e-Competence Framework (e-CF) — A common European Framework for ICT Professionals in all sectors — Part 4: Case Studies

ICS:

CCMC will prepare and attach the official title page.
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European foreword

This document (prCEN/TR 16234-4:2020) has been prepared by 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 CWA 16234-4:2014.

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

- Development of new case studies in the light of the EN16234-1 revision and benefitting from multiple e-CF user experiences gathered and application feedback received.

The EN16234-1 standard for ICT professional competence being the main reference of this document outlines the minimum requirements of competence (i.e. a threshold) in the work context. It includes typical knowledge and skills examples that are not standardised but provided to support orientation and understanding. When applying the standard, this approach must 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 is made up of four parts:

- Part 1: is the Framework of the e-CF published as an European Norm (EN).
- Part 4: provides a series of Case Studies illustrating e-CF practical use from multiple ICT sector perspectives and published as a CEN Technical Report (TR)

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

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. Understanding these guiding principles is equally vital for applying the standard in multiple environments concerned with ICT professionalism.

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 Technical Report provides a series of practical case studies supporting understanding, adoption and use of EN 16234-1 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 technical report supports Information and Communication Technology (ICT) stakeholders dealing with ICT Professional competences from multiple perspectives, in particular:
- ICT service, demand 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 across Europe, to adopt, apply and use the framework in their 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 e-Competence Framework (e-CF) - A common European Framework for ICT Professionals in all sectors
- TR16234-2 User Guide for the application of the e-Competence Framework (e-CF)
- TR 16234-3 Methodology of the e-Competence Framework (e-CF)

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

4 Executive overview

4.1 e-CF overview: structure, content

The e-CF 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.
Complementary, the standard incorporates a transversal component which provides basic generic ICT descriptors for successful application of e-CF competences in a workplace context.

<table>
<thead>
<tr>
<th>Table 1 — The e-CF four dimensions and transversal aspects</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dimension 1:</strong> 5 e-Competence areas</td>
</tr>
<tr>
<td><strong>MAY APPLY</strong></td>
</tr>
<tr>
<td>derived from the ICT macro processes PLAN – BUIL – RUN – ENABLE – MANAGE. They provide the entry point to the e-Competences and reflect a process perspective based upon the waterfall approach. However, the e-CF is equally relevant to the steps applied in agile process structures such as Agile/DevOps lifecycles.</td>
</tr>
</tbody>
</table>

| **Dimension 2** 41 e-Competences                          |
| **SHALL APPLY**                                           |
| 41 e-Competences in total provide the European standard references of ICT Professional competence as required and performed in IT work context. Each dimension 2 description contains a competence title and a generic competence description, defined from an organisational perspective. |

| **Dimension 3** 5 e-CF proficiency levels                  |
| **SHALL APPLY**                                           |
| 5 e-Competence proficiency levels characterised by increasing levels of context complexity, autonomy, influence and typical behaviour. To each e-Competence, specifically relevant proficiency levels are assigned. The dimension 3 level descriptors provide the individual perspective of competence performance. |

| **Dimension 4** knowledge and skills examples              |
| **MAY APPLY**                                             |
| Examples of knowledge and skills relate to the e-Competences generic descriptions 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 specific knowledge and skills assignment according to contextual needs. |

| **Transversal aspect**                                     |
| components provide basic generic ICT related descriptors for successful application of e-CF competences in a workplace context. |
| **MAY APPLY**                                             |

The four-dimensional structure of the e-CF offers comprehensive insight into the competences required by organisations and executed by IT professionals. The focus of the framework is to articulate the 41 competence descriptors found at the heart of the structure in dimension 2. This dimension, which is complemented by the remaining three, provides a usual start point for initial understanding of the e-CF.

The figure below illustrates the content of a typical competence, A.2 Service Management, it shows how the central dimension 2 provides the competence description and how this can be further articulated in dimension 3, at different proficiency levels (level 3 and level 4 in this example). Furthermore, examples of knowledge and skills listed in dimension 4, provide additional illumination of the core competence description from dimension 2.

Figure 1 provides an example of e-Competence description in all four dimensions.

**Figure 1 — EN16234-1:2019 “e-CF” e-Competence example A.2. Service Level Management**
As stated above, 41 competences are defined by this standard and each are constructed in the same way, from the 4 dimensions, previously described. The following table presents the entire compendium of competences in a consolidated form. It demonstrates that although the format of each competence is structured in a similar way, the number of applicable dimension 3 level descriptions varies according to workplace relevance.

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

Transversal aspects are represented by statements that complement the descriptors of dimension 2. Figure 3 illustrates the seven transversal aspects which are applied to every competence either from the standpoint of being ‘aware of’ or ‘behaving proactively’ according to context.

Figure 2 — Transversal Aspects applying across the entire framework
Figure 3 — EN16234-1:2019 e-Competence Framework (e-CF) overview

<table>
<thead>
<tr>
<th>Dimension 1 5 e-CF areas</th>
<th>Dimension 2 41 e-Competences identified</th>
<th>Dimension 3 5 e-Competence proficiency levels</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>e-1  e-2  e-3  e-4  e-5</td>
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<tr>
<td><strong>A. PLAN</strong></td>
<td></td>
<td>A.1. Information Systems and Business Strategy Alignment</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A.2. Service Level Management</td>
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<tr>
<td></td>
<td></td>
<td>A.3. Business Plan Development</td>
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<td></td>
<td></td>
<td>A.4. Product/Service Planning</td>
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<td></td>
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<td>A.5. Architecture Design</td>
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<td></td>
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<td>A.6. Application Design</td>
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<td></td>
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<td>A.7. Technology Trend Monitoring</td>
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<td></td>
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<td>A.8. Sustainability Management</td>
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<td></td>
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<td>A.9. Innovating</td>
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<td></td>
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<td>A.10. User Experience</td>
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<tr>
<td><strong>B. BUILD</strong></td>
<td></td>
<td>B.1. Application Development</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B.2. Component Integration</td>
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<td></td>
<td></td>
<td>B.3. Testing</td>
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<td></td>
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<td>B.4. Solution Deployment</td>
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<td></td>
<td></td>
<td>B.5. Documentation Production</td>
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<td></td>
<td></td>
<td>B.6. ICT Systems Engineering</td>
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<tr>
<td><strong>C. RUN</strong></td>
<td></td>
<td>C.1. User Support</td>
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<tr>
<td></td>
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<td>C.2. Change Support</td>
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<td></td>
<td></td>
<td>C.3. Service Delivery</td>
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<tr>
<td></td>
<td></td>
<td>C.4. Problem Management</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C.5. Systems Management</td>
</tr>
<tr>
<td><strong>D. ENABLE</strong></td>
<td></td>
<td>D.1. Information Security Strategy Development</td>
</tr>
<tr>
<td></td>
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<td>D.2. ICT Quality Strategy Development</td>
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<td></td>
<td></td>
<td>D.3. Education and Training Provision</td>
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<tr>
<td></td>
<td></td>
<td>D.4. Purchasing</td>
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<tr>
<td></td>
<td></td>
<td>D.5. Sales Development</td>
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<td></td>
<td></td>
<td>D.6. Digital Marketing</td>
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<td></td>
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<td>D.7. Data Science and Analytics</td>
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<td></td>
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<td>D.8. Contract Management</td>
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<td></td>
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<td>D.9. Personnel Development</td>
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<td>D.10. Information and Knowledge Management</td>
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<td></td>
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<td>D.11. Needs Identification</td>
</tr>
<tr>
<td><strong>E. MANAGE</strong></td>
<td></td>
<td>E.1. Forecast Development</td>
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<tr>
<td></td>
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<td>E.2. Project and Portfolio Management</td>
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<tr>
<td></td>
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<td>E.3. Risk Management</td>
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<td></td>
<td></td>
<td>E.4. Relationship Management</td>
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<td></td>
<td></td>
<td>E.5. Process Improvement</td>
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<td></td>
<td></td>
<td>E.6. ICT Quality Management</td>
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<tr>
<td></td>
<td></td>
<td>E.8. Information Security Management</td>
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<tr>
<td></td>
<td></td>
<td>E.9. Information Systems Governance</td>
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</tbody>
</table>
4.2 **Overview of e-CF case studies provided by this document**

In support e-CF application within multiple environments, a series of illustrative case studies provide examples, benefits and hints of how to make best use of the e-CF.

