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**From Strategy to Practice  
in University  
Entrepreneurship Support:  
Strengthening  
Entrepreneurship and Local  
Economic Development in  
Eastern Germany: Youth,  
Entrepreneurship and  
Innovation**

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*The opinions expressed and arguments employed herein do not necessarily reflect the official views of the Organisation for Economic Co-operation and Development, or of the governments of its member countries.*

## **The project**

Eastern Germany has made impressive progress in restructuring its economy since 1990 and pursuing economic convergence with western Germany and Europe. Start-ups and young businesses have become key contributors to the region's economic and employment growth due to their dynamism and their capacity to exploit the local knowledge base. Over recent years, the entrepreneurship activity gap between western and eastern Germany has been significantly reduced, leading to almost equal levels in both parts of the country, involving approximately 1.7 percent of people aged 18 to 64 years in business start-up activity in 2007. The entrepreneurial potential however, especially amongst the highly qualified, is far from being exhausted, and further strengthening of indigenous entrepreneurship will be required to drive future economic development and respond to the global economic crisis.

University graduates have enormous potential for innovation and economic development. Mobilising them for entrepreneurial careers, enhancing their entrepreneurial skills and providing support for their business start-up are important. These tasks for higher education institutions are only now being fully recognised. Universities in eastern Germany are actively engaged in supporting entrepreneurship. Many have established entrepreneurship professorships, departments and institutes for entrepreneurship that already feature as integral parts of the internal support structure. Dedicated start-up support services by Entrepreneurship Centres and technology transfer units offer would-be entrepreneurs and those already in the start-up process, consultation and access to networks and premises. A clear strength to build on is the presence of people – students, professors, researchers, university staff – with a clear interest in entrepreneurship. Much can be learned from an international exchange of information on what works and what are the likely pitfalls. That's where this joint project policy development project comes in. The aim of the project has been to analyse policy challenges and options in enhancing entrepreneurship and to offer inspiration for new approaches through local capacity building and international exchanges of policy experiences.

The OECD LEED Programme was invited by the Federal office for reconstruction of eastern Germany (Angelegenheiten der neuen Bundesländer) at the German Federal Ministry of Transport, Building and Urban Affairs in 2008 to continue the work which started back in 2005<sup>1</sup> focusing on universities, entrepreneurship and innovation and to collaborate with the six eastern German *Länder* to review current entrepreneurship support in selected universities and university partner organisations with the aim of stimulating the inception of new and effective initiatives in creating entrepreneurial mindsets and getting those with a viable business idea 'into business'. Berlin and Rostock have been selected for case studies, respectively the Freie Universität Berlin, the Technical University of Berlin, the Beuth Technical University of Applied Sciences (Beuth Hochschule) and the University of Rostock. The case study work included the preparation of background reports, gathering of information from questionnaires involving a broad group of local stakeholders, and meetings and interviews with key actors in the respective university entrepreneurship support systems. For the latter international review panels were formed and study visits organised to Rostock (2-4 December 2008) and to Berlin (9-12 February 2009).

## **The report**

This report brings together findings from the case studies in Berlin and Rostock on how entrepreneurship support is organised, the activities in entrepreneurship education and start-up support, and the strategy behind. In addition, the report provides in its “fishing ideas from international

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<sup>1</sup> Results of the 2005-2007 work are published in a Compendium of policy recommendations, see [www.oecd.org/cfe/leed/entrepreneurship/compendium](http://www.oecd.org/cfe/leed/entrepreneurship/compendium).

good practice” section 13 short descriptions of how places and universities collaborate elsewhere in mobilising their talents for entrepreneurial action. These short case studies are intended to provide inspiration for both policy and local action on the key issues in making places conducive to entrepreneurship and innovation, in entrepreneurship education, and in making university entrepreneurship support systems work.

The two main parts of the report are followed by useful Annex documents. In Annex 1 and 2 Action Plans for the reviewed universities are presented, based on the synthesis reports were delivered to the Berlin Senate Administration for Economics, Technology and Women’s Affairs, as the main partner institution at Berlin Senate level, and the Ministry of Economics and Labour of Mecklenburg-Vorpommern as the main partner institution in Mecklenburg-Vorpommern. The assessment framework and previous OECD LEED work on university entrepreneurship (OECD, 2008) contributed to the development of a criteria list with six dimensions of good practice. The OECD LEED Programme has to date invited 19 universities across seven OECD member countries to have their entrepreneurship support self-assessed against the six dimensions. The criteria list is presented in Annex 4.

