

## Expert Workshop Report

# High-Tech Skills Demand and Supply and Forecasting Scenarios until 2025+

### *Innovative Approaches for Demand and Supply Measurement and Forecasting Scenario Development*

Date: **4<sup>th</sup> October 2018, 9.30 – 12.30 hrs.**

Location: EU Liaison Office of the German Research Organisations (KoWi), Rue du Trône 98, 1050 Bruxelles, Belgium (8th floor)

Attendants: Carles Perez, everis  
Aikaterini Sylla, ESCO  
Martin Ulbrich, DG CNECT  
Jiri Branka, CEDEFOP  
Michael Horgan, DG EMPL  
Georgiana Ivan, Eurostat (F1 Social indicators)  
André Richier, DG GROW  
Niels van der Linden, CapGemini  
Co Siebes, CapGemini  
Marianne Kolding, IDC  
Tobias Hüsing, empirica  
Werner Korte, empirica

## Objectives of the workshop

For several years now, the European Commission has invested in a number of regular activities aimed at the measurement of digital and high-tech skills demand and supply and at forecasting labour market developments into the future. These measurements have shown that demand for high-tech skills in industry keeps growing very dynamically, with demand for high skills evolving both in quantitative terms and terms of the variety and sophistication of skills. As a result, there have almost permanently been skills gaps and shortages as the supply apparently could not keep up and match with these developments. Consequentially, several actions have been taken at EU and national level which have contributed to reducing the anticipated gaps and shortages by improving high tech skills supply. While there have been increases in the numbers of ICT/Computer Science graduates from higher education institutions and VET recently, these do not even come close to matching the labour market growth. Especially in the IT labour market the supply of high tech skills has been upheld mostly from so—called lateral entries, i.e. workers without a formal subject matter degree but with other entry paths into the IT workforce such as certification and further education.

At the same time, the availability of labour market information has massively increased with information from online vacancy scraping services, such as the ICT labour market database used by DG Connect, or, potentially, from professional networks such as LinkedIn and their Economic Graph

project, delivering valuable information about the kinds of skills sought after in a real-time fashion and with unprecedented granularity.

The present situation indicates the need for further increasing the effort in the development of rock solid and relevant education and training with higher education and VET curricula and programmes, both in initial VET or degree education as well as in life-long-learning professional education. Ideally, such programmes benefit and are informed by the labour market intelligence available and from recent experiences in industry which increasingly gets involved in designing and delivering education.

All these activities need to be accompanied by regular evidence based demand and supply measurements and sophisticated scenario-based forecasting models to put policy development on solid grounds.

This expert workshop aims to get together leading experts in the field to share information about data sources and demonstrate approaches and methodologies used for measurement and forecasting.

The workshop is by invitation only and aims to bring together experts who have worked in this area and come up with substantial knowledge and expertise for constructive discussion. A further objective will be to take a further step towards mutual agreement on a coordinated further procedure for reliable, effective and efficient future high-tech skills demand and supply measurements and forecasts at European and national level. Each presentation will last around 15 minutes followed by a 15 minute discussion. This will be followed by a final discussion and a wrap-up and conclusions including possible further next steps towards a coordinated action.

## Programme

<b>9.30 hrs</b>	Welcome & introductions	<b>André Richier</b> , European Commission, DG GROW
<b>9.45 hrs</b>	Demand and supply forecasts for IT professionals and e-leaders	<b>Tobias Hüsing</b> , empirica <b>Marianne Kolding</b> , IDC
<b>10.15 hrs</b>	Real-time ICT tech skills demand measurement – Methodology & results from an online vacancy analysis	<b>Carles Perez</b> , everis <b>Martin Ulbrich</b> , European Commission, DG CNECT
<b>10.45 hrs</b>	Coffee break	
<b>11.00 hrs</b>	Brief presentation about Eurostat and Cedefop activities in this area	<b>Georgiana Ivan</b> , Eurostat <b>Jiri Branka</b> , Cedefop
<b>11.20 hrs</b>	Discussion	<b>All</b>
<b>12.00 hrs</b>	Wrap-up & conclusions	<b>André Richier</b> , European Commission, DG GROW
<b>12.30 hrs</b>	Closure	

## Presentations

An overview of the different approaches developed and taken by the invited experts is provided in the following figure.