These case studies relate to practical e-CF application experiences and have been elaborated together with organizations applying the e-CF Europe-wide.

**Table 2 — Overview of e-CF case studies provided by this document**

<table>
<thead>
<tr>
<th>Case Study</th>
<th>Case study title and source</th>
<th>e-CF usage</th>
<th>Key perspectives</th>
</tr>
</thead>
</table>
| **A** 5.1  | “Skill-UP: Please, mind the gap” e-CF and ICT Professional Role Mapping to accelerate company transformation  
*Nexi Payments S.p.A./Mercury Payments S.p.A.; Italy* | e-CF and ICT Professional Role Profiling to standardize roles across markets, to map competences and experiences, to enhance Nexi IT organization with specialised job profiles and to boost people development | Identification of future competence needs  
Cross company and cross border common language  
Competence gap identification  
Decision support on develop or buy new competences |
| **B** 5.2  | “Educating the European ICT Professionals of the Future” - an e-CF compliant curriculum  
*HU University of Applied Sciences (HU), Utrecht, The Netherlands* | In order to create a future proof curriculum for the part-time (continuing education) Master of Informatics at the HU the e-CF was incorporated. Competences related to professional role profiles are taught across several modules in order to prepare IT professionals for their next challenge in their organisation. | Identification of current and future roles based on the EU ICT Professional Role Profiles  
Education based on the related competences  
Unique competitive advantage as e-CF competences are increasingly demanded |
| **C** 5.3  | 5.3. “Teaching students human resources practices in the ICT profession within Informatics services management course - example of hiring process”  
*University of Zagreb, Faculty of Organization and Informatics* | One of the important topics within IT service management is human resources management, related to the ICT profession. In order to introduce students to the process of preparation of job advertisements and job applications, we used ICT profiles and related e-CF competences. | Identification of job profiles/roles in an ICT company based on the EU ICT Professional Role Profiles  
Preparation of job advertisements for a specific profile based on related e-competences  
Preparation of a job application for a specified job ad (ICT profile)  
Evaluation of candidates according to their application |
| D 5.4 | "Implementation of Software Engineering Competence Remote Evaluation for Master Program Graduates" - e-CF based Learning Outcome usage for Improving the Quality and Relevance of Higher Education | Boosting innovation and digital skills in European universities in order to deliver high quality education and digital skills. SE Master Program's learning outcome structuring on the base of e-CF competences. | • e-CF competence on-line evaluation for HE establishments as Open Educational Resource  
• Increased opportunities for professional development for ICT Master students,  
• Greater understanding of interconnections between formal, non-formal education  
• Student oriented Software Engineering Master Program design |
|---|---|---|---|
| E 5.5 | German VET ICT profile review process: use of e-CF at four different points | Use of e-CF in the process of the amendment of the German vocational training ICT profiles and mapping of all the skills and competences to the e-CF to ensure a European understanding. | • To exchange about optimal proficiency level of competences  
• As inspiration for definitions and descriptions  
• As checklist  
• To translate vocational training ICT profiles into e-CF competences |
<p>| F 5.6 | Making a role profile of an early adopter of Blockchain using the e-CF standard | Along with other technical innovations blockchain shares the trait that accepted descriptions of related skills, competences and knowledge are scarce or non-existent. Transfer and sharing of knowledge on this decentralized database technology often takes place in masterclasses, short-term education and seminars. There, early adopters, developers as well as users, render their experiences and findings, while discussing use cases in practice. In this contribution the e-CF is used to describe results of a search for skills, knowledge and competences of Dutch Blockchain early adopters. | • To translate vocational training ICT profiles into e-CF competences |</p>
<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>University of Minho</td>
<td>under development</td>
</tr>
<tr>
<td>5.7</td>
<td>e-CF for developing data competences and capabilities in the IT organisation</td>
<td>under development</td>
</tr>
<tr>
<td>H</td>
<td>e-CF for developing data competences and capabilities in the IT organisation Cap Gemini, The Netherlands</td>
<td>under development</td>
</tr>
<tr>
<td>I</td>
<td>“Developing an e-CF based systematic engagement between universities, VET and employers in a national qualification authority context.” Development of the Estonian National skills strategy by the Estonian Association of Information and Technology in co-operation with the National Qualifications Authority.</td>
<td>Estonia decided upon an ICT competence approach to create national economic competitive advantage. This required co-operation and common understanding between industry, education providers and national qualifications authority. The e-CF provided a common structure and platform for co-operation.</td>
</tr>
<tr>
<td>J</td>
<td>“Using the e-CF to develop a certification framework and spin-off curricula and VET programmes. Promanad, Rotterdam, The Netherlands</td>
<td>In order to develop internationally recognizable curricula a certification framework was developed based on the e-CF in order to assess knowledge, comprehension and application of concepts that form the foundation for the development of the e-CF competences.</td>
</tr>
<tr>
<td>K</td>
<td>e-CF supporting cultural change in the ICT user organisation Red Electrica de Espana</td>
<td>under development</td>
</tr>
</tbody>
</table>

- e-CF and ICT profiles were deployed
- Competence was at the heart of the skills approach
- Curriculum development was supported by the application of learning outcomes

- By using the e-CF for defining a certification framework, it has a clear rationale behind it that can be easily explained to all stakeholders.
- By using the e-CF to develop exams, these are not only nationally but also internationally recognised.
- By using the e-CF and the European ICT professionals job profiles to build ICT curricula, programs are not only much more appealing to students, but also to employers and to accreditation committees.
5 Case studies: e-CF for multiple application across multiple target groups

5.1 Case Study A: “Skill-UP: Please, mind the gap” e-CF and ICT Professional Role Mapping to accelerate company transformation

Table 3 — Case Study A in short

<table>
<thead>
<tr>
<th>Case study title and source</th>
<th>e-CF usage</th>
<th>Key perspectives</th>
</tr>
</thead>
</table>
| “Skill-UP: Please, mind the gap” e-CF and ICT Professional Role Profiling to standardize roles across markets, to map competences and experiences, to enhance Nexi IT organisation with specialized job profiles and to boost people development | e-CF and ICT Professional Role Profiling to standardize roles across markets, to map competences and experiences, to enhance Nexi IT organisation with specialized job profiles and to boost people development | ▪ Identification of future competence needs  
▪ Cross company and cross border common language  
▪ Competence gap identification  
▪ Decision support on develop or buy new competences |

5.1.1 About Nexi and the Italian market

Nexi is the leading PayTech Company in Italy, listed on the MTA market of Borsa Italiana. Our business benefits from our long-lasting partnership with approximately 150 partner banks covering 80% of the banking sector in Italy in terms of number of branches. Our integrated end-to-end omni-channel technology connects banks, merchants and consumers enabling digital payments. We help simplify payments for our clients and digitize the Italian economy. Nexi operates in three market areas: Merchant Services & Solutions, Cards & Digital Payments and Digital Banking Services:

▪ **Merchant Services & Solutions:** Nexi, together with its partner banks, provides services to approximately 900,000 merchants and manages approximately 1.4 million POS terminals;

▪ **Cards & Digital Payments:** Nexi, together with its partner banks, manages approximately 41 million credit and payment cards for c. 30 million cardholders; and
**Digital Banking Solutions:** Nexi managed 13,400 ATMs, approximately 420,000 e-banking workstations and over 900 million clearing transactions in 2018. In addition, Nexi is developing the open banking system in collaboration with the CBI consortium, to which the main Italian banks have already adhered.

