FIRST GRADUATES IN BUDAPEST OF THE EIT ICT LABS MASTER SCHOOL - A NEW DOUBLE DEGREE PROGRAMME OF A EUROPEAN NETWORK IMPLEMENTING THE KNOWLEDGE TRIANGLE

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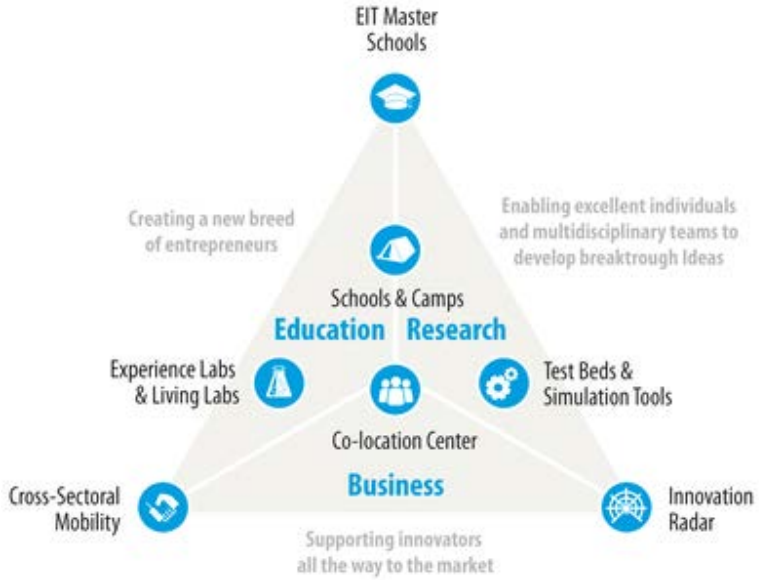
Abstract
Eötvös Loránd University as leader of the Budapest Associate Partner Group participating in the Information and Communication Technology Labs (ICT Labs) of the European Institute of Innovation and Technology (EIT) acts as a driving force for implementing the Knowledge Triangle in the Central and Eastern European region. The EIT ICT Labs Master School's double degree programmes implemented at 19 European top universities, and the Doctoral Training Centres established in 6 European ICT hotspots offer an integrated education of technical knowledge and innovation & entrepreneurship skills by linking together education, research and business.

Key words: *Europe, innovation, technology, education, research, business*

1. THE EIT AND ITS KNOWLEDGE AND INNOVATION COMMUNITIES

The European Institute of Innovation and Technology (EIT) is a body of the European Union (EU) created in order to give a boost to European innovation by helping students to become entrepreneurs, channelling research results into the industry, and turning ideas into marketable products or services. The strategy of EIT is integrating the three sides of the so-called knowledge triangle, namely education, research and business in Europe, the importance of which has been emphasized in the definition of the '2020 Vision for the European Research Area'.[1] As the Director of EIT, José Manuel Leceta, and the Chairman of the EIT Governing Board, Alexander von Gabain have stated it, "(..) many excellent higher education institutions, research centres and businesses can be found in Europe, but what is often missing, is the lack of geographical and cross-sectoral collaboration. (…) In order to make the most of its innovation potential, Europe must overcome this fragmentation and this is exactly why the EIT was set up."[2]

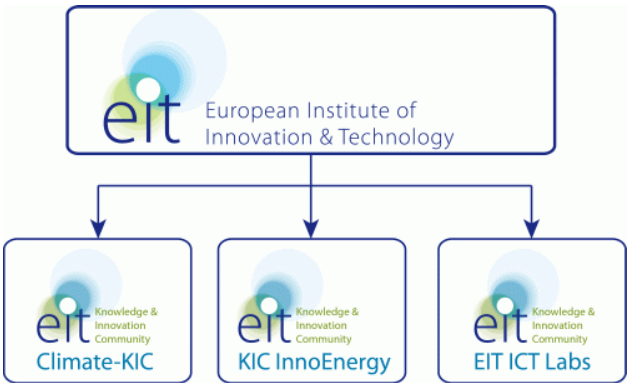
[1] Competitiveness Council 2008, *Council conclusions on the definition of a "2020 Vision for the European Research Area,"* Reference no. 16767/08, Council of the European Union, Brussels, p. 4.
[2] European Institute of Innovation and Technology, SE n.d., *The EIT at a Glance*, European Institute of Innovation and Technology, p. 2, viewed 15 June 2014, <http://eit.europa.eu/sites/default/files/EIT_Brochure.pdf>.



