and therefore can be used as a significant knowledge reference. Attitudes are integrated into the transversal aspects of the EN 16234-1 (e-CF) which in turn are associated with knowledge and skills.
3. **“Observable results”** can be identified from documents and deliverables mentioned in EN 16234-1 (e-CF) within the descriptions of dimensions 2, 3 or 4. Although this is the primary source for ‘observable results’ as it comes from normative information, a catalogue can be developed and enriched by using information from Annex B of CEN/TR 16234-2:2021 (Examples of deliverables related to e-CF competences) or CWA 16458-2 (ICT Professional Profiles). Within the European ICT Professional Role Profiles each role profile includes typical deliverables and indicates associated responsibility (accountable, responsible, contributor).

The relationship between the e-Competence definition and these three key elements is illustrated in Figure 1.

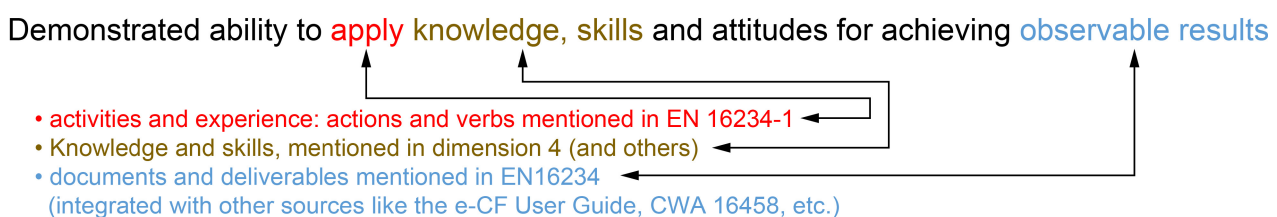


Figure 1 — Relationship between definition of e-Competence and elements of EN 16234-1

The foundations for assessing if an individual is e-competent at a specific proficiency level are based on the description of e-Competences which describe the key elements for each of the 41 e-Competences.

Analysis of the content of each dimension provides the base for building a methodology to develop the mechanisms, guidelines and elements required for the assessment and recognition of competence at a specific e-competence level of proficiency.

Dimension 1: e-Competence area

The function of the five areas PLAN – BUILD – RUN – ENABLE – MANAGE is to serve as a navigation aid and entry point to e-competences (and to relate them to capabilities and processes of the enterprises). These general areas may be used to consider the context of an ICT professional's experience, but add little value in individual assessment or verification.

Dimension 2: e-Competence

EN 16234-1 (e-CF) states: "Each e-Competence is specified by a title and a generic description of the competence. A total of 41 e-Competences have been identified. [...] The e-Competences defined within the standard are not exhaustive; nonetheless they provide a basic, clear, and sound orientation for individuals and organizations. [...] The comprehensive descriptions articulated in Dimension 2 provide primary e-Competence reference points for application of the framework."

The 41 e-Competences are a normative part of EN 16234-1. The descriptions are short statements of the most typical actions (understood as abilities, including experience) and results which are achievable within the addressed e-Competence.

In the example "A.2. Service Level Management" actions can be identified as follows:

"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."

The observable result is obvious: "service level agreements (SLAs)".

The corresponding abilities, including experience as well as attitudes, are further specified by describing and embedding the activities, e.g. as "taking into account the needs and capacity of stakeholders and business."

In this way the key elements actions, abilities and observable results for assessment and for building indicators are identifiable in the Dimension 2 description. Furthermore, it is possible to describe and/or discuss, what these key elements look like in a specific environment and for a specific person, possibly to identify the e-Competence at a specific proficiency level, by referencing the e-CF level descriptors of Table 3.

Dimension 3: e-CF proficiency levels

As previously stated, the scope of this document is to create assessment criteria and indicators for e-CF e-competence at defined levels to meet different evaluation requirements. Therefore, the assessment of e-Competence needs to be targeted to define proficiency in an e-Competence at a specific level. Dimension 3 is an essential element for defining proficiency levels and has to be referenced alongside dimension 2 in the assessment process.

EN 16234-1 (e-CF) states: "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."

The level parameters are illustrated in Annex A of EN 16234-1:2019 and reproduced in Table 3 of this document.

The five proficiency levels are a normative part of EN 16234-1. The level descriptions are holistic and incorporate a combination of influence, complexity (of the context), autonomy, behaviour and a summarizing "level descriptor". Key elements, including abilities/activities on a specific level can be derived from Table 3.

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It can be observed from Table 3 that individuals possessing an e-competence at proficiency level e-4 are able to:

- provide executive leadership in;
- unpredictable and/or unstructured environments/processes/...;
- act on a level of autonomy on which he/she demonstrates leadership and innovation in unfamiliar, complex and unpredictable environments and addresses issues involving many interacting factors;
- shows typical behaviour like conceiving, transforming, innovating, finding creative solutions by application of a wide range of technical and/or management principles.