Measurements	empirica / IDC	DG CNECT / everis	CEDEFOP	EUROSTAT	LinkedIn
	e-Skills and e-Leadership skills demand and supply and forecasting	Online vacancy analysis of ICT tech skills	Skills Panorama: skills needs in occupations	ICT specialists and digital literacy statistics	Economic Graph
<b>Skills type</b>	ICT practitioners, e-Leaders	ICT specialists	Occupations and qualifications as skills proxies at 3 qualification levels	ICT specialists, digital literacy; occupation statistics	?
<b>Workforce</b>	+		+	+	
<b>Demand</b>	+		+	+	
<b>Supply</b>	+		+	+	
<b>Vacancies</b>	+	+	+		
<b>Forecasts</b>	+		+		
<b>Index</b>	+		+		
<b>Sources</b>	Vacancy data (textkernel), IDC demand figures, Eurostat occupation statistics	Vacancy data (textkernel)	Eurostat occupation statistics	own statistical data	
<b>Presentation</b>	Reports, presentations	interactive website	Reports, presentations, website	interactive website, reports	

Each of these were presented and discussed at the workshop with the objective to take a further step towards mutual agreement on a coordinated further procedure for reliable, effective and efficient future high-tech skills demand and supply measurements and forecasts at European and national level.

### ***Demand, supply and vacancy analysis & forecasting***

The demand for high tech skills is on a solid growth track. It is anticipated that the number of IT practitioners will grow from 8 million in 2015 to almost 8.7 million in 2020 in the EU. The latest estimate<sup>1</sup> of the gap between demand and supply is 500,000 in 2020, down from an estimate of 756,000 released in December 2015. The reduction of the gap comes at least in part from an increased number of IT educated professionals specifically coming out of Vocational Training (VET). Under the scenario, 240,000 graduates from IT related HE programmes and VET schemes keep entering the labour market per year, plus more than 100,000 new people without such a formal degree (lateral entries). Jobs newly created account for a third to 40% of the number of new entrants.

According to the ICT vacancy analysis activities of DG CNECT (Vacancies for ICT- Online Repository (VICTORY)) using textkernel online vacancy data from 7 EU Member States **the identified growing number of vacancies is due to the growth of the ICT labour market. There are no structural reasons for this development.**

<sup>1</sup> Source: empirica, January 2017

The analysis of trends related to IT job statistics over the past few years hint at a growing polarization of skills: the highest skills category (management, architecture and analysis jobs) and the lowest (mechanics and servicers) have increased their shares of employment over the last five years (8.3% and 7.4% annually, respectively). Mid-level skills, especially at the associate and technician level, have seen rather little (yet still some) gains and might get under pressure as productivity gains from automation and commoditization of IT services continue. Continuous, life-long education and training therefore gain more relevance than ever as the industry strives for maturing the IT profession and keeping pace with disruptive change.

Cross-disciplinary leadership skills that exploit new digital and key enabling technologies<sup>2</sup> for enterprises to excel in their business are crucial factors for an increasing high-tech economy. Experts estimate that 600,000 leaders who combine a T-shaped digital, business and strategic expertise portfolio were in post in 2015. In addition, regarding the group of the key enabling technologies, the estimate of the total number of high tech leaders is at 200,000 in 2015.

According to expert scenarios Europe will require to generate around 50,000 additional high-tech leaders per year in the years up to 2025, or a total of around 450,000 until 2025.

These figures do not yet take into account of the needs of medium to low skilled workers. We can be sure that the overall numbers for the entire work force will be many times higher since already today European enterprises face significant shortages of highly-skilled workers.

The supply of IT professionals is insufficient and the estimated vacancy potential would be around 526,000 in 2020. In a high growth scenario this figure would even increase to 749,000. The thin red lines in the two graphics - which are based on available statistical data - indicate the actual past development in the ICT workforce development from 2016-2017. The results indicate that the second scenario maps the present and likely future development much better. The likelihood is high that the skills shortage will increase dramatically over the coming years.

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<sup>2</sup> In February 2018, the High-Level Strategy Group on Industrial Technologies recommended a new definition for KETs: confirming the existing six KETs while merging four of them into two broader categories ("materials and nanotechnology", and "photonics and micro- and nano-electronics"); broadening the KET "biotechnology" to "life sciences technologies"; and adding two new main fields, namely: "artificial intelligence"; and "digital security and connectivity". Re-Finding Industry: report from the High-Level Strategy Group on Industrial Technologies, 23 February 2018. See: [https://ec.europa.eu/research/industrial\\_technologies/pdf/re\\_finding\\_industry\\_022018.pdf](https://ec.europa.eu/research/industrial_technologies/pdf/re_finding_industry_022018.pdf)

**Forecast Supply and Demand of e-Skills in Europe (2016-2020): Moderate Growth Scenario**



Source: empirica, 2018

**Forecast Supply and Demand of e-Skills in Europe (2016-2020): High Growth Scenario**



Source: empirica, 2018

Comparing the actual development of the ICT work force to the estimated forecasts until 2017 (indicated by the thinner red lines) reveals that so far the high growth scenario seems to be the more applicable one, i.e. the figures on shortages are likely to be at the upper end in 2020 and beyond.

