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**Digital Organisational Frameworks and IT Professionalism**

EASME/COSME/2016/016

## **Workshop 3**

### **Designing for Digital Transformation**

**IT Professionals and e-Leaders**

**Demand and Supply Forecasts (2020)**

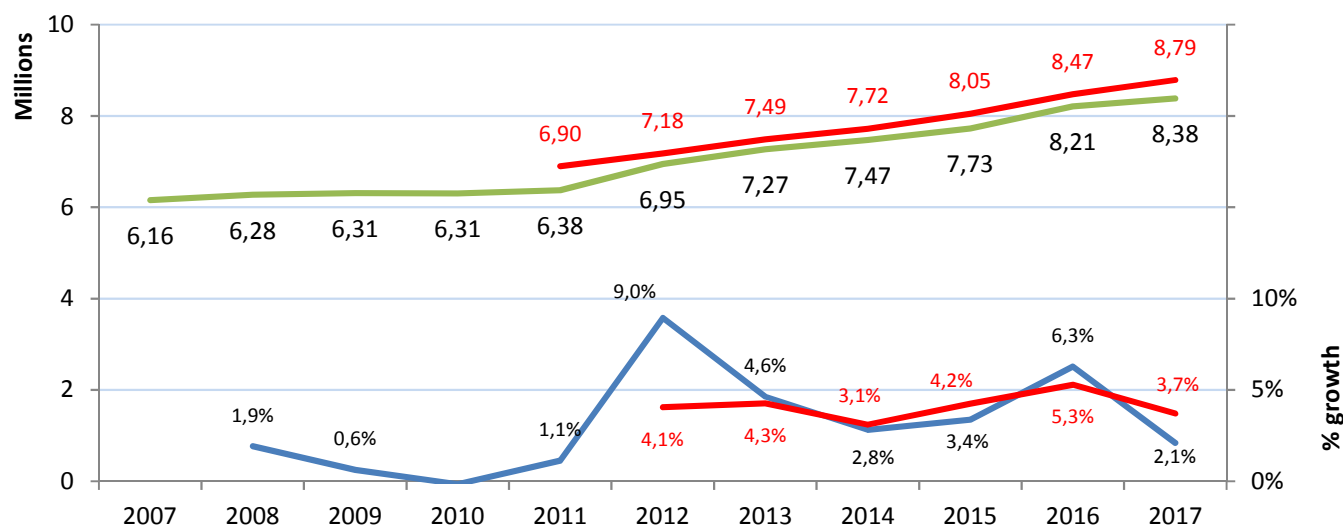
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# Contents of the presentation

- ❑ IT professional statistics
  - Developments and breakdowns
  - Foresight model, two scenarios, and check against latest official statistics
  - The case for IT professionalism
  - Conclusions
- ❑ e-Leaders quantification
  - Definition and quantification possibilities
  - Demand proxy via Structural Business Statistics (SBS)
  - Demand measurement through online vacancy analysis
  - Conclusions

# IT PROFESSIONALS

# ICT Workforce in the EU

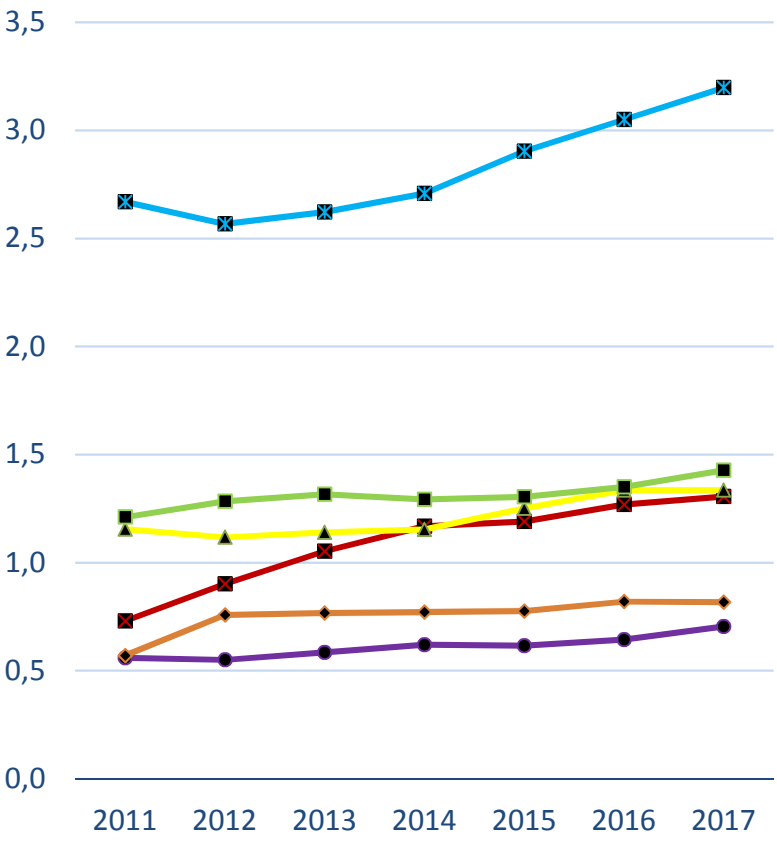


— Employed IT Specialists (Eurostat)    
 — Empirica estimate    
 — % growth    
 — % growth Empirica

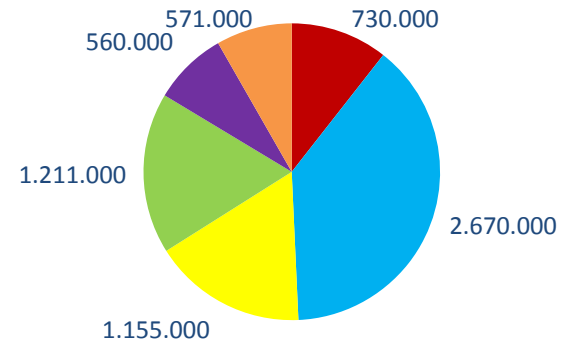
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	
Employed IT Specialists (Eurostat)	6,157,600	6,275,700	6,314,900	6,305,100	6,376,500	6,947,200	7,269,800	7,474,400	7,726,300	8,211,400	8,383,500	CAGR 07-17
% growth		1.9%	0.6%	-0.2%	1.1%	9.0%	4.6%	2.8%	3.4%	6.3%	2.1%	3.1%
Empirica estimate					6,901,300	7,181,300	7,488,400	7,720,500	8,048,300	8,473,800	8,788,800	CAGR 11-16
% growth Empirica						4.1%	4.3%	3.1%	4.2%	5.3%	3.7%	4.1%

Source: Eurostat. NB: Due to different missing data imputation „our“ totals (rows 3 and 4) differ

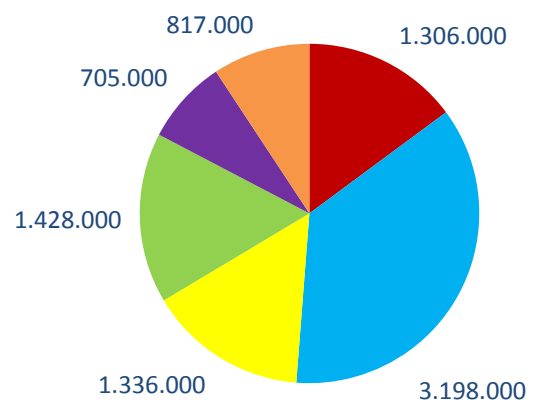
# Shifts in the ICT Workforce (2011-2017)



