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High-Tech Skills for Europe

National Policies and Funding Programmes for Skills Development

Expert Workshop

Learning from Best Practices for Scaling up and Re-focussing Policies and Funding Programmes

February 2018

Workshop Report prepared for the
European Commission
Directorate-General for Internal Market,
Industry, Entrepreneurship and SMEs

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Imprint

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Preface

The objective of work in this service contract for the European Commission is to benchmark public policies and public-private partnerships, and make recommendations for scaling up best practices and re-focusing funding programmes and incentives in Europe specifically related to the acquisition of high-tech skills.

The activities aim to mobilise a large number of stakeholders and Member States contributing to the success of the EU high-tech skills strategy and efforts to facilitate the uptake of digital and key enabling technologies by European enterprises, especially SMEs and start-ups.

The results are supposed to inform policy-makers and business and social leaders regarding more effective policies, partnerships, funding programmes and incentives to increase the high-tech talent pool, employment and the competitiveness of the European economy and to contribute to the further evolution and improvement of European and national initiatives on high-tech skills.

The focus will be on high-tech skills which encompass the skills needs related to digital technologies (e-skills) and a group of six key enabling technologies (KETs) including: micro and nanoelectronics, nanotechnology, industrial biotechnology, advanced materials, photonics, and advanced manufacturing technologies.

Contractor:

Subcontractor:

1   Introduction

The digitisation of the economy and key enabling technologies are drastically and fundamentally disrupting the way enterprises operate. This is posing new demands in terms of knowledge, skills and competences towards the economy and workforce. Demand for high-tech skills is increasing fast which is resulting in significant shortages at all levels in organisations: technical, professional, management and strategic leadership level.

Member States and EU policies and initiatives need to take these disruptions into consideration and further develop and adapt their programmes and incentives to better anticipate and cope with change and allow individuals and organisations to acquire and/or update these specialised skills and provide the economy with a large talent pool and the high-tech skills and competences needed. Education and training systems in Europe need also to react on these new demands and develop appropriate training offers.

empirica and PwC will analyse the situation at national level and EU level[1] and the synergies between the different instruments with a view to identify successful ones, i.e. best practices. These may be scaled up to become even more successful and sustainable and they may also serve as a guide for re-focusing and improving existing funding programmes and incentives.

The overall objectives are to:

- Benchmark public policies and public-private partnerships,
- Make recommendations for scaling up best practices and re-focusing funding programmes and incentives in Europe
- Mobilise a large number of stakeholders and Member States contributing to the success of the EU high-tech skills strategy and
- Invest efforts to facilitate the uptake of digital and key enabling technologies by European enterprises, especially SMEs and start-ups
- Inform policy-makers and business and social leaders regarding more effective policies, partnerships, funding programmes and incentives to
- Increase the high-tech talent pool, employment and the competitiveness of the European economy and
- Contribute to the further evolution and improvement of European and national initiatives on high-tech skills.

For the 2020+ funding period changes are currently under discussion. Without interfering in the political process, our work will bring a contribution by analysing and documenting best practices and identifying scalable and sustainable mechanisms to support policy makers and stakeholders in improving the effectiveness and efficiency of their funding programmes and incentives.

This activity is undertaken as part of the service contract 'High-Tech Skills for Europe launched by the Commission (DG GROW). Results from an investigation of existing policies and funding programmes will be presented at the workshop.

Several experts have been invited to this workshop to present promising practices of national policies and funding programmes with the aim of critically reviewing and learning from these for scaling up and re-focusing but also supporting improving the effectiveness and efficiency of their funding programmes and incentives.

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[1]   At EU level funding opportunities for skills development include: the European Structural and Investment Funds: European Social Fund; European Regional Development Fund; Youth Employment Initiative; European Agricultural Fund for Rural Development; European Maritime and Fisheries Fund; Erasmus+; Horizon2020; European Fund for Strategic Investment; EU Programme for Employment and Social innovation; European Investment Bank's "Skills and Jobs' loan programme"; COSME – Europe's Programme for SMEs; European Globalisation Fund ; and the LIFE Programme. Source: European Commission: Staff Working Document: Analytical underpinning for a New Skills Agenda for Europe Accompanying the Communication from the European Commission "A New Skills Agenda for Europe: Working together to strengthen human capital, employability and competitiveness" {COM(2016) 381 final}, Brussels 10.6.2016, p. 76

https://ec.europa.eu/info/funding-tenders/european-structural-and-investment-funds_en

2   Promising practices of national funding programmes

2.1   Actions and achievements so far

Since the start of this activity in summer 2017 we have carried out an identification and first analysis of around 260 policies, funding programmes, incentives, instruments. Around 60+ are currently further analysed. More than 50 expert interviews have already been carried out.

The country coverage agreed with the Commission is as follows: DE, FR, UK, ES, IT, PL, NL, SE, FI, EE. However, further interesting cases from other countries (e.g. DK, BE) are also considered. The following table provides an overview of the number of schemes identified in the different countries and those selected as promising practise and currently under further investigation.

Country		Identified	Selected
Germany	DE	51	8
France	FR	19	9
United Kingdom	UK	26	10
Spain	ES	13	3
Italy	IT	20	9
Poland	PL	39	8
Netherlands	NL	16	9
Sweden	SE	46	8
Finland	FI	18	2
Estonia	EE	12	2
TOTAL		261	68

The present report describes work in progress.

In parallel the establishment of an informal expert group of around 100 experts from all over Europe took place. These experts are supposed and have committed themselves to support the partners and the European Commission in this work by actively attending workshops, taking part in online surveys (the first survey will be organised for March 2018) reviewing documents and giving recommendations.

The plan is to have a first description of the state-of-the-play and best practice candidates ready by the end of May 2018. The second workshop will take place on 16th May 2018 in Brussels.