Digital payment solutions are widely distributed in Italy, but unfortunately very poorly used. Only 26% of transactions are paid by cards or digital instruments vs. 45% of the European Average. This misalignment between distribution and usage is Nexi’s major focus, with one clear vision: every payment will be digital. It is only a matter of time and we believe that, that day is today.

Nexi vision is supported by a clear positioning in the market: to be the PayTech of Italian Banks, providing highly advanced payment solutions. Bearing this in mind, more than 2,000 employees and 1,000 consultants work every day at Nexi, where IT area represents 1/3 of the Company population.

Nexi was founded in 2017, stemming from two large Companies, and since its creation, more than 50% of the overall Company population has changed. This turn over originated from massive external hiring, as well as from merging additional companies with vertical expertise. In this situation, Nexi required a structured integration process, which could unlock individual competences within a collective framework.

Skill-UP is the project to address integration needs and to support Nexi Human Capital growth, within the IT area.

Skill-UP operative goals were very clear from the beginning:

1. map the IT competence at the start of the project, considering also future scalability, competence development and maintenance
2. define criteria to make or buy
3. identify specific learning initiative tailored on IT people and roles
4. boost internal job rotation and cross-functional side-step

### 5.1.2 e-CF and ICT Professional Profiles usage

Nexi adopted an integrated mapping approach to identify comprehensive profiles, with both soft and hard skills.

**Figure 4 — Nexi approach to competences assessment and integrated profiles definition**
In particular, the project combined:

- An **e-CF based model** with common IT competencies, **enriched with skills needed** in the near future, with additional **business domain IT competencies** (on Cards & Digital Payments, Acquiring & POS, Payments & ATM). The mapping phase was carried out through a web-based survey tool provided by AICA;

- A **Digital DNA custom model** that included **Digital soft skills** (Self-Empowerment & Continuous Learning, Digital Collaboration & Engagement, Cybersecurity & Digital Awareness) and **Job-Related Skills** (Technological Trends, Customer Centricity, Data Driven Decision Making) as well as **Lateral Thinking attitudes**. This phase was implemented through a mix of web-based surveys and diagnostic tools, in partnership with Polytechnic of Milan.

The project involved 6-months of work and more than 350 people, including 70 Managers which indicates the Nexi effort and commitment to Skill-UP.

Within the various steps, the set-up and customization phases required the most dedication and attention. During these phases, future skills requirements were identified through interviews with Senior Managers and workshops engaging IT Managers. This facilitated construction of a custom-made competence model for Nexi personnel and competence requirements, based on the e-CF framework.

### 5.1.3 Facing challenges

Synergies between HR and IT were at the core of the project, supported by the Nexi value system and with clear scope and planning. This is not only a key success factor of the process in the short-term, but it is also a guarantee of future scalability and maintenance. Other important factors for the success of the project include:

- **Strong Top Management sponsorship and middle management involvement are essential**, since it is not an HR process but a Company process
- **Initial training**: all people involved must be aware from the very beginning of the process and the adopted framework to support strong focus on the practical results
- **Select appropriate timing**: choose a timeframe separated from performance evaluations, to avoid misunderstanding. It is a development process!
- **Individual commitment**: ask for valuable, passionate commitment from all participants, since it is an important Company investment.
5.1.4 **Added value in summary**

There are major key benefits in adopting the e-CF and ICT Profiles:

- Choosing the European e-Competence Framework, European standard EN 162341 and ICT professional Profiles provides a common language to define, map and foster competences and capabilities. It ensures acceptance and common understanding across organizations and countries. Since the payment industry in Italy is often compared to international markets, a European standard language can help identify more accurate and reliable benchmarks.

- Working with ICT profiles and using the e-competence requirements for each profile allows the identification of skill gaps. This provides the basis for IT talent management and definition of HR people development programs.

- Time is a critical factor for an evolving industry with continuous technology and regulatory changes. The adoption of a standard framework makes it possible to speed up the skill acquisition process (also in hiring evaluation) and gain faster time to market.

- Working with the e-CF allows timely detection of skills gaps and prompt attention to training and for preparing the workforce for the future.

- Finally, it is important to time the project to align it with the implementation of the IT strategy and of the industrial plan, to ensure the right people, with the right skills, in the right place at the right time.

5.2 **Case Study B: “Educating the European ICT Professionals of the Future” - an e-CF compliant curriculum**

Table 4 — Case Study B in short

<table>
<thead>
<tr>
<th>Case study title and source</th>
<th>e-CF usage</th>
<th>Key perspectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Educating the European ICT Professionals of the Future&quot; - an e-CF compliant curriculum</td>
<td>In order to create a future proof curriculum for the part-time Master of Informatics at the HU the e-CF was incorporated. Competences related to five ICT Professional role profiles are taught across several modules in order to prepare IT professionals for their next challenge</td>
<td>▪ Identification of current and future roles based on the ICT professional Role Profiles ▪ Education based on the related competences ▪ Unique competitive advantage as e-CF competences are increasingly demanded (especially in public sector)</td>
</tr>
</tbody>
</table>

5.2.1 **About HU University of Applied Sciences (HU) and the Master of Informatics (MSc.)**

The Master of Informatics falls under the Institute for ICT at the HU University of Applied Sciences. The institute offers a wide range of educational programs for IT professional at all stages of their professional development. In addition to the Bachelor’s degree in ICT, it offers continuing educational programs on Business IT & Management, Cloud and Security and thus also the Master of Informatics.
The Master of Informatics program is intended for professionals with an executive mentality who will initiate, implement and manage IT-related initiatives and innovations. They combine in-depth IT knowledge with business insight to add value to their organization. The most important characteristics of these professionals are the ability to see the bigger picture of the organization. They able apply knowledge to make the right decisions, understand how actions and decisions influence important business and leadership objectives and they can effectively communicate ideas to other employees, managers, executives and the public.

5.2.2 e-CF and ICT Professional Profiles usage

The European e-Competence Framework (e-CF) serves as a foundation to the education profile. For the master, three e-CF role profiles are utilized to build the curriculum, which are Business Analyst, Business Information Manager and Chief Information Officer. The associated competences provide a solid base for the content (described in terms of learning outcomes) of the masterclasses. To ensure completeness the competences related to the roles are mapped onto the different masterclasses (see Figure 5 and Table 4).

