e-Leadership and Key Enabling Technologies

FIRST EUROPEAN CONFERENCE ON DIGITAL AND KEY ENABLING TECHNOLOGIES SKILLS

Brussels, 1-2 June 2015

OBJECTIVES AND CONTEXT

This report[1] summarises the key outputs of the first European Conference on Digital and Key Enabling Technologies skills which was held in Brussels on 1 and 2 June 2015. The event was organised in the context of two major initiatives. The first aimed to produce a "vision and sectoral pilot on skills for key enabling technologies" (hereafter "KETs skills Initiative"). The KETs skills initiative, launched in January 2014, is focusing on the current and anticipated needs of employers with regard to KETs skills and the ways to best satisfy those needs. The initiative builds on the work of the High-Level Group on KETs and their recommendations on skills. The e-leadership initiative, in turn, started in 2013 and focused on the leadership needs of top decision-makers and business leaders at larger enterprises. A further initiative on "e-leadership skills for SMEs" was then launched in 2014. It targets SMEs and start-ups. These initiatives have been launched DG Internal Market, Industry, Entrepreneurship and SMEs (GROWTH) of the European Commission.

The conference offered an interactive platform for exchanging opinions and co-creating solutions on the skill issues in KETs and digital technologies and to bring together the representatives of all key stakeholder groups. The conference built on the synergies between the KETs and e-leadership initiatives, and brought the digital and KETs worlds together by addressing the most relevant skills-related challenges. KETs and digital technologies are the driving engines of growth and industrial competitiveness that have already penetrated literally all aspects of our lives. While they enable the growth of the European economy, their development and deployment are enabled by people with appropriate skills. Any skills imbalances are likely to significantly diminish their economic potential and employment effects.

Today Europe is already facing challenges related to the quality of skills possessed by the current and future employees, as well as the number of people qualified, available and willing to work in KETs and ICT. Unless an appropriate action is taken, the situation will only deteriorate in the future. There is a clear need for Europe to reinforce and rapidly develop these industries to compete for the future. These challenges and proposed solutions were addressed during the conference.

The conference was a two-day event, with day 1 being dedicated to the skill issues of KETs, and day 2 focussing on the skills related to e-leadership. The programme featured multiple high-level speakers representing industry, academia and policy makers. Furthermore, the conference offered a chance to get acquainted with the latest research findings on the skill situation in Europe.

On day 1, the results and conclusions of the extensive work within KETs Skills Initiative were for the first time presented to a broader audience. The following aspects were addressed:

- Current and future skills that employers need from KETs workers;
- Good practice examples of relevant initiatives from Europe, United States and East Asia;
- Issues of the demand and supply of KETs skills and the forecasts till 2025;
- European action plan highlighting detailed recommendations;
- Results of sectoral pilots of the proposed measures in three Member States.

On day 2, suitable e-leadership training offers developed for SMEs and start-ups and the results from their use by SMEs were demonstrated together with the lessons learnt and practical real live cases. The conference addressed:

- Latest forecasts on the demand and supply of e-leadership skills;
- e-Leadership Scoreboard for all 28 EU Member States and best practices;
- European higher and executive education landscape in the field of e-leadership;
- New education and training opportunities and concrete policy recommendations

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[1] This report has been prepared by PwC EU Services and empirica

DAY 1: VISION AND SECTORAL PILOT ON SKILLS FOR KEY ENABLING TECHNOLOGIES

SUMMARY AND CONCLUSIONS FROM DAY 1

This report summarises the key outputs of DAY 1 of the First European Conference on Digital and Key Enabling Technologies (KETs) skills that was held in Brussels on 1 June 2015. DAY 1 of the conference was organised in the context of the initiative on the "Vision and Sectoral Pilot on Skills for Key Enabling Technologies, carried out by PwC for DG GROWTH of the European Commission.

The conference aimed to become an interactive platform for exchanging opinions and co-creating solutions on the skill issues in KETs and ICT and to bring together the representatives of all key stakeholder groups. On DAY 1, the key results and conclusions of the extensive work within KETs Skills Initiative were for the first time presented to a broader audience. Specifically, the following aspects were addressed:

- Current and future skills that employers need from KETs workers;
- Good practice examples of relevant initiatives from Europe, United States and East Asia aiming to tackle the issue of skills mismatch in KETs;
- Issues of the demand and supply of KETs skills and the forecasts till 2025;
- European action plan highlighting detailed recommendations;
- Results of sectoral pilots of the proposed measures in three Member States.

The analysis of skill requirements for KETs showed that:

- KETs rely on a balance of both technical and non-technical competences;
- Specific knowledge and skill requirements for KETs vary significantly, depending (among others) on the industry/application area and the employer;
- Smart combinations of people with diverse profiles are needed;
- STEM should be converted into STEAM, with Arts included, which refers to creativity that can lead to innovations.

The analysis of demand and supply suggested that:

- The majority of KETs employment is formed by highly skilled workers;
- Between 2013 and 2025, the demand for KETs skills is expected to grow rapidly. The key share of this extra demand is made up by replacement demand (e.g. due to retirement or moving to other sectors);
- Most of jobs related to additional demand will require highly skilled people.

The analysis of good practice examples suggested that:

- Top-down initiatives are prevailing in Europe and East Asia. Bottom-up initiatives are most predominant in the United Sates;
- The world regions which were analysed demonstrate a clear difference in focus areas when it comes to tackling specific challenges;

Finally, key directions for action regarding both qualitative and quantitative KETs skills-related challenges include:

- Ensuring a good alignment of educational programmes with industry needs;
- Facilitating regular (re-)training of current employees;
- Raising awareness about KETs in the society; *and*
- Improving the image of KETs as a field to work in.

Chairperson: Prof. Jan Willem Velthuijsen, Managing Partner of PwC Economics Europe and Leader PwC Technology Megatrends.

OPENING SPEECH

Markku Markkula (President of the EU Committee of the Regions)

Mr. Markku Markkula emphasised that KETs are instrumental in modernising Europe's industrial base. The EU's major weakness lies in translating its knowledge base into goods and services. Regional innovation clusters, as well as smart specialisation strategies can have an important role to play here. 60% of regions registered in the smart specialisation platform have already indicated a KETs-related priority, and cluster-specific actions are being promoted. Taking this into account, Mr. Markkula proposed a name change to "key enabling competences and industrial technologies".

There is a clear need for quantitative and qualitative solutions, which better match supply with demand and continuously ensure employees have the necessary and constantly evolving skills to match labour markets needs through life-long learning. In some circumstances, public resources could be used to assist companies with specific skills training. The Juncker Plan can help KETs to bear fruit, specifically in the five key areas of growth and job creation, reindustrialisation, the digital single market, the Energy Union and global competitiveness.

Within this context, Mr. Markkula advises against redeploying appropriations initially earmarked for the Horizon 2020. This could potentially wipe off hundreds of millions of EUR from the KET budget: this fund should only be tapped after all other options under the European budget have been exhausted.

WELCOME ADDRESS

Michel Catinat (Head of Unit, DG for Internal Market, Industry, Entrepreneurship and SMEs, European Commission)

Mr. Catinat shared some of the key results within the area of KETs policy initiatives in Europe over the last few years. The European Commission initiated a policy aimed at triggering a KETs-based industry. KETs are now a priority for Horizon 2020, Structural Funds, and the investment pacts. EU funding instruments have been adapted to the needs of KETs.

Specifically, Horizon 2020 has a dedicated budget for KETs and has been rebalanced to be focused on close-to-market products, to facilitate industrial take-up, and on the integration of various KETs technologies/products. KETs are now one of the priority areas for investment funds. Combining Horizon 2020 and Structural Funds made it possible to initiate a number of highly ambitious KETs-related projects.