In the following chapter the results from the first workshop are described. The 8 funding programmes are presented in summary description highlighting the major points of relevance. This is followed by a brief presentation of some major points from the discussions at the workshop. Finally, and in chapter 3, a first summary and some preliminary conclusions and a specification of the next steps are provided.

2.2 Expertkompetens – Graduate Professional Development programme (Sweden)

Olle Vogel, Programme Manager, kk stiftelsen

Expertkompetens (Graduate Professional Development Program)
Sweden
Type: Government / Foundation programme
Funding institution: Foundation (KK Stiftelsen)
Receiving organisation / applicant: Universities
Beneficiaries: Universities, companies, professionals
Funding scheme: Ggovernment plus funds from participating companies and universities
The Expertcompetens programme supports the co-development of research-related courses and education programmes for advanced-level professionals among 8 universities, 20 research centres and trade organisations and >150 companies. The objective is to develop and deliver courses on master level or higher where the expertise in strong research environments matches the strategic needs for expertise in companies. This requires close collaboration between academic environment and companies in development work. The training programmes are then offered to the market. The first two runs of the programmes are funded by the government. Afterwards the programmes are to become part of the university offers run by the university and at their own risk and / or become part of the company's learning and training systems.
First round results until 2016: >1000 programme participants from about 300 companies with 50% of these companies having participated in programme development). Second round submission deadline was January 2018.

Points from the discussion:

The focus of Expertkompetens is on important industries and sectors and strong academic environments providing support and incentives to co-develop between universities and industry innovative further training programmes for professionals and build a strong academic environment.

The intention is to involve the best researchers as trainers in the training programmes.

Expertkompetens has been successful in acquiring and involving the top Swedish (global) industry companies in the co-development of these programmes and courses on the one hand and sending their staff to attend these courses on the other. The experience has shown that for professionals short course modules are the best fit and that training should take place at a quarter speed compared to normal full-time students.

There is the need to train the trainers to develop e-learning offers, since a growing number of course modules are offered as web-based courses.

Trainers – some of which come from the participating companies - are involved as teachers and the training offers are increasingly also embedded in company training systems.

The participating universities are the programme owners, IPRs are with them.

2.3 DEMOLA – innovation ecosystem combining the talent of students with company R&D activities and university research (Finland)

Ville Kairamo, CEO, DEMOLA

DEMOLA
Finland and further countries: Finland, Sweden, Denmark, Norway, Spain, France, Lithuania, Latvia, Hungary, Portugal, Mexico, Namibia, South Africa and Japan
Type: industry initiative
Funding institution: industry
Receiving organisation / applicant: Demola
Beneficiaries: universities, students, industry
Funding scheme: Payment is through service fees from the partner organisations, university education for Demola
Demola is an international organisation that facilitates co-creation projects between university students and companies, either locally or internationally. Demola is an alliance of various partners including universities, their faculties, researchers and students, as well as companies, local agencies and a growing number of Demola Centers around the globe which is truly international and interdisciplinary. It operates a co-creation concept that is geared to solve real challenges. Every project has an outcome – be it a new concept, a demo, or a prototype. The project results enable better further investment decisions in innovative concepts. If the partner company finds the outcome useful, the company can license or purchase the outcome, and take it for further development. The Demola process and professional facilitation ensures that the work is systematic and runs on schedule. This way, the work itself can be as creative as possible, but the process keeps things under control both in terms of time and deliverable. Demola is a framework that makes is easy for partners to come in and cooperate. Each partner has a clear role, and the work is guided by simple procedures. Contracts, intellectual property rights, licensing models, and other legal requirements are in place and meet international business standards and practices. Demola offers new ways and practices for collaboration between businesses, students and universities. For companies and other organisations, Demola offers an opportunity to test and co-create innovative solutions with multidisciplinary university student teams and researchers. The Demola was launched in Tampere, Finland in 2008 and has subsequently expanded to 14 countries in Europe, Latin America, Africa and Asia. Projects and challenges are developed jointly by companies, public sector and universities. Multidisciplinary teams are formed from students from multiple universities and participating staff from partner companies and organisations. Demola is internationally part of universities' education and research processes providing an unique opportunity to create inspiring combinations of knowledge. Numerous laboratories of Demola alliance universities are as well available to the Demola co-creation teams A typical local Demola site carries out about 30-100 projects per year with variety of students and project partners.
So far more than 10 000 participants went through this scheme successfully. Payment is through service fees from the partner organisations, university education for Demola and research operations.

Points from the discussion:

DEMOLA is about skills development aimed at students and professionals to become more innovative to enable them to quickly renew their business when needed. It is an industry initiative offering a simple platform combining partners from industry and universities in co-creation teams.

Students work for 8-12 weeks in a project on a company / industry case or problem. This takes place in co-creation teams of businesses, researchers and students working on a company case.

Companies pay DEMOLA under a service contract for their work which also includes facilitator training. There are no other types of funding, e.g. project funding of funding through for instance European Commission programmes.

IPR issues related to the cases are regulated and agreed on in a specific agreement for which a template is offered by DEMOLA. Typically IPRs are shared between company and student (the latter own the results of what they do).

DEMOLA could be replicated in any Master programmes (5-10 ECTS).

2.4 École 42 – Disrupting software engineering education (France)

Olivier Crouzet, Dean of Studies, École 42

École 42
France
Type: Philanthropic
Funding institution: Philanthropic programme by Xavier Niel
Receiving organisation / applicant:
Beneficiaries: Students
Funding scheme: free course
École 42, founded by Xavier Niel, is a private information technology school in Paris. It has no teachers or traditional classes and no lectures but is based instead on a system of self-learning and peer-to-peer learning with project-based modules. The training of École 42 is based on a system of self education, namely peer-to-peer- and project-based learning. The program is completely free of charge and does not issue any diploma or degree. The purpose of École 42 is to provide a full three-year long computer specialist education to young people in preparation for digital jobs in the dedicated sector, and in the other sectors as well as part of the unavoidable digital transformation. The overall goal is to increase the number of digitally-skilled employees in France. Around 80,000 applicants a year apply for the program through an 'online' game; and 3,000 are selected for an intensive, 4-week course. Around a 1,000 applicants are finally selected for the training. Currently 3,200 students are enrolled on the Paris site. 1,300 students successfully completed the course. There are around 125 drop-outs per year for personal reasons. The three year training is free of cost, students can get funding for accommodation and education loans up to €15,000 if needed.
The overall budget given by Xavier Niel is 60 million Euro for 10 years which amounts to 2000 Euro/student/year.