The Knowledge Triangle

Source: "The Knowledge Triangle," EIT ICT Labs website[3]

The EIT started operating with the establishment of its headquarters in Budapest in 2008. In 2010, three Knowledge and Innovation Communities (KICs) were launched to realize the mission of EIT in three topics: climate change (Climate-KIC), information and communication technologies (EIT ICT Labs), and sustainable energy (KIC InnoEnergy), followed by two new KICs in 2015: Innovation for healthy living and active ageing; and Raw materials: sustainable exploration, extraction, processing, recycling and substitution. The aim of EIT ICT Labs is to turn Europe into a global leader of innovation in the field of information and communication technologies (ICT) by overcoming the so-called 'innovation paradox', which means that research results in Europe are not well utilized by the industry.



The EIT and its Knowledge and Innovation Communities

Source: "Introducing EIT ICT Labs," EIT ICT Labs Budapest Associate Partner Group website[4]

The operation of the KICs is based on their Co-location Centres (CLCs), which are the physical representations of the knowledge triangle, as partners from education, research and business are

[3] http://www.eitictlabs.eu/about-us/strategy/the-knowledge-triangle, accessed April 2014.
[4] http://ictlabs.elte.hu/_old/index.php?id=eit-ict-labs, accessed April 2014.

located together at the CLCs. In this structure, "[t]he EIT gives the vision, the KICs provide the forum for strategy-making in the selected areas of societal challenges and the Co-location Centres are the primary delivery mechanisms (…) by which the range of activities in terms of education, research and innovation, are implemented."[5] The co-location centres of the EIT ICT Labs nodes and associate partner groups bring together top universities, leading research centres, global companies, SMEs and startups in the field of ICT. The nodes are located in Berlin, Eindhoven, Helsinki, London, Paris, Stockholm, and Trento, while the associate partner groups can be found in Budapest and Madrid.

Being the only EIT ICT Labs associate partner located in Central and Eastern Europe, the EIT ICT Labs Budapest Associate Partner Group aims at fostering innovation not only in Hungary but in the whole region. The partner group is led by Eötvös Loránd University (ELTE) and includes Budapest University of Technology and Economics (BME) and the industrial consortium partners, namely Ericsson Hungary and Magyar Telekom. Further strategic business and research partners are Cisco Systems Hungary, Nokia Solutions and Networks, General Electric Healthcare, ELTE-Soft Nonprofit Ltd., and the Institute for Computer Science and Control of the Hungarian Academy of Sciences (MTA SZTAKI). In order to support the development of small and medium sized enterprises (SMEs), the Budapest Associate Partner Group has also created a platform of innovative Hungarian SMEs. The two universities, ELTE and BME are involved both in the EIT ICT Labs Master School and in the EIT ICT Labs Doctoral School, which combine ICT education with innovation and entrepreneurship training.

2. INDUSTRY DRIVEN ICT EDUCATION

2.1. EIT ICT Labs Master School

Education at the EIT ICT Labs Master School combines ICT knowledge with business skills, providing seven technical majors and an Innovation & Entrepreneurship (I&E) minor. The technical majors focus on the most innovative fields of ICT, namely Digital Media Technology, Distributed Systems and Services, Embedded Systems, Human Computer Interaction and Design, Internet Technology and Architecture, Security and Privacy, as well as Service Design and Engineering. Each technical programme consists of three parts: a common base in the first study year, a specialization in the second year, and the master's thesis project. The I&E minor includes courses on economics, finance, marketing, human resources, intellectual property, management, as well as business development. As part of the I&E minor, summer schools are organized where students can participate in a business plan development project, visit companies, meet entrepreneurs and researchers, and join social activities. In order to make it possible for students to utilize and further improve their technical and business knowledge acquired during the master's programme, internships are guaranteed at ICT companies or research centres.