In addition, EIB lending to KETs projects has been increasing by 20% each year. KETs Observatory has been established to provide quantitative and qualitative inputs for policy makers. Furthermore, the Commission is exploring how SMEs can better access KETs-related technologies. To support this work, an inventory of KETs technologies and infrastructure is currently being performed.

The Commission also explores how trade policy can better facilitate knowledge transfer in the area of KETs. Finally, the Commission is launching an initiative to promote KETs skills, to be specifically discussed during the conference.

THE WAR FOR TALENT - THE WORLD'S MOST TALENT READY COUNTRIES

Bruno Lanvin (INSEAD Executive Director for Global Indices)

Mr. Lanvin stressed that talent will be the currency of global competition in a digital world. Improving Europe's abilities to grow, attract and retain talent requires the combination of three approaches, namely (1) offering a 'working definition' of talent, (2) equipping decision makers with credible 'talent metrics', based on such a definition, and (3) identifying possible strategic implications of such metrics for Europe.

Traditionally, talents (and skills) are defined in relation to specific functions (and jobs). Yet, there is a need to recognise that (especially in the digital sphere), jobs are constantly being redefined and will continue to do so. Key talent can still be broadly defined for the decades to come, typically around two categories, namely Global Knowledge Skills (or GKS, higher level interactive) and Vocational/Technical Skills (or VTS, linked to a specific range of functions).

The main purpose of GTCI (Global Talent Competitiveness Index) is to benchmark countries efforts to grow, attract and retain talents (both GKS and VTS) required by their specific social and economic needs, with the following three main objectives in mind: (1) encourage and foster action by public and private decision makers, (2) provide tools for direct cooperation between government, industry and academia around the concept of 'employable skills' in particular, and (3) monitor efforts made in all parts of the world regarding talent policies, and keep track of best practices and results.

Four key messages and implications include: (1) talent is a fluid resource (requires an open mind to comprehend); (2) talent is not an end in itself: we need to aim for employable skills; (3) go beyond formal education: skills in formal education will not be given for life; (4) technology affects all segments: all will be subject to competition from machines.

WHAT EUROPE CAN DO TO FOSTER THE DEVELOPMENT OF KETS SKILLS: RECOMMENDATIONS OF HIGH LEVEL GROUP ON KEY ENABLING TECHNOLOGIES

Prof. em. Roger De Keersmaecker (IMEC, Co-chair of Working Group on KETs skills and education)

Prof. De Keersmaecker pointed out that the High-Level Group on KETs has proposed in its Final Report a set of measures in order to boost the development of skills essential for Europe's economic growth. The education and skills development ecosystem requires an active interplay - of the European Commission, the Member States and Regions and their education providers and Industry - and measures addressing each of these key stakeholders.

Key tasks for the European Commission are to (1) raise awareness and appreciation of KETs in society; (2) stimulate & fund partnerships between companies and education providers; (3) incentivise excellence in teaching; and (4) provide seed funding & guidance for apprenticeships & dual-learning.

Key tasks for the Member States and Regions and education providers are to (1) encourage dialogue with youngsters with regards to societal challenges and the role of KETs; (2) update skills of teaching staff with support of industry; (3) change the learning environments, promote innovation in teaching and adapt curricula; (4) and rethink workers' lifetime education. Key tasks for Industry are to (1) engage in partnerships with the education providers; (2) rethink the hiring practices and invest more actively in (re)training programs; (3) integrate skills development in KETs pilot lines; and (4) develop transferable talents especially of the workforce with intermediate-level skills.

SKILLS THAT EMPLOYERS NEED FROM KETS WORKERS

KETS SKILLS INITIATIVE: KEY SKILL REQUIREMENTS FOR KETS AND KEY AREAS OF MISMATCH

Dr. Kristina Dervojeda (Senior Manager, PwC Innovation Research Centre)

Dr. Dervojeda presented the results of the analytical work on skill requirements for KETs within the KETs Skills Initiative. Specific knowledge and skill requirements for KETs vary depending on KET, industry/application area, specific job profile and the employer. KETs rely on a balance of both technical and non-technical competences. Technical competences can be considered the 'heaviest' category in terms of required knowledge and skills due to a highly knowledge-intensive nature of KETs. Other relevant but non-technical competences include quality, risk & safety; management & entrepreneurship; communication; innovation and emotional intelligence. A high diversity in skill requirements for KETs can never be covered by a single person or even a company. 'Smart' combinations of people with diverse profiles are needed, with many of them coming from domains not directly related to KETs. Besides individual competences, KETs also heavily rely on collective competences. Rather than some particular competences, it is a combination of the previously mentioned individual and collective competences, linked to an endless number of potential application areas, what makes KETs skill requirements unique. KETs commercialisation trajectories are linked to knowledge and skills from literally every field of life.

INSIGHTS FROM MICRO-/NANOELECTRONICS

Prof. Rudy Lauwereins (Vice-president, IMEC)

Prof. Lauwereins presented the results of the survey among directors leading large nano-electronics teams about their needs to solve the competence gap. The nano-electronics domain evolves faster than any other field and, in addition, becomes quickly more multidisciplinary in nature. This makes hiring, fast on-boarding and sustained deployment a serious challenge. All researchers occasionally get in contact with customers and therefore require business skills. Management skills need to be strengthened; this is something that is observed in all sorts of companies. There is insufficient attention for retraining people in highly capital-intensive environments. Hands-on training on the expensive equipment is highly challenging. New educational methods need to be developed for the capital-intensive environments. The USA and Canada lead in this regard. Organisations like IMEC need specific courses, because the engineering courses are too general to be able to handle highly specialised environments, like micro-/nanoelectronics. Prof. Lauwereins proposed to initiate an Erasmus programme for industry workers. KETs workers need to go to universities and research institutes, to explain how the industry works. Blue collar workers in KETs are often recruited locally and need additional specific training. Awareness of STEM should be increased by mass deploying STEM exercises in schools, promoting the image of engineers as people that fuel growth, and making people aware of companies like IMEC.

INSIGHTS FROM ADVANCED MANUFACTURING

Rob Hartman (Director Strategic Technology Program, ASML)

Mr. Hartman started the presentation by providing a brief introduction to ASML. With average price of machines being 100 million EUR, hands-on training can be a challenge. ASML applies open innovation from design to manufacturing in a swarm. ASML has an account manager to manage all the workers at supplier-side companies, working on behalf of the company. ASML has a highly diverse worker base in terms of nationalities. For the sustainability of the system, it is questionable whether it is good that many ASML workers originate from various countries. ASML has a somewhat liberal structure aiming at not limiting people too much in their creativity. ASML workers have to be able to work with internal team members, and co-inventors from the side of suppliers. ASML focuses on the retention of its workers, due to the high investment in people. It is key to maintain the attractiveness of the company for employees; otherwise the investment will be lost.

INSIGHTS FROM INDUSTRIAL BIOTECHNOLOGY

Mr. Carlos Freixas (Director of Marketing, Roche Diagnostics)

Mr. Freixas started the presentation with a brief introduction to Roche. Competences coming from STEM are not sufficient. It requires STEAM, with Arts included, which refers to creativity that can lead to innovations. Arts and creativity should not be forgotten. Some Asian countries and the United States are more advanced when it comes to the inclusion of creativity in STEM areas. Research fellows in Europe are less oriented to business than those in the United States. Universities should foster business skills also in the training curricula. Due to the complexity of skills, people working in KETs need a deep sense of team work and other soft skills to ensure success. The willingness of scientists to share their knowledge is crucial, but not easy, based on the nature of their competitive work for publishing earlier than any peers. Furthermore, KETs companies have to deal with more and more compliance rules and standards. Policy makers should explore ways to make this compliance easier for KETs workers. High unemployment in South European countries allowed Roche to attract good people to work as project managers in Roche's more Northern R&D locations.