Points from the discussion:

École 42 offers face-to-face peer-to-peer learning. MOOCs are not used at all since these are judged as an "automation of what is happening in classrooms" which does not fit with the école 42 approach.

The focus of learning is on creativity (what AI can't do). Of course, students learn tech skills but more importantly also adaptation skills, self learning, problem solving, collaboration, creativity.

There are no degree requirements for enrolment.

The school offers a list of pre-defined projects to select from.

Mentoring services are not offered. Mentoring takes place between students

École 42 is fully independent. There is no influence from politics which maybe the recipe of success!

2.5   The Science Industry Partnership – All years on (UK)

Malcolm Skingle, Director, GSK Medicines Research Centre, GlaxoSmithKline & Chair of SIP Board

Science Industry Partnership (SIP)
United Kingdom
Type: government + industry (initiation phase), industry (operation phase)
Funding institution: UK government (initiation phase), industry (operation phase)
Receiving organisation / applicant: industry (initiation phase)
Beneficiaries: students / apprentices
Funding scheme: apprenticeship

SIP is the lead strategic employer member forum for science industry skills. Its main goal is to meet the sector demand for a skills workforce at every level, utilizing the home skills market. Its Operational Plan includes the following targets:

- Apprenticeships: ambition is for 20,000 apprentices in the next 5 years

- Infuence on a new system for Apprenticeship Levy to support members

- Project Funding: new opportunities, so far raised £348k in operational phase

- Careers: build an active network of SIP Careers Ambassadors

- Innovation in Skills: build a responsive online platform to ensure innovation in skills

- Skills Strategy, Workforce Development and Higher Education etc.

Since 2015, the SIP has supported or delivered:

- 7,500 new Apprenticeship starts in the science sector

- £765,000 of skills investment through funded projects

- 376 new SIP Ambassadors for industry

- 170 new science industry placements and a national network of skills partners investing in skills

- 6 new Apprenticeship Standards ranging from Level 2- Level 6

- With a further 7 Standards in development including Level 5- Level 8

- 3 best practice brochures published for employers, apprentices and students

- A range of policy and position papers on skills issues submitted to Government including the Sector Deals for Life Sciences and Industrial Sciences.

By 2020, the SIP's ambition is to see:

- 20,000 Apprentices into the science sector

- £3m of new investment on skills programmes into the sector

- 1000 new SIP Ambassadors for industry
- 300 new science industry placements
- A national network of skills partners investing in skills
- A suite of Apprenticeship Standards for occupations required by Industry
- An annual SIP Survey on apprenticeships (inc data on levy raised and spent) published October 2018.
- Occupational map regularly updated and work to develop and publicise a plan for new standards completed.
?

Points from the discussion:

SIP offers apprenticeships from Level 2 to 6 (Level 5 – 8 under development) following the 'earn and learn' principle.

The UK government with matching funds from industry spent 52 million GPS (https://www.gov.uk/government/news/52-million-boost-for-skills-and-training-in-uk-science-sectors) for getting the partnership and membership organisation set up and operational which was preceded by an 18 months phase of needs and requirements analysis.

SIP managed to keep momentum, despite the fact that all government money came to an end.

The UK tax system with its apprenticeship levy has been very supportive since it allows companies offering apprenticeships to claim back their contribution. It came into effect in April 2017 after the UK government's promise of 3 million new apprentices by 2020. The levy applies to employers in England, who have an annual pay bill above £3m. The levy is 0.5 per cent of the annual pay bill. All employers will receive a £15,000 annual allowance, to be offset against the bill. This effectively means that employers with an annual pay bill of £3m or less pay no levy. From May 2017 employers not paying the levy, who offer apprenticeships to 16 to 18 year olds, receive 100 per cent of the cost of the training from the Government, up to the maximum funding bands. Employers will have to pay 10 per cent of the cost of the apprenticeship training for those aged 19 and over and the Government will pay the remaining 90 per cent, up to the maximum funding bands. This support applies to all age groups. For non-levy businesses with less than 50 employees there is also a new £1000 incentive towards apprenticeships for taking on someone aged 16 to18.

2.6 Imec.academy - an innovative model for smart education in nanoelectronics and digital technology (Belgium)

Mirko Scholz, Program Manager, imec.academy

Imec.academy
Belgium
Type: Government+ external revenues
Funding institution: Industry (70%), Flemish government (10-15%), European projects (rest)
Receiving organisation / applicant: imec.academy
Beneficiaries: Students, professionals, industry
Funding scheme: ???

IMEC INTERNATIONAL is a world-leading high-tech research centre driving the digital economy combining longstanding leadership in microchip technology with in-depth expertise in software and ICT. It performs world-leading research in nanoelectronics and delivers industry-relevant technology solutions. Imec is headquartered in Leuven, Belgium, and has offices in Belgium, the Netherlands, Taiwan, USA, China, India and Japan. The staff of about 2,500 people includes almost 800 industrial residents and guest researchers. Imec has been a global leader in the domain of nanoelectronics for more than 30 years, and has innovated applications in smart systems for the Internet of Things (IoT), Internet of Health, and Internet of Power. It has built an extensive and worldwide partner network, as well as in Flanders, and has generated successful spin-offs. Imec created the Imec.academy, imec's learning institute, which offers specialized courses on nanoelectronics and digital technology and engages in research on educational technology. Its technical training programs combine world-class expertise with hands-on applications for the local and international industry, academia and the imec employees. With its smart education research, imec strives to increase learning effectiveness by using smart technologies.