Figure 5 — Overview of the Master of Informatics curriculum

![Overview of the Master of Informatics curriculum](image)

Table 5 — Mapping of the e-competences on the masterclasses

<table>
<thead>
<tr>
<th>Competences</th>
<th>Masterclasses</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 mandatory masterclasses</td>
<td></td>
</tr>
<tr>
<td>Information Management</td>
<td></td>
</tr>
<tr>
<td>Strategy &amp; Organisation</td>
<td></td>
</tr>
<tr>
<td>Enterprise Architecture</td>
<td></td>
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<tr>
<td>Business Process Management</td>
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<tr>
<td>Digital Transformation</td>
<td></td>
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<tr>
<td>Security</td>
<td></td>
</tr>
<tr>
<td>Data &amp; Business</td>
<td></td>
</tr>
<tr>
<td>Personal Development, Coaching &amp; International Orientation</td>
<td>5 EC</td>
</tr>
<tr>
<td>Academic Writing &amp; Research Methods</td>
<td>10 EC</td>
</tr>
<tr>
<td>Master Thesis</td>
<td>15 EC</td>
</tr>
<tr>
<td>e-CF areas</td>
<td>e-Competences</td>
</tr>
<tr>
<td>------------</td>
<td>---------------</td>
</tr>
<tr>
<td>Plan</td>
<td>IS and Business Strategy Alignment</td>
</tr>
<tr>
<td></td>
<td>Service Level Management</td>
</tr>
<tr>
<td></td>
<td>Business Plan Development</td>
</tr>
<tr>
<td></td>
<td>Product / Service Planning</td>
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<tr>
<td></td>
<td>Architecture Design</td>
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<tr>
<td></td>
<td>Application Design</td>
</tr>
<tr>
<td></td>
<td>Technology Trend Monitoring</td>
</tr>
<tr>
<td></td>
<td>Innovating</td>
</tr>
<tr>
<td>Enable</td>
<td>Information Security Strategy Development</td>
</tr>
<tr>
<td></td>
<td>Purchasing</td>
</tr>
<tr>
<td></td>
<td>Information and Knowledge Management</td>
</tr>
<tr>
<td></td>
<td>Needs Identification</td>
</tr>
<tr>
<td>Manage</td>
<td>Forecast Development</td>
</tr>
<tr>
<td></td>
<td>Project and Portfolio Management</td>
</tr>
<tr>
<td></td>
<td>Risk Management</td>
</tr>
<tr>
<td></td>
<td>Relationship Management</td>
</tr>
<tr>
<td></td>
<td>Process Improvement</td>
</tr>
<tr>
<td></td>
<td>Business Change Management</td>
</tr>
<tr>
<td></td>
<td>Information Security Management</td>
</tr>
<tr>
<td></td>
<td>IS Governance</td>
</tr>
</tbody>
</table>
5.2.3 **Facing challenges**

One challenge we faced is the alignment of e-CF with national frameworks. In the Netherlands, the national foundation of HBO-I is responsible for a framework for educational bachelor's and masters for ICT programs at universities of applied sciences. The synergy between their framework and e-CF is difficult to map.

Making the mapping of e-competences on the masterclasses controllable and future proof needs attention. The world of IT is increasingly changing. New roles are coming up regularly and existing ones alter rapidly. Hence, adaptivity is key for a curriculum. The body of knowledge of the masterclasses logically changes in line with this, which makes it difficult to keep up with the pace in regard to keeping the mapping to e-CF up to date.

5.2.4 **Added value in summary**

The following are key benefits for us in adopting the e-CF and its ICT Profiles:

- It provides an international standard and hence a benchmark for the program against international masters.
- It is recognizable for employers and their employees who seek educational programs. Moreover, when e-CF is used within their organization, they are able to assess knowledge gaps and can plan their educational needs accordingly.

It provides a sound justification for the curriculum. Developed by experts in the field it provides a clear connection between professions and competences which narrows the gap between university educational programs and workplace professional roles.

5.3 **Case Study C – Teaching students human resource practices in the ICT profession as a component of an Informatics services management course – example of a hiring process**

**Table 6 — Case Study C in short**

<table>
<thead>
<tr>
<th>Case study title and source</th>
<th>e-CF usage</th>
<th>Key perspectives</th>
</tr>
</thead>
</table>
| “Teaching students human resource practices in an ICT profession as a component of an Informatics services management course – example of a hiring process” University of Zagreb, Faculty of Organization and Informatics | An important topic within IT service management is human resource management, related to the ICT profession. To introduce students to this process of job advertising and job application, we used ICT profiles and related e-CF competences. | • Identification of job profiles/roles in an ICT company based on the EU ICT Professional Role Profiles  
  • Preparation of job ad for a certain profile based on the related e-competences  
  • Preparation of an application for a job advertisement (ICT profile)  
  • Evaluation of candidates according to their application |
5.3.1 About FOI

The Faculty of Organization and Informatics, established in 1962, is one of the constituent units of the University of Zagreb, the largest university in Croatia. Over decades, the faculty has provided education to future experts in the field of information sciences and technologies, economics, organization, communication and other related fields.\(^1\)

The study structure has been devised as a three-level model (3 + 2 + 3), comprising of: a 3-year undergraduate study, a 2-year graduate study and a 3-year doctoral study. Two study programme orientations are delivered at the undergraduate level at FOI: Information Systems and Business Systems.

5.3.2 e-CF and ICT Professional Profiles Usage

The course, ‘Informatics Services Management’ is obligatory at the third year of undergraduate study for both students in Information Systems and Business System. The main goal is to introduce students to all aspects of informatics services management, where topics such as market analysis, wireframing and prototyping, financial management, time management, human resource management and communications with potential clients and teamwork are also included.

The course is performed over 17 weeks, including 14 laboratory exercises and 14 lectures. Lectures are aimed at introducing students to the theoretical aspects of certain phases of IT service development, as well as various best practices, development methods, and connected concepts. During laboratory exercises students form groups of four, where each group represents a different small IT company (‘virtual company’). Each group is tasked to develop a new IT service in the form of a web or mobile application. The main objective is to put students in a very similar situation to the that experienced in the real professional world.\(^2\)

A week of the course is dedicated to the topic of human resources management in IT companies, as illustrated below (Figure 6):

- **Step 1:** First, during lectures students are introduced to different frameworks in the field, such as e-CF and SFIA.
- **Step 2:** During the laboratory exercises each student team is tasked to create a job advertisement for one of the ICT Professional Profiles, referencing to the competencies from e-CF. The creation of advertisement is based on students’ research of job advertisements published on different job portals. The idea behind this task is to familiarise students with the structure of advertisements and the application of the e-CF for competences required for particular jobs.
- **Step 3:** Prepared job descriptions are published in a group forum within Moodle platform for the course Informatics Services Management, so that all members of one group (24 students – 6 teams with 4 members) are able to view it.
- **Step 4:** Each student individually chooses one of the published job ads and prepares a job application. During the exercise students are introduced to the structure and content of an application, since only a few will have any previous experience of job applications. In their preparations students are asked to assess their own e-competencies gained during previous education or work experiences.

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\(^1\) [https://www.foi.unizg.hr/en/about-us/general](https://www.foi.unizg.hr/en/about-us/general)  
Step 5: Finally, student teams are required to evaluate all applications and choose the most suitable candidate for the position posted. Students are required to define evaluation criteria based on the structure of their job advertisement and compare candidates, by focusing on their competences.