INSIGHTS FROM A NON-MANUFACTURING WORLD OF KETS

Prof. Ian Phillips (Principal Staff Engineer, ARM)

Prof. Philips started his presentation by explaining the essence of the non-manufacturing world of KETs, and specifically the nature of business of ARM. Currently ARM does not have recruitment challenges, because it is a global operator and has a good image. However, it may become challenging in the future. ARM does not need large numbers of engineers and scientists, but it does need the best people with a wide range of STEM skills and backgrounds. ARM expects to develop and train its workers through their professional lives with the company. While its largest operations are in Europe, recruits do not have to come from Europe. For ARM, acquisition, as a form of acquiring new talent, proves to be more effective than traditional recruitment, as groups of acquired workers are already able to work together and perform from day one. No educational institute can produce engineers or scientists, but can only produce people able to become a scientist/ engineer. Governments have to encourage and support intellectual elitism. This would benefit the supply of KETs skilled workers.

DEMAND AND SUPPLY OF KETS SKILLS AND FORECASTS TILL 2025

OUTCOME OF KETS SKILLS INITIATIVE

Mark Lengton (Quantitative Analysis Expert, PwC Innovation Research Centre)

Mr. Lengton presented the results of the analysis of the demand and supply of KETs skills from a quantitative perspective. He provided a snapshot of the current situation and an estimate of the future developments. Between 2013 and 2025, an additional 953,000 to 2,991,000 KETs professionals are needed to satisfy demand, depending on how the field develops. On average, there will be an additional demand of 79,000 to 249,000 KETs workers per year up till 2025. Most of these jobs require high skills (62%), followed by medium skills (30%) and low skills (8%). This demand is created both by the retirement of professionals working in KETs (replacement demand) and by new positions in KETs (expansion demand). Data shows potential for a skills gap, both for high and medium skills. There is a potential gap of approx. 21,000 – 83,000 per year for high skills and approx. 10,000 – 44,000 per year for medium skills, depending on how the field develops. This is under the assumption that KETs will continue to grow in significance relative to the STEM occupational fields. There is also a potential for a surplus (if KETs do not continue to grow in significance in the STEM fields) of approx. 12,000 –37,000 per year for high skills and approx. 15,000 – 28,000 per year for medium skills.

PANEL DISCUSSION: IS THERE REALLY A SHORTAGE OF KETS GRADUATES AND WORKERS IN EUROPE? STATEMENTS AND EXPERIENCES FROM STAKEHOLDERS

Chairman: Prof. em. Roger De Keersmaecker (IMEC, Co-chair of Working Group on KETs skills and education)

Panellists:

- *Dr. Bernd Dworschak (Senior Researcher, Fraunhofer IAO)*
- *Carlos Lee (EPIC - European Photonics Industry Consortium)*
- *Filip Geerts (Director General, CECIMO - European Association of the Machine Tool Industries)*
- *Dr. Laurent Zibell (industriAll)*
- *Oana Radu (Project Officer, DG CONNECT, European Commission)*
- *Zeljko Pazin (EFFRA - European Factories of the Future Research Association)*

Key statements made during the panel discussion:

- Typical characteristics of KETs-related students are that they are intrinsically motivated, curious, confident, persistent, patient, fascinated by the subject (Oana Radu).
- We need people who can work with multiple technical fields simultaneously. Both technical and soft skills are of high importance here (Filip Geerts).
- There is no real shortage of KETs graduates/workers in Germany (Dr. Bernd Dworschak).
- Also in photonics, skill shortage does not represent a significant challenge (Carlos Lee).
- Retraining of people from other sectors is a key source for upgraded skills and people for KETs. There are massive shifts between ICT and related sectors. The preferred way to organise this migration is by involving the social partners through a structured dialogue with trade unions and employers' associations (Dr. Laurent Zibell).
- Measures are needed to encourage universities to become more active in mobility of students (Carlos Lee).
- There is a need to identify best practices and apply them on a broader scale (Zeljko Pazin).

GOOD PRACTICES FROM EUROPE AND OTHER PARTS OF THE WORLD

Diederik Verzijl (Senior Expert, PwC Innovation Research Centre)

Mr. Diederik Verzijl addressed the issue of how KETs skills-related challenges are currently being tackled worldwide. Key good practices are typically found in Western Europe, East Asia, and the United States; focus either on multi-KETs, nanotechnology, or photonics; demonstrate a clear difference in focus areas across world regions; have clear underlying mechanisms which can be learned from. Attention is paid especially to challenges that relate to the need for regular re-training of current employees, to educational programmes not being fully aligned with industry needs, and to the limited opportunities to study KETs. The analysed world regions demonstrate a clear difference in focus areas when it comes to tackling specific challenges.

KETS skills initiatives in the United States typically are heavily funded at the Federal level, or feature capital intensive research and education facilities that are managed by university networks or industry-academia partnerships. Key good practices in East Asia typically focus on upskilling the national KETs labour force, either through sourcing talent from abroad or, more common, investing heavily in KETs skills amongst domestic workers. Key initiatives in Europe are typically propelled by government, and implemented in collaboration with educational institutions. These initiatives most often target higher education students and PhD students, and focus on increasing both the possibilities and the appeal of studying KETs, and on aligning educational tracks with industry needs.

GIANT ALLIANCE

Dr. Francine Papillon (Coordinator Minatec)

Dr. Papillon presented how Grenoble Institute for Advanced New Technologies creates the link between Industry and Education in Nanotechnologies. Grenoble has long been famous for Science and Innovation and its historical high-tech industrial area. With a vast research infrastructures including European large instruments (ESRF, ILL, EMBL), basic and applied research laboratories (CNRS and CEA) and academic partners (GEM, UJF, INP), the GIANT alliance aims to contribute to tackling the key challenges facing society in the fields of information technology (MINATEC), new low carbon energies (GreEN) and life Science (NanoBio). Companies, researchers and students work together closely to accelerate the development of innovative technologies and their transfer to the industrial sector. As a result of an ambitious science and technology program and cooperative projects between GIANT partners, several initiatives were presented to illustrate how GIANT facilitates the link between industry and education in nanotechnologies.

1ST SUSTAINABLE NANOTECHNOLOGY SCHOOL

Prof. Antonio Marcomini (Università Ca' Foscari Venezia)

Prof. Marcomini provided insights into the key aspects of the 1st Sustainable Nanotechnology School, an initiative by the University of Venice. Uncertainties around the Environmental, Health and Safety (EHS) risks of manufactured nanomaterials (MN) are raising societal concerns that can block the benefits from nanotechnology. Scientific and policy analysis on EHS implications of nanotechnologies is needed to protect innovation. There is a need to train a new generation of creative, entrepreneurial and innovative Early Stage Researchers (ESRs) and professionals able to: face the current challenges in NanoSafety research; convert the resulting multidisciplinary knowledge and ideas into products and services for economic and social benefit (from nano-safety to nano-sustainability). These researchers and professionals should be able to continue and consolidate their professional careers (across the academic or non-academic sectors) as experts in nanoEHS. The 1st Sustainable Nanotechnology School (1 week full immersion school), following four editions of Nanosafety School, was developed to cope with the following objectives: to train a critical mass of ESRs and professionals in scientific, technical and transferable skills related to nanotechnology R&D across different sectors and scientific disciplines; to develop original expertise in a variety of research areas related to EHS and innovation through integrated and comprehensive training; to transfer state of the art knowledge from established experts to the new generation nanoEHS professionals; to help develop a new professional profile (i.e. nanoEHS expert); and to contribute to strengthening the EU innovation capacity.