Imec.academy creates >1 million Euro revenues/year (including customised programmes abroad). It has 20 courses on open offer per years with >500 participants/year. The offer is continuously growing, especially due to online offerings.

Points from the discussion:

Imec.academy receives its funding mostly by generating revenue with its open offer, offering customized courses for external customers and by supporting and participating in EC programmes. This includes the EUROPRACTICE IC Service funded through the H2020 program which brings ASIC design and manufacturing capability within the technical and financial reach of any European company and academia. The EUROPRACTICE IC Service, offered by IMEC and Fraunhofer, offers low-cost ASIC prototyping and ASIC small volume production ramp-up to high volume production through Multi Project Wafer - MPW - and dedicated wafer runs. In addition training of engineers and researchers on IC design and relevant process technologies is an essential part of the EUROPRACTICE programme.

All the courses are IP-free and contain knowledge that is a direct outcome of Imec's R&D and application domains.

Imec.academy showed an interest in using the école 42 learning model in parallel to practicing the current forms of learning and development.

The replicability of the imec.academy is questioned since it would require a very substantial upfront investment and the willingness of partners to share their knowledge which is doubted.

2.7 The 'Industrial Doctorates' and 'Physics Industrial Partnership Programmes (IPP)' at NWO (Netherlands)

Maarten de Zwart, Responsible for IPP programmes, Netherlands Organisation for Scientific Research (NWO)

Industrial Doctorates
Netherlands
Type: Government
Funding institution: Netherlands Organisation for Scientific Research (NWO)
Receiving organisation / applicant: universities
Beneficiaries: PhD students

Funding scheme: 100% government
The aim of the Industrial Doctorates programme is to make intensive collaboration possible in PhD projects within both a knowledge institution and a company in every scientific area to strengthen or create the scientific knowledge acquired and the collaboration in a PPP and contribute to talent development in research. Additionally it provides an opportunity to apply or further develop the scientific knowledge acquired relatively quickly (parallel to or after the doctoral research) and to make optimal use of the knowledge from a company in the research. Researchers (at least assistant professor) from Dutch universities, University Medical Centres, KNAW and NWO institutes, the Netherlands Cancer Institute, the Max Planck Institute for Psycholinguistics in Nijmegen, the DUBBLE Beamline at ESRF in Grenoble, NCB Naturalis, Advanced Research Centre for NanoLithography (ARCNL) and the Princess Maxima Centre can submit applications.
The maximum grant from NWO which can be applied for per project is 222,563 Euros. This budget is primarily intended for the personnel costs (amount of 217,563 Euros) and the associated bench fee (5,000 Euros) for a PhD project for a period of maximum four years on the basis of a full time appointment at a knowledge institution recognised by NWO. The programme started in 2017 and has an overall budget of 10 million Euro.

Physics Industrial Partnership Programmes (IPP)
Netherlands
Type: Government + industry
Funding institution: Netherlands Organisation for Scientific Research (NWO)
Receiving organisation / applicant: Universities
Beneficiaries: companies / industry
Funding scheme: 50% public, 50% industry contribution in cash
The 'NWO Physics Industrial Partnership Programme' (IPP), formerly a FOM Industrial Partnership Programme, is a longer-term funding instrument of NWO to build a bridge between fundamental physics research and application-oriented research from industry. Academic knowledge is then linked to industrial ambitions by carrying out high-quality physics research in collaboration with companies. In an IPP, academic researchers come into close contact with company researchers in areas with good innovation potential and challenging scientific questions. This joint approach can lead to groundbreaking innovations. An 'NWO Physics Industrial Partnership Programme' (IPP) is meant to strengthen the connections between academia and industry. At the time FOM introduced the IPP in 2004 to increase the contribution that research makes to the Dutch knowledge economy. In the IPP the researchers and the companies enter the collaboration on an equal footing: the partners formulate the research objectives together and during the realisation of the research there is a lot of interaction on equal terms. This equal footing also applies to the funding: the companies contribute at least fifty percent in cash to the research. The partners often make considerable in-kind contributions as well (for example equipment and personnel). The research can take place at both a university/research institute, as well as at a company. In October 2014 the Governing Board of FOM commissioned an evaluation of the IPP funding instrument. In the evaluation report of the IPP, the committee concluded the following: the IPP as an instrument for public-private partnership occupies its own, unique, position within the innovation landscape and is of major strategic importance for fundamental physics and the application of this. FOM has successfully linked top quality to innovation.
The committee called for an expansion of this unique funding instrument, which focuses on precompetitive, fundamental research with a fifty percent company contribution in cash.

Points from the discussion:

The major focus of the Industrial Doctorates and Physics Partnership Programmes is on the provision of grants to R&D activities. However, the activities are also resulting in further education and training to ensure sufficient talent and skills levels at top level in companies. It has some similarities to the PhD skills development initiatives 'Software Campus' in Germany and the Innovation Fund Denmark in Denmark activities in this area.

The successes of the programmes are outlined in the presentation and e.g. include the fact that twice as many PhD students from these programmes than normal make a career in industry.

There exists a UK equivalent programme 'PhD studentships' and similar programmes also in Sweden.

2.8 High Tech U (HTU) a global skills development programme for the electronics manufacturing industry (global)

Emir Demircan, Senior Manager, Advocacy & Public Policy, SEMI Europe

High Tech U (HTU)
Global
Type: industry
Funding institution: industry
Receiving organisation / applicant: schools
Beneficiaries: schools and pupils
Funding scheme: programme and service paid for by industry
The High Tech U (HTU) is a three-day programme for high school students who want to know more about careers in the tech industry. Students put science, engineering, technology, and math (STEM) skills to use during hands-on workshops led by industry volunteers (http://www.semifoundation.org/semi-high-tech-u/). The mission of the SEMI Foundation is to support education and career awareness in the fields of high technology. This internationally acclaimed career exploration programme offers its 3-day programme to high school students. It is hosted on a high-tech industry site and taught by industry instructors.
The costs of approx. 20.000 – 25.000 Euro/event are covered by industrial companies (SEMI members).