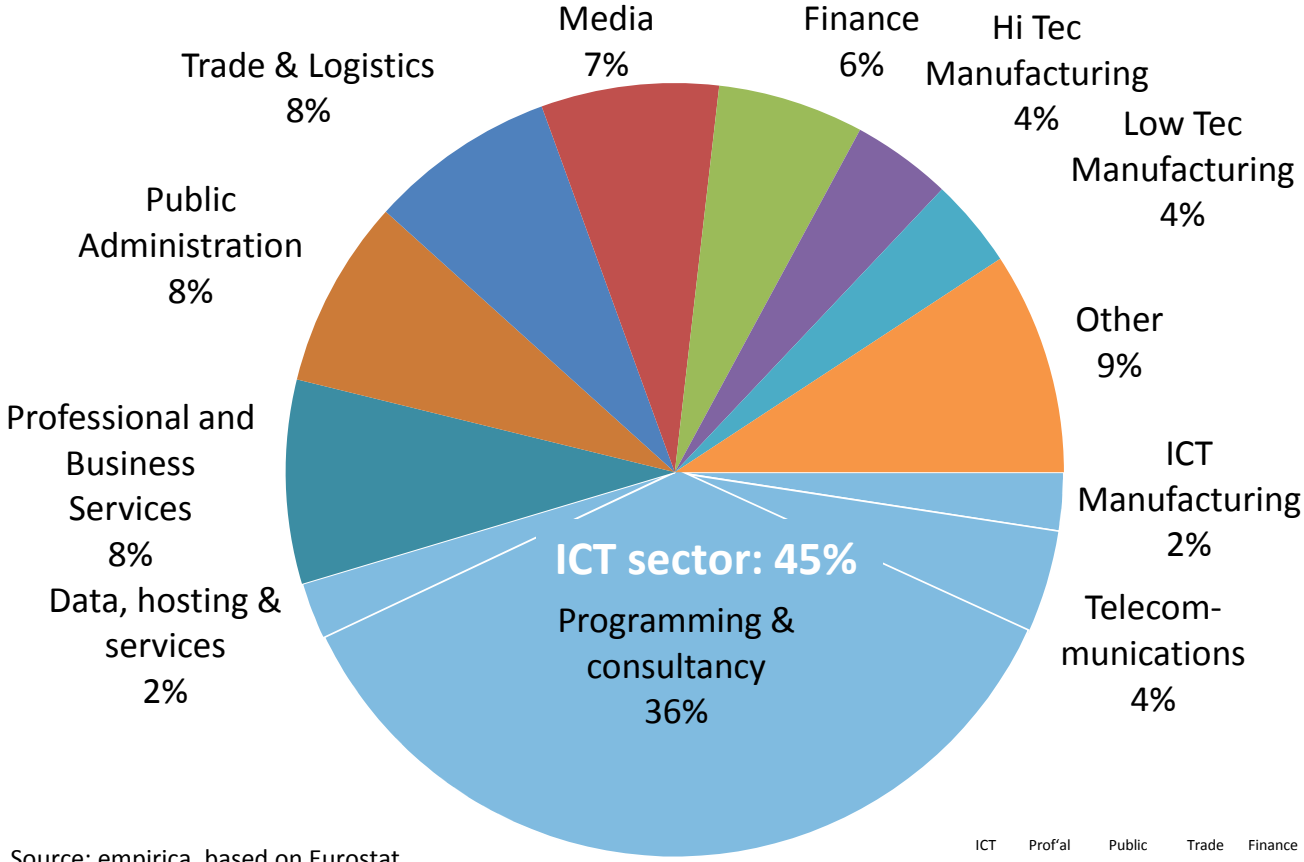
2011



2017



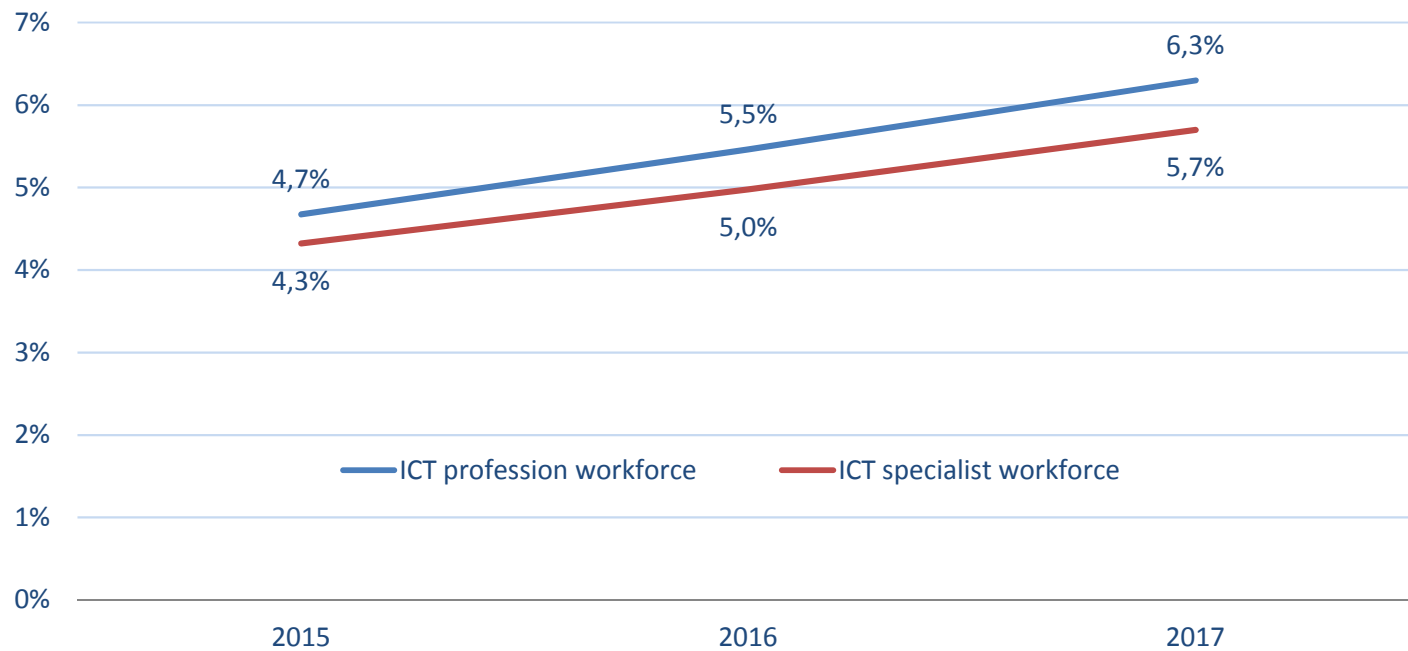
# Sector Distribution of the ICT Workforce



Source: empirica, based on Eurostat LFS data **2016**. ISCO codes 133, 25 and 351 per NACE 2d.