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**PART 1**

**FROM STRATEGY TO PRACTICE  
IN ENTREPRENEURSHIP SUPPORT IN UNIVERSITIES**

## **UNIVERSITY ENTREPRENEURSHIP SUPPORT IN BERLIN UNIVERSITIES**

### **Overall findings**

Berlin has a good track record in graduate entrepreneurship and a rich support framework. The strong science base, with 34 universities, a range of high-profiled scientific institutions and centres of research excellence, attracts top-level students. University-industry relationships are well-established. Berlin is a global centre for certain types of business, cultural industries are of increasing importance to the local economy and an increasingly popular global tourist destination. Creative people from all around the world want to spend time and/or live in Berlin. All of this provides a rich pool of opportunities for new entrepreneurship.

Public policy on federal and state level, the entrepreneurship enhancement and support offer of universities and external support for graduate entrepreneurship should be thought of as a coherent set of mutually reinforcing drivers in Berlin's entrepreneurship ecology. There is a high level of awareness of the economic and social impacts of entrepreneurship. The challenge is to define entrepreneurship in a broad way, recognising the importance of entrepreneurialism and not only starting companies, and paying attention to concept creators and social entrepreneurs as much as to technology applicators.

Universities actively promote entrepreneurship. So far, public policy has been a main driver for this. The challenge is now to develop a more strategic approach that is reflected both within the universities and at the Senate level. Universities should have a clear mission towards entrepreneurship, which is focused on changing mindsets and clear expectations of what they want to achieve by this. To get young people thinking about creating value rather than getting the job done, entrepreneurship education is as much needed as entrepreneurship support activities.

### **Entrepreneurship education**

Entrepreneurship education at the reviewed universities, as well as at Berlin city level, is in an early phase of development, reflected in a small breadth of entrepreneurship education activities in each of the reviewed university and a small proportion of students benefiting from them (currently 5-7% of the total student population). A clear strength to build on is the presence of people – teachers, researchers, and non-faculty members – with a clear interest in entrepreneurship education, who are involved in entrepreneurship education activities at all three universities. Some of these appear to be key 'resources' which could be leaders in expanding entrepreneurship education across Berlin's universities.

Public policy in general, and support programmes of the Senate, the federal government and the EU in particular, are strong drivers for higher education institutions to get engaged in the promotion of entrepreneurship. Whereas this is clearly reflected in the entrepreneurship support activities offered on campus (see below), entrepreneurship education seems to be less a priority. At the Senate level there seems to be a lack of:

- A clear and shared vision of the role of entrepreneurship education for graduate entrepreneurship.



- A written strategy and its translation into specific instruments to advance entrepreneurship education.
- Strategic indicators to measure entrepreneurship outcomes and the effectiveness of entrepreneurship education and entrepreneurship support activities funded by the Senate.

Centres for Entrepreneurship were established at all three universities to group together start-up support activities and to promote entrepreneurship education activities. The directors of these Centres report to the university boards (rector or vice-rector). The creation of formal Chairs is planned at either the Faculty of Educational Science and Psychology (Freie University) or the Faculty of Economics and Management (Technical University and Beuth Hochschule).

Yet, the current extent of entrepreneurship education is more the result of a bottom-up process and not fully reflected in university policy and institutional set-up. This is visible in:

- A lack of strategic anchoring. Entrepreneurship education is strongly dependent upon the individual commitment of few faculty members and non-faculty staff and not yet fully reflected in curriculum development or the university budget.
- Weak academic status and legitimacy. Entrepreneurship is predominantly viewed by the university leadership as a third mission and it is not seen as a field of research or an academic subject, limiting the resources put into it.
- A co-ordination deficit. A range of services, departments and structures are delivering their own entrepreneurship education activities. Each unit has its own understanding of what entrepreneurship education means and requires, and acts accordingly.

The Centres have established wide networks of contacts and collaboration with alumni founders, business consultants and business support organisations, business angels and venture capitalists. These are regularly engaged in the education activities. Such networks bring in a practice-oriented perspective and form a strong and necessary pillar of entrepreneurship education.

There is experimentation with the conceptual framework of entrepreneurship education and the teaching methods. The concept of entrepreneurship education at Freie University is a source of innovative and original approaches. The VENTURE CAMPUS seminar programme of the TUB also offers an innovative way of how interdisciplinary business plan courses, based on collaboration between five university chairs and the involvement of external experts, can be run. Exchange of experience happens but rather at an individual and personal level than as part of a learning-from-each other process.