Figure 6 — Steps in introducing students with e-CF and ICT profiles

Step 1
• Students are introduced to eCF during lectures

Step 2
• Students (in teams of 4) prepare job ad for one the ICT Profiles

Step 3
• Students publish their job ads at course Moodle platform

Step 4
• Each student individually prepares an application letter for a certain job advertisement

Step 5
• Students in teams evaluate applications for their job and select the most suitable candidate for a the position

Below, Table 7 shows a modified example of job ad prepared by students’ teams for the purpose of this course.
<table>
<thead>
<tr>
<th><strong>Table 7</strong> – A modified example of job announcement prepared by students based on e-CF</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Job title</strong></td>
</tr>
<tr>
<td><strong>Company name</strong></td>
</tr>
<tr>
<td><strong>Type of employment</strong></td>
</tr>
<tr>
<td><strong>Mode</strong></td>
</tr>
<tr>
<td><strong>Job description</strong></td>
</tr>
</tbody>
</table>
| **Main tasks** | • Developing and integrating components  
• Defining and solving problems  
• Application design and development  
• Keeping records  
• Component and system testing |
| **Conditions for applying for the competition** | BA Degree in Computer Science or related field or equivalent experience  
Knowledge of the following languages : C#, C++, Java, HTML  
Experience in working with SQL databases |
| **According to ECF 3.0** | A.6. Application Design  
B.1. Application Development  
B.2. Component Integration  
B.3. Testing  
B.4. Solution Deployment  
B.5. Documentation Production  
C.4 Problem Management  
E.5 Process Improvement |
| **What we offer** | Learning ability, flexible working hours, a motivating and comfortable work environment, an experienced mentor, team buildings & fun activities |
| **Application method and deadline** | An application letter written in Croatian language should be sent to companyXY@gmail.com.  
The application deadline is 1.4.2020.  
Feel free to contact us for any additional information. |
5.3.3 Facing challenges

As this example presents training for students, there were no major challenges, but some minor can be summarized as follows:

- One shortcoming is a limited number of lecture/exercises available to spend on this topic, compared to the comprehensiveness of e-CF.
- Third year students with no practical experience had difficulties to completely understand ICT Profiles and related competences as defined in e-CF.
- In Croatia, there is still no evident usage of standardized description of particular ICT jobs/profiles (i.e. based on e-CF).

5.3.4 Added value in summary

Here are the key benefits in adopting the e-CF and ICT Profiles:

- As students are introduced to ICT profiles, it gives them an insight into the IT labour market and their potential position in the future
- It helps students to think about their future career as an ICT professional as they can see the main tasks, knowledge and skills required for each ICT profile
- The e-CF enables students to self-assess their own competency level and create a personal career plan.

5.4 Case Study D – ”Implementation of Software Engineering Competence Remote Evaluation for Master Program Graduates” - e-CF based Learning Outcome usage for Improving the Quality and Relevance of Higher Education

Table 8 — Case Study C in short

<table>
<thead>
<tr>
<th>Case study title and source</th>
<th>e-CF usage</th>
<th>Key perspectives</th>
</tr>
</thead>
</table>
| **” Implementation of Software Engineering Competence Remote Evaluation for Master Program Graduates”** - e-CF based learning outcome usage for improving the quality and relevance of Higher Education Transport and Telecommunication Institute (TTI), Riga, Latvia | Boosting innovation and digital skills in European universities in order to deliver high-quality education and digital skills. SE Master Program’s learning outcome structuring on the basis of e-CF competences. | e-CF competence on-line evaluation for HE establishments as Open Educational Resource

• increased opportunities for professional development for ICT Master students,
• greater understanding of interconnections between formal, non-formal education
• student oriented Software Engineering Master Program design
5.4.1 About TTI and the Latvian ICT market

The transport and telecommunication institute (lat. Transporta un sakaru institūts – TSI) – is a modern university with centennial history. Nowadays TSI – is the only private technical higher educational institution in Latvia, providing higher education in Latvian and English languages. The institute offers the following academic programs: transport and logistics, computer sciences, electronics and telecommunication, economics and management and aviation transport. TSI provides higher education of the first and second levels, bachelor’s and master’s degrees, prepare and defend a doctoral dissertation. TSI also conducts diversified research scientific work.

Foreign trade in Latvia has consistently increased since the regaining of independence, particularly after Latvia's accession to the EU. According to the data provided by the Central Statistical Bureau of Latvia, in 2018 the value of total exports increased by 9% and imports increased by 11% compared to the previous year (http://www.liaa.gov.lv/en/trade/foreign-trade-statistics).

According to (http://www.liaa.gov.lv/en/trade/industry-profiles/information-and-telecommunications-technology-industry) in 2018, there were approx. 6,894 companies active in the ICT sector. Only 111 producing ICT equipment, 539 operating in the telecommunications industry, while more than 5,000 companies specialized in other ICT services and 544 in ICT equipment sales. In 2018, the number of employees in the ICT sector was more than 36,000.

5.4.2 e-CF and ICT Professional Profiles usage

e-CF and ICT Professional Profiles descriptions were used for the definition of measurable competence characteristics as well as for Rubrics Templates development for personal competence self-assessment. A syllabus template for a master program in Software Engineering and an on-line training course were developed. Testing material for the Software Engineering masters graduate program was established and learning outcome evaluation was provided.

5.4.3 Facing challenges

This case study provides analysis of existing models for competence evaluation and describes the implementation of a software engineering competence, remote evaluation process model. Competence was separated into two domains, professional and academic. The model was applied to e-CF professional competence and academic competence evaluation for software engineering master’s program graduates.

The remote evaluation process is based on the developed methodology, it deploys four steps following the e-CF four-dimensional structure.

The remote evaluation process consists of two business processes: (a) Competence test design, and (b) Competence test completion. A BPMN (Business Process Model and Notation) model was developed as a summary of both processes. The models are illustrated below, Figure 7.
This Case Study is based on the design and implementation of the Software Engineering Competence Evaluation Internet Portal (SECEIP). The web portal was dedicated to the training content and supervision of a joint master program synchronized across several European universities. The functionality of the portal provides a common support service for learning outcomes information exchange. It provides a repository of graduate academic knowledge, skills and competence as well as e-CF professional competences following completion of the Master of Science in Software Engineering (Information Technology) Program.

5.4.4 Added value in summary

The following practical results were accrued from the use of the e-CF:

- The model and description of the Software Engineering and IT Master program learning outcomes, including test material for graduates’ competence evaluation, incorporated e-CF competences at the core of the OER (Open Education Resource).

- Three localized copies of the e-CF oriented Software Engineering Competence Evaluation Internet Portal (SECEIP) were installed at three partner universities (in Riga, Arta, and Murcia) to serve as OER for SE&ST Master Program graduates’ competencies evaluation.

- An additional positive outcome from using the e-CF was a better understanding and recognition of the skills and qualifications by graduates, on the SE & IT master’s program, which increased their motivation and satisfaction in daily work.
## 5.5 Case Study E – ICT profile review process in the context of the German dual Vocational Training System: use of e-CF at four different points

### Table 9 — Case Study E in short

<table>
<thead>
<tr>
<th>Case study title and source</th>
<th>e-CF usage</th>
<th>Key perspectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICT profile review process: use of e-CF at four different points</td>
<td>Use of the e-CF in the process of the regulatory procedure of German vocational training ICT profiles and mapping of all the skills and competences to the e-CF to ensure a common European understanding.</td>
<td>To exchange optimal proficiency level of competences</td>
</tr>
<tr>
<td>Federal Institute for Vocational Education and Training in collaboration with IT social partners, Germany</td>
<td></td>
<td>As an inspiration for definitions and descriptions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>As a checklist</td>
</tr>
<tr>
<td></td>
<td></td>
<td>To translate vocational training ICT profiles into e-CF competences</td>
</tr>
</tbody>
</table>

### 5.5.1 About the Germany Vocational Education System

This case study is based upon the use and value of the e-CF within the German regulated dual vocational training system. It includes the implementation of IT occupation profiles introduced in August 2020.