	ICT	Prof'al	Public	Trade	Finance	Media	Hi Tec	Low Tec	Other
NACE	26;61-63	68-74; 77;78;82	84;85	45-53	64-66	58-60	20;21; 27-30	10-19; 22-25; 31-33	1-9;35-43; 55; 56; 75; 79-81; 86-99
rev. 2									

## Vacancy Rates of ICT specialist and ICT profession workforce



*(vacancies per 100 jobs, source: empirica's analysis of jobfeed data)*

# Online vacancy monitor of the EC

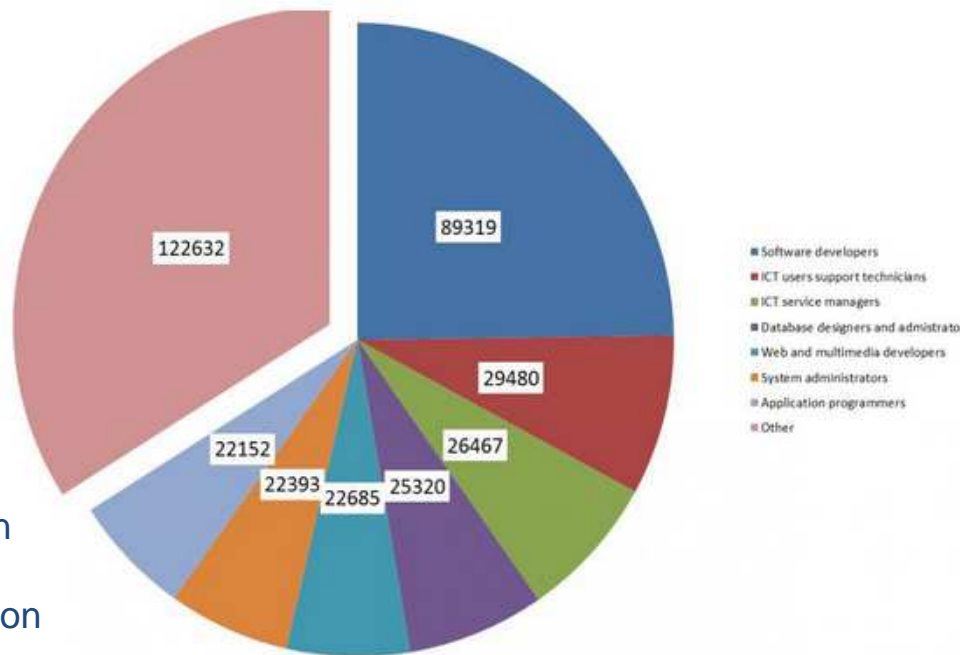
Quote from:

<https://ec.europa.eu/digital-single-market/en/news/pilot-project-monitors-online-vacancies-ict-specialists-real-time>

## Pilot project monitors online vacancies for ICT specialists in real-time

“Today there are 360,000 online vacancies for information and communication technologies (ICT) professionals in seven EU countries, up more than 170% from just 130,000 in July 2016. **On this basis, the number of vacancies for ICT specialists for the entire EU could be estimated at 600,000.** These are some results from a pilot project that monitors online vacancies in real-time that can be used by policy makers, universities and companies to provide key information for their digital strategies.”

Source European Commission (link above)



600K out of 8.4M = 7.2%!

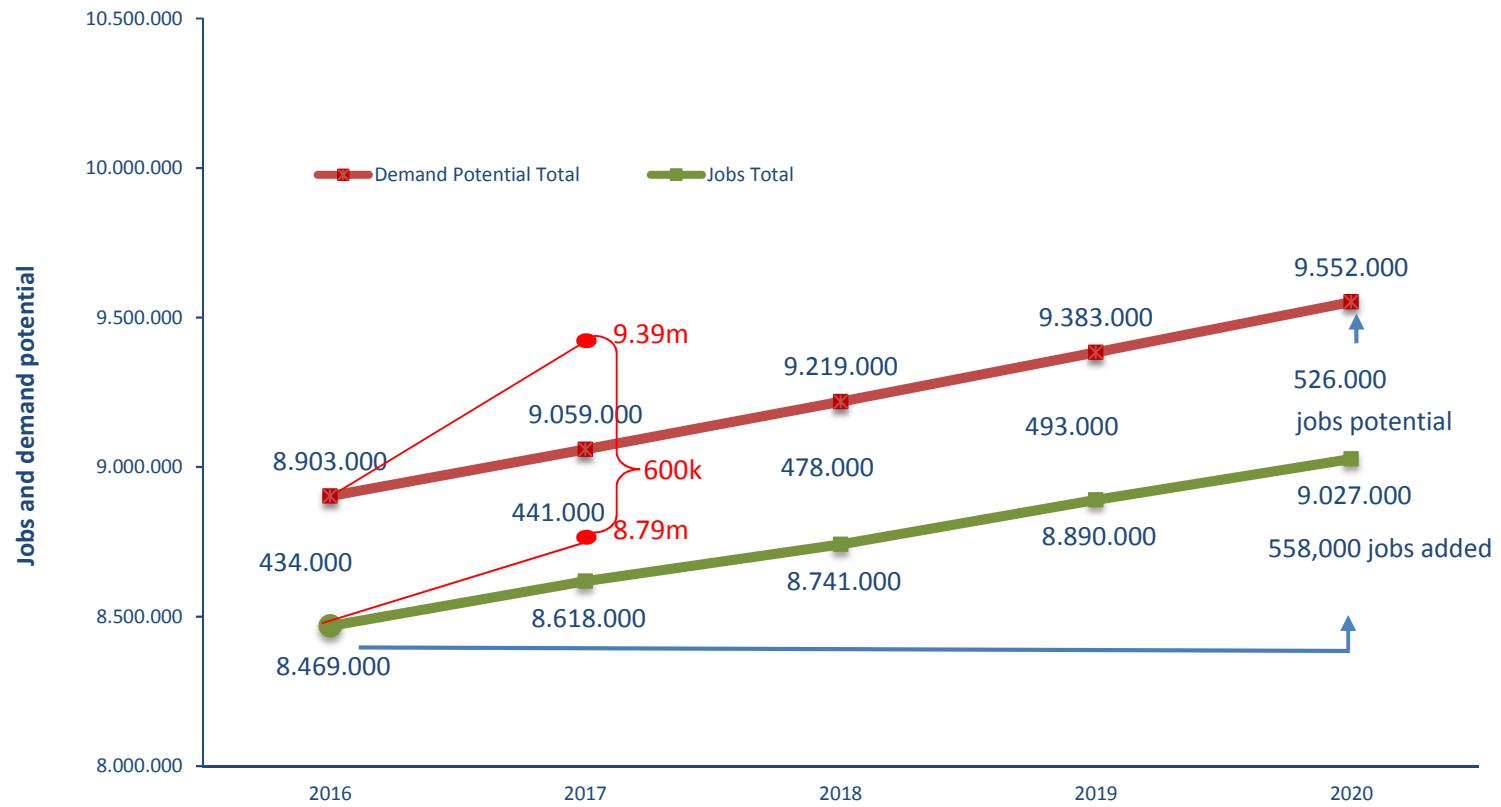


# Forecast – two scenarios – Scenario 1

## Moderate growth forecast scenario

- Scenarios done earlier this year, before 2017 data became available (baseline is therefore 2016)
- Expectation of rather low demand growth
  - Reasons: large share of IT budgets still spent on automation and productivity increase (AI, cloud)
  - Maturing technologies can be maintained by a smaller workforce
  - Emerging technologies are increasingly not very labour intense (yet) - **require few extremely high skilled specialists**
- Expectation of flat supply
  - 252,000 ICT graduate (HE,voc) entries / year
  - 125,000 lateral entries / year