The Master School involves nineteen top universities of eight European countries, providing an excellent mobility opportunity for students participating in a master's programme of EIT ICT Labs. Students can build an individual study track based on their skills and interests, choosing one technical major and two universities. Students study at the 'entry' university in the first year and at the 'exit' university in the second year, therefore upon completion of the programme they receive a double degree, in addition to the certificate of EIT ICT Labs. The universities of the Budapest Associate Partner Group, ELTE and BME are exit universities of three technical majors, namely Security and Privacy, Service Design and Engineering, and Digital Media Technology, and offer internship opportunities at large companies, SMEs, and research centres.

The Master School was launched in 2012, starting with 94 students selected from applicants from all over the world, 36 of them EU citizens. In 2013, the number of registered students increased to 178, including 67 students from the EU, 13 of them from Hungary. Among the students registered in 2012,

[5] Technopolis group 2012, *Catalysing Innovation in the Knowledge Triangle - Practices from the EIT Knowledge and Innovation Communities*, European Institute of Innovation and Technology, p. 4, viewed 15 June 2014, <http://eit.europa.eu/sites/default/files/EIT_publication_Final.pdf>.

one quarter of the European students were Hungarian, most of them joining the Security and Privacy (S&P) and the Service Design and Engineering (SDE) majors, starting their studies in Helsinki, Eindhoven, and Trento. After having successfully completed the first academic year, our students, accompanied by classmates from Mexico and China, have returned to ELTE, Budapest and joined the specializations Distributed Service Systems and Advanced Cryptography of the SDE and S&P majors respectively. Both specializations are closely connected with university research groups, strong and innovative industrial partners, and joint academic industrial research development labs running at the university. In the second semester of this second year, the students worked on their master's thesis projects as interns at our industrial partners, namely Ericsson Hungary, MTA SZTAKI, CrySys, and BalaBit. All students had to write a minor thesis, a study on the innovation and business potential of the technical results of their master's thesis project. Four supervisors supported the students: one professor from the entry university and one from the exit university related to the technical content, a supervisor responsible for the innovation and entrepreneurship minor thesis, and a supervisor from the industrial partner. All of the 10 students enrolled in their second year of ICT innovation master's studies at ELTE have successfully completed their studies. Some of them have established their own startup, others have been offered a job by our industrial partners, and two students have entered the PhD School of Informatics at ELTE. As Dorottya Maksay, the winner of the EIT CH.A.N.G.E Award 2013, master's student at the SDE major in Budapest summarized, "the EIT ICT Labs Master School is a special educational programme, as it consists of not only technical but also entrepreneurial courses, and it offers a great opportunity of networking, international mobility, and to launch an innovative startup." Dorottya won the EIT CH.A.N.G.E Award 2013 for her Homebuddy initiative, which matches elderly people with students, providing social interaction for the elderly people and accommodation for the students. She is working on her startup idea with the mentoring and coaching support of the EIT ICT Labs experts.

The EIT ICT Labs Master School students in Budapest shared a couple of courses with other international students (e.g. students from Brazil and Saudi Arabia) enrolled in the traditional Computer Science master's programme, which helped us establish an inspiring international community of IT students at the Faculty. A professional student advisor (MSc in Intercultural Psychology) was also employed to take care of any kind of potential problems international students may have arising from intercultural differences and homesickness. The students gained a unique set of skills in ICT and business knowledge, while our professors and educational coordinators learned how to run a master's programme in strong cooperation with leading European universities and companies as well as how to develop the entrepreneurial mind-set of computer science students. Following the first successful year, we are glad to continue with 17 new students arriving to Budapest in September and to start the third major in Digital Media Technology at BME.