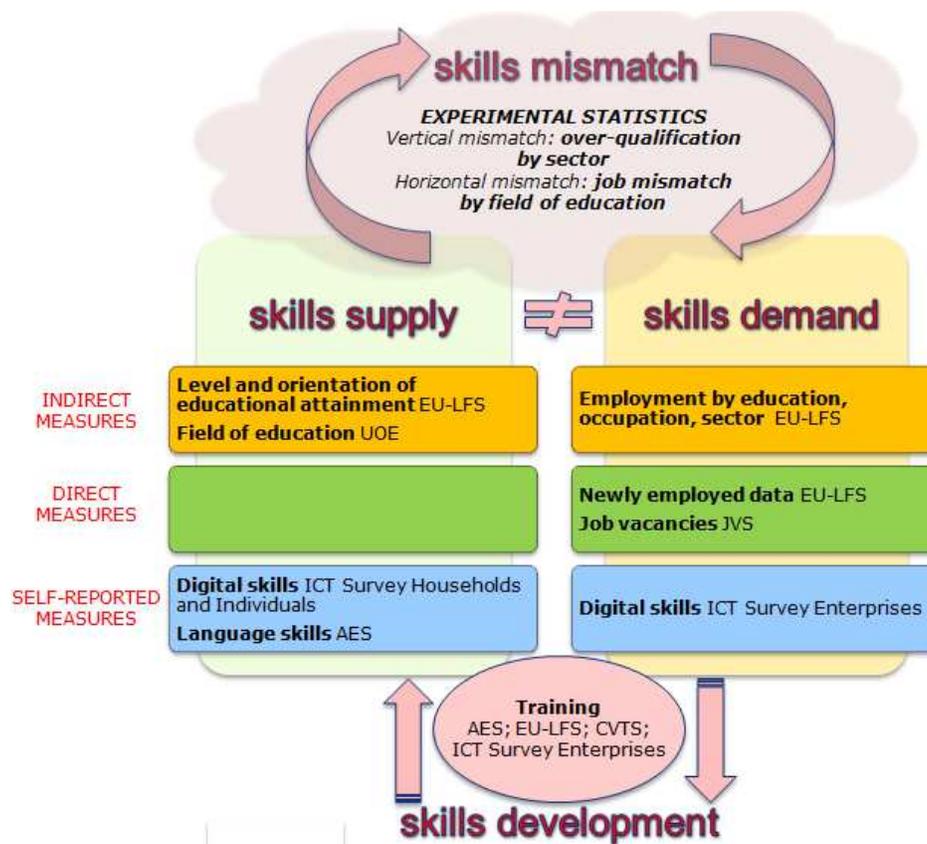
High tech skilled workers are in high demand globally and the demand is not likely to be met by the current supply from formal education and training institutions. However, the work force should be

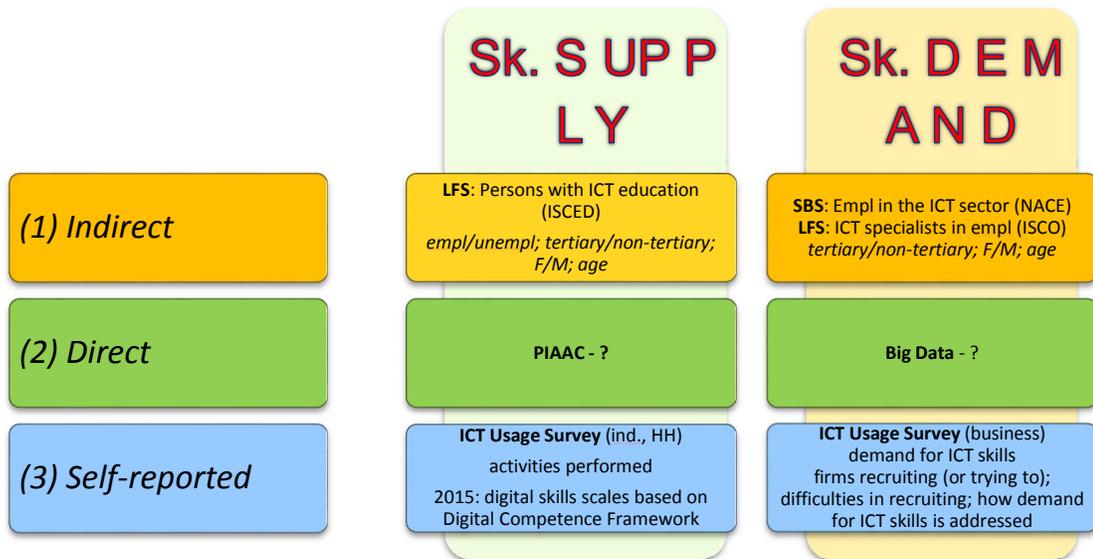
provided with relevant education and training opportunities. If Europe does not manage to foster the supply of these high-tech workers it runs the danger of severely missing out on innovation opportunities and leaving them to be taken up by its competitors.