# Forecast Supply and Demand (2016-2020): Moderate Growth Scenario

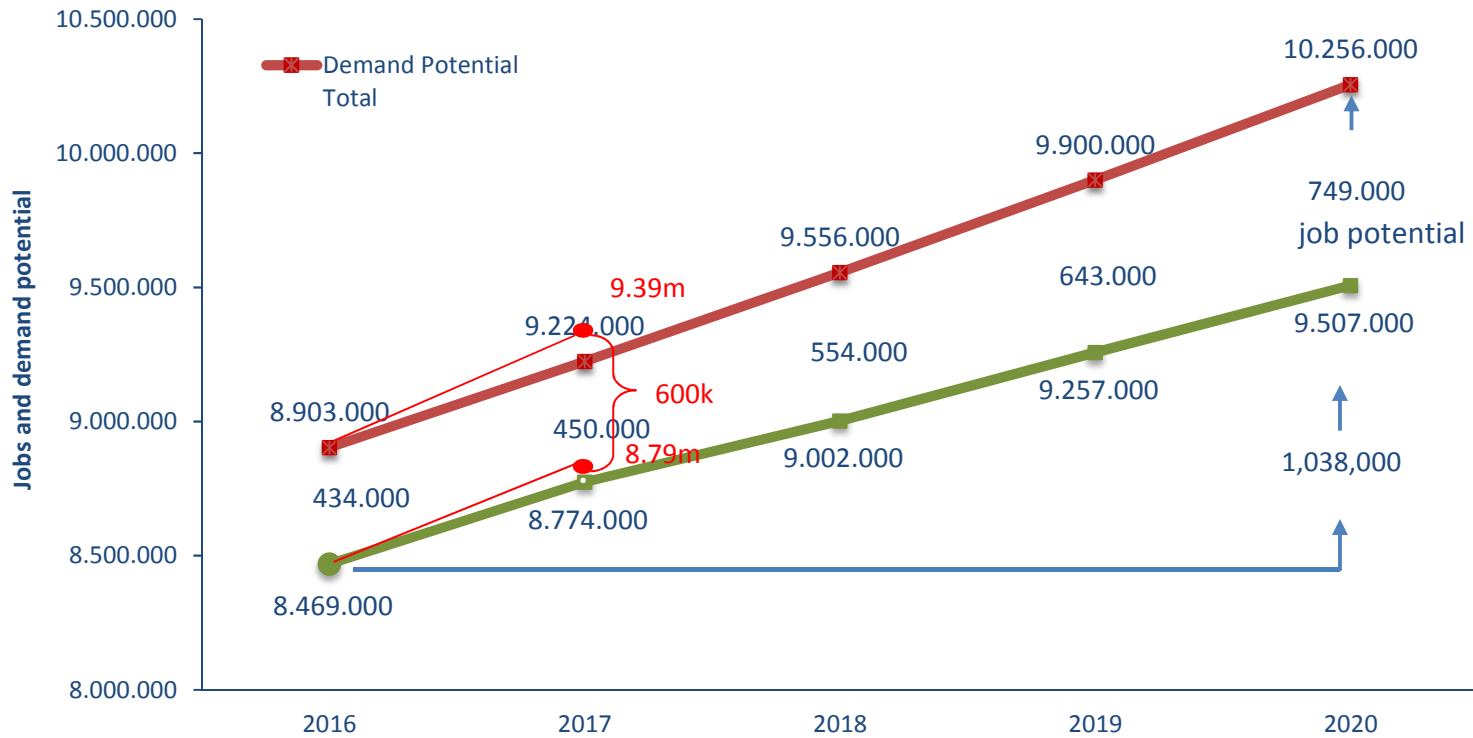


# Forecast – two scenarios – Scenario 2

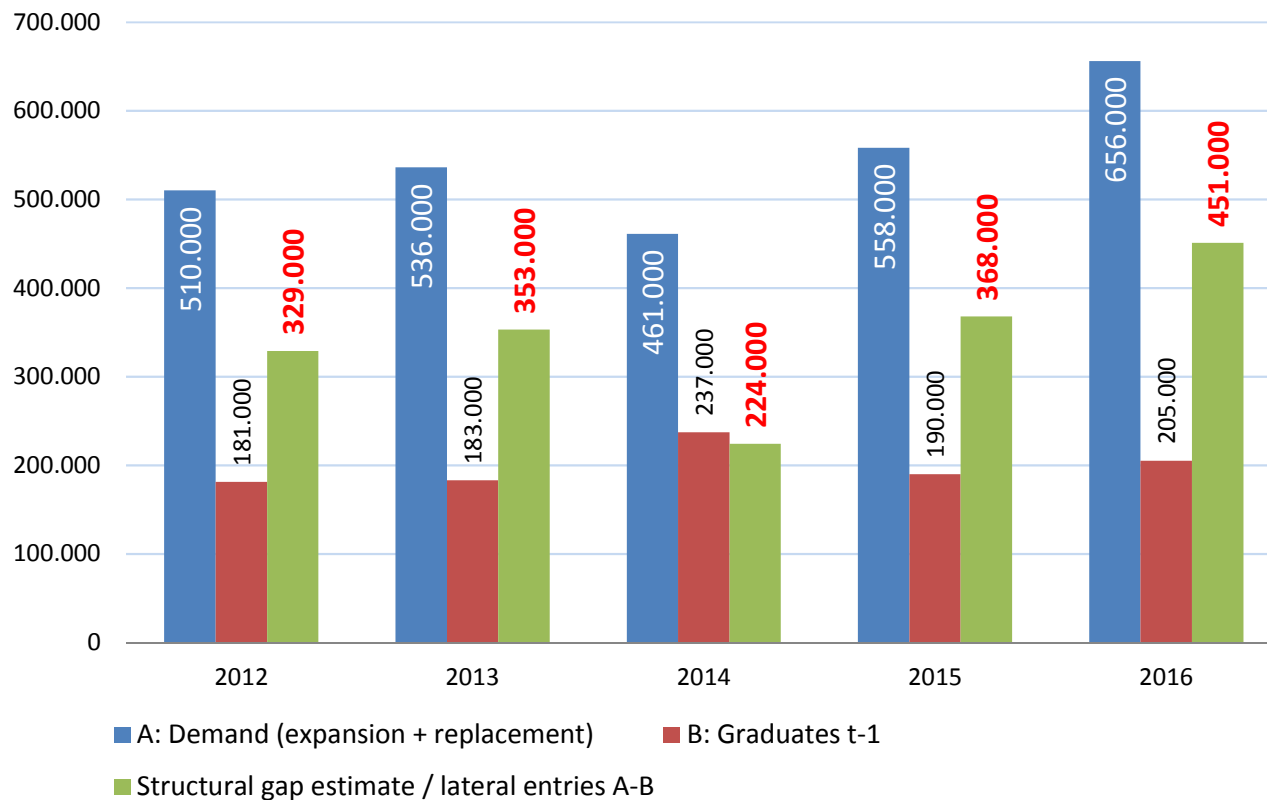
## High growth forecast scenario

- Expectation of higher demand growth
  - Extrapolation of aggregate level (EU28) trend
  - Assumption: uniformity of demand across time and place: + 3.6% (average 2002 – 2016)
  - Expectation of higher supply
  - Reason: adapting to lessons from previous forecasts in anticipating robustness of supply
  - 252,000 ICT graduate (HE,voc) entries / year
  - 240,000 lateral entries / year