*text under development*
5.6 Case Study F - Making a role profile of an early adopter of Blockchain using the e-CF standard

Table 12 — Case Study F in short

<table>
<thead>
<tr>
<th>Case study title and source</th>
<th>e-CF usage</th>
<th>Key perspectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Making a role profile of an early adopter of Blockchain using the e-CF standard</td>
<td>Along with other technical innovations, blockchain shares the trait that accepted descriptions of related skills, competences and knowledge are scarce or non-existent. Transfer and sharing of know-how on this decentralized database technology often takes place in masterclasses, short-term education and seminars. Early adopters, developers as well as users, render their experiences and findings, while discussing application in practice. In this environment, the e-CF is used the skills, knowledge and competences sort by Dutch Blockchain early adopters.</td>
<td>• Providing the base for the identification and development of new and evolving technology competence articulation</td>
</tr>
</tbody>
</table>

5.6.1 About the Dutch Blockchain Coalition (DBC)

The Dutch Blockchain Coalition (DBC) is a joint venture between partners from the government, knowledge institutions and industry. DBC’s mission is to advance reliable, robust and socially accepted blockchain applications and create the best possible conditions. A part of the activity is related to the Human Capital Agenda. This agenda has focused on knowledge and skills from the outset. A hurdle in achieving these goals is finding experts in the field of blockchain that can support the various parties and organizations that want to investigate and implement innovative blockchain applications. In order to better advise part on which knowledge, competences and skills blockchain specialists should acquire, the idea arose to look at early adopters and investigate their competences profiles. In this way the e-CF framework could be deployed as a research tool alongside an assessment instrument developed by EXIN. e-CF® NEXT.

The European e-Competence Framework provides a common language to describe the competences including skills and knowledge requirements of ICT professionals, professions and organisations at five proficiency levels, and is designed to meet the needs of individuals, businesses and other organisations in public and private sectors.3

5.6.2 e-CF and ICT Professional Profiles usage: result of the study

To find early adopters, the DBC4 approached its network and in two batches in 2018 and 2019, early adopters were identified and associated e-CF assessed profiles collected. Using the same process, profiles were established in a consistent manner. To gain additional insight, open interviews with blockchain knowledgeable personnel were also held.

3 https://www.ecompetences.eu/
Using the EXIN Portal, the Blockchain Early Adopters (11) answered online questions that provided insight into their e-CF competence profile. Because of the many options and combinations possible, questions are selected based on previous answers. In this way, an e-CF competence profile is developed specifically for each individual. No profile or individual is the same.

To our surprise the profiles of the early adopters of Blockchain revealed five common competences at senior level 3 and above. The common competences were:

**A.7 Technology and Trend Monitoring**
- Investigates latest ICT technological developments to establish understanding of evolving technologies.
- Encourages and explores internal and external sources (including e.g. research activities, patents, start-up activities, digital communities) for innovative ideas and opportunities.
- Devises innovative solutions for the adoption or integration of existing or new technology and/or ideas into existing products, applications or services or for the creation of new ones.

**B.5 Documentation Production**
- Produces documents by integrating information and maintaining compliance with relevant requirements.
- Selects the appropriate style and format by determining the media type and presentation mode of the documentation.
- Creates templates for document-management systems. Ensures that documentation complies with customers', technical and ICT application development process needs and that existing documents are valid and up to date.
- Provides support for the development of interactive documents.

**D.10 Information and Knowledge Management**
- Identifies information and knowledge relevant to the organisation and develops processes and structures to manage it.
- Creates information structure to enable the exploitation, optimisation and sharing of information.
- Understands appropriate tools to be deployed to create, extract, maintain, renew and propagate business knowledge in order to capitalize from the information asset.

**E.4 Relationship Management**
- Develops positive business relationships in a diverse stakeholder environment facilitating multi-disciplinary team collaboration.
- Maintains regular communication with colleagues, customers, partners and suppliers, displaying empathy with their different contexts and perspectives.
- Ensures that different stakeholder needs, concerns or complaints are understood and addressed in accordance with organisational policy.

**E.7 Business Change Management**
- Assesses the implications of digital transformation, potential digital disruption and change.
- Defines the requirements and quantifies the business benefits.
- Manages change taking into account structural and cultural issues.
- Maintains business and process continuity throughout change, monitoring the impact, taking any required remedial action and refining approach.

The descriptors of these five common competences provided an early idea of possible elements required within a blockchain roll or specialised blockchain professional. Additionally, it offered an insight into the knowledge and skills available to our group.
This was a significant result, but to establish a role profile to address blockchain recruitment was not enough. Within the e-CF standard documentation other links could be used to expand the idea. The results could be connected with role profiles, lists of deliverables, other frameworks and examples of how to build specific profiles based upon the e-CF. In this case study several have been applied.

**RECRUITMENT AND COMPETENCES**

In support of the e-CF standard CEN Workshop Agreement (CWA) 16458:2018 is devoted to the description of 30 generic professional ICT role profiles\(^5\). They are considered to be representative for the variety of roles of ICT professionals in organizations. In each of the 30 roles, a maximum of five and a minimum of three e-CF competences are identified. The profiles should not be seen as a rigid standard and these role profiles are less specific than actual job descriptions. However, from these role descriptions it is possible to establish a relationship with descriptions of positions or roles in the ISCO -, ESCO - classifications or O*net that are more known within the labour market. A table provides a link between the competences and described roles. In total 19 profiles have 1 of the 5 competences in common only 3 have 2 in common.

The roles are:

- **Business Information Manager**: The person Proposes, plans and manages functional development of the Information System (IS) focusing upon the needs of users.
- **Digital consultant**: Supports understanding of how digital technologies add value to a business
- **Data scientist**: Leads the process of applying data analytics. Delivers insights from data by optimizing the analytics process and presenting visual data representations.

**Figure 8 — European ICT Professional Profiles version 2 Family Tree and the 3 Profiles selected**

![European ICT Professional Profiles version 2 Family Tree and the 3 Profiles selected](image)

Individuals with the characteristics belonging to these 3 roles have a “small” gap in their profile compared with the group in the study. In order to fulfill a blockchain role requirement, this indicates a relatively small upskilling need.

\(^5\) [https://www.cen.eu/work/areas/ict/education/pages/ws-ict-skills.aspx](https://www.cen.eu/work/areas/ict/education/pages/ws-ict-skills.aspx)
Making the connection to these 3 roles the link with the labour market can be made. Related skills shortages in the market become identified and potential development paths for candidates become visible.

**INNOVATION AND COMPETENCES**

Innovative technology often arises within an organization from a combination of new insights, new questions, new problems or challenges. Yet, the normal reaction is to resist change and challenge the investment cost versus potential benefits. In this Blockchain technology study the competences identified in early adopters give an insight into the cost benefit ratio for the adoption of a new technology.

The five competences found in early adopters indicated that they had experience with and have delivered on one or more of the following:

- definitions of a business processes
- a change management plan
- a data management plan
- a data model
- a knowledge or information base
- a proposal for a new solution including a critical business process integration.

5.6.3 **Facing Challenges**

This first, small study shows new roles and skills are based upon previous experience and capabilities. Individuals do not suddenly appear out of the blue as blockchain specialists, they develop through the continuous habit of self-development and regular knowledge updates. This aspect lies implicit in the concept of competence but is often overlooked. It implies that successful early adopters or implementors are not by default bright youngsters but can also be seniors with a considerable experience and a desire to continuously develop their competences.