There is a job to do to increase Europe's talent pool and reduce skills gaps, mismatches and shortages. This requires the right mindset among politicians and stakeholders and the recognition that lifelong learning and retraining is crucial and that national education systems are enabled to respond and act properly.

**Eurostat statistics on skills and activities**

Eurostat’s analysis of the state of play in statistics on skills has revealed indirect and self-reported measures. An overview is provided in the following figures.





Eurostat mid-term actions include the **examination of possibilities for improving current data collection**. This refers in particular to data from the EU-LFS within the new framework regulation on Integrated European Social Statistics (IESS). An **LFS module on Skills** is proposed to take place every 6 years in this context. Difficulties in choosing the right variables as space is quite limited. Further activities are addressed to **Big Data with the further exploration of possibilities of partnership in Eurostat, with other Commission's DGs and agencies**. Pilot projects are being undertaken. Finally, a methodological discussion with the Member States on skills has been proposed but not yet implemented.

### Cedefop

Cedefop skills forecasts offer quantitative projections of the future trends in employment by sector of economic activity and occupational group. Future trends on the level of education of the future force are also estimated. Cedefop's forecasts use harmonised international data and a common methodological approach with the aim to offer cross-country comparisons about employment trends in sectors, occupations and qualifications.

The Cedefop skills forecast offers a unique database of comparable data developed following a single harmonised methodology, currently providing 2016-2030 horizon. It uses occupations and qualifications as a proxy for skills and competences, differentiates skills demand at three different qualification levels (low, mid, high) and covers the whole of Europe.

In the 2016-2030 forecast, Cedefop estimates 6% growth of the total employment. The fastest growing sectors will be Hotels and catering, Health and social care and Financial services. Technological change and automation will impact on the future EU economy; for example the Electrical equipment manufacturing is expected to reach 24% value added growth, but at the same time to lose 15% of its employment. A set of indicators based on the forecast, focusing on so-called "high-tech jobs" and "high-tech economy" has been very recently published on the Skills Panorama website.

As for occupations, the highest employment growth is expected for those requiring high level skills in science and technology, including ICT professionals. Other high skilled workers, such as business administration professionals but also unskilled workers will also experience high employment growth. The polarization of the labour market and hollowing out the medium level skilled jobs is therefore expected to continue.

The results have become available online. The main report will be published in the end of 2018, the country fiches in early 2019. The next forecast update is planned for 2020 with a possibility to reach more detailed occupational forecast at 3-digit ISCO level.

## Major discussion topics and results

A major concern shown in the results of the ICT graduates development over the past more than 15 years is the **long-term trend of the numbers of ICT graduates not increasing but basically stagnating**. According to workshop participants a multitude of reasons can be made responsible for this development including lack of professors in some universities resulting in lack of relevant programmes and courses and as a consequence a small (insufficient) number of student places for enrolment, lack of interest in computer science and STEM subjects among school leavers and the youth in general. The latter applies specifically also for women with a very low share of just 16% of computer science students being female. Interestingly enough their share is significantly higher among those studying for instance media informatics or medical informatics. The latest figure on these from Germany indicate that with a share of around and above 40% these programmes seem to be significantly more attractive to women than pure computer science courses.

In addition to ICT-related skills **the need for non ICT knowledge and skills specifically sector / business knowledge, soft skills, communication and team building skills** were emphasised as critically important to properly perform as an IT professional.

**Industry has obviously managed to compensate the lack of suitable graduates through training and employing what is commonly called 'lateral entries'**. Given the fact that most lateral entries gain their knowledge and expertise from more or less intensive and mostly rather short-term training courses this development **could become a problem in terms of IT professionalism**.

Very little is known about the qualification background of lateral entries. **Career path tracking of IT workers is seen as an urgent need** to obtain more information on this issue, better understand developments and take best possible action at all levels and by all actors concerned ranging from policy to education and training.

**The European Commission DG EMPL** has launched a **graduate tracking initiative under the Skills Agenda** and set up an expert group on graduate tracking. This expert group will be meeting 6 times over the course of the next 2 years to discuss how graduate tracking practices in different countries should be improved through exchange of experience among experts. The membership of the group has been established - 51 country delegates, 9 representatives of stakeholder organisations and social partners (selected through an open call), Eurostat, Cedefop and ETF. The first constitutive meeting of the group took place in Brussels on 8 October 2018. The main output of the group will be the Council Recommendation implementation report, due in May 2020.