# Forecast Supply and Demand (2016-2020): High Growth Scenario



# The strong case for IT professionalism



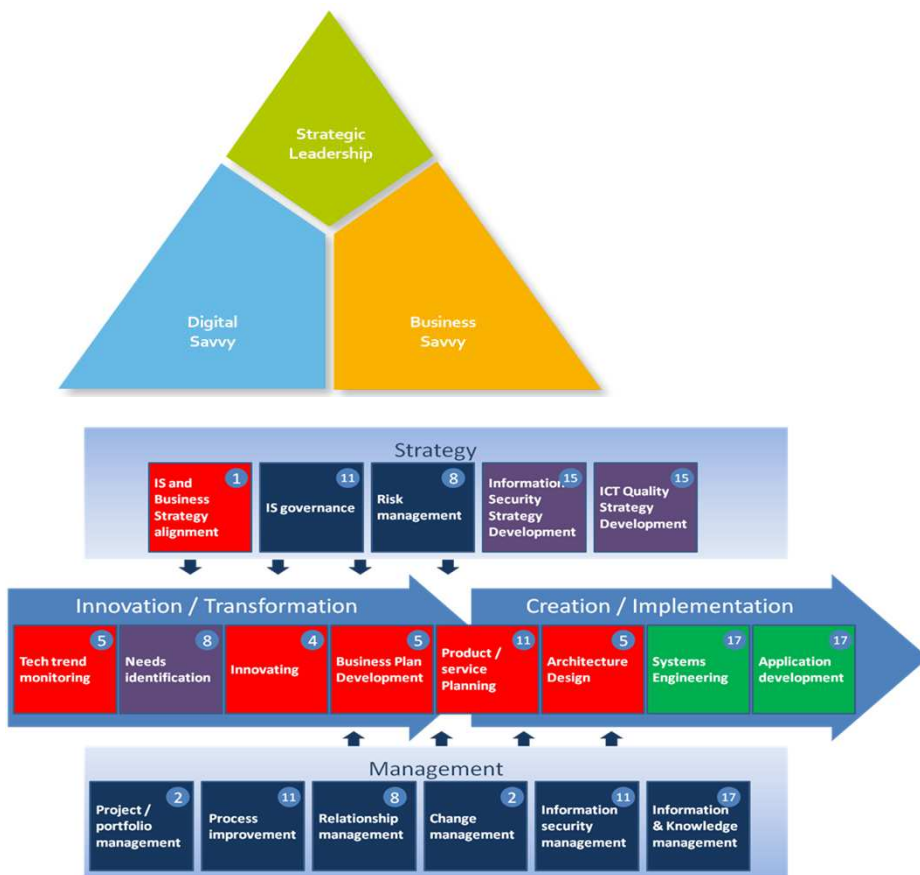
- We've seen rapid growth of workforce and # of vacancies is still increasing
- Labour market entrances by people without a recent and domestic degree in ICT (has been underestimated)
- Future research: educational (=subject) background, career tracking studies
- Workarounds exist in industry and have existed for long. Were it not successful, this practice would have ceased at some point.
- Need to acknowledge this and learn from existing quality approaches

# Main Conclusions

- ❑ Structural changes in workforce in recent years are expected to continue
- ❑ Second scenario works best for now – scope for better scenario based forecasting with adapted assumptions
- ❑ The anticipated effects of productivity increase through cloud and AI seem to be overcompensated by recent growth of scope of ICT work
- ❑ Growing number of jobs and vacancies especially in highest skills areas.
- ❑ Supply is improving, both formal and also via side-entries: rapid training, certification, etc.
- ❑ Growing importance of quality assurance and professionalism
- ❑ Actions have been taken and contributed to reduce the anticipated gap because the supply increased, even if not mainly from graduates majoring in IT
- ❑ Existing (workaround) practice in bringing outsider entries up to speed, both in industry and education sector, may serve as role model for streamlining and harmonisation with a view to professionalism
- ❑ Also demography requires much stronger reliance on re-training and professional education and attracting foreign talent
- ❑ Underscores the importance of highest level skills education
- ❑ Underscores the importance of certification and new skills and experiential learning validation systems
- ❑ However: New tech trends change the skills mix required (Big data → statisticians, but also data wranglers) and extend into new job domains, such as blue collar – think of IoT → installers and technicians

# E-LEADERSHIP

# e-Leadership Skills Quantification Approaches



## HOW TO QUANTIFY?

- Gauge Skills in Surveys (such as PIIAC)
- Assume e-Leadership Type of Occupations as Represented in Official Statistics (ISCO)
- Assume e-Leadership demand based on structural business statistics (SBS): per enterprise in certain industries, depending on size \*
- Market Surveys (Survey of CIOs, using SBS for Cross-Economy Estimation) \*
- Big Data Analytics: Online Job Ads \*



# e-LEADERSHIP SKILLS – demand proxy

2016

Type of sector	Size of firm	Assumed demand of e-leaders per enterprise	Number of enterprises	Estimated TOTAL demand of e-leaders by firm type
ICT sector	medium	4	7,000	28,000
	large and very large	8	1,500	12,000
High ICT intensity sectors	medium	2	65,000	130,000
	large and very large	5	15,000	75,000
Low ICT intensity sectors	medium	1	155,000	155,000
	large and very large	2	27,000	54,000
All sectors	high growth SMEs	1	140,000	140,000
<b>TOTAL</b>				<b>594,000</b>