5.6.4 **Added Value in Summary**

The e-CF has helped to show that early adopters of blockchain technology have 5 specific competences, which are in the field of:

- data: collection, use, processing and analysis.
- change of business processes
- interest in new developments

The e-CF has helped reinforce that early adopters are persons who stay tuned with new technological opportunities through the application of continuous training and upskilling

5.7 **Case Study G**

*University of Minho, Portugal – under development*
5.8 Case Study H – e-CF for developing data competences and capabilities in the IT organisation

*Cap Gemini, The Netherlands – under development*

5.9 Case Study I - “National approach to systematic multi-stakeholder engagement for ICT education” - using e-CF as a common language

<table>
<thead>
<tr>
<th>Case study title and source</th>
<th>e-CF usage</th>
<th>Key perspectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;Developing an e-CF based systematic engagement between universities, VET and employers in a national qualification authority context.&quot; This case study is based upon the development of the Estonian National skills strategy by the Estonian Association of Information and Technology in co-operation with the National Qualifications Authority.</td>
<td>Estonia decided upon an ICT competence approach to create national economic competitive advantage. This required cooperation and common understanding between industry, education providers and national qualifications authority. The e-CF provided a common structure and platform for co-operation.</td>
<td>▪ e-CF and ICT profiles were deployed&lt;br&gt;▪ Competence was at the heart of the skills approach&lt;br&gt;▪ Curriculum development was supported by the application of learning outcomes</td>
</tr>
</tbody>
</table>

5.9.1 About the Estonian Association of Information Technology and Telecommunication

The Estonian Association of Information Technology and Telecommunications (officially abbreviated as ITL) is a voluntary organisation, whose primary objective is to unite the Estonian information technology and telecommunications companies and organisations, to promote their co-operation in Estonia’s development towards information society, to represent and protect the interests of its member companies and to express their common positions. The main priorities of the association are to address the digital economy, E-state and information society policy and education, labour and Research and Development.

5.9.2 e-CF and ICT Professional Profiles usage

With the objective to enhance Estonian National competitiveness the Association of Information and Telecommunication together with the Estonian Qualification Authority, set out to establish a common national framework for the development of ICT professional education. The aim was to create employer influenced curricula across 3 universities and 18 Vocational Education Institutions, to bridge the gap between formal education and workplace competence requirements. With competence at the centre of their approach the following schematic demonstrates connections between society and learning.
To implement the competence circle, three key elements were addressed;

- Needed competences were applied to occupational standards
- New Curricula was developed to complement the standards
- and Qualifications or certifications were formulated to verify curricula successful completion

These important elements of the competence circle were supported by extracting competences from the e-CF guided by their relevance to each of the European ICT Professional Profiles.

5.9.3 **Facing challenges**

Addressing the competence circle required active engagement and communication across many organisations including government, academia, training providers and employers. Furthermore, the competence approach required clarity of thought and common understanding.

**Figure 10 — The competence based approach**
Knowledge, skills and attitudes needed to be extracted from the workplace environment and converted into curricula and qualifications standards in the educational environment. There were inevitable differences in definitions of activities arising from the workplace or within a learning environment, exemplified in job role versus computer science debates. These linguistic and perspective discussions were support by references to the e-CF and associated profiles.

5.9.4 Added value in summary

The major benefits and demonstrable value add of the e-CF to addressing this multi-stakeholder approach to benefiting the Estonian economy are articulated below.

- Provision of a holistic picture & common language for educators and employers
- A quick and easy development tool
- Support for work procedures for Curriculum Development Advisory Boards
- Understandable communication towards students defining competences each curriculum will provide

5.10 Case Study J – “Using the e-CF to develop a certification framework and spin-off curricula and VET programmes”

Table 14 — Case Study J in short

<table>
<thead>
<tr>
<th>Case study title and source</th>
<th>e-CF usage</th>
<th>Key perspectives</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Using the e-CF to develop a certification framework and spin-off curricula and VET programmes. Promanad, Rotterdam, The Netherlands”</td>
<td>In order to develop internationally recognizable curricula a certification framework was developed based on the e-CF in order to assess knowledge, comprehension and application of concepts that form the foundation for the development of the e-CF competences.</td>
<td>▪ By using the e-CF for defining a certification framework, it has a clear rationale behind it that can be easily explained to all stakeholders. ▪ By using the e-CF to develop exams, these are not only nationally but also internationally recognised ▪ By using the e-CF and the European ICT professionals job profiles to build ICT curricula, programs are not only much more appealing to students, but also to employers and to accreditation committees.</td>
</tr>
</tbody>
</table>

5.10.1 About Promanad and the SPIH project

Promanad is primarily an educational services provider. Its services range from designing curricula and courses, developing and publishing training materials to managing teams of trainers/teachers and providing programmes and training. We provide services to higher education institutes (universities and universities of applied sciences) and Vocational Education and Training (VET) providers (secondary and higher VET; Lifelong Learning programmes). Promanad offers its services not only to
public institutions but also to private institutions. Although covering most educational areas with our services, our fields of expertise are business/management education and ICT education.

Especially in the private sector we have experienced that certification adds value to a training in the eyes of the student. The SPIH project addressed this need.

In this project all private universities of applied sciences in the Netherlands worked together to create a certification framework that could be incorporated in their programmes. Private universities of applied sciences in the Netherlands provide complete part-time associate degree, bachelor and some professional master programmes, but many shorter professional programmes and training aimed at reskilling and upskilling the workforce. In this sense they have the characteristics of a (higher) VET provider.

We developed a framework consisting of 11 certificates based on the e-CF. The foundation consists of three certificates representing basic knowledge for every ICT student and professional. These are positioned at e-CF 2/ EQF 5 level. Therefore, these are suited for incorporating into associate degree (level) programmes and in the first part of bachelor programmes. The eight other (core) exams are positioned at e-CF 3/ EQF 6 level and suited for bachelor level programmes. This resulted in a framework of eleven certificates that validate knowledge, comprehension and (basic) application of concepts that form the foundation for the development of the e-CF competences. Students can select multiple certifications that are relevant for their ICT job profile or can choose a group of exams that cover a certain area of expertise.

The framework was translated into eleven exams by developing exam requirements and specifications. Based on that, exam questions were developed that can be put together flexibly in exams using test blueprints. The two largest independent exam ICT institutes in the Netherlands EXIN and Associatie joined forces to implement these exams. Initially the exams were labelled iEXA, but EXIN rebranded them to AMBI e-CF®. Referring to the old, in the Netherlands very well known, AMBI framework for ICT knowledge and skills and of course to the fact that the exams are e-CF based.

Having the framework and exams in place, curricula could be developed that incorporate these certifications. The easiest implementations were to offer courses that prepare for one exam or for a group of exams, for example the three foundation exams. But also, complete part-time associate degree and bachelor curricula were implemented based on this framework. In these programmes the more theoretical courses related to the certifications are complemented with generic, transversal skills courses and courses consisting of practical assignments and workplace training to develop competences. These programmes have a broad base and subsequently focus on a specific area and job profile.

5.10.2 e-CF and ICT Professional Profiles usage

The e-CF and the ICT Professional Profiles were used as a reference point throughout the entire project.

When developing the certification framework, we used the e-CF as the base to model our framework. We took the e-CF dimension 1 areas and matched them with three architectural layers that are widely recognised as a standard partition in the ICT (educational) field: infrastructure, applications and business processes. At e-CF level 2, comparable with EQF 5 level, the architectural layers were leading as otherwise the topics would become too fragmented. For each e-CF area the competences were grouped into one or two certificates. With one certificate relevant for all or most layers and one more specific focused on one layer.
Figure 11 — The certification framework

The final step was the translation to curricula. The certification framework together with the e-CF and the ICT professional profiles formed the base for complete programmes at associate and bachelor degree level, but also for shorter re- and upskilling programmes. The short programmes consist of one or more courses that were completed with one or more exams, for example the programme ICT fundamentals consisting of the courses business processes foundation, applications foundation and infrastructure foundation that are completed by passing the exams with the same names. Other short programmes consist of courses that educate for a specific ICT professional profile.