Entrepreneurship education is at present not sufficiently integrated into curricula. Courses, seminars and lectures are offered as electives, bearing few or no credits. This has an impact on the take-up rate: students who took entrepreneurship courses often 'overloaded', or there were caps on enrolment, or activities were not widely known amongst students.

Student engagement is still low relatively to the total student population. Entrepreneurship education activities are targeted mainly at undergraduate students. The Freie University initiative (still at a very early phase of negotiations) to offer future Dahlem Research School entrepreneurship courses to doctoral students will be an important means of reaching this level of university education.

The offered selection of entrepreneurship courses is limited. There is a strong focus on business plan development and the 'how to' approach, that is, how to develop a successful business plan, how to start a business, etc. The current approach focuses on business administration knowledge, skills and techniques in marketing, financing, accounting, law, etc., and less on different forms of entrepreneurship, (such as corporate, social, institutional, academic, business, and high-tech versus low-tech).

There are limited qualified resources to teach entrepreneurship at the three levels of education and a lack of teaching resource management and development through training and practice/experience exchange. At the same time, there are very few incentives for faculty members to engage into training or be more active in teaching entrepreneurship. The lack of qualified teaching resources can impact enrolment rates and visibility throughout the campus.

The connection between research and teaching is weak, yet integrating up-to-date research with teaching is considered important by those currently involved. At Freie University, three professors in the Faculty of Educational Sciences and Psychology are currently engaged in research, and funding is sought for more activities related to social entrepreneurship. At the Technical University, research may advance in light of the recruitment of a new faculty member. At Beuth Hochschule, a phased monitoring of the impact of entrepreneurship support activities is underway. The evaluation practice includes a post course evaluation of students and a graduation questionnaire as well as a survey of alumni.

There is yet no systematic assessment and evaluation of entrepreneurship education activities. Important levels of evaluation, such as learning (what do the students really learn?) or behaviour (does learning lead to changes in attitudes, perceptions and behaviours?) are not taken into consideration. The background of students engaged in entrepreneurship courses, for example, is crucial as prior exposure to entrepreneurship (through family, previous entrepreneurial or similar experiences) shapes the needs and biases the learning results but is not yet taken fully into account.

### **Start-up support framework**

The entrepreneurship support framework is well-endowed with programmes and initiatives to assist students, graduates and young researchers in starting-up a business. It is characterised by a high level of competence and enthusiasm, with people having first-hand experience with entrepreneurship or being well-trained.

The Berlin Brandenburg Business Plan Competition<sup>2</sup> and several other smaller university internal business plan events are key instruments in 'marketing' entrepreneurship. The strong emphasis on a business plan approach means that many of the support mechanisms are tailored to the very early stages of entrepreneurship.

Coaching and mentoring are key components of the support framework. Evidence available is insufficient to judge upon quality or outcomes but suggest that the overall strategy of linking entrepreneurs with experienced coaches and mentors in a systematic, evaluated and subsidised manner appears sensible.

Interviews with graduates and young researchers revealed that it is not always readily apparent what programmes were available and suitable (50-odd networks in Berlin, of which not all were

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<sup>2</sup> See [www.b-p-w.de/2010/index.php](http://www.b-p-w.de/2010/index.php).

considered productive or active). This suggests a gap in communication and information flow and high search costs.

Bureaucratic barriers were reported by EXIST<sup>3</sup> supported founders to slow down the start-up process and cause an increase in opportunity (time) costs for the would-be entrepreneur. It was noted that EXIST and coaching programmes were not sufficiently flexible or responsive to the diversity of start-ups. For example, earmarked funding does not allow for different types of spending and funds were not readily available according to the level of the entrepreneur's situation or the level of the venture's development. Coaching services were not always sufficiently tailored to needs. Although rules were designed to reduce waste and abuse, they seem to have introduced rigidity to the system which attenuated the effectiveness of the outcomes.

The emergence of entrepreneurship support initiatives and dedicated government support programmes poses the question as to whether the university internal entrepreneurship support initiatives are a reaction to this or the result of an internally-driven process. It seems that entrepreneurship support is treated and managed away from the core university strategy. The strategic logic, from the highest levels of the university to the entrepreneurship centres, was not always visible. Besides the entrepreneurship support provided by the entrepreneurship centres, there appear to be parallel efforts at the department or unit level.