**The pilot European graduate survey launched in January 2018** is running according to the project schedule. The survey will be conducted among more than 80,000 graduates throughout autumn in 8 pilot countries: Austria, Croatia, Czech Republic, Germany, Greece, Malta, Lithuania and Norway. The targets are graduates of Bachelor, Master and tertiary short cycle studies who graduated one and five years ago. The data will allow more insights about their labour market integration, their perceived skills, career paths, social integration and citizenship; and how other contextual factors (primarily socio-demographic and economic) affected their path.

**'Overqualification' of IT professionals** was raised as another issue. This relates to the fact that a substantial number of today's IT professionals are lateral entries (see above) many of whom with an academic degree in a non-IT domain. However, a significant number of these are employed in occupations which do not necessarily require a higher education but a vocational education and training degree. Anecdotal evidence suggests that often VET IT graduates seem to be better prepared for the job as IT specialists than university graduates with a non IT study background entering the market as lateral entries.

The provocative **question was raised as to the future suitability and relevance of universities as the sole institution to educate and train ICT students in the future** or whether other training providers, IT vendors or industry itself may take over since they may be better positioned due to a closer proximity to the needs of industry, higher levels of flexibility and adaptability to changing contexts and demands etc. It remains to be seen how the positioning of the different education and training institutions at different levels and the division of work will look like in the future and which share of training will take place via online learning and MOOCs.

**Certification** – or in more general terms – workforce credentialing **becomes a major issue** in times where ICT-related education and training is no longer mainly restricted to formal education and training institutions. In the meantime **vendor certificates** are recognised and acknowledged in industry, others not. Workforce credentialing relates to the process of awarding individuals recognised verifiable indicators of a demonstrated qualification particularly for assessing workplace readiness. The credentials gauge knowledge, skills, and competencies applicable to work performance. It includes digital badging, which is increasingly important as a validated indicator of accomplishment, skill, quality, or interest earned in many learning environments. **Open digital badging** makes it easy for anyone to issue, earn, and display badges across the web through an infrastructure that uses shared and open technical standards (<http://openbadges.org>). Specifically higher and executive education and training institutions as well as other training providers may want to work with industry associations to develop **standards on workforce credentialing alternatives and quality badging formats for ad-hoc and short-term courses**. Better balance and understanding are needed on the **co-existence of formal certification** (Bachelor and Master programmes with Bologna certification) **and other forms of workforce credentialing**, such as **digital badging and micro-credentials**. Creating working models, transparency, consistent standards and visibility to potential employees and employers will help. Thought may also be given to the accumulation of certain micro-credentials to result in an formal Master degree. This would provide the link and connectivity to the national formal education and training systems.

At present there are no reliable sources which would allow for a **quantification of the volume of IT certifications differentiated by type of certification**. The inclusion of a relevant question in the LFS

DIGIFRAME - Digital Organisational Frameworks and IT Professionalism (EASME/COSME/2016/016)

or Adult education survey (AES) would probably reveal less reliable results than **using sources such as LinkedIn**.

**Occupations may no longer be a relevant concept for measuring skills and competences in the future.** The advantage of using occupations statistics is the fact that these are measured in statistical terms, skills and competences not. The approach of the **O\*NET Program** in the US (<https://www.onetcenter.org/overview.html>) offers an alternative. **The question as to whether it offers a new model also for Europe remained unanswered and would require further investigation.**

The O\*NET Program is the nation's primary source of occupational information. Central to the project is the O\*NET database, containing hundreds of standardized and occupation-specific descriptors on almost 1,000 occupations covering the entire U.S. economy. Every occupation requires a different mix of knowledge, skills, and abilities, and is performed using a variety of activities and tasks. These distinguishing characteristics of an occupation are described by the O\*NET Content Model, which defines the key features of an occupation as a standardized, measurable set of variables called "descriptors". This hierarchical model starts with six domains, describing the day-to-day aspects of the job and the qualifications and interests of the typical worker. The database, which is available to the public at no cost, is continually updated from input by a broad range of workers in each occupation. The data have proven vital in helping people find the training and jobs they need, and employers the skilled workers necessary to be competitive in the marketplace. The Occupational Information Network (O\*NET) is developed under the sponsorship of the U.S. Department of Labor/Employment and Training Administration (USDOL/ETA) through a grant to the North Carolina Department of Commerce.

Reference was made to the **European Jobs Monitor [EJM]** which tracks structural change in European labour markets: <https://www.eurofound.europa.eu/de/observatories/emcc/european-jobs-monitor>. It analyses shifts in the employment structure in the EU in terms of occupation and sector and gives a qualitative assessment of these shifts using various proxies of job quality – wages, skill-levels, etc. The EJM covers all 28 EU Member States and is based primarily on analysis of European Labour Force survey data.