EUROPEANS@SIEMENS: WORK-BASED EDUCATION MODELS, THE DIGITAL TRANSFORMATION, AND EMPLOYABILITY

Dr. Juergen Siebel (Human Resources, Siemens AG)

Dr. Siebel started by stating that digital transformation implies challenges that require specific hard and soft skills, in order to keep Europe competitive. Future jobs will be less Tayloristic and more integrated across value chains – the required skill sets will therefore be more horizontal and more holistic. Learning of digital skills will not happen online entirely, because practical experience in the workplace cannot be virtualised. The duality of theory taught in classrooms and applied learning in the workplace that has made the German, Swiss and Austrian vocational education models famous can provide guidance for education reform elsewhere. Dual education delivers employability, the precursor for employment itself, and can be applied beyond the vocational level, too. It also works outside its traditional markets. The international apprenticeship program "Europeans@Siemens" proves that dual education is attractive for currently 88 young learners from 18 EU Member States. Such schemes should be made available in their home countries too, to save costs. With increase in investment in dual education, companies will have access to a great talent pool, learners will earn while they learn and will learn relevant skills, and society will attract more investments. These three beneficiaries still need to be convinced of the benefits of this approach.

TACKLING KETS SKILLS CHALLENGES TOGETHER: THE WAY FORWARD

OUTCOME OF KETS SKILLS INITIATIVE

Dr. Kristina Dervojeda (Senior Manager, PwC Innovation Research Centre)

Dr. Dervojeda presented the key highlights of the Vision Paper document. She sketched the overall vision on skills for KETs in Europe, and addressed specific measures within the key directions for action regarding both qualitative and quantitative KETs skills-related challenges. For Europe to be able to fully realise KETs growth potential in the future, there is a need to align the supply and demand of KETs skills. The development and maintenance of KETs skills in Europe is a complex multi-faceted challenge that requires a complex solution. This complex solution consists of various clusters of measures each targeted at specific aspects of the overall challenge. Key directions for action regarding both qualitative and quantitative KETs skills-related challenges include: (1) ensuring a good alignment of educational programmes with industry needs (quality); (2) facilitating regular (re-)training of current employees (quality); (3) raising awareness about KETs in the society (quantity); and (4) improving the image of KETs as a field to work in (quantity). Priorities can be set within the list of the identified measures for each direction. Measures that, based on PwC analysis and stakeholder feedback, were suggested to be the most crucial areas for action in order to create a European-scale impact are: embedding technical multidisciplinarity in the curriculum; embedding non-technical courses in technical curricula; updating the skills of teachers/professors; promoting innovation in teaching; and developing a targeted communication strategy to increase awareness on KETs and improve their image.

PANEL DISCUSSION: PLANS AND STATEMENTS FROM DIFFERENT MEMBER STATES

Chairman: Elco Rouwmaat, Expert, PwC Innovation Research Centre

Panellists:

- *France: Dr. Francine Papillon, Coordinator, Minatec*
- *Germany: Frank Bösenberg, Cluster Manager, Silicon Saxony*
- *United Kingdom: Derek Boyd, CEO, NMI*

The sectoral pilot aimed to apply the main priority recommendations from the Vision Paper to the context of the three selected MS (France, Germany, and the United Kingdom), and to develop tailor-made action plans for these MS. Based on this exercise, PwC aimed to identify next steps and initiate action within these leading European MS in a selected KET (micro-/nanoelectronics).

Dr. Papillon highlighted some of the key challenges experienced in the Grenoble microelectronics cluster, and several specificities French companies are facing due to specific laws. Mr. Frank Bösenberg highlighted some of the key challenges experienced in the Saxony microelectronics cluster. In addition, he addressed several challenges that Germany faces due to the German educational system being organised on a Bundesländer level. Mr. Derek Boyd presented the key findings that were discussed during the workshop at Renishaw's site in Charfield. In addition, he highlighted the UK government's efforts of introducing a graduate level apprenticeship, to attract more students to technical fields of study and make them more relevant to companies.

DAY 2: e-LEADERSHIP FOR THE DIGITAL TRANSFORMATION OF THE EUROPEAN ECONOMY

SUMMARY AND CONCLUSIONS FROM DAY 2

This report summarises the key outputs of DAY 2 of the First European Conference on Digital and Key Enabling Technologies (KETs) skills that was held in Brussels on 2 June 2015. DAY 2 of the conference was organised in the context of the European e-Leadership initiative, carried out by empirica for DG GROWTH of the European Commission.

The conference aimed to become an interactive platform for exchanging opinions and co-creating solutions on the skill issues in KETs and ICT and to bring together the representatives of all key stakeholder groups. On DAY 2, the e-Leadership initiative:

- Shared the latest forecasts on the demand and supply of e-leadership skills;
- Presented the e-Leadership Scoreboard for all 28 EU Member States and best practices;
- Presented the European higher and executive education landscape in the field of e-leadership;
- Discussed about new education and training opportunities and concrete policy recommendations.

The analysis of e-leadership skills requirements and education and training provision showed that Europe is facing:

- Insufficient supply of suitable graduates from higher education with the potential for e-leadership:
    - Universities concentrate on initial education in most countries
    - Professional education at academic level is relegated to business schools
    - Executive education is (too) expensive
    - and not seen as the natural choice of small or young enterprises
- None of the more than 500 selected combined business and ICT programmes from higher and executive education institutions were found to fulfil all e-leadership criteria (combination of high level IT, business and leadership skills, start-up or SME focussed, targeting innovation or transformation, for experienced professionals and managers, not career start). However, exceptions are starting to emerge with the modular offers at some Universities, including some newly developed courses at New Bulgarian University, Aarhus University, Henley Business School, IE Business School and Antwerp School of Management, all of which are currently in their demonstration and validation phase but whether there are opportunities for Higher Education and what these could be still need to be explored
- Other actors – including the 'more natural' suppliers of SME training also still need to develop suitable training offers and programmes when it comes to e-leadership and at the conference some of the new and innovative players in the digital skills and transformation training market presented their approach, programmes and courses which appear to be promising.
- MOOCs could theoretically contribute to e-leadership skills development at a large scale but at present only a good range of offers for mainstream and technical topics could be identified
- Again, the opportunities for the other training providers and MOOC players are not yet fully explored

The analysis of e-leadership related policies and initiatives showed that Europe is faced with:

- A variety of policies and initiatives of different type, size and depth throughout Europe with a relationship to e-leadership skills but also
- Significant differences in maturity of policy practice across the different EU Member States
- The details on a country-by-country level together with the results from an e-leadership scoreboard for each country and examples of relevant higher education and training offers can be obtained from the EU28 Country Reports: http://leadership2015.eu/documents/

The analysis of demand and supply of e-skills and e-leadership skills suggested that the:

- Structural changes in the ICT workforce in recent years are expected to continue
- Forecast sees a growing number of potential vacancies in highest skills areas.

- European Commission and Member State efforts are paying off: ICT workforce supply is improving, however there is an increasing mismatch with the risk of unemployment of practitioners with outdated skills and a growing number of potential vacancies for specialist and advanced skills
- Demography requires much stronger reliance on re-training and professional education and attracting foreign talent
- Europe is faced with the need for improving highest skills level education (qualitatively and quantitatively)
- Growing trend towards more e-Leadership skilled employment and need for better education and training

With respect to e-leadership skills it became apparent that:

- e-Leadership skills are acquired by a mix of work experience, education and training and that these are key levers for supply side measures
- there is an urgent need for improving e-Leadership skills talent pool(qualitatively and quantitatively)
- Demand side measures could consist in fostering entrepreneurship culture, better infrastructures and innovative digital and high-tech clusters
- Some countries can serve as role models for others.