ELTE has several double and multiple degree programmes both at master's and doctoral level. There have already been joint degree programmes also at the Faculty of Informatics, but the experience we have gained due to the EIT ICT Labs Master School is very special. First of all, the EIT ICT Labs master's programmes are offered by a big consortium: 19 universities cooperate for delivering 7 technical majors. The state-of-the-art academic knowledge is completed by a hands-on module on Innovation and Entrepreneurship. With the valuable help and coordination of the central EIT ICT Labs Master School Office, ELTE and its partner universities have learnt how to handle the special requirements that such a study programme presents to the participating institutions. The Master School with more than 250 students enrolled is run by the international team of academic and administrative staff with joint effort. At the moment of the first graduation, we realize that the concept seems to work out well: startup ideas were born thanks to the several networking opportunities such as the Summer Schools, and a real EIT ICT Labs community has formed. Our first graduates have established their Alumni Association and our Alumni are ready to act as student ambassadors of the Master School. The students are members of the well-functioning EIT ICT Labs network, thus we hope that they will help our organisation boost European innovation, whether they stay in Europe as entrepreneurs starting their own business or as employees of European industry, or they return home to contribute to the development of the local ecosystem of their home country.

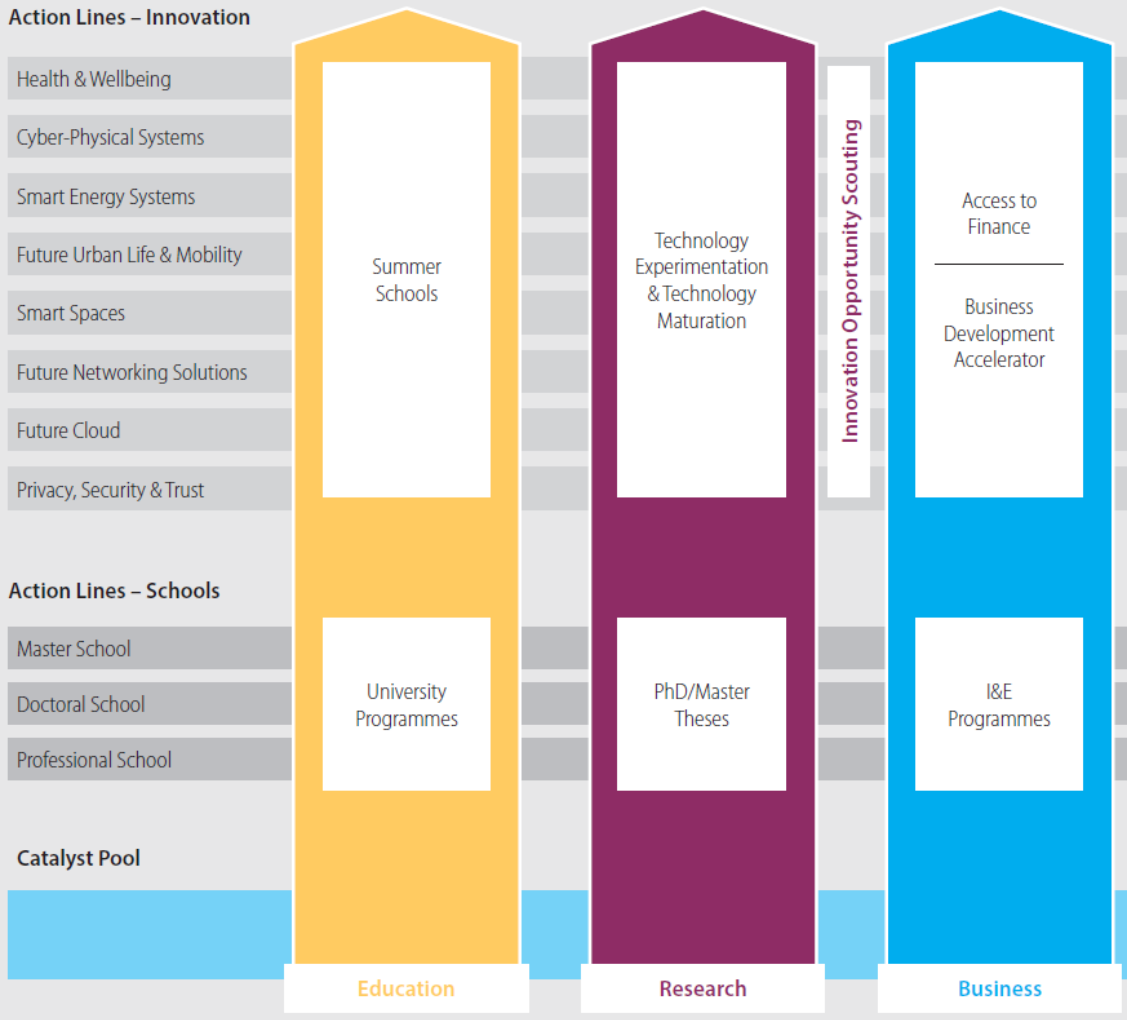
2.2. EIT ICT Labs Doctoral School

In line with the motto "[f]rom idea to product, from lab to market and from student to entrepreneur",[6] the EIT ICT Labs Doctoral School combines ICT related research topics with I&E education and aims at supporting the development of the startups founded by the doctoral students based on their research results. In order to become a student of the EIT ICT Labs Doctoral School, applicants have to be enrolled in a doctoral programme of one of the partner universities, such as ELTE or BME in Budapest. The theme of the EIT ICT Labs Budapest Doctoral Training Centre (DTC) is "Excellence in communication software and system performance". The Budapest DTC cooperates tightly with the partners of the Budapest Associate Partner Group, such as Ericsson Hungary, Magyar Telekom, Cisco Systems Hungary, Nokia Solutions and Networks, ELTE-Soft, and MTA SZTAKI.