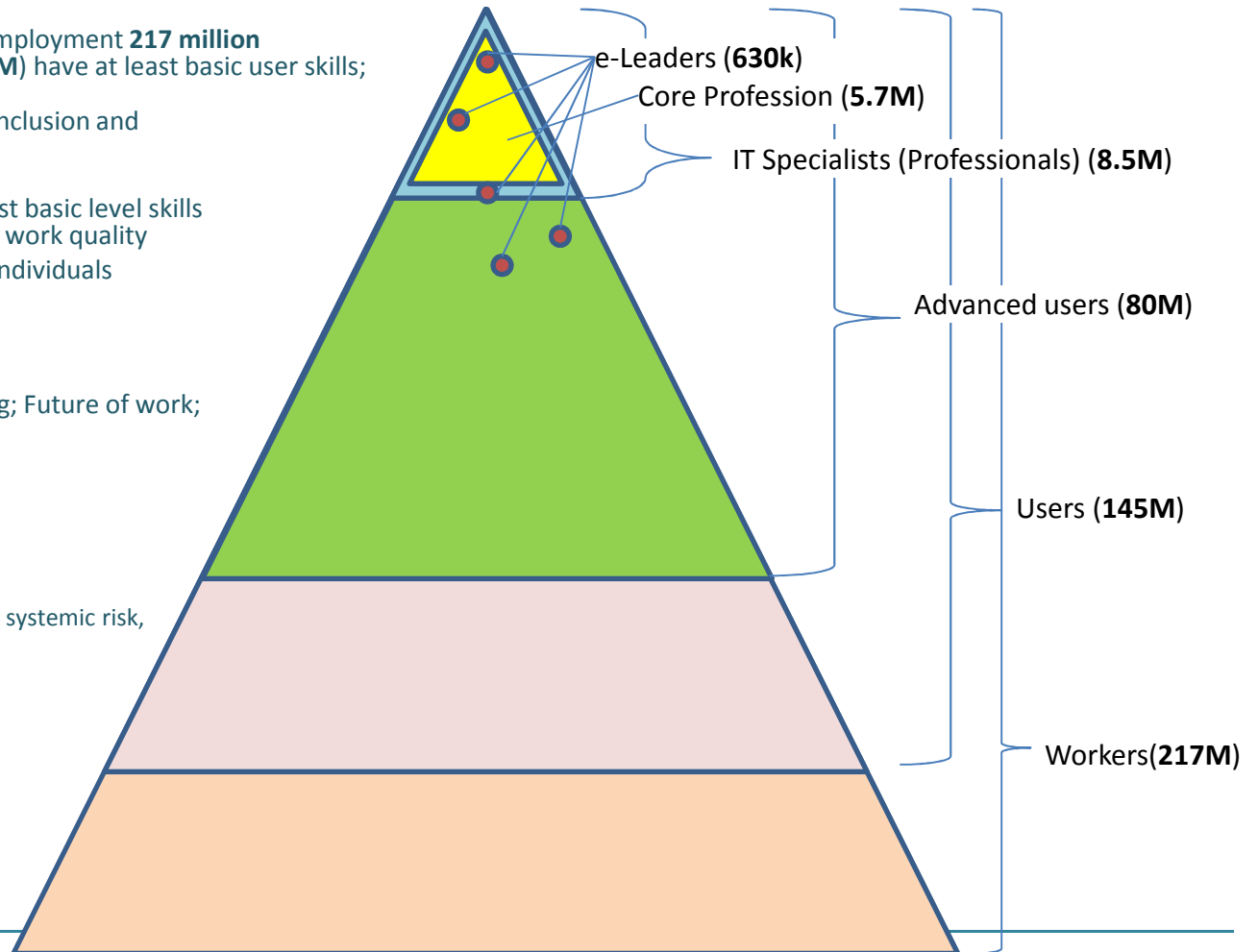
2018

Type of sector	Size of firm	Assumed demand of e-leaders per enterprise	Number of enterprises	Estimated TOTAL demand of e-leaders by firm type
ICT sector	medium	4	8,300	33,200
	large and very large	8	1,800	14,400
High ICT intensity sectors	medium	2	67,000	134,000
	large and very large	5	16,000	80,000
Low ICT intensity sectors	medium	1	154,000	154,000
	large and very large	2	28,000	56,000
All sectors	high growth SMEs	1	158,000	158,000
<b>TOTAL</b>				<b>629,600</b>

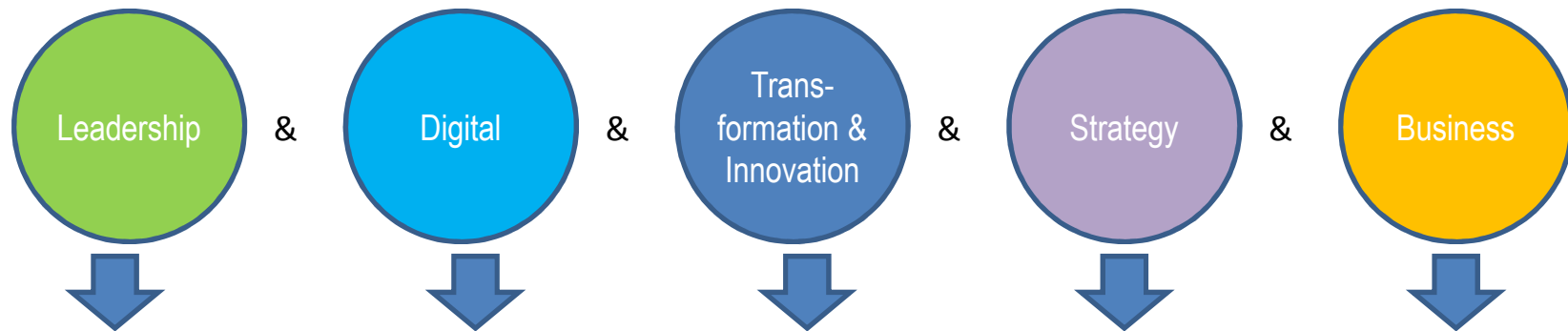
CAGR:  
3.0%

# E-Skills pyramid – an order of magnitude sketch

- ❑ EU- Population **512 million**; employment **217 million**  
57% (of pop 16-74 years) (**220M**) have at least basic user skills;  
31% have above basic skills  
Main concerns: Participation, inclusion and basic digital literacy
- ❑ **Of 217 million employment**,  
Users: 67% (**145M**) have at least basic level skills  
Main concerns: employability, work quality
- ❑ Advanced users: 7% (**80M**) of individuals in employment have above basic level digital skills  
(Non-manual workers 47%, manual workers 15%)  
Concerns: new ways of working; Future of work; „Race against the machine“
- ❑ ICT Specialists (**8.2M**)
- ❑ Core Profession (**5.7M**)
  - Management **450k**
  - Software **3.4M**
  - Network&data base (**505k**)
  - Core technicians (**1.4M**)
 Concerns (both): professionalism, systemic risk, competitiveness, innovation, business & job generation
- ❑ e-Leaders (**~630,000**)  
Concerns: competitiveness, innovation, business & job generation
- ❑ (data 2016 or latest available)



# Searchword-chain for e-leadership identification in online job ads



- For each of the five domains there are 1-8 Searchwords, plus variants and allowing for truncation, inflection, etc. These have also been translated and tested in the other languages.
- Each domain must have at least one positive hit in the add to be eligible (boolean „&“-term above)
- There are stop words such as junior, trainee, internship that exclude an ad.

# Explosive growth of e-leadership job adds?

	DE	AT	UK	NL	FR	BE
Number of vacancies 2015	2,481	157	939	603	1,245	-
Number of vacancies 2018	3,384	283	16,906	3,244	16,920	4,468*
Increase	+36%	+80%	+1700%	+438%	+1259%	-

•In Belgium, there were 1,859 job adds in Dutch and 2,609 job ads in French. It is however unclear how many of these are translated duplicates.

Done on 17-11-2015 and on 21-02-201

The observation is valid but: is the increase real or a fad? Change in actual job requirements or change of fashion in job ad wording? Or a bit of both?

# Main Conclusions

- ❑ Quantification remains problematic
- ❑ **Strong hints at continuing trend towards more e-Leadership** skilled employment
- ❑ e-Leader type requirements/job descriptions **spread into broader array of job ads**
- ❑ e-Leadership skills are acquired by a mix of **work experience, education and training** – these are different key levers for **supply side measures**
- ❑ E-Leadership features, such as T-shaped, are however becoming mainstream, in digital business skills mass programs such as by Facebook and other tech companies and vendors certifications or in HE digital entrepreneurship offers. Digital is naturally engrained in business education these days
- ❑ More research into job ads, e.g. what are job titles of eleaders? Maturing job roles might one day result in “eleader” being a discernible set of ISCO-categories