Level e-4 proficiency is relevant to the previously applied example “A.2. Service Level Management”. The condensed descriptor for this level is derived from stakeholder agreed examples of competence performed at this level. The descriptor reads: “Negotiates revision of SLAs, in accordance with the overall objectives. Ensures the achievement of planned results.” (EN 16234-1, e-Competence A.2, Dimension 3: e-CF proficiency level).

From this we can observe:

- typical actions are negotiating, ensuring and planning; and
- typical results are SLAs and plans.

The corresponding abilities, including experience and even attitudes, are specified in the description and embedding of activities, e.g. as “Negotiates revision of SLAs, in accordance with the overall objectives.” This description is supported by the general level description and characteristics given in the level table.

In this way the key elements, actions, abilities and observable results for assessment and for building indicators are identifiable from the Dimension 3 descriptions. Using Table 3 it is possible to describe and/or discuss, what these key elements look like in a specific environment and for a specific person.

When referencing the level descriptions in Dimension 3 and the characteristics defined in Table 3, it is important to consider context when identifying and assessing competence. Complexity, autonomy and influence are obviously related to the context and the environment in which an ICT professional operates. Therefore, it is crucial to always consider context when assessing competence and associated levels and when determining indicators and criteria beforehand.

It should be noted that assessment needs to be related to a specific level of proficiency of an e-Competence, it is not feasible to apply a global assessment for all levels of proficiency. This raises a question on the aggregation of proficiency levels. In general, it is not possible to guarantee that a candidate demonstrating competence at an upper level (e.g. level 4) of an e-Competence is automatically competent at lower levels.

DIMENSION 4: knowledge and skills examples

EN 16234-1 (e-CF) states: “Examples of knowledge and skills relate to the e-Competences in Dimension 2. These examples are provided to add value to the competence descriptor and are not intended to be exhaustive. They offer inspiration and orientation for the identification of further context specific knowledge and skills assignment.”

These key elements are provided to facilitate understanding of e-competence. They may also inspire the recognition and validation of e-competence.

Within EN 16234-1, the number of knowledge and skills items per e-competence ranges from 4 to more than 10 items, depending on the e-Competence. CEN/TR 17748-2 (ICT BoK) also articulates knowledge required and deployed by ICT professionals and provides an additional knowledge reference.

In the example “A.2. Service Level Management” five knowledge and also five skills examples are listed, from “K1 SLA documentation” to “K5 impact of service level non-compliance on business performance” and from “S1 analyse service provision records” to “S5 anticipate and mitigate against potential service disruptions”.

Consequently, typical knowledge and skills (K&S), applied by an ICT professional, are identifiable, however the lists provided are informative, not normative nor exhaustive.

In summary:

- Dimension 1 describes five e-competence areas: plan, build, run, enable and manage. This dimension is of limited use for assessment.
- Dimension 2 describes each e-competence with concise sentences that explain the key features of the competence, describing activities and using verbs such as “responds”, “assures”, “evaluates”. Within each description, references are made to results, outcomes, and deliverables.
- Dimension 3 sub-divides each e-competence into e-CF proficiency levels 1 to 5 (these are related to EQF levels 3 to 8). This format of this dimension is similar to dimension 2 in that it includes short statements. The descriptions are grouped into levels of proficiency within the competence. Analysis of these sentences may also reveal activities with relevant verbs and possible results and deliverables.
- Dimension 4 contains a non-exhaustive list of knowledge and skills examples providing an opportunity to include additional items, following careful analysis of alternative sources.

5 Assessment of e-Competences in different contexts

5.1 Context assessment: general considerations

Competence assessment supports the identification of IT professionals and their capabilities. The application of EN 16234-1 (e-CF) as a common framework and language makes consistent assessment possible. However, the comprehensive and holistic character of e-competences presents challenges in the identification and applicability of competences characteristics at the micro level. Consequently, the application of the EN 16234-1 (e-CF) and especially its use for assessments requires a clear understanding of the context in which it is to be deployed. Three questions need to be answered:

1. What is the specific scenario in which the e-Competences are to be identified and possibly evaluated?

Only within real-world situations (embedded in, e.g. projects, orders or work processes) and in the face of challenges, the skills and expertise (“demonstrated ability”) become apparent. The following additional questions require consideration:

- the environment (e.g. enterprises/organization, education, professional organization);
- the use and adaption of the e-CF in this environment (see also Annex A “The EN 16234-1 (e-CF) adoption Maturity Model”);
- the enterprises/organizations/business processes where the ICT professional applies their e-Competencies (“abilities ... to achieving observable results.”) and so on.

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2. What is the reason and objective of the assessment?