Points from the discussion:

High Tech U (HTU) was started by SEMI® the global industry association representing the electronics manufacturing supply chain as an awareness raising programme to motivate kids to STEM through a cooperation of industry with high schools. Industry / companies sponsor 100% of the costs of approx. 20.000 – 25.000 Euro/event. Parent's night are organised prior to the events to bring the parents on board.

It has some similarities with the EIT Raw Materials schools (RMSchools: https://rmschools.isof.cnr.it/index.html) funded as a project under the H2020 programme

2.9   Go-Inno: voucher-based   funding   programme   for   skills development and technical process innovation support for SMEs through the use of a subsidised consulting expert (Germany)

Werner B. Korte, empirica (on bahalf of Oliver Scherr, Deutsches Zentrum für Luft- und Raumfahrt (DLR))

go-inno
Germany
Type: Government programme
Funding institution: Federal German Ministry for Economic Affairs and Energy (BMWi)
Receiving organisation / applicant: Consultants (approved and authorised by the government)
Beneficiaries: SMEs
Funding scheme: 50 : 50 – government : SME
go-inno promotes external consultancy and training for the preparation and implementation of product and technical process innovations via BMWi (Federal German Ministry of Economics and Energy) innovation vouchers (go-inno). It is addressed to SMEs and the funding covers up to 50 percent of external consulting expenses by BMWi-authorized consulting firms that have been selected according to strict quality criteria.
This is a voucher-based system. An application process is not required like for R&D project grant proposals. The budget is 10.97 million Euro for 2011-2020. 1431 SMEs were funded so far, each with 7,700 Euro on average.

Points from the discussion:

Voucher-based programmes like go-inno bring competences into the company (here: SMEs).

Reference was made to the ActPhast programme in the photonics area (EU H2020 project, voucher type based for innovation boosting: http://www.actphast.eu/) and the Flemish SME voucher system. Similar systems also exist in other countries.

3   First conclusions and next steps

The workshop participants agreed that as a starting point a policy vision is needed for the revision of present and the development of new more appropriate funding programmes, instruments and mechanisms. Policy itself is asked to come up with this. To some extent this already exists through the different recent European Commission policy documents and Communications in this area. These should be integrated and further developed, streamlined and put forward as a common policy document proposal. It should be developed in a coordinated fashion involving the different DGs at the Commission dealing with these issues and involving relevant national EU Member State stakeholders and government departments and policy decision makers to achieve an overall Europe-wide agreement.

Based on that decision and agreement, necessary partnerships, programme types and funding instruments and mechanisms and details as to necessary monetary dimensions as to budgets to be allocated to specific (new) ways of funding need to be developed. One-size-fits-all policies and programmes will not provide the necessary basis and means to address future challenges. Based on a first analysis of identified promising practices it becomes apparent that the future policy and funding landscape is likely to be multi-facetted with a co-existence and combinations of:

- New and innovative (free) peer-to-peer learning programmes without curricula like école 42,
- Tri-partite ecosystem development partnerships for joint problem solving or case handling and thereby professional skill development like DEMOLA,
- Co-development programmes for professional skills development like Expertkompetens,
- Voucher-based systems for bringing innovation competences into SMEs like go-inno,
- Excellence programmes for PhD skills development followed by a career in industry instead of university like the Industrial Doctorates and IPP programmes and the
- Career exploration programme offers of High-Tech U.

These are the results from the current work in progress. Further types of programmes and funding or investment mechanisms may be identified in the course of our future work, evaluated and decisions taken as to their appropriateness for the future.

The above programmes are addressed to different target groups and education and training levels, have different sources and types of funding and investment but they have one goal in common: they all aim at high-tech skills development and talent creation in Europe needed to keep Europe at the forefront of developments.

In a further step an evaluation of the best practice candidates and a final best practice selection will be carried out to reveal information on how to better focus / re-focus funding programme and incentives to foster scalability and sustainability of best practices. This evaluation will result in a repository of best practices. A proposal for these evaluation and selection criteria is included below.

Criteria for selecting best practices

Evaluation criterion	Evaluation question	Associated questions
Transparency	To what extent is it possible to have access to information about the policy / funding programme	- To what extent is it possible to get information about the set-up, implementation status, etc.? - To what extent is it possible to access information about the outcomes, etc.?
Effectiveness	How effective is it in providing the target groups with relevant information (orientation and guidance on training and funding or incentives of different type)	- How successful is it for reaching the target groups? - How successful is it for creating awareness and mobilising stakeholders? - How successful is it for providing orientation and guidance to stakeholders? and target groups?

Evaluation criterion	Evaluation question	Associated questions
		- How effective is it in providing funding? - How successful is for developing industry-relevant high-tech skills for the target groups?
Efficiency	How efficiently has it been implemented?	- How efficient is the organisation and management in reaching its objectives? Indicators: capital and operational expenditure, cost/outcome ratio, input/output ratio … (where relevant data can be made available) - How efficient was the interaction with the target groups? Indicators: satisfaction (students/professionals, industry, employers, universities …) (self-assessment)
Impact (direct and indirect)	What are the effects on the target groups addressed? Individuals, enterprises and the economy at large. Those participating directly and those touched indirectly.	- Has it contributed to genuinely increase the talent pool? To which extent? Small, medium, large? - Has the implementation led to tangible benefits 1) to the participants (acquisition of high-tech skills) at acceptable costs? and 2) to the economy at large? - How and to what extent does it make a difference to 1) individuals? and 2) the human capital competitive position of enterprises? and more specifically of SMEs? - Beyond those who benefited directly, what is the impact for the economy, the broader stakeholders and target groups are concerned? Small, medium, large?
Scalability	To what extent are the results and this activity scalable?	- How could it be expanded? - Is there a scaling-up plan? - Does it come up with the necessary capability and instruments? Which ones? - Are their mechanisms or flexibility allowing for adaptation and re-focussing to ease scaling up?
Sustainability	To what extent is this activity sustainable?	- Are the governance and the economic models susceptible to guarantee the sustainability efficient? - What are alternative options? - Is funding or sources of revenues secured in the long-run and how? - What is the financing commitment and capability of 1) public authorities and 2) key stakeholders like? Are these secured in the long-term (>5 years), mid-term (2-3 years) or only short term (less than 2 years)?