3. RESEARCH, DEVELOPMENT AND INNOVATION

As the Strategic Innovation Agenda of EIT ICT Labs states it, „(…) EIT ICT Labs focused its investments on a limited number of innovation areas. These have been selected with respect to European relevance and leadership potential. The activities in these domains have been grouped into eight research-based innovation Action Lines (…)."[7] The innovation areas include Health & Wellbeing, Cyber-Physical Systems, Smart Energy Systems, Future Urban Life & Mobility, Smart Spaces, Future Networking Solutions, Future Cloud, as well as Privacy, Security & Trust. The Action Lines concern the activities of EIT ICT Labs not only in research but also in education and business: EIT ICT Labs related research, development and innovation (R&D&I) projects address these issues, the EIT ICT Labs Summer Schools are organized in these areas and the startup contests of EIT ICT Labs call for ideas on these topics.

[6] EIT ICT Labs, SE n.d., *The Knowledge Triangle*, EIT ICT Labs, viewed 14 April 2014, <http://www.eitictlabs.eu/about-us/strategy/the-knowledge-triangle>.
[7] EIT ICT Labs 2014, *Blended Life in a Connected World - Strategic Innovation Agenda 2014-2016*, EIT ICT Labs, p. 15, viewed 15 June 2014, <http://www.eitictlabs.eu/fileadmin/files/2014/docs/EIT-ICT-Labs_SIA_Q4_public_RevA.pdf>.



The Action Lines and the three fields of the Knowledge Triangle

Source: "Figure 2.2 EIT ICT Labs Value Creation Engine," EIT ICT Labs 2014, Blended Life in a Connected World - Strategic Innovation Agenda 2014-2016, EIT ICT Labs, p. 11.[8]

Current research projects at the Budapest Associate Partner Group concern a range of Action Lines: Cyber-Physical Systems, Future Networking Solutions, Urban Life and Mobility, Future Cloud, Smart Spaces, and Smart Energy Systems. The EIT funding of the projects complements the financial support from the Research and Technological Innovation Fund of Hungary. The partners working on the projects include the two universities, ELTE and BME, as well as the business partner Ericsson Hungary and the research centre MTA SZTAKI.

4. BUSINESS DEVELOPMENT

4.1 Business Development Accelerator

EIT ICT Labs stimulates the birth of new enterprises, helps innovative SMEs and startups to grow to a European level and beyond, enriches companies with new technologies and provides support to turn research results into successful innovations. The main tool to achieve these objectives is the EIT ICT

[8] http://www.eitictlabs.eu/fileadmin/files/2014/docs/EIT-ICT-Labs_SIA_Q4_public_RevA.pdf, accessed June 2014.