Also Cedefop in their activities on skills profiles some years ago developed a **methodology for occupational skills profiles** (Cedefop: Occupational skills needs in Europe: Occupational skills profiles: methodology and application. Research Paper No. 30, 2013: [http://www.cedefop.europa.eu/files/5530\\_en.pdf](http://www.cedefop.europa.eu/files/5530_en.pdf)).

National projects in this area exist in countries such as Spain, Netherland, Germany and Slovenia. A further relevant project in this area is the **'where the work is'** one of IPPR and Burning Glass in the UK which is funded by the J.P. Morgan Foundation under their New Skills at Work programme: <http://wheretheworkis.org/>. It uses online vacancy data provided by Burning Glass, a job market analytics comparable to textkernel providing the vacancy data for the European Commission DG CNECT activity 'Vacancies for ICT- Online RepositorY (VICTORY)'.

The expert workshop was seen as a further step towards mutual agreement on a coordinated further procedure for reliable, effective and efficient future high-tech skills demand and supply measurements and forecasts at European and national level in which different types of data from different sources will have to play a role.

There was agreement among the experts that Big Data activities as the ones described in this document will increasingly be used to support policy development but these will not be used as official statistics in any time soon. Both will continue to co-exist, whereby it still remains unclear how coordination of activities could best be achieved and which roles institutions such as Cedefop and Eurostat can play here.

## Expert Workshop Report

# Designing for Digital Transformation – the Digital Capability Reference framework (DIGIFRAME)

*Demonstration, discussion and validation of DIGIFRAME results*

Date: **4<sup>th</sup> October 2018, 13.30 – 16.30 hrs.**

Location: EU Liaison Office of the German Research Organisations (KoWi), Rue du Trône 98, 1050 Bruxelles, Belgium (8th floor)

Attendants: Martine de Groot-Grosman, VIVAT  
Austeja Trinkunaite, CEPIS  
Michael Hanley, IVI  
Liesbeth Ruoff-van Welzen, LRWA  
Aikaterini Sylla, Everis  
PP Verroen, KNVI  
*Rocco Defina, Oxys Consulting*  
*Freddy Van den Wyngaert, EuroCIO*  
*Fiona Fanning, Certiport*  
André Richier, DG GROW  
Niels van der Linden, CapGemini  
Co Siebes, CapGemini  
Marianne Kolding, IDC  
Tobias Hüsing, empirica  
Werner Korte, empirica

### Objectives of the workshop

The digitalisation of the economy leads to profound changes. Value chains shift, business models, organisations and workflows find new ways and the competitiveness of enterprises is newly defined. Digital transformation is the increasing adoption of digital tools and technologies by an organisation to fundamentally alter both its internal and external processes and functions. The digital transformation of enterprises is enabled by IT competences and professionalism at individual level and digital organisational capabilities at enterprise level. They are mutually reinforcing. There is a need to increase the competences of individuals in tandem with the collective organisational capabilities of the enterprise. This is what successful enterprises are doing but it remains a big challenge for many businesses.

The European Commission, Executive Agency for Small and Medium-sized Enterprises (EASME), initiated a service contract to develop an integrated digital organisational reference framework to

strengthen capabilities to digitally transform businesses. This initiative with acronym **DIGIFRAME** is coordinated by Capgemini Consulting in partnership with IDC and Empirica, and runs until 2018.

The final workshop under this service contract aims to share and discuss the results of this two year activity and validate the Digital Capability Reference framework. The **interim-report** published earlier in 2018<sup>3</sup> presents the insights that were gathered on how organisations shape their digital transformation and which digital capabilities, tools and competences are most important in that process. In the meantime, work has continued and the Digital Capability Reference framework has been created. The framework will be demonstrated and will constitute the basis for discussion at the event. We would like to obtain expert views and critical comments which will put the consortium of partners in a position to finalise it for its beneficial use in industry and businesses.

The key objectives of the day are to share results, gather feedback and explore the way forward.

## Major discussion topics and results

The afternoon programme of this workshop consisted in three presentations by the consortium leaders, covering the key questions related to the Digital Capability Reference framework by the following points:

- Understanding the capability-competence connection
- Defining synergy between IT Frameworks and IT Professionalism building blocks
- Facilitate the use of a digital capability reference framework and promote to all

### 1. *Understanding the capability-competence connection*

The first session presented answers to three questions:

- a. How do organisations approach transformation?
- b. What do we mean by capabilities and competences?
- c. How can organisations develop capabilities and competences in tandem?