The analysis of good practice examples showed how important specific e-leadership skill sets are for successfully starting, growing and running companies and that these differ depending on the life cycle stage of companies but are crucial for survival, growth and innovation. Industry stakeholders confirmed and reinforced the need for e-leadership talent and skills development and presented some corporate strategies and success factors to develop and retain these capabilities. Universities and Business Schools presented newly developed and demonstrated programmes that tackle the need for SME training in e-Leadership. These are based on a solid and empirical stock-taking of SME requirements for learning formats and outcomes.

Key directions for action regarding both qualitative and quantitative e-Leadership skills-related challenges include:

- The urgent need for new training offers to foster e-leadership skills development for SMEs and start-ups
- Traditional higher and executive education institutions to 'disrupt' themselves and explore the opportunities and develop and experiment with new training formats more geared to a more flexible 'tapas bar' (or 'boutique learner') approach instead of a traditional and not very flexible 'set menu' approach prevalent in other institutions offering traditional Bachelor and Master programmes, which are sometimes slightly outdated and not aimed at teaching precisely for industry demands
- The emergence of new training opportunities for traditional and new players in the market with markets opening up for traditional SME consultants, training institutions of SME and start-up associations but also traditional higher and executive education institutions willing and able to move away from traditional teaching formats and widening the scope of their (further) training activities
- With the inclusion of MOOCs as accompanying means for teaching specific subjects and also allowing for more easily scaling up training activities.

The audience was asked to select and prioritise key priority actions. The results of this consultation are the following key actions to be further pursued (list of actions according to priorities given by stakeholders and experts):

1. Maintenance and promotion of pan-European guidelines for new curricula for e-leadership skills and encouraging the development of new courses (including MOOCs)
2. Mobilisation of stakeholders to foster promotion, governance and cooperation activities on e-leadership in synergy with the "e-Skills for Jobs" campaign and the future initiatives on skills and training
3. Development of a comprehensive agenda on e-leadership at EU and national level for digital and key enabling technologies (KETs) including all relevant policy initiatives (e.g. digital education, entrepreneurship etc.)
4. Analysis of labour market disruptions at EU and national level and the specific requirements for e-leadership skills in Europe (2016-2020) taking into account the increasing world-wide competition for talent

5. Market and business watch including statistics and forecasts (2016-2020) concerning the supply and demand of e-leadership skills in Europe and the benchmarks of Member States policy initiatives to identify good practices

WELCOME AND INTRODUCTION

Chairperson: Jan Muehlfeit, Global Strategist | Coach | Mentor

EUROPEAN COMMISSION POLICIES AND INITIATIVES ON E-LEADERSHIP

Kirsi Ekroth-Manssila, Head of the "KETs, Digital Manufacturing and Interoperability", European Commission's DG for Internal Market, Industry, Entrepreneurship and SMEs

Kirsi Ekroth-Manssila welcomed the expected synergies between e-skills and digital initiatives (e-leadership and ICT professionalism activities) with those related to KETs and advanced manufacturing. These should constitute an important component of the new skills and training initiatives which have been mentioned in the Digital Single Market strategy adopted by the European Commission on 6th May 2015. Less than 2% of European enterprises are taking full advantage of the new wave of advanced digital technologies, such as mobile communications, social media, cloud computing, big data analytics, and the Internet of Things. 41% of all EU companies do not use any of them. The Digital Single Market strategy is a significant step towards the digital transformation of European organisations. It is estimated that 75% of the benefits of the digital economy would come from increased productivity, competitiveness and job-creating ability of Europe's existing industry and enterprises, including social enterprises. While the creation of new digital start-ups is important, the biggest digital opportunity for Europe is in the digital transformation of the existing industry and enterprises.

The European Commission will support Member States' efforts and will play its role in enhancing the recognition of digital skills and qualifications and increasing the level of ICT professionalism in Europe. The Commission also will address digital skills and expertise as a key component of its future initiatives on skills and training and will further promote ICT professionalism in Europe. A new initiative will be launched in September to develop with stakeholders a comprehensive European Framework for ICT Professionalism and a new initiative on e-leadership skills will also be launched this September. Kirsi Ekroth-Manssila emphasised the Commission would listen to participants' views and recommendations and she is very grateful that so many stakeholders came together to produce a "Call for Action" to promote e-Leadership in Europe.

KEYNOTE SPEECHES

e-LEADERSHIP: VIEWS FROM A DEMAND PERSPECTIVE

Charlotte Holloway, Head of Policy, TechUK

Charlotte Holloway contributed views from a demand perspective, representing TechUK, the UK's association of IT, telecommunications and electronics companies. There are immediate skills gaps as well as longer term tech talent pipeline issues to be addressed in the UK. Overall access to digital skills and talent is a constant challenge for UK firms and European Commission research suggests that the skills gap is larger in the UK than anywhere else in the EU. Research from e-Skills UK shows that 120,000 new recruits a year are needed for IT specialist jobs in the UK, while Baroness Martha Lane-Fox states that 1 million new tech jobs will be created by 2020.

Specific shortages concern Big Data analysts, scientists, visualisations, Cyber security, Development and programming, while cross cutting shortage issues concern that digital skills needs are pertinent across all sectors, Cluster development across the UK should be fostered, gender representation be balanced, more emphasis be put on the creative application of digital skills. Skills needs of scale-ups and SMEs need to be addressed and tech education be made more appealing for youngsters.

The TechUK manifesto calls for leadership across government and industry to invest in the innovation capacity, to drive public sector transformation and invest in both security and inclusiveness. Concerted effort is required at every level of the education system and also within industry. Improving the quality and volume of STEM teaching in schools is a high priority. Charlotte recognised that good progress has been made with an increase in the number of students taking STEM subjects to A-level this year and that the new UK computing curriculum is a much needed addition, although there are significant concerns that schools are currently under-resourced to teach the curriculum effectively.

Gender imbalance remains a pervasive issue throughout the education system and within the IT workforce. Only 16% of the UK's IT specialists are female. Concerted action is required at every stage in the education and career development process, with industry taking the lead on ensuring that the sector is open and attractive to all. £27.5m Tech Partnership launched by industry and Government -delivering greater coherence to existing apprenticeship schemes and making this route far more attractive to talented young people. A smart migration policy should be implemented for the UK to be a global hub for talent. TechUK has functioned as leader of UK operations of the EU e-Skills for Jobs campaign and staged many relevant events.

AGILE LEADERSHIP: FIVE IMPERATIVES FOR NAVIGATING DIGITAL

Philippe Trichet, Digital Expert Director, The Boston Consulting Group, Paris

Philippe Trichet spoke about Agile Leadership: Five Imperatives for Navigating Digital. The pace of disruption has exponentially increased. Digital is everywhere in business, in products, processes and the business model. Philippe Trichet gave two examples for the banking and the automotive industry. Digital innovation can take the form of IT consumerisation, continuous improvement or game changing disruption.

Five priorities for the C-suite follow: an agile approach to strategy, digitization of the core business, disrupting one's business before others do, creating value from data and defining one's role in the broader ecosystem.

An agile strategy uses rapid prototyping for products and approaches and tests them continuously. Digital transformation of the core business must be truly customer centric and builds on agile ideation & prototyping, Quick deployment & integration, and Adoption & value realization through user change management. Disrupting one's own business requires new practices, namely rapid experimentation, low capital investment - buy (vs. build) and customise, no rules of competition, all segments to be on the market from day one and months rather than years of development.

Data is integral to value creation. Trichet presented exemplarily how data can add value from product development to asset management in the financial industry.