Labs Business Development Accelerator (BDA), the experts of which scout and coach innovative SMEs and startups in Europe.[9]

The BDA groups operate at the EIT ICT Labs CLCs, including the Budapest CLC, where the BDA team has recently started operating actively and has already introduced JOINECT Technologies, a Hungarian startup to the European market. Sopreso, an application created by JOINECT Technologies to enable audiences to ask, comment and like presentations live, was presented and used by the speakers at the EIT ICT Labs Partner Event in Berlin, on 9-10 April 2014. Due to the Budapest Associate Partner Group, JOINECT Technologies could also participate in a panel at the conference PODIM 2014, taking place in Maribor, Slovenia on 14-15 May 2014. In addition to the BDA activities, the Budapest Associate Partner Group has created a platform of dynamically developing SMEs, including AITIA International, Attrecto, BalaBit IT Security, BHE Bonn Hungary Electronics, BInergy, ICT Association of Hungary, IND Group, IntelliFactory, NETvisor, and Prezi.

4.2 EIT Awards

In order to promote new enterprises, the EIT has launched the annual EIT Awards, namely the Venture Award to present innovative business ideas emerging from the KICs, and the Change Agents and Next Generation of Entrepreneurs (CH.A.N.G.E.) Award to introduce young entrepreneurs participating in the education programmes of the KICs. In both categories there are three winners every year, one from each KIC, offering them the prize of a tailor-made mentoring and coaching programme.

4.3 Idea Challenge

In addition to the EIT Awards, EIT ICT Labs has also launched the Idea Challenge, which targets new business ideas related to one of the eight EIT ICT Labs Action Lines. Awarded participants win up to 40.000 EUR cash, office space for six months in one of the CLCs, as well as coaching and mentoring from experts of the EIT ICT Labs BDA team.

5. X-EUROPE OUTREACH PROGRAMME

In the framework of the X-Europe Outreach Programme, which is coordinated from Budapest, EIT ICT Labs builds partnerships with those member states of the European Union where no EIT ICT Labs node is located. The purpose of the programme is to provide opportunities for students, to empower the academic and research sector in the focus countries, and to activate startups.

5.1 Opportunities for students

The Outreach Programme provides opportunities for talented and innovative ICT students from the focus countries by offering scholarships to support them to join the EIT ICT Labs Master School, which is free of charge for the citizens of the EU, EEA and Switzerland. Students from the focus countries can also participate in the EIT ICT Labs Summer Schools and they can get a scholarship which covers their travel and accommodation costs related to the Summer Schools. Further opportunities include short visits to one of the CLCs in order to work on a thesis project, to take subsets of EIT ICT Labs Master School courses, or to do an internship.

5.2 Opportunities for professors and researchers

The Outreach Programme provides opportunities for academics by offering access to a network of excellence. By joining this network, professors and researchers can become partners of international EIT ICT Labs projects and they gain an increased chance to submit successful proposals in European research and innovation programmes, such as Horizon 2020.

Partnership in education is planned through bilateral agreements: in exchange of helping with the recruitment of students for the EIT ICT Labs education programmes, EIT ICT Labs offers benefits to

[9] EIT ICT Labs Budapest Associate Partner Group 2014, *R&D activities business development - Innovation support programs at the EIT ICT Labs Budapest Associate Partner Group*, EIT ICT Labs Budapest Associate Partner Group, Budapest, p. 2.

the university. These opportunities include short visits to EIT ICT Labs CLCs and partners, participation in EIT ICT Labs summer schools or master's programmes as guest lecturers, as well as cooperation with action line leaders and business partners in mutually relevant projects.

5.3. Opportunities for startups

The Outreach Programme activates startups from the focus countries by connecting them to EIT ICT Labs related innovation programmes and contests, including the Startup Activation Berlin, Summer of Startups in Helsinki, TechPeaks in Trento, and BrassTacks in Budapest.