Funding allocation from the central university budget is low and only a marginal amount of the entrepreneurship centres' budgets is acquired from private investors and corporate firms, which leaves the entrepreneurship support structure dependent upon time-limited public funding (European Social Fund, Federal government and Senate). Except for Freie University strategy to attain self-financing by 2012, long-term financial self-sustainability is not yet fully tackled.

A clear incentive and reward structure is absent. Despite the enthusiasm and positive attitudes towards entrepreneurship in the centres for entrepreneurship, there are very few incentives other than a weak hope for future revenues and increased legitimacy.

Evaluation of the support initiatives is not incorporated in the daily administration of the programmes but occurs after programme termination. This makes it difficult to assess effectiveness and to identify and prioritise areas for improvement.

All three reviewed universities have established their own entrepreneurship centres, closely linked with the technology transfer offices. These centres provide information, facilitate access to finance and manage the utilisation of university premises and laboratories by founders. Except for the latter, these kinds of support can also be accessed through external structures. The entrepreneurship centres have established networks with external support organisations to which students and graduates are referred. Key partners are Investitionsbank Berlin (IBB) – Berlin's development bank, which runs coaching facilities<sup>4</sup> and organises the annual Berlin-Brandenburg Business Plan competition.

The entrepreneurship centres give information on the different financing possibilities (subsidised grant and loan schemes, business angels, venture capital and bank loans), assist with applications for

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<sup>3</sup> EXIST is a support programme of the Federal Ministry of Economics and Technology and specifically designed to improve the entrepreneurial environment at universities and research institutes and to increase the number of technology and knowledge based company formations.

<sup>4</sup> See [www.tcc-berlin.de](http://www.tcc-berlin.de) for coaching offers to technology intensive start-ups, and [www.tcc-berlin.de/das-Kreativ-Coaching-Center.phtml](http://www.tcc-berlin.de/das-Kreativ-Coaching-Center.phtml) for start-ups in the creative industries.

EXIST and accompany EXIST stipends throughout the funding period. The IBB, as the main external partner, offers phase-tailored and well-balanced programmes with respect to the different phases of entrepreneurship. For the early phase and for most types of businesses there seems to be no obvious financing gap.

All three universities offer premises for selected founders, either on or off-Campus, and free access to laboratories. Assistance with business planning, help in raising finance, networking and training in accounting and marketing are available to tenants. Location afterwards in Berlin's science and technology parks is facilitated.

At Beuth Hochschule, following the tradition of a university of applied sciences, encouraging and supporting entrepreneurial activities follows a structured approach to translating entrepreneurial ideas into enterprises. *Gründerwerkstatt*<sup>5</sup>, a subsidised location for founders in the central part of Berlin, offers up to 20 start-up teams from different universities who have passed a sophisticated selection process, a *Gründerstipendium* and 18 months of free location to develop their products or services.

At Technical University, the *Gründungsservice*<sup>6</sup> organises information events, entrepreneurship education in the framework of a lecture series with alumni, enhancing entrepreneurial traits, a one-week Entrepreneurship Academy, networking and an online start-up team matchmaking database, coaching and mentoring, as well as technology scouting. The office also manages allocation of premises to selected founders and access to laboratory space. The Technical University has an impressive track record of spin-off firms but it remained unclear to what extent *Gründungsservice* capitalises on earlier experience in entrepreneurship support. Whilst interest in entrepreneurship was mentioned at the top level of the university, it did not seem to be supported widely by departments and faculties.

At the Freie University, the entrepreneurship centre *Profund*<sup>7</sup> is under the Vice-rector for Research and part of the technology transfer office. *Profund*, the entrepreneurship centre, is particularly interesting for its professional management and its strategy to achieve financial self-sustainability.

Networking and information exchange amongst the entrepreneurship centres is well-developed on a personal and informal level, as confirmed by the high level of knowledge about other support offers. Yet, the level of formal university co-operation in entrepreneurship support is low and based mainly on students participating in the offers by universities other than their own. With regard to the overall entrepreneurship support system, it is unclear whether what is offered by each university is sufficient in terms of quality and quantity for the different phases and types of entrepreneurship, or whether increased collaboration would increase the scale and scope of the support.

Linkages with the universities' key areas of research and the Senate's prioritised areas of research and industrial strengths (*Kompetenzfelder*) appeared to be weak or inexistent, as is the link between entrepreneurship support and university-industry relations. This may leave entrepreneurial opportunities unexploited. The recently-started innovation cluster in aviation technology, steered by the Senate Administration for Science and Education and involving the Technical University, aims at stimulating synergies and facilitating their translation into technology transfer and business start-ups.