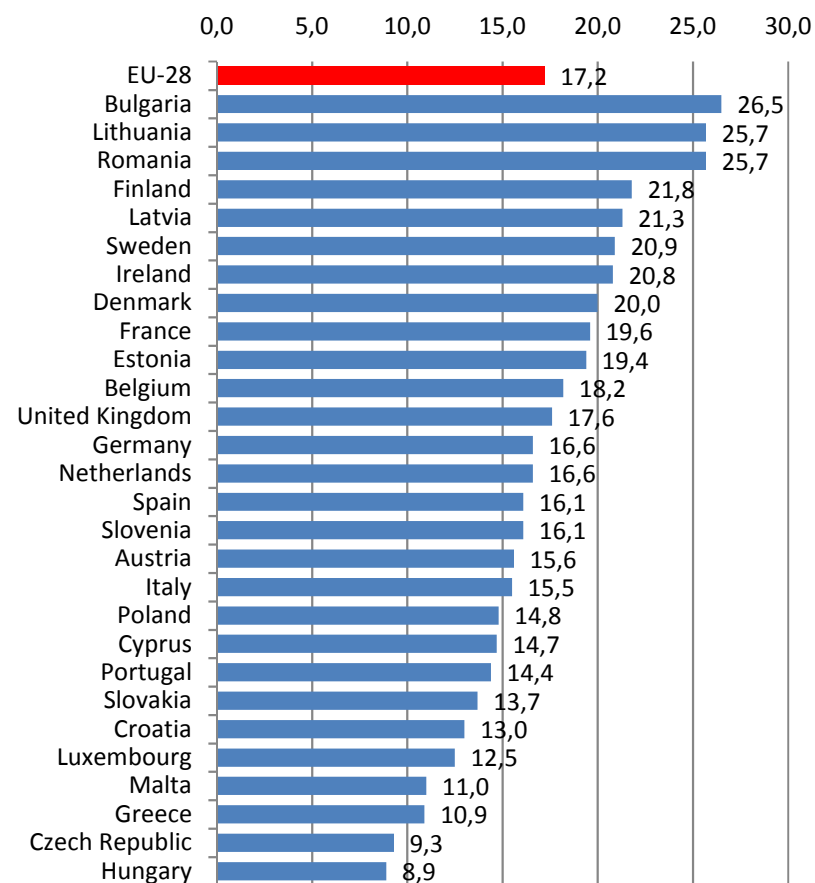
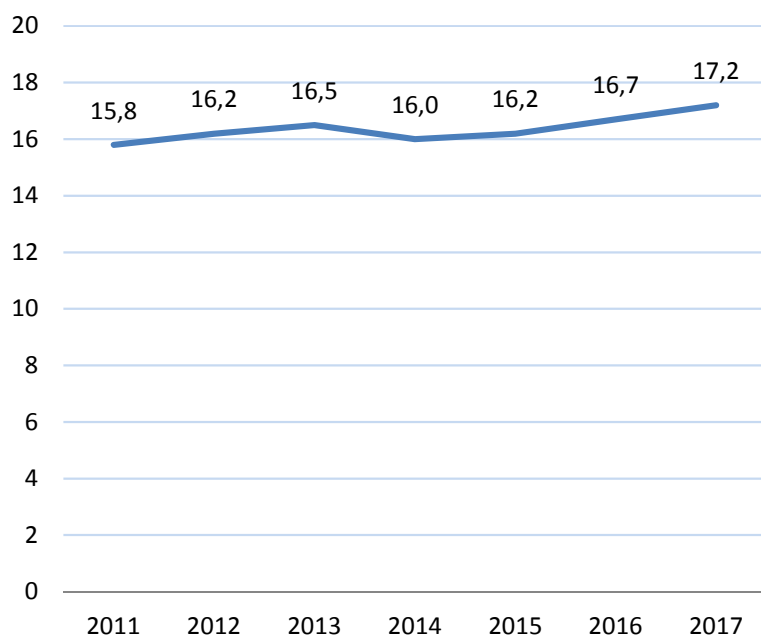
Demand and Supply Forecasts  
(2016-2020)

**THANK YOU**

# BACKUP SLIDES

# Distribution of the ICT Workforce by sex

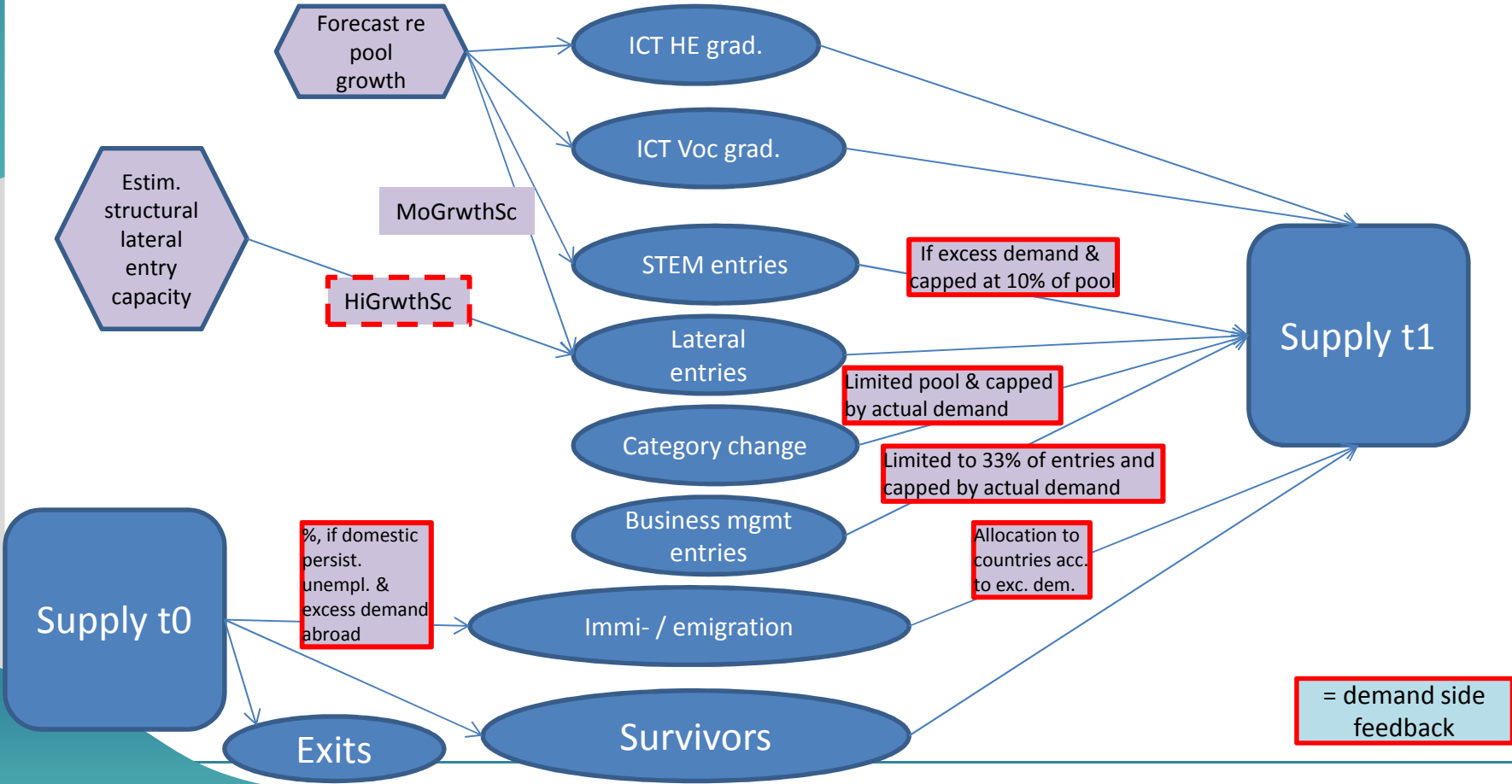
## Share of women (%) in employed ICT specialists (EU28)