E-LEADERSHIP IN PRACTICE

SKILLS AND e-LEADERSHIP SKILLS REQUIRED TO RUN A GLOBAL BUSINESS

Veerle Lozie, Global IT and Operations Manager at Melexis, CIO of the Year in Belgium 2014

Veerle Lozie presented the example of Melexis which provides innovative micro-electronics solutions for the auto-motive industry. Talent sourcing, talent development and talent retention are particularly important. Melexis fosters this by emphasizing a strong set of corporate values, by focusing on aligning all employees to a common goal and by building engagement capital. Employees need to develop intrinsic motivation to be self-determined for the goals of the company. Two goals were presented as complimentary, in a yin and yang fashion: Creative Innovation and Lean Quality.

SECONDARY TICKET MARKET PLATFORM TICKETBIS – AN ENTREPRENEURSHIP SUCCESS STORY

Ander Michelena, CEO Ticketbis 2014

Ander Michelena presented the case of Ticketbis, a company that he co-founded in 2009, with his partner Jon Uriarte. Ticketbis is a marketplace where fans can buy or sell tickets in a secure and safe way. Five years later, Ticketbis is the leading secondary ticketing platform in South Europe, Latin America and Asia with presence in 30+ countries and over 350 employees in 14 offices around the world with revenues of EUR 53m in 2014. Skills that proved important in securing the success of Ticketbis were described as relying on an "A-class" and experienced key management team (e.g. CTO of 10+ years' experience, several managers who previously worked at competitors, etc.). The two founders have 10 years of combined experience in investment banking, which turned out to be a huge help to raise money and had the advantage of being experienced in executing fast, good at analysing the market and the competitors and that the finance bit of the business was covered.

But the real success according to Michelena was the skill "to recognize what we were lacking and the skills to hire the right team" to bring knowledge of the ticketing industry, online marketing experience, e-commerce experience. Other skills such as leadership, team management, etc. were learned on the job over the past 5 years. The main e-commerce skills needed included online marketing, interactive design, data scientist skills, UX specialist knowledge and programming skills. However, most of this set of skills is not even offered at schools and universities.

For some skills such as programming, Michelena stated that even though there is an entire 4 years career, students come out of it with the same practical knowledge that a non-university graduate will get in less than 3 months. Ticketbis therefore focuses hugely on training mainly in the first year but also during the entire work live.

THE SKILLS NEEDED BY INDIVIDUALS TO BECOME A DIGITAL ENTREPRENEUR / START-UP – THE VIEW OF A VENTURE CAPITALIST

Daniel Jarjoura, Managing Director, Startup42

Daniel Jarjoura talked about the skills needed to become a Digital Entrepreneur. He was asked to present skills that make the difference to be a successful entrepreneur. Important skills could be a combination of a number of the following list of skills: Software programming, UX Design, Lean Startup + Continuous Deployment, Metrics Framework + Continuous Testing, Building Functional Prototypes, Customer Acquisition, Design Thinking, Creative Problem Solving, Fundraising and Pitching. Instead of skills, Daniel stated that it is predominantly attitudes that make the difference.

WORKFORCE DEMAND AND SUPPLY TRENDS AND FORECASTS (2015-2020)

Tobias Hüsing, Senior Research Consultant, empirica GmbH

The ICT workforce in the EU keeps growing, growth between 2012 and 2014 had been 130,000 in the core definition and 210,000 in the broader definition. The workforce today consists of at 4.75m (core) or 7.53m (broad) workers, respectively. Between 2011 and 2014 we saw an increase of the sum total by 260,000 or 3.5%. However, comparing the composition of the 2014 workforce with the data for 2011, it becomes apparent that there are substantial structural shifts going on. In the highest skills category we see an increase by 34%. This is made up of ICT managers, architects and analysts. It is the category that probably has the largest overlap with the e-leadership definition. But also core ICT practitioners have seen an increase, by 9% at the professional level, and 7% at the technician level. On the other hand there has been a decline in other ICT jobs that are not core ICT, such as telecoms engineers, IT sales professionals, but also more industry specific technicians such as process control, air traffic, health sector, or broadcasting. The massive shifts are visible in the numbers of jobs but it is not clear to what extent job holders have been affected by these changes, i.e. how many have employees changed from a declining job into a job more in demand, and how many have not managed this. It is clear however, that it will not be possible without any rising in the unemployment figures. It is important to note, that ICT professionals do not in the majority work in the ICT sector, but about half and half work in and outside it.

There are considerable country differences as to the segmentation of national ICT workforces. Countries like the Netherlands, Finland and the UK have the most mature ICT workforce in terms of those skills that have seen an increase in deployment. Comparing long term dynamics and today's share of ICT workers, there are very different dynamics between countries. Among countries with a large share of ICT workers in the economy there are dynamic countries (Estonia, Luxemburg, Ireland, UK and Finland) as well as countries where the IT workforce does not grow very fast any more (Netherland, Sweden, Denmark). Among countries with a smaller share of ICT in their workforce, there are dynamic countries as well, which can be expected to catch up in terms of restructuring their economy: Poland, Bulgaria, Romania, Portugal, Slovakia and the Czech Republic. Countries that are struggling to catch up are Greece, Lithuania, Latvia, France and Slovenia. But also countries like Italy and Germany have not been very dynamic in the past ten years. The workforce in Europe is projected to grow to almost 8 million by 2020 (based on 2013 data), while there will be a potential to add even 825,000 more jobs, which will not be filled due to undersupply. However, recent data shows that supply is improving and more jobs were generated recently than had been anticipated, which may be an indication for policy efforts to be successful. Structural changes in workforce in recent years are expected to continue and forecasts see a growing number of potential vacancies in highest skills areas. There will increasingly be problem of mismatch between supply and demand. This is expected to take the form of unemployment of practitioners with outdated skills at the same time as there being a growing number of potential vacancies (up to 10%) for specialist and advanced skills. Together with the known demographic challenges, Europe is required to much stronger rely on re-training and professional education and attracting foreign talent if it wants to meet the urgent need for need for improving especially the highest skills level education (qualitatively and quantitatively).

Regarding e-Leadership skills, quantification approaches were presented. Using survey results, Tobias Hüsing quantified the number of e-Leaders in Europe to be in the range of 620,000-875,000 in 2015. From 2015 to 2020 at an assumed growth of 4.6% and given the lower bound of the range, there will be a need for 156,000 new e-Leaders (expansion demand), plus a replacement demand of about 100,000, so a total need for new e-Leaders in the order of magnitude of 250,000, or 50,000 per year. There is thus a necessity to "create" 250,000 practitioners and managers with e-Leadership skills through work experience, training and education. The question was put whether and how the education system can support the business sector to produce 50,000 e-Leadership skilled people per year. An e-Leadership Scoreboard benchmarking national e-Leadership systems was introduced and results presented. Finland, UK and Ireland were found to be best positioned in terms of their national e-Leadership ecosystems.

e-LEADERSHIP EDUCATION AND TRAINING, POLICIES AND INITIATIVES IN THE EU28 COUNTRIES

Werner B. Korte, Director, empirica GmbH

Werner B. Korte, director of empirica then gave an overview of the huge differences between the European countries when it comes to policies and initiatives relating to e-leadership and digital entrepreneurship. Using a newly developed e-leadership scoreboard he illustrated further differences among the European countries in e-leadership demand and supply aspects. Finally and when describing the education and training landscape on e-leadership he concluded with the urgent need of action to be taken by key stakeholders in basically all countries to develop programmes that can help and enable individuals to obtain the necessary skills needed.

THE PERSPECTIVE OF A GLOBAL IT AND SERVICES COMPANY

Gary Kildare, Chief HR Officer, IBM Corporation Europe, Madrid

Gary Kildare gave the perspective of IBM on e-Leadership skills by also highlighting the personal characteristics for employee success in the view of CEOs on the one hand and students on the other which were taken from surveys of 1700 CEOs and 2700 students from universities. What became apparent is that those skills demanded are those close to e-leadership type skills. Communication and collaboration skills rank first followed by flexibility and creativity which also rank top for both target groups while technology savviness only follows on rank 9.