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<sup>5</sup> See [www.beuth-hochschule.de/gruenderwerkstatt/](http://www.beuth-hochschule.de/gruenderwerkstatt/).

<sup>6</sup> See [www.gruendung.tu-berlin.de/](http://www.gruendung.tu-berlin.de/).

<sup>7</sup> See [www.fu-berlin.de/wirtschaft/profund/](http://www.fu-berlin.de/wirtschaft/profund/).

## UNIVERSITY ENTREPRENEURSHIP SUPPORT IN THE UNIVERSITY ROSTOCK

### Overall findings

In Rostock the sectoral priorities of the region, the rural economy, marine technology and tourism are beginning to combine with a real strength in innovation (especially in biomedical-related sectors), a strong pure and applied research base and the infrastructures to support knowledge transfer from higher education to industry in a way which will give the region a unique sectoral specialism over time. This specialism is likely to develop around the healthcare sectors, including health tourism and should lead to long-term sustainable development for the region which is neither seasonal nor 'old' economy. Rostock and the surrounding area have a multitude of different technology transfer institutions as well as a strong research base within the University of Rostock.

Creating an entrepreneurial culture has been put high on the policy agenda in Rostock for several years. Whilst there appear to be several short- and medium-term opportunities to strengthen graduate entrepreneurship, a large part of the policy effort should focus on achieving a number of longer-term shifts. This includes continuing the fostering of positive attitudes by staff and students to enterprise and entrepreneurship activity but also increasing the scale and breadth of public-private linkages. Examples include increasing the extent of university-industry linkages, in research as well as teaching (*e.g.* guest lecturing, sandwich courses/student internships etc.), but also the linking of public and private financing for start-ups. Also, it ought to be possible for the public and private sectors to work more closely together in addressing image problems and raising the attractiveness of the city and its surroundings as business location.

Public funding has been used to set up and support a range of different initiatives and not-for-profit organisations to enhance technology-based and academic entrepreneurship. Several of these are quite successful. Most of the initiatives, however, are in the form of short-term projects with an uncertain future. In addition, several of the initiatives and organisations are competing with each other for the same public funding. This has not helped to create a supportive environment where the initiatives can complement and learn from each other.

### Entrepreneurship education

Overall, there is a strong desire and enthusiasm for entrepreneurship education/training and graduate entrepreneurship amongst those interviewed. These individuals recognise its importance in the context of establishing the region as a competitive and innovative competitor globally. Among the interviewees there is a wealth and depth of experience and knowledge. There is a range of additional offers to support student enterprise and graduate entrepreneurship. Several initiatives in entrepreneurship education and graduate entrepreneurship have been established, promoting entrepreneurship to students across the campus and creating new entrepreneurship education modules aimed at undergraduate students. Clearly, there has been substantive development of a wide and varied infrastructure to promote and support entrepreneurial activity both inside and outside the University of Rostock and this environment covers different stages in the venture creation process and targets some specific market segments, *e.g.* in technology and biotechnology in particular.

The interviews raised a number of existing and potential challenges for the growth and development of entrepreneurship education and graduate entrepreneurship across the higher education sector in Rostock. The university-assigned task of motivating staff and students is under-funded, which is why it is mainly performed in different time-bound projects. There are few university internal

incentives for researchers to become engaged in entrepreneurship; no money, no allowances and no reduced teaching is offered. Yet, this must be viewed with regard to the need for more qualification and motivation (listed below) which was perceived amongst staff.

The opportunity for student engagement appears, however, to be serendipitous and not embedded within the educational system.

- Professors interviewed suggested that other colleagues were not willing, able or interested in taking a similar entrepreneurial approach, though there was general agreement that this would be beneficial to their students.
- Students interviewed suggested that there were too few opportunities to engage in entrepreneurship at the university, realising that having a professor as a mentor was a real stimulus but recognising that it was difficult finding an appropriate professor to do this.
- Linked to the above point was the observation from students that there were also too few opportunities for engaging with businesses and entrepreneurs.
- Students learn what they need by finding solutions concerning entrepreneurship through internet searches and their social networks. These solutions can be expensive and are often provided outside Rostock or the region.

There is no opportunity for staff development in teaching entrepreneurship. Professors learn through their own efforts and from their network activities. They locate good practice examples from wide sources as they discover them. This creates many personal approaches to entrepreneurship without any overarching institutional conception which is promoted to all students.