The PowerPoint presentation related to this summary explains the approaches that answer these questions. There is not so much attention to the mechanisms of capability and competence development in literature. Peppard and Ward (2004) also pointed that out and it was **re-confirmed by participants – also emphasising the relevance of the topic and welcoming this EC initiative**. Peppard & Ward offer a perspective on the management of IT in organizations that specifically considers how organisations can continuously derive and leverage value through IT. It is premised on management proactively seeking out opportunities for competitive advantage through IT, whereby:

- Resources are what an organisation had under its control or at its disposal;

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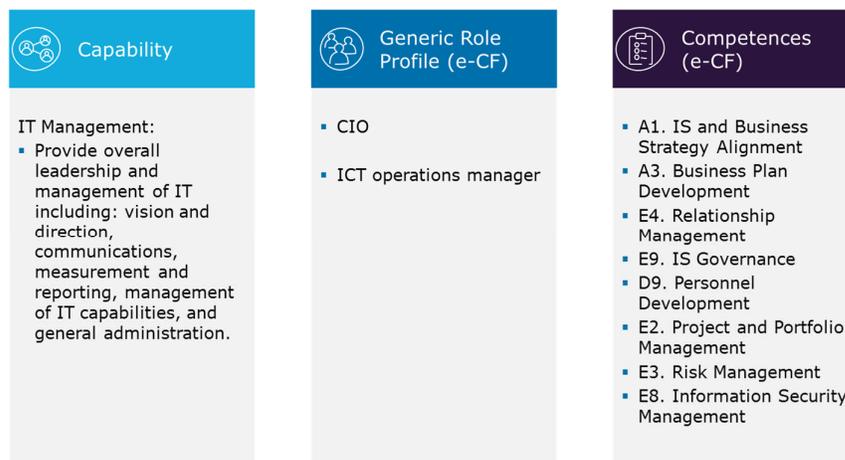
<sup>3</sup> Access the interim report online: <https://www.capgemini.com/nl-nl/wp-content/uploads/sites/7/2015/12/digital-organisational-frameworks-and-it-professionalism.pdf>  
The communication of the launch can be found: <https://www.capgemini.com/nl-nl/wp-content/uploads/sites/7/2015/12/release-interim-report.pdf>

- Competencies are the abilities of the organisation to develop, mobilise and use those resources;
- Capabilities is what the business can achieve through focussed investment and deployment of competencies.

The key lesson for the Digiframe is that it connects capabilities to competences to roles and then to IT frameworks and standards, to allow organisations to understand:

- Which capabilities they need to invest in?
- Which competences are relevant for developing a particular capability?
- Who in the organisation is carrying out a role associated with those competences? And is the employee involved matching the requirements for that role? Thus providing input for decisions as regards upskilling, recruiting, or outsourcing.
- Which IT organisational and management frameworks provide the competences, knowledge and skills related to the required area of expertise? Which methods/tools can support our employees?

In Digiframe, IT capabilities are mapped to e-CF roles and competences:



However, a reference framework has its limits: it doesn't assess maturity. **Michael Hanley from IVI explained how the IT-CMF has developed a way to describe 'what good looks like'**. The added value of IT-CMF is in the fact that it benchmarks critical capabilities against a proven maturity model, that outcomes indicate what value can be realised when improving (roadmap) and includes concrete practices, outcomes and metrics (significant database of peer organisations). He explained an example (of IT Leadership) in terms of how it can be measured and how organisations benefit from this. The proposal to include reference to IT-CMF capabilities and descriptions was very much welcomed by participants. It was recommended to further elaborate in the report on IT-CMF's origin and development.

The discussion also underlined the importance of 3<sup>rd</sup> parties to implement such framework.

A question was raised as to whether Digiframe should not also consider linking to other competency frameworks that are used in organisations, especially in the business side as digital transformation is not only an IT concept. This was recognised, and even though the structure of the capabilities

triggers the discussion between IT and Business – it could benefit from adding business competency frameworks in the future.

Another discussion was around other dimensions that influence an organisation’s decision: retained capabilities (it was considered tricky as very context specific, but reference could be made to existing studies or frameworks), DevOps & agile (indeed convenient to include a filter or marking to highlight roles important for DevOps), inclusion of soft skills (to await e-CF 4.0 update – but then possibly include reference to sources that indicate complexity level of certain skills), and automation.

## 2. Defining synergy between IT Frameworks and IT Professionalism building blocks

The second part of the presentation further dived into:

- a. Which IT frameworks and standards are considered most relevant?
- b. How do they relate to the e-CF?
- c. What are the benefits of adopting these frameworks in conjunction with e-CF?

The presentation explained how the exercise was approached and what it delivered. The bottom line was that e-CF is a great tool that can work in conjunction with IT frameworks and standards. It’s a trustworthy source, flexible to use in practice and can be used in both traditional (Waterfall) as well as agile environments.