In most cases, the complete associate and bachelor programmes consist of a broad base followed by a more focused core part and leading to a specialized last part of the programme. The propaedeutic year consists of courses that prepare for the foundational exams. This makes up a quarter or maximum half of this first year depending on how the courses are organised and what they cover besides the direct preparation for the exams. The remaining part of the first year is divided between courses on transversal skills and practical assignments in which students have to produce deliverables that are relevant to most professional profiles. The second phase of the programmes is focused on a cluster of professional profiles in most cases grouped by the architectural layers. In this phase courses preparing for relevant core exams are part of the programme complemented with courses on generic, transversal aspects and practical/ work-based assignments. The final part of the programmes is focused on a specific professional profile like an information security specialist or data specialist. Specific theory, practical courses, an internship and thesis are all part of this specialisation phase.

Because the certification framework is composed of logical units, each of them representing the same study load when translated to curricula, modular programmes can be built that are highly flexible. These programmes can easily be redesigned and adapted to changing needs. The flexibility of these modular programmes is even higher because we formulated learning outcomes for each course, that simplify credit transfer.
5.10.3 Facing challenges

A complex undertaking like this with many stakeholders and phases always faces challenges. The most important challenge in this project was to align partners.

The first step was to align the partners of the universities of applied sciences on the content of the exams. Although they understood rationally that the e-CF would add value, they instinctively wanted to hold on to what they were familiar with. So, for the three foundational certificates/exams a traditional division of areas was used, but the relationship with e-CF was directly made by connecting these with e-CF competences, using dimension 2 and 3 descriptions for formulating exam requirements and specifications and the dimension 4 knowledge and skills examples to detail those further. Using traditional names for the foundational exams and combining them with the e-CF. This opened the way to make the e-CF leading for the eight core exams.

After this the exam institutes also had to be aligned, because we had selected two exam institutes to work together. EXIN with a lot of specific knowledge of the ICT sector and Associatie with a broader experience in different fields and test methods. They also had to stay aligned with the universities, because else they wouldn’t use the exams. Especially in this part of the process the lack of a broadly accepted general Body of Knowledge became a challenge. Some university partners argued that no books or other sources were necessary, while others argued the opposite. Making exam questions without having one source turned out almost impossible certainly because in the field of ICT where multiple definitions and methods for the same thing exist. A European foundational Body of Knowledge will solve this issue.

Finally, the universities of applied sciences and VET providers had to be aligned. Although they understood the importance and benefits of using a European standard, they were worried that their own specific identities would disappear. To mitigate these concerns, we made clear that although the competences, professional profiles and the certification framework were standard, they still could have
their own signature. Ways of doing this are for example adding courses related to their specific target groups or by formulating practical assignments adapted to the local situation.

5.10.4 Added value in summary

The following are key benefits of adopting the e-CF and its ICT Profiles in this project:

• By using the e-CF for defining a certification framework, it has a clear rationale behind it that can be easily explained to all stakeholders. Exam and educational institutions saw the benefits and adopted this framework to develop exams and curricula.

• By using the e-CF to develop exams, these are not only nationally but also internationally recognised. In combination with the certification framework this provides an added value for students and for educational institutions. These institutions can promote their international focus. We noticed that this helped very much to promote the exams.

• By using the e-CF and the European ICT professionals job profiles to build ICT curricula, programs are not only much more appealing to students, but also to employers and to accreditation committees. It is clear directly to everyone that it is internationally recognized and therefore increases the mobility of employees, but also the possibility for employers to better assess international applicants that had their education based on the e-CF and professional profiles. Accreditation committees value this international approach.

5.11 Case Study K — e-CF supporting cultural change in the IT organisation

Red Electrica de Espana, Spain – under development

5.12 Case Study E – VIVAT: Aligning IT Professional Resources to the Company Strategy

Table 15 — Case Study E in short

<table>
<thead>
<tr>
<th>Case study title and source</th>
<th>e-CF usage</th>
<th>Key perspectives</th>
</tr>
</thead>
</table>
| Aligning IT Professional Resources to the new Company Strategy VIVAT | In 2016, VIVAT refreshed its strategy to prepare for the future by focusing on four strategic themes: Customer Centricity, Digitalisation, Data and Innovation. Addressing ICT Human Resources was a key factor in this change process. The e-CF supported this imperative from tactics to strategy. | • Definition of ICT Job Descriptions  
• Connecting Job Descriptions to Training Requirements  
• e-CF was adopted as reference framework supporting the HR management process at the strategic, tactical and operational levels for the integration with different frameworks (Cobit5, SAFe) |
5.12.1 About VIVAT and its business

VIVAT is a major player in the Dutch insurance market, with strong and reliable insurance labels and an asset manager focusing on sustainable investment.

In 2016, VIVAT refreshed its strategy to address the future and enhance profitability; the goal was to leverage insight into market developments and trends through the application of four company-wide strategic themes:
- Customer centricity
- Digitalisation
- Data
- Innovation

5.12.2 e-CF and ICT Professional Profiles usage

VIVAT commenced adoption of the e-CF in 2016. The first step was to use the e-CF to define a set of job roles integrating e-CF ICT competences alongside soft skills and business skills.

The resultant job descriptions included two primary components:
- Basic requirements common to all IT Professionals
- Additional requirements for specified jobs

Subsequently, a job classification (rating) by Hay Group for all job descriptions was applied. It is interesting to note that VIVAT job descriptions drew from the full range of e-CF competences confirming the broad and comprehensive applicability of the e-CF in a practical environment.

The second step involved conducting a skills gap analysis to enable the development of a roadmap linking job descriptions to training plans.

In developing their new strategy VIVAT chose to adopt best practice and recognised that established frameworks offered a fast start for creating a new Way of Working in which different competencies were requested from IT professionals. Furthermore, VIVAT appreciated the benefit of combining different frameworks to meet different process requirements. By adopting and integrating the following frameworks, into their corporate practices, VIVAT successfully realized their organisational strategy:

- **Cobit5**: addresses IT Governance:
  - For Human Resource VIVAT focused on 2 Processes:
    - EDM04 Ensure Resource Optimisation in the Evaluate, Direct and Monitor area
    - APO07 Manage Human Resources in the Align, Plan and Organise area

- **SAFe**: addresses the way of working of the organization

- **e-CF**: defines the competencies needed in an IT organisation
Specifically, the e-CF was adopted as a common language at different levels:

**Strategic level**
- Guidelines for allocation of resources based on capabilities
- ICT sourcing strategy analysis based on costs, risks
- Definition, communication and monitoring of sourcing strategy

**Tactical level**
- Skill development plan(s)
- Sourcing plan & supplier selection (current & new sourcing solutions)

**Operational level**
- Portfolio demand analysis
- Human resource planning
- Skills gap analysis and training plans
- Sourcing activities: recruitment, talent planning,

### 5.12.3 Facing challenges

It is necessary to develop a good understanding of the e-CF, especially the underpinning methodology, to fully exploit the potential provided by the framework. The VIVAT team is relatively small and it was straightforward to share and apply the e-CF across the company environment. However, it was more
difficult to communicate and share e-CF principles with suppliers and training providers that generally lack experience of the e-CF, especially in the practical application of the framework.

To overcome this problem, VIVAT provided the necessary interpretation to suppliers and training companies.

5.12.4 Added value in summary

The e-CF was a valuable tool at several levels, from supporting the definition of the company strategy to identifying and developing the digital strategy. It was used to define the required competences and to articulate the skills to be developed and the talent required.

Furthermore, the e-CF provided a common language for describing competence, skill, knowledge and job descriptions.
Annex B
(informative)
Bibliography

[1] EN XXXX, *Title of reference*

*under development*