There is an opportunity for staff development in supporting enterprising students. Providing entrepreneurial learning opportunities to students involves a wide range of personnel. Other staff in the support environment could benefit from awareness and development training – careers advisers, technology transfer officers, incubation managers, etc.

There are no explicit institutional policy frameworks or visions for entrepreneurship education:

- There is no overarching policy framework which articulates explicitly what is being sought from education at all levels in the education system.
- There is not yet an explicit structure which joins up existing learning opportunities at the university with clear aims and outcomes for each component and is clearly promoted to the student and graduate population.
- The role of other actors in the entrepreneurial eco-system, including all relevant policy organisations and other structures and their strategies and activities, is unclear.

There is a lack of strategic investment for longer-term sustainability of the university's entrepreneurship support. A common observation was the challenge in planning for future activities and growth in an uncertain funding environment. This is causing continuity and sustainability difficulties for staff and for projects/programmes.

Too few students are currently engaged in entrepreneurship education activities. The scale of student engagement is generally low as a percentage of the total student population, although good responses are received for what is offered. Engagement is mainly targeting undergraduate students.

There is an emphasis on a narrow conception of entrepreneurship. In the main, provision is aimed at business start-up processes and technology transfer. Profit-oriented approaches will not meet the motivations of all students. Broader, inclusive conceptions are required which are aimed at developing entrepreneurial graduates across all disciplines.

### **Start-up support framework**

The university has a technology transfer unit and established an entrepreneurship centre, which, according to the entrepreneurship support providers outside the university, are understaffed.

There is broad university external entrepreneurship support offer targeted to graduates and young researchers in the region (Spin-off/FMV, Techno-Start-upMV and others) Premises for graduate entrepreneurship and technology transfer activities are in place with different kinds of incubators, science and/or technology parks in close proximity to the university. There is a good mix of initiatives, including high- and low-quality premises for business start-ups. The different incubator facilities and technology centres are all financed publicly.

The availability of reserved land for 'free builders', that is, tenants wanting to build their own premises when leaving the incubator/technology centre is a key strength of Rostock. Approximately one-third of high-tech start-ups are located in two technology centres. The *Technologiezentrum Warnemünde*<sup>8</sup> (TZW), located outside Rostock city, is focusing on technology-based entrepreneurship and has at present almost 100 tenants. The majority (ca. 80) is located in the TZW itself, whereas the rest are located in the land/technology 'park'. There is reserved land for tenants to move in or to expand after graduation from the TZW. TZW provides well-developed space (mainly work space) and offers a range of support services for tenants. Rents are close to market price. Students and graduates are offered support but so far this has only resulted in one start-up per year. The Technology Centre in Rostock city is insolvent but will not be closed down. The prestigious *Biomedizinisches Forschungszentrum*<sup>9</sup> (BMFZ) opened for tenants two years ago and had the potential to become an incubator for biotech firms. Major advantages include its proximity to the university and hospital and the availability of reserved land for future expansion of biotech firms close to BMFZ main building. BMFZ is now a real estate/office hotel. The part which is run by the Municipality has no management or support facility for tenants. Rents are high (the same as in Berlin) and the occupation rate is still low.

The motivation of academic entrepreneurs for financial profit-making does not appear to be very strongly developed in Rostock. In turn, new firms may place insufficient attention on becoming financially strong and this might reduce the demand for private financing, such as venture capital and business angels.

The available public financing schemes for knowledge-intensive and technology-intensive start-ups can be considered a strength as such support is very much needed to encourage both the establishment of an entrepreneurial culture and knowledge-based start-ups. This kind of funding is also essential to attract private financing. Progress has been made in reducing overlap between

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<sup>8</sup> See [www.tzw-info.de/](http://www.tzw-info.de/).

<sup>9</sup> See [www.bmfz-rostock.de/](http://www.bmfz-rostock.de/).

different funding schemes and delivery agencies. Work in this direction needs to be continued. Yet there is a risk of over-dependence on public funding for continuation of the current technology-based entrepreneurship initiatives and a need to complement public funding with private financing, such as venture capital, business angels, commercial loans and private industry investments. This is even more important with regard to recent cuts in public funding. The system for public financing of new enterprises and entrepreneurship will need to change. The availability of private financing (private individuals and investors, business angels, venture capital, banks) is limited. This is a clear weakness for the creation of high-growth new firms. However, it was not clear whether this is the result of a lack of demand for private financing or insufficient supply. The limited availability of private financing also results in low levels of collaboration between the public and the private sector, e.g. university-industry linkages. Commercial banks' lending policy is considered very restrictive and the situation on the property market makes it often unfavourable for entrepreneurs to borrow money from commercial banks. This shortcoming is balanced by the Guarantee Bank, which offers, as a special credit institute with exclusive guarantees, loans to SMEs