PANEL DISCUSSION: e-LEADERSHIP COALITION OF EUROPEAN REGIONS – SCALING UP EFFORTS AND JOINING FORCES FOR THE FUTURE

Panellists:

- *Erik Neumann, EIT ICT Labs, German government, industry and academia initiative 'Software Campus'*
- *Charlotte Holloway, Head of Policy, TechUK*
- *Alfonso Fuggetta, professor at Politecnico di Milano and CEO at CEFRIEL*
- *Kumardev Chatterjee, Founder and President, EYIF – European Young Innovators Forum*
- *Sebastiano Toffaletti, Secretary General, PIN-SME*
- *Eva Fabry, Director of the European Centre for Women and Technology (ECWT)*

Highlights from relevant national policies, strategies from the UK and Italy and multi-stakeholder partnerships like the Software Campus in Germany where presented and discussed in the first expert panel which could feature as best practice examples for developing, implementing and scaling up relevant initiatives towards e-leadership coalitions at national and European level.

These were followed by the views of key stakeholders on the need to also address the start-up and SME perspective and not to forget about the mostly untapped resource of women in these efforts to achieve a maximum in terms of achievements and benefit to create the necessary skills of the largest possible number of individuals to make Europe more innovative and competitive and create the necessary skilled jobs and professions to make this happen.

GOOD PRACTICE FROM e-LEADERSHIP TRAINING PROGRAMMES

STRATEGIES FOR DIGITAL LEADERSHIP - A HENLEY HIGH PERFORMANCE SME PROGRAMME

Prof. Kecheng Liu; Dr Maksim Belitski, Henley Business School, University of Reading (United Kingdom)

Prof. Liu and Dr. Belitski presented the SME programme at Henley Business School. Henley is currently developing a MOOC on e-leadership for SMEs for which a trailer was presented. Henley also carried out a one day workshop with SMEs on the topic of e-Leadership Skills for SMEs and the Executive Education programme on e-Leadership was presented. Henley wants to open doors for SMEs and offers them relevant services through support and continuity, community building and capacity building. Topics for SME courses are about increasing turnover with effective e-leadership strategies, enhancing business performance through system integration and design, actively engaging with stakeholders in the growth agenda, designing effective e-commerce strategies, leading creative teams and building an innovative working environment which requires clearly identify roles, responsibilities and accountability in management, exploiting digital trends and building efficient e-competences and identifying key technologies and skills needed to exploit them.

E-LEADERSHIP PROGRAMME PORTFOLIO OF IE BUSINESS SCHOOL FOR EXECUTIVES, SMES AND START-UPS

Silvia Leal, Academic Director, IE Business School (Spain)

Silvia Leal presented good practices from e-Leadership training at IE Business School. She started off by stressing the importance of SMEs for the Spanish economy. e-Leadership is taught in several IE programmes including Master programmes: Master in Management (junior), Master in Business Analytics and Big Data, Master in Market Research and Consumer Behaviour, and MBAs. IE staged as a demonstration in the European e-leadership initiative (www.eskills-lead.eu) the one-day event on "Innovacion Digital" which around 25 people attended and which was also broadcasted on the internet and recorded. The event consisted of four hours training and was offered as a course free of charge with a certificate of attendance. Content was very focused on digital trends, the course included roundtables and real experiences and provided networking opportunities.

Another e-Leadership course for SMEs is the programme "PS en Direccion de la Innovacio Digital y Govierno TI" which is currently about to finish. It is a programme that compared to an MBA has a reduced price (25%) consisting of 100 blended academic sessions. 30% of the students are willing to start a business. Around 35% of them are already launching their own business. It has a strong focus on leadership skills and is offered in alliance with CIONET and APMG. For SMEs, it opens the gate to the IE venture lab.

THE PRACTICE OF HIGH GROWTH ENTREPRENEURSHIP

Peter Kelly, Aalto University, Helsinki (Finland)

Peter Kelly challenged the notion that entrepreneurship is predominantly about starting up a business. To him, entrepreneurship is the pursuit of opportunity in resource constrained environments. Entrepreneurship fuelled ventures rarely behave the way they have been planned. Entrepreneurship also has not as much in common with strategy as widely believed, as strategy is about establishing routine responses to challenges, whereas entrepreneurship often demands non-routine responses. Kelly called for more emphasis on intuitive thinking in entrepreneurship and less analytical thinking. The overlap of and the balance between both would be ideal and is also the location of Design Thinking.

Established business centres around low strategic disruptiveness, short payback and large opportunities. Entrepreneurship searches for opportunities somewhat more distant from the centre, such as higher disruptiveness, longer payback terms or smaller opportunities – or combinations of these – as these are usually the places that incumbents avoid.

Creative environments encouraging play, as well as passion and resilience are important ingredients to entrepreneurship and therefore also for e-leadership. Opportunities often come from co-creation and lucky encounters.

EXPERIENCES AND SUCCESSES FROM INTENETACADEMI E-LEADERSHIP AND EMPLOYEMENT COURSES, PROGRAMMES AND CERTIFICATIONS

Rodrigo Miranda Beltrán, ISDI and internetAcademi General Manager

Rodrigo Miranda Beltrán presented internet Academi's e-leadership and digital employment courses. ISDI is an institution created by internet professionals with the objective to accelerate a swift change towards a new, more competitive and efficient digital business model and to maximize the digital potential of individuals, professionals, companies and markets. It is a novel 7 year old, digital Business School with +3.000 students/year in Madrid, Barcelona, México, Lima, Bogotá, and Boston.

In Spain ISDI addresses current challenges: poor digital transformation of SMEs, due to a lack of vision and talent, massive unemployment and a lack of digital talent. Programmes at ISDI are targeting e.g. Digital Marketing, Data Analytics, Mobile App development, e-commerce, e-CRM, Analytics, search engines, content design and UX and social media. Targeted roles include, e.g., Community Manager, Social Media Strategist, SEM Manager,

ACADEMY CUBE – EUROPEAN JOB AND ELEARNING PLATFORM FOR TALENT GENERATION

Bernd Böckenhoff, CEO Academy Cube

Bernd Böckenhoff stated a mismatch between classical education and future industry requirements in areas such as technical s skills (Cloud; Cyber Security, Big Data, Software-defined Networking, Internet of Things) and in 21st Century Skills (Critical thinking, Collaboration, Communication, Creativity, Problem-solving, Business transformation, Change Management). Academy Cube tackles this mismatch through blended learning offers and MOOCs.

In Academy Cube, as a non-for-profit initiative, universities provide content and learner access, Content Providers provide training content, Learners access job offers and develop skills and knowledge. Job Agencies provide talent access and fund content, while Associations provide partner access and Industry Partners post job offers, provide content and fund operations.

Academy Cube, as the hub between these stakeholders provides the technical platform and operates it, manages the content and improves matches between stakeholders.

PANEL DISCUSSION: TOWARDS AN e-LEADERSHIP ECOSYSTEM

Panellists:

- *John Higgins, Secretary General, DIGITALEUROPE*
- *Peter Hagedoorn, Secretary General, EuroCIO*
- *Frits Bussemaker, Partner, CIONET*
- *PIN SME, Bo Sejer Frandsen, CIO IT Forum, Denmark, President PIN-SME*
- *JA Europe, Caroline Jenner, Chief Executive Officer Europe*
- *Cheryl Miller, Executive Director, Digital Leadership Institute*

The industry associations in this expert panel (EuroCIO, CIONET, DIGITALEUROPE and PIN-SME) agreed on the themes to be address urgently which need to include the mapping of existing ICT education to e-CF/ICT profiles, the revision of existing certificates creating European (not national) certificates. In addition the involvement of ICT professionals in further developing ICT profiles (security managers, architects, etc.) and the revision of existing programs was asked for as well as the creation of user (market) - suppliers (education) interactions in improvement programs in parallel to the start of European accreditation and quality systems and register for European ICT professionals (security, architects, etc.). EuroCIO demanded the key stakeholders to soonest agree this needs to be solved and giving a commitment to act and agree on a "minimum" European Governance to solve the issues. Such Governance should be composed of a Board (representing major stakeholders) and a (small) executing organisation with a business and operation plan to be made and agreed upon and a minimal funding and capacity to be secured.