Scores for the assessment of the initiatives with regard to the selection criteria

Selection criteria		Scores
Transparency	3	**Excellent**: the policy / funding programme is well documented, there is access to rich information material already through desk research, contact persons are identified.
	2	**Good**: sufficient information material about basic facts is available through desk research.
	1	**Moderate**: only basic information is easily available through desk research – further information would require more research (interviews).
Effectiveness	3	**Highly effective**: the policy / funding programme is very successful in terms of providing the target groups with information about, orientation and

Selection criteria	Scores	
		guidance on as well as training and funding or incentives of different type.
	2	**Considerably effective:** the policy / funding programme is successful in terms of providing the target groups with information about, orientation and guidance on as well as training and funding or incentives of different type.
	1	**Not or only partly effective**: the policy / funding programme shows little signs of effectiveness or no such information is available.
Efficiency	3	**Highly efficient**: the policy / funding programme has demonstrated to have a well-defined governance and control structure with clear allocations of responsibilities and description of tasks – is very efficient in achieving its objectives and setting future goals.
	2	**Significantly efficient**: predicted targets and objectives are attained through a good utilisation of resources.
	1	**Partly efficient:** there is no clear projection of estimated time and resources needed to implement the policy / funding programme and attain predicted targets.
Impact (direct and indirect)	3	**High**: the policy / funding programme is committed to provide the target groups with information about, orientation and guidance on as well as training and funding or incentives of different type – and where appropriate - in close collaboration with relevant stakeholders. These activities are fully operational and good and measureable results from evaluation activities are already visible and made available. These describe direct and indirect impacts at different levels: individuals, enterprises and the economy at large (indirect impact).
	2	**Significant**: the policy / funding programme is operative and first (mostly not fully measurable) results showing some impact are already available. Information on and some assessments of direct and indirect impacts can obtained in interviews with key stakeholders from respeonsible organisations ideally differentiating different impact levels: individuals, enterprises and the economy at large (indirect impact).
	1	**Moderate**: the policy / funding programme is operating and the responsible organisations and institutions express the view that the chances for impact creation are promising.
Scalability	3	**Highly scalable**: the policy / funding programme has a clear plan and capability to expand with the instruments for scaling up in place. It demonstrates the flexibility allowing for adaptation and re-focussing to ease scaling up.
	2	**Considerably scalable**: the policy / funding programme has the intention to expand but no clear plans yet and unclear capability but there is some indication for availability of the flexibility needed for adaptation and re-focussing to ease scaling up.
	1	**Fairly scalable**: the policy / funding programme has no intention and capability to expand but at a maximum continue as it is. There are no real signs for the flexibility needed for adaptation and re-focussing needed for a successful scaling up.
Sustainability	3	**Highly sustainable**: the policy / funding programme is built upon a solid and long-term strategy to help ensure sustainability of successful activities in the long-run, in partnership with key industry players / other relevant stakeholders. It can build on a stable governance and economic model which is very likely to secure sufficient levels of funding or sources of revenues for future operation.

Selection criteria	Scores	
	2	**Considerably sustainable**: the policy / funding programme demonstrates the potential of continuation even after initial funding is no longer available by ensuring sustainability of outcomes through broad own ownership or institutionalisation. Solid governance structures are in place and the economic model is likely to secure sufficient levels of funding and sources of revenues in the short or even mid-term
	1	**Fairly sustainable**: continuation of activities and sustainability of achievements depend on the availability of funds and future commitment plans of involved stakeholders or other external actors. Currently future funding or sources of revenues bear some risks and are not fully secured to allow for a continuation of activities at demonstrated today.

The plan is to segment the best practice programmes according to target groups (high school learners, vocational education, graduate, post graduate, professionals…) and further criteria. A metrics for the "scalability" of these programmes will be defined where the necessary data can be made available. With a view to identify the most effective and efficient best practices which bear the most promising potential to reduce the skills gaps, this will include data on how many, for how much, for how much time, and for how long: i.e. estimating additional efforts/time/resources/investments/individual cost per extra unit. However, it needs to be borne in mind that this type of information is often not disclosed by the organisations operating these programmes. The same hold true for evaluation reports which could contain this information but which are regularly not made available to the public.
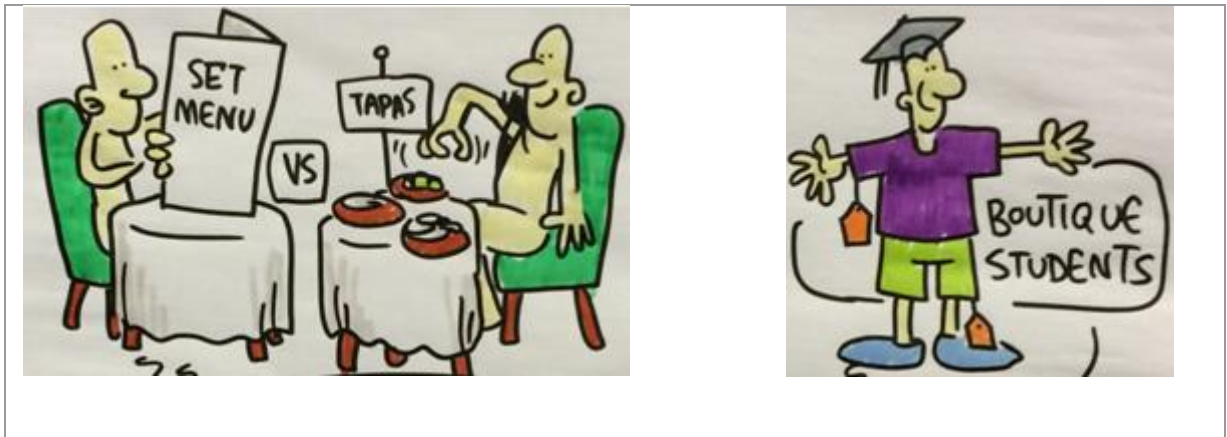
The whole process needs to be guided by the ambition to not continue to stubbornly stick to old programmes and instruments simply because these have been in place for many years or even decades.