The assessment of an ICT Professional as part of a job application is different from the assessment of a team member in the context of business processes improvement. Many different aims for conducting assessments can be envisaged and for each it is crucial to consider the specific goal and the unique characteristics of each situation. National examples include, the skill assessment (*bilan de competence*) required by the French law¹.

3. Has the assessor the appropriate capability?

Assessing e-Competences presents special challenges for the assessors. They:

- are competent, or have access to or work in collaboration with personnel with a proficiency level in the specific area of e-competence under consideration;
- are competent in the field of skills, knowledge, and competence assessment, being experienced in collecting information through different methods and in analysing pieces of evidence in order to make decisions;
- are able to contextualize the e-Competence and related proficiency levels by considering the specific context and objective, as defined in previous points 1 and 2.

5.2 Customization of EN 16234-1 (e-CF)

An important aspect to consider when designing an e-Competence assessment is the level of customization required within the specific context/organization. EN 16234-1 (e-CF) provides users with the possibility of customization to fit the organization/mission/business/scope. This flexibility offers the opportunity to maintain alignment with the EN 16234-1 from a limitless range of contexts and environments through the application of a common language to promote universal understanding.

Annex A (The e-CF adoption maturity model) explains that advanced level of adoption of EN 16234-1 (e-CF) within a specific organization, has a linear relationship with higher levels of customization. In practice, this means that organizations with high levels of e-CF maturity adoption will have created documentation, based on the EN 16234-1, of value to the assessor.

It is useful to understand that the maturity level of organizations in adopting EN 16234-1 directly influences and informs the process of defining specific indicators for the assessment. As stated, organizations that have a higher level of maturity, necessarily have a higher level of personalization. In this case the indicators may be derived not only from the standard, but also from the specific and customized documentation available (deliverables, job descriptions, etc.).

Naturally it is recommended that assessors verify that specific and personalized documentation does not conflict with EN 16234-1 (e-CF).

The different elements of the e-CF that are usually personalized for use in a specific context are:

— Knowledge and skills (K&S)

Knowledge and skills are the fundamental elements/components that describes the contents of competences from a technical and practical point of view.

The examples of knowledge and skills contained in EN 16234-1 (e-CF) are provided to add value to the competence descriptor and are not intended to be exhaustive. They offer inspiration and orientation for the identification of further context specific knowledge and skills assignment. For this reason, K&S are the elements that can be customized by the organization to meet the demands of the environment and the role to which the standard is applied.

¹ GPEC, Gestion Prévisionnelle des Emplois et Compétences - Code du travail.

— Deliverables

Deliverables are useful for competence assessment as they can be readily associated to the “observable results” that the assessor is looking for in order to prove the presence of a specific competence. A list of deliverables is provided in CEN/TR 16234-2 and CWA 16458 (all parts). In both documents the lists are not mandatory. They are offered as examples as they are not exhaustive and do not cover every aspect of the full competence description.

However, deliverables offer linkage to the e-CF from a workplace perspective by relating job requirements to competence. Consequently, consideration of deliverables can help assessors to identify the experience of IT professionals.

— Proficiency levels

“Dimension 3, level assignments, defined by the e-CF level table, (see Table 3) provide the second element of the definitions in EN 16234-1. However, it is necessary to understand that level 3 descriptors derived from stakeholder agreed examples of the competence performance and applied at each level, are of necessity merely typical examples used to illustrate competence at the relevant level. The standard’s normative level definitions are provided by the e-CF level table backing each level description.” (see Table 3).

The customization of the proficiency level description is allowed but not modification of the level table characteristics.

Furthermore, EN 16234-1 (e-CF) does not allocated five levels to all competences, typically competencies are populated by two or three levels. To remain compliant to the standard, it is not permitted to add additional levels to the those published in EN 16234-1 (e-CF).

The assessor needs to consider the customization of proficiency levels.

5.3 Typical use cases for validation and recognition of e-Competences

When considering assessment of e-competences and associated levels, there are many different scenarios, contexts or use cases where this process may be required.

Some possible intended goals of these processes are:

- Certification of e-competence: assessment where the presence of the candidate results in a statement which can be shown to third parties as proof of proficiency in an e-competence at a specific level. As the certification is a general-purpose statement, it aims to be valid in many contexts. The indicators, metrics, and criteria should be selected with the goal of wide applicability in mind.
- Talent recruitment for an organization: assessment connected to the need for recruiting talent from outside of the organization. To match the requirements of a position, it has to have been defined, at least partially, in terms of e-competences (at a specific level) required for successful performance in the position.
- Internal career development: as part of HR management, organizations analyse the match of existing human assets to the requirements of each position in the company. This is made possible if the profile of e-competences of each employee is known. The assessment of e-competences can then be used to create internal career development plans combined with internal training programs, and to better allocate existing employees to existing or future positions.