This was underlined by ms de Groot-Grosman from VIVAT Insurances, who applied e-CF in their digital transformation and in conjunction with various IT frameworks and standards.

A new addition that was welcomed by the audience presented a research that defined five staged of maturity for start-ups, and that we enriched by including the IT frameworks that in each of these steps could add most value to the organisation. One of the potential users of Digiframe is a start-up or SME that is growing significantly and hence needs to better organise and structure its growth.

STAGE I Existence	STAGE II Survival	STAGE III Success	STAGE IV Take Off	STAGE V Resource Maturity
<ul style="list-style-type: none"> <li>Develop initial site and launch beta release</li> <li>Obtain initial customers through grass roots marketing</li> <li>Testing market idea with rapid iterative modifications Typical Framework</li> </ul>	<ul style="list-style-type: none"> <li>With a slightly refined product and existing customers, seek out funding</li> <li>Funding to hire first employees to continue product development</li> <li>At this point, many startups have no plans to monetize</li> </ul>	<ul style="list-style-type: none"> <li>Service or product has reached a defining milestone – reach critical mass, broke sales threshold</li> <li>Running low on capital, need to continue the momentum in growth thus far or risk going bankrupt</li> </ul>	<ul style="list-style-type: none"> <li>Rapid growth including massive marketing efforts acquisitions of young web start-ups</li> <li>Many web start-ups at this point are also looking to be acquired</li> </ul>	<ul style="list-style-type: none"> <li>Web Startup is now successful</li> <li>Considers IPO exit strategy</li> </ul>
<p><b>Typical Frameworks:</b> Agile/Scrum CMAP Lean – Six Sigma Project Man/Prince</p>	<p><b>Typical Frameworks:</b> TPI Next Securiy e.g. CISSP ISO 9001</p>	<p><b>Typical Frameworks:</b> SAFe ITIL DevOps</p>	<p><b>Typical Frameworks:</b> COBIT IT CMF TOGAF/Archimate SWEBOK, DMBOK, SNABOK</p>	<p><b>Typical Frameworks:</b> SIAM Data Science:Edison BISL HFI COSO/Risk Cloud: OpenStack</p>

Example: Flevy.com

It was also mentioned that Ethics should be awarded greater attention in the Digiframe – and that the IT community should take responsibility and include more guidance on how to apply ethics in

practice, and in the various domains of IT. Similar to an initiative initiated in the Netherlands by P.P. Verroen. Another point made concerned certifications and if Digiframe could help to bring more transparency. Certifications are considered an essential part of professionalism by participants. Keeping a database of certification is almost impossible if coordinated centrally, as there are too many updates and a too wide playing field. A possible option could be a 'crowdsourced' model, where certification providers themselves keep their certifications in the database up to date.

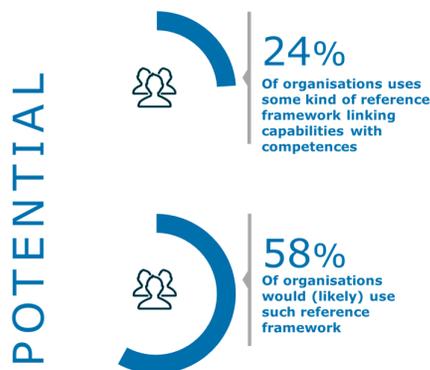
Finally, it was also suggested to add further details to explain the potential link to ESCO.

### **3. Facilitate the use of a digital capability reference framework and promote to all**

The last session of the afternoon workshop presented answers to:

- a. For whom is it?
- b. How should practical application and guidance look like?
- c. What about the packaging?

There is great potential for Digiframe as the survey conducted reveals:



The participants welcomed the ideas to include some scenarios that illustrate how Digiframe can be used. In particular, the idea to create an interactive tool to provide users with access to all the mappings was greatly welcomed. Even though Excel is a great tool to make mappings, it is not the most user friendly tool. Participants welcomed the idea to explore innovative, interactive ways such as the Power BI prototype that was shown during the workshop.

There was also consensus that a single place of access to everything related to IT professionalism should exist.

Concluding, the Digiframe:

- Illustrates the connection between capabilities and competences to support organisations in creating competitive advantage;
- Describes how strategies for improving digital organisational capabilities of enterprises could be developed, together with IT competences development – and the relevant connection with IT-CMF that allows for a more effective development of digital organisational capabilities;

DIGIFRAME - Digital Organisational Frameworks and IT Professionalism (EASME/COSME/2016/016)

- Sets out a coordinated approach concerning the adoption of IT frameworks and IT professionalism;
- Promotes e-CF and the IT Professionalism framework;
- Facilitates use via various documents and initiated thinking on tooling to further increase usability.

*Registration for the EU conference on 15 November: <http://ictprofessionalism.eu/conference-registration/>*