The programme revisions and proposed new funding types may be disruptive and a move away from 'business as usual'. It is also very likely that at some stage hard decisions need to be taken in terms of prioritising specific types of programmes at the expense of others since financial limitations will not allow for all different types of programmes and activities to be implemented and then operated, neither at European nor at national levels.

Participants at the workshop expressed the view that European Commission support and funding for cross-country implementation of (national) programmes and instruments that have proven to be sustainable, scalable and allow for transferability (this requires a better understanding of the necessary conditions for replication which need to be in place to achieve a successful transfer) would be an interesting option to be pursued by the Commission. Many initiatives presented at the first workshop already have an international / global approach and as such 'built-in' transferability. For instance, Ecole 42 has learners trained in the US and Europe, DEMOLA, imec, NWO, SIP have several of non-EU headquartered partners/members active in Europe, SEMI has a global programme supporting companies.

Agreement became apparent on the need for innovative funding with a mid/long-term perspective and not focussing on 'quick fixes' and EC interventions with only short-term effects.

This may include thinking beyond existing structures and formats in the present education and training landscape and systems and even a (move away or) downgrading of existing Bachelor and Master education types of programmes. The current unbundling of education, the growing demand for short and focussed learning and resulting from that the trend towards smaller learning packages (e.g. learning 'nuggets' or 'tapas' or modules) has already found a supply, in MOOCs and elsewhere, of targeted courses of shorter duration catering for an adult and returning higher education clientele. These (life-long) learners, who have already gained practical experience and witnessed or at least started a professional career, have also been termed "boutique students", picking trainings they think most appropriate to enhance their competence portfolio.

Source: *European Institute for Innovation and Technology: illustrations of a presentation by Werner B. Korte, empirica at the EIT – European Institute for Innovation and Technology - Education Roundtable on 6th May 2015 in Budapest*

Funding programmes also need to be critically reviewed with a view as to the types of activities related to skills development for the future included but especially those excluded from funding (e.g. the H2020 programme is not allowed to fund curricula development). Furthermore funding rules and regulations need to be analysed with a view of evaluating their appropriateness for attracting the key experts, stakeholders to most professionally carry out these tasks and whether these act as facilitators or constraints (e.g. Erasmus + programme setting very low maximum daily rates for experts to run for instance the Knowledge Alliance or Strategy Alliance activities and projects which is excluding specific types of experts probably well-placed to do the job).

Participants also expressed the desire for the Commission to create a one-stop shop for best practice presentation, courses from different corporations and vendors resulting from the present 'High-tech skills for Europe' activity which could be used as a learning tool and thereby help in scaling up successful initiatives and programmes and ensuring their implementation also in other European countries where these currently do not yet exist

4   Annex: Workshop programme and participants

10:00 - 10:30	**Welcome and Introduction**	
	• European Commission Policy Background	
	• The service contract ‚High-Tech Skills for Europe'	*André Richier, European Commission DG GROW*
		Werner B. Korte, empirica

10:30 – 12:30	**Promising Practices of National Policies and Funding Programmes – Presentations & Discussion I**
	• Expertkompetens – Graduate Professional Development programme (Sweden): *Olle Vogel, Programme Manager, kk stiftelsen < confirmed >*
	• DEMOLA – innovation ecosystem combining the talent of students with company R&D activities and university research (Finland): *Ville Kairamo, CEO, DEMOLA < confirmed >*
	• École 42 – Disrupting software engineering education (France): *Olivier Crouzet, Dean of Studies, École 42 < confirmed >*
	• The Science Industry Partnership – Two years on (UK): *Malcolm Skingle, Director, GSK Medicines Research Centre, GlaxoSmithKline & Chair of SIP Board < confirmed >*
	• Imec.academy - an innovative model for smart education in nanoelectronics and digital technology (Belgium): *Mirko Scholz, Program Manager, imec.academy < confirmed >*

| 12:30 – 13:30 | **LUNCH** |

13:30 – 15:00	**Promising Practices of National Policies and Funding Programmes – Presentations & Discussion II**
	• The 'Industrial Doctorates' and 'Physics Industrial Partnership Programmes (IPP)' at NWO (Netherlands): *Maarten de Zwart, Responsible for IPP programmes, Netherlands Organisation for Scientific Research (NWO) < confirmed >*
	• Go-Inno: voucher-based funding programme for skills development and technical process innovation support for SMEs through the use of a subsidised consulting expert (Germany): *N.N., Deutsches Zentrum für Luft- und Raumfahrt (DLR) < confirmed >*
	• High Tech U (HTU) a global skills development programme for the electronics manufacturing industry (global): *Emir Demircan, Senior Manager, Advocacy & Public Policy, SEMI Europe <confirmed>*
	• Software Campus – a high-tech skills excellence initiative (Germany): *< confirmed > presentation by programme evaluator empirica*

15:00 – 15:45	**Lessons Learned and Proposals for Scaling up and Re-focussing – Expert Discussion**	*Werner B. Korte, empirica*
	• Lessons learned	*Erisa Gruda, PwC*
	• Innovation	
	• Scalability	
	• Sustainability: financing and funding models	