Startup Activation Berlin 2013 was an idea contest organized by EIT ICT Labs Berlin in order to support startups from the focus countries of the Outreach Programme. Applications were expected in the field of two Action Lines of EIT ICT Labs, namely Cyber-Physical Systems and Future Cloud. The final event of the contest took place in Berlin on 25 November 2013, where all the nine finalists received 1000 EUR grants. In addition, the two best startups, LineMetrics from Austria and Transmetrics from Bulgaria won 30,000 EUR each.[10]

The Budapest Associate Partner Group has launched a startup training programme called BrassTacks for Central and Eastern European startups. At BrassTacks 2013, the ten best startups could participate in a workshop in Budapest on 2-4 December 2013, organized in cooperation with the Hungarian Mobility and Multimedia Cluster[11] and with Avec[12]. In the course of the practice oriented and interactive training, the young entrepreneurs coming from countries including Austria, Bulgaria, Hungary, Romania, and Slovenia could acquire skills and competences related to business modelling, customer-centric thinking, product development, and other fields that are crucial for early-stage startuppers. The programme included coaching and one-on-one mentoring sessions, as well as meetings with experts, local investors, and successful startups.[13]

6. GOALS FOR 2014-2016

6.1 Furthering the implementation of the knowledge triangle

By 2016, the EIT ICT Labs Professional School will have been established in order to provide ICT and business education for professionals, decision makers and executives. The Professional School will combine classroom courses with online modules, creating an innovative learning platform.[14]

In the period 2014-2016, EIT ICT Labs will foster research-based innovation by promoting the so-called High Impact Initiatives, which will be defined with regard to the priority areas of the Action Lines.[15]

Since its establishment in 2012, the EIT ICT Labs Business Development Accelerator has screened 750 SMEs and startups and has selected 70 of them for coaching. By 2016, the aim is to support 200 SMEs and startups and turn at least 25 % of them into successful European enterprises.[16]

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[10] EIT ICT Labs, SE n.d., *Startup Activation Berlin*, EIT ICT Labs, viewed 21 March 2014, <http://www.eitictlabs.eu/outreach/startup-activation-berlin/>.
[11] http://mmklaszter.com/en/
[12] http://avecincubator.com/
[13] EIT ICT Labs Budapest Associate Partner Group 2013, *Three days, six countries, ten startups: BrassTacks*, EIT ICT Labs Budapest Associate Partner Group, viewed 21 March 2014, <http://ictlabs.elte.hu/_old/index.php?id=three-days,-six-countries,-ten-startups-brasstacks>.
[14] EIT ICT Labs 2014, *Blended Life in a Connected World - Strategic Innovation Agenda 2014-2016*, EIT ICT Labs, pp. 30-31, viewed 15 June 2014, <http://www.eitictlabs.eu/fileadmin/files/2014/docs/EIT-ICT-Labs_SIA_Q4_public_RevA.pdf>.
[15] EIT ICT Labs 2014, *Blended Life in a Connected World - Strategic Innovation Agenda 2014-2016*, EIT ICT Labs, p. 14, viewed 15 June 2014, <http://www.eitictlabs.eu/fileadmin/files/2014/docs/EIT-ICT-Labs_SIA_Q4_public_RevA.pdf>.
[16] EIT ICT Labs 2014, *Blended Life in a Connected World - Strategic Innovation Agenda 2014-2016*, EIT ICT Labs, pp. 24-25, viewed 15 June 2014, <http://www.eitictlabs.eu/fileadmin/files/2014/docs/EIT-ICT-Labs_SIA_Q4_public_RevA.pdf>.

6.2 Outreach on a global scale

During the period 2014-2016, EIT ICT Labs intends to establish a physical representation in the Silicon Valley, in order to create a link between the ICT community in Europe and in the USA. Several members of the EIT ICT Labs network already have established partnerships with actors of the ICT related education, research and business sectors in the USA. In addition to these existing connections, EIT ICT Labs aims at increasing mobility, promoting joint work, and improving access to finance. By 2016, EIT ICT Labs will also have explored the opportunities in the BRIC countries, namely Brazil, Russia, India, and China. As a result, the European ICT community will soon be connected to the key innovation hotspots of the world.[17]

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