The SME Holding Company Mecklenburg Western Pomerania<sup>10</sup> (*Mittelständische Beteiligungsgesellschaft Mecklenburg Vorpommern mbH*), a financial institute linked with the Guarantee Bank Mecklenburg Western Pomerania, offers subsidised mezzanine financing for high-tech SMEs but also, and to a large extent, business founders and existing businesses in traditional industries. This is meant to facilitate access to loans and private capital. As a result of the 2007 EU decision, public financing for SMEs was reduced from EUR 2.5 million to EUR 312 000. In the light of the current crisis, Germany increased the maximum amount of public financing for SMEs to EUR 750 000 until 31 December 2010. Because of the crash on the mezzanine capital market, a further increase of the maximum amount might be needed.

There is a lack of private venture capital in the region. Earlier attempts to create business angel networks in the region have not yet been successful. Public venture capital schemes exist and offer seed and start-up financing. However, public venture capital is not a substitute for private venture capital.

The Venture Cup<sup>11</sup> competition is considered an important way to finance academic start-ups in Rostock. It was first launched in 2008/09 and succeeded Venture Sail, a similar competition organised by the PVA. Around 50 ideas are generated per year; the record year held 120 ideas. The quality of ideas has improved over the years. The prize-money (financed by the Land government and the European Social Fund) is used for pre-seed and seed financing of several new ventures and non-financial support for business start-up and development. The precondition that winners should not have registered their business when being awarded the prize is considered a barrier.

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<sup>10</sup> See [www.buergschaftsbank-mv.de/index.php?id=1](http://www.buergschaftsbank-mv.de/index.php?id=1).

<sup>11</sup> See [www.venturecup-mv.de/](http://www.venturecup-mv.de/).



## CONCLUSIONS AND KEY POLICY ISSUES

### Good practice

All of the reviewed universities are actively engaged in supporting entrepreneurship. They either use government schemes, private sector funding or a combination of both to sustain and expand their 'third mission'. They have established dedicated start-up support services, in the form of entrepreneurship centres and technology transfer units, which offer would-be entrepreneurs and those already in the start-up process consultation and access to networks and premises. In addition, they provide direct support to start-up: mentoring, grants, incubation facilities. A clear strength to build on is the presence of people – teachers, researchers, and university staff – with a clear interest in entrepreneurship support. All of these developments demonstrate the importance given to the creation of new growth potential ventures out of the university environment.

In particular, initiatives of good practice can be found in the following.

*Start-up team building.* Start-up team building is recognised and being supported by a number of universities. Entrepreneurship Centres and individual professors get people with innovative ideas, technological know-how and business skills together, and in this way, help to create new ventures with growth potential. The Technical University of Berlin, for example, runs an online database that helps connecting people at city and even broader levels.

*Start-up support collaboration and networking.* Collaboration between university-internal and external entrepreneurship support providers works well, because roles are clearly defined, referral is well-organised, and university-internal start-up support acts as a single window for students. Inter-university referral is also well developed.

### Areas for improvement

Entrepreneurship support in the reviewed universities is under development. Besides the above mentioned good practice some areas for improvement have been identified.

*Entrepreneurship education.* Entrepreneurship education at the reviewed universities is in an early phase of development. The overall entrepreneurship effort is still lower than in leading universities in the OECD area, reflected in smaller breadth and refinement of the entrepreneurship education offer. Student engagement is also still low relatively to the total student population. The current extend of entrepreneurship education is more the result of a bottom-up process, and not fully reflected in university policy and institutional set-up.

*Systematic assessment and evaluation of entrepreneurship support activities.* Most of the entrepreneurship support activities started half a decade ago. Yet, there is little systematic self-assessment and evaluation of entrepreneurship education activities. Important levels of evaluation, such as learning (what do the students really learn?) or behaviour (does learning lead to changes in attitudes, perceptions and behaviours?) are not taken fully into consideration. The background of students engaged in entrepreneurship courses, for example, is crucial as prior exposure to entrepreneurship (through family, previous entrepreneurial or similar experiences) shapes the needs and biases the learning results, but not yet given full account.