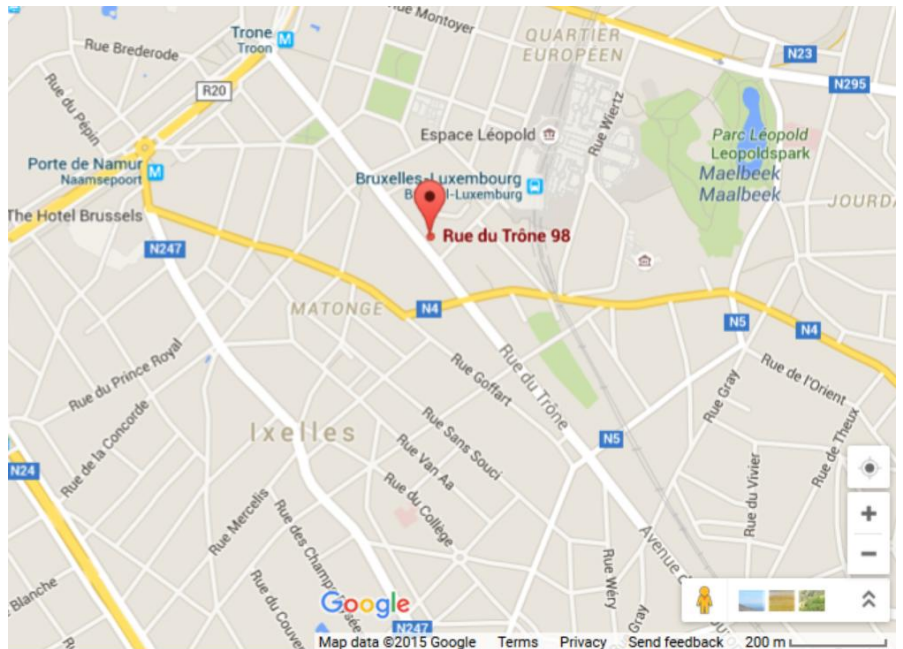|		
	• Proposals for scaling up and re-focussing	
15:45 – 16:00	**Wrap-up, Conclusions and Next steps**	*André Richier, European Commission DG GROW*
		Werner B. Korte, empirica

Workshop venue and location

EU Liaison Office of the EU Liaison Office of the Deutsches Zentrum für Luft- und Raumfahrt (DLR)

Rue du Trône 98

1050 Bruxelles

List of registered participants

*) = presenters of best practice candidate programmes

No.	First Name	Surname	Role	Organisation	Country
1	Olivier	Crouzet *)	Director IT Education	École 42	FR
2	Rima	Dapous	Education Director	EIT KIC Raw Materials	DE
3	Emir	Demircan *)	Manager, Advocacy & Public Policy	SEMI-Europe	BE
4	Sjoerd	De Vries	Professor	University of Twente / EIT Digital	NL
5	Maarten	De Zwart *)	Responsible for IPP programmes	Netherlands Organisation for Scientific Research (NWO)	NL
6	Fabrizio Vittorio	Famà	Senior Vice President HR & Corporate Affairs	Lfoundry	IT
7	Fátima	Gallo	Director Digital Talent	ISDI – The first digital business school	ES
8	Filip	Geerts	Secretary General	CECIMO (European Association of the Machine Tool Industries)	BE
9	Danny	Gooris	Oracle Academy	ORACLE	BE
10	Carsten	Johnson	Area Academy Manager	Cisco Networking Academy Program	DE

No.	First Name	Surname	Role	Organisation	Country
11	Ville	Kairamo *)	Head of Demola Network	Demola International	FI
12	Cristian	Matti	Knowledge and Learning Manager - Transitions Hub	EIT Climate	
13	Fabrizio	Porrino	SVP Global Public Affairs	Facility Live	
14	Mirko	Scholz *)	Program Manger	imec.academy	BE
15	Malcolm	Skingle *)	Director, GSK Medicines Research Centre & Chair of SIP Board	GlaxoSmithKline	UK
16	Dirk	Torfs	CEO	Flanders Make	BE
17	Freddy	Van den Wyngaert	Secretary General	European CIO Association	BE
18	Olle	Vogel *)	Program Coordinator	KK Stiftelsen	SE
19	Michael	Zibrowius	Economist, Vocational Education and Training	Cologne Institute for Economic Research	DE
20	NN *)			Deutsches Zentrum für Luft- und Raumfahrt (DLR)	DE
21	André	Richier	Principal Administrator	European Commission	BE
22	Erisa	Gruda	Consultant	PwC	NL
23	Jza	Abbas	Research Consultant	empirica GmbH	DE
24	Tobias	Hüsing	Senior Research Consultant	empirica GmbH	DE
25	Werner B.	Korte	Director	empirica GmbH	DE

Waiting list:

No.	First Name	Surname	Role	Organisation	Country
1	Bernd	Böckenhoff	CEO	Academy Cube	DE
2	Mark	Lester	Director of Partnerships Development	FutureLearn	UK
3	Liesbeth	Ruoff	Chair SIG	KNVI - Koninklijk Nederlandse Vereniging van Informatieprofessionals	NL
4	Manuel	Fradinho Duarte de Oliveira	Senior Research Scientist	Sintef	NO
5	Christoph	Auch	Professional Education Lead	EIT Climate	DE
6	Rocco	Defina		Fondazione Politecnico di Milano	IT
7	Jens	Vermeersch	Assistant to the Director	GO! Onderwijs van de Vlaamse Gemeenschap	BE

No.	First Name	Surname	Role	Organisation	Country
8	Sue	Martin	Business Transformation Consultant		DE
9	Antonio	Gallo	President	Futuro Digitale	IT
10	Vincenzo	Apa		Futuro Digitale	IT
11	Pantelis	Nikolaidis	European and International Relations	Ministry of Administrative Reconstruction	EL
12	Lucien	Reuter	Coordinator	DSJC Luxembourg	LU