Other panellists brought the SME perspective (PIN-SME) into play and expressed their willingness to join and play an active role in an activity as the one described above. When speaking about their own activities and a serious of global surveys indicating the need for entrepreneurship and digital skill development JA Europe referred to the need of starting already at an early age and to the importance of setting ambitious goals in the education system regarding penetration rates for entrepreneurship education at all levels while DLI presented relevant activities of the Digital Learning Institute and the need to reach out to woman as an untapped resource to help solve this issue.

CONCLUSIONS, NEXT STEPS

Chairperson: Jan Muehlfeit, Global Strategist | Coach | Mentor

The chairperson summarised the key actions for the future and referred to a Call for Action on e-Leadership of key stakeholders throughout Europe asking the audience to select and prioritise key actions either using the paper-based feedback form or an online link for doing this online. He presented the following five key actions which had been developed following a Europe-wide expert consultation process. Participants were invited to rank them and provide their comments.

- Maintenance and promotion of pan-European guidelines for new curricula for e-leadership skills and encouraging the development of new courses (including MOOCs)

- Development of a comprehensive agenda on e-leadership at EU and national level for digital and key enabling technologies (KETs) including all relevant policy initiatives (e.g. digital education, entrepreneurship etc.)

- Analysis of labour market disruptions at EU and national level and the specific requirements for e-leadership skills in Europe (2016-2020) taking into account the increasing world-wide competition for talent

- Market and business watch including statistics and forecasts (2016-2020) concerning the supply and demand of e-leadership skills in Europe and the benchmarks of Member States policy initiatives to identify good practices

- Mobilisation of stakeholders to foster promotion, governance and cooperation activities on e-leadership in synergy with the "e-Skills for Jobs" campaign and the future initiatives on skills and training'.

FEEDBACK FROM THE EVENT

From the analysis of the completed feedback forms it became apparent that the participants highly valued the quality of the event and show an overall satisfaction rate of 88% (4.4 on a scale of max. 5.0).

- The relevance of the concept of e-leadership and the need for e-leadership skills training programmes and curricula were understood and rated very positively by an outstanding 94% (4.7) of the audience.
- The chairpersons' moderation was rated very positively by 90%.
- The two best rated speakers received each 92% positive ratings (4.6).
- The lowest speaker rating is 4.0 which is a very good result showing an appreciation rate of 80%.
- Only the time available for discussion was rated slightly lower than that (78%, 3.9).

More time for interaction and discussion opportunities with the participants and the use of online social media like twitter should be considered for future events.

- The services provided by the organiser, the website, the venue and the materials handed out at the event received a high satisfaction rate of between 89% and 92% (4.4 – 4.6).
- 91% (4.5) stated that the event was worthwhile attending and 92% (4.6) would participate again next time.

- European Conference on Digital and Key Enabling Technologies Skills: http://leadership2015.eu/conference/
- e-Skills for Jobs 2015 high level conference under the Latvian Presidency of the Council of the European Union: http://eskillsforjobs.lv/
- 7 Regional Cluster Events on 'Are you fit for the Digital Economy? Training and Education Pathways for SMEs and Start-ups' in 2015 in Berlin, Madrid, Helsinki, Lisbon, London, Paris, Prague: http://eskills-lead.eu
- 10 Regional Cluster Events on 'New Curricula for e-Leadership - Delivering Skills for an innovative and competitive Europe' in 2014 in Sofia, Reading, Madrid, Milan, Munich, Antwerp, Budapest, Aarhus, Paris and Wroclaw: http://eskills-guide.eu/home
- European e-Skills 2014 Conference: e-Leadership and ICT Professionalism: http://eskills2014conference.eu
- European Guidelines and Quality Labels for new Curricula Fostering e-Leadership Skills: http://eskills-guide.eu/home/
- e-Leadership Skills for Small and Medium Sized Enterprises: http://eskills-lead.eu/home/
- e-Skills: The International Dimension and the Impact of Globalisation: http://www.eskills-international.com/index.html
- European e-leadership skills conference 2013: http://www.insead.edu/events/e-leadership-conference/
- E-Skills for the 21st Century website - DG Enterprise and Industry: http://ec.europa.eu/enterprise/sectors/ict/e-skills/index_en.htm
- Grand Coalition for Digital Jobs website: http://ec.europa.eu/digital-agenda/en/grand-coalition-digital-jobs-0
- European e-Competence Framework (e-CF) website: http://www.ecompetences.eu/
- CEN Workshop on ICT Skills: http://www.cen.eu/CEN/sectors/sectors/isss/activity/Pages/wsict-skills.aspx
- e-Skills for Competitiveness and Innovation: Vision, Roadmap and Foresight Scenarios: http://eskills-vision.eu/home/
- Towards a European Quality label for ICT industry training and certification: http://eskills-quality.eu/home/
- E-Skills: the international dimension and the impact of globalisation: http://www.eskills-international.com/
- European guidelines and quality labels for Curricula for e-leadership skills: http://eskills-guide.eu/home/
- Monitoring and benchmarking e-skills policies and partnerships in Europe: http://eskills-monitor2013.eu/home/
- Fostering the ICT Profession in Europe: http://cepis.org/index.jsp?p=827&n=940
- Professional e-Competence in Europe: http://cepis.org/index.jsp?p=940&n=2406
- Monitoring e-skills demand and supply in Europe: http://www.eskills-monitor.eu/
- Evaluation of the Implementation of the Communication on e-Skills for the 21st Century: http://eskills21.eu/

- High-Level Expert Group on Key Enabling Technologies: http://ec.europa.eu/enterprise/sectors/ict/key_technologies/kets_high_level_group_en.htm
- Status Implementation Report of High-Level Expert Group on Key Enabling Technologies (July 2013): http://ec.europa.eu/enterprise/sectors/ict/files/kets/hlg_ket_status_implementation_report_final_en.pdf
- Memorandum of Understanding between the European Commission and the European Investment Bank in respect of their cooperation in Key Enabling Technologies: http://ec.europa.eu/enterprise/sectors/ict/files/kets/kets__en_memorandum_en.pdf
- KETs Observatory: https://ec.europa.eu/growth/tools-databases/ketsobservatory/
- Cross-sectoral analysis of the impact of international industrial policy on Key Enabling Technologies: http://ec.europa.eu/enterprise/sectors/ict/files/kets/ket-report_en.pdf
- Exchange of good policy practices promoting the industrial uptake and deployment of Key Enabling Technologies: http://ec.europa.eu/enterprise/sectors/ict/files/kets/ex_of_practice_ket_final_report_en.pdf
- The Multi Key Enabling Technologies Pilot lines project: http://www.mkpl.eu/home/
- Identification of skill needs in nanotechnology: http://www.cedefop.europa.eu/files/5170_en.pdf
- Skill Set for the Nanotechnology Workforce Defined by NSF: https://www.nsf.gov/crssprgm/nano/info/EX09_8a.3d_TechnologicalEducationCenterDescriptionbyNACK_2skills.pdf

- Skill needs in emerging technologies: nanotechnology:
  http://www.cedefop.europa.eu/files/nanotechnology_proceedings_unedited
- Training new skills for the new jobs in nanoelectronics:
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