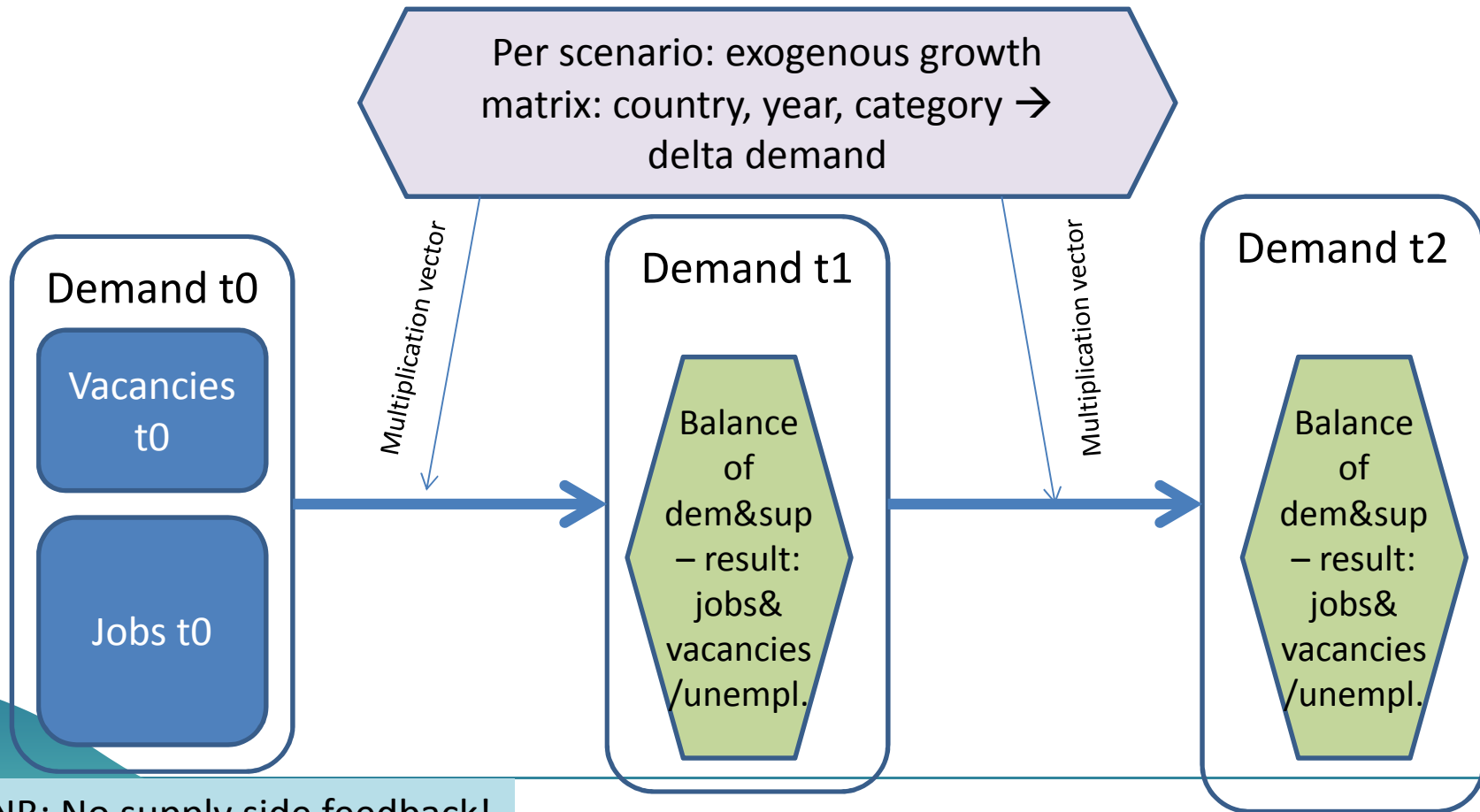
# Foresight: Supply side model in a nutshell

(This is calculated per country)



# Foresight: Demand side model in a nutshell

(This is calculated per country)



NB: No supply side feedback!

## Disconnect between growth of the ICT workforce and total ICT graduates (2011 – 2016)

	Growth ICT workforce (net, i.e. even <u>without</u> <u>replacement demand</u> )	Total graduates (vocational and tertiary first degrees)
2011		181,000
2012	280,300	183,000
2013	305,700	237,000
2014	231,100	190,000
2015	328,300	205,000
2016	426,200	

- We've seen rapid growth of workforce and # of vacancies is still increasing
- Importance of labour market entrances by people without a recent and domestic degree in ICT (has been underestimated)
- Future research: educational (=subject) background of LFS ICT specialists, also by cohort, country and job (ISCO 4-digit)
- Future research: Career tracking studies of a) ICT graduates and b) ICT job entries

# Previous forecasts



Foresight date	Jan 17	Dec 2015	May 2015	2013
<b>Occasion</b>	High-Tech and Leadership Skills for Europe Conference 26 <sup>th</sup> January 2017	Working paper update	Working paper V.1	"Monitor" contract, middle scenario
<b>Definition</b>	ICT specialist	Empirica broad definition	Empirica broad definition	Empirica broad definition
<b>Based on latest jobs data for</b>	2015	2014	2013	2012
<b>Jobs at the time (definition used in forecast, which has changed over time)</b> <sup>a</sup>	8,033,000	7,535,000	7,325,000	7,403,000
<b>Jobs at the time in ICT specialist definition</b>	8,033,000	7,715,000	7,484,000	7,178,000
<b>Vacancies estimated at the time</b> <sup>b</sup>	363,000	373,000	270,000	274,000
<b>Foresight for 2016: Jobs</b> <sup>c</sup>	<b>8,186,000</b>	<b>7,767,000</b>	<b>7,598,000</b>	<b>7,571,000</b>
<b>Actual data for 2016: Jobs</b> <sup>d</sup>	<b>8,469,000</b>	<b>8,469,000</b>	<b>8,469,000</b>	<b>8,469,000</b>
<b>Foresight job increase</b> <sup>e=c-a</sup>	153,000	232,000	273,000	168,000
<b>Actual job increase</b> <sup>f=d-a</sup>	436,000	934,000	1,144,000	1,066,000
<b>Foresight for 2016: Vacancies /Potential</b> <sup>h</sup>	<b>370,000</b>	<b>472,000</b>	<b>462,000</b>	<b>598,000</b>
<b>Actual data (estim.) for 2016: Vacancies /Potential</b> <sup>k</sup>	<b>434,000</b>	<b>434,000</b>	<b>434,000</b>	<b>434,000</b>
<b>foresight missed actual vacancies by</b> <sup>n=k-h</sup>	<b>64,000</b>	<b>-38,000</b>	<b>-28,000</b>	<b>-164,000</b>
<b>missed by % of vacancies</b> <sup>o=n/l</sup>	<b>15%</b>	<b>-9%</b>	<b>-6%</b>	<b>-38%</b>
<b>Foresight for 2020: Jobs</b> <sup>p</sup>	8,675,000	8,209,000	7,984,000	7,950,000
<b>Foresight for 2020: Vacancies /Potential</b> <sup>q</sup>	500,000	756,000	825,000	913,000

- [1] Presentation given at the High-Tech and Leadership Skills for Europe Conference, Brussels, 26th January 2017 [http://leadership2017.eu/fileadmin/scale\\_conference/documents/huesing\\_20170126.pdf](http://leadership2017.eu/fileadmin/scale_conference/documents/huesing_20170126.pdf)
- [2] Hüsing, Tobias, W.B. Korte, E. Dashja: e-Skills in Europe. Trends and Forecasts for the European ICT Professional and Digital Leadership Labour Markets (2015-2020) <http://eskills-lead.eu/fileadmin/lead/documents/w>
- [3] T. Hüsing, W.B. Korte, E. Dashja (2015): E-skills and e-leadership skills 2020. Trends and forecasts for the European ICT professional and digital leadership labour market. Empirica Working Paper, Bonn
- [4] e-Skills for Jobs in Europe – Measuring Progress and Moving Ahead (2014) [http://eskills-monitor2013.eu/fileadmin/monitor2013/documents/country\\_reports/brochure/e-skills\\_monitor\\_broschuere.pdf](http://eskills-monitor2013.eu/fileadmin/monitor2013/documents/country_reports/brochure/e-skills_monitor_broschuere.pdf)