*Training of trainers.* There are not enough qualified resources to teach entrepreneurship at the three levels of education. There is a lack of teaching resource management and development through training and practice/experience exchange. The lack of qualified teaching resources can impact enrolment rates and visibility throughout the campus.

*Incentives and rewards.* There is a need for strong incentives to increase the participation of professors in entrepreneurship support activities, such as teaching, mentoring or sharing of research results. Existing rewards are limited to university internal celebrations and local media coverage. It should be envisaged to reduce the teaching load for those involved in 'strategic' entrepreneurship activities, such as entrepreneurship ambassadors and mentors, and reward those having designed and implemented innovative and high quality teaching and pedagogical material, and those who shared and/or instigated the dissemination of ideas and good practice. Furthermore, recruitment and career development should be entrepreneurship sensitive.

### **Overall policy messages**

Summarising the findings from the case studies and relating them to the criteria list with its six dimensions of good practice, presented in Annex 4, suggest the following directions for public policy involvement in university entrepreneurship support:

- *Strategy:* There is clear role for public policy in 'opening up' universities towards their 'third mission', which ideally should be part of their key missions – research and teaching. Clear incentives and rewards are needed for professors, researchers and students to engage. Public policy can facilitate their introduction by adding 'entrepreneurship support' to the list of performance criteria.
- *Resources:* Public kick-off funding for entrepreneurship support infrastructure is common to many OECD countries. Yet, it is the balance between a minimum long-term financing for staff costs and overheads and the openness to private sector involvement in the financing of Entrepreneurship Chairs and incubation facilities which proves to be successful.
- *Support Infrastructure:* Universities will need to find their place in existing start-up and entrepreneurship support systems. Networking and incentives for clear referral systems can be useful to increase the effectiveness and efficiency of start-up support and to reduce duplication, confusion and waste of resources.
- *Entrepreneurship education:* The exchange of good practice in creative teaching methods allows for improvement and innovation. Universities need to have a genuine interest in such exchange, but public policy can facilitate the creation of platforms, publications, teaching material, etc. Another important area for public policy intervention is curricula development and the integration of entrepreneurship courses, such as creativity classes.
- *Start-up support:* A key success factor for university entrepreneurship support lies in private sector collaboration. Universities can create a protected environment for nascent entrepreneurship. This can be an important stimulus for students and researchers to make a first step towards the creation of a venture. Yet, in order to avoid 'over protection', early exposure to market conditions is advisable.
- *Evaluation:* Public policy organisations and universities will need to work 'hand in hand' in developing a monitoring and evaluation system which demonstrates the socio-economic impact of university entrepreneurship support and reveals needs for changes.



**PART 2**

**FISHING IDEAS  
FROM INTERNATIONAL GOOD PRACTICE**

## PLACES, ENTREPRENEURSHIP AND INNOVATION

The context, or ‘opportunity structure’ for entrepreneurship, includes a wide range of economic, social, and cultural factors (Aldrich and Wiedenmayer 1993; Thornton 1999). Availability of, and access to, financial, physical and human resources, and information, as well as the presence of networks and clusters, and the societal perception of entrepreneurship are key components of an entrepreneurial ecology. There is an important national dimension of this, but it is the local dimension that triggers the start of a new venture or what stimulates its growth. Co-operation and learning are crucial for building opportunity structures around higher education and research.

In this chapter three key issues in creating contexts conducive to entrepreneurship and innovation are discussed and illustrated in short case studies. Box 1 gives an overview.

**Box 1. Key issues in creating contexts conducive to entrepreneurship and innovation**

<p><b>Build an entrepreneurial eco-system around higher education and research.</b></p>	<p>Building an entrepreneurial eco-system around higher education and research should ensure the meaningful engagement of a wide range of stakeholders who share in the risks and rewards.</p> <p style="text-align: right;"><a href="#">Leuven, Medicon Valley, Manchester and the North West of England</a></p>
<p><b>Promote learning.</b></p>	<p>Learning is crucial to the creation of sustainable entrepreneurial ecosystems. Many of the existing networks around university entrepreneurship are focused around ideas as much as experiences. Mentoring activities and open spaces in incubation facilities and technology centres are creating ‘buzz’ and informal networking between entrepreneurs, would-be-entrepreneurs and the wider university community.</p> <p>Incubators, science parks and technology centres form an important component of the entrepreneurial ecosystem. Ideally they complement each other in an entrepreneurial learning and development system.</p> <p>Entrepreneurial support is not just about buildings and infrastructures. Making young people aware of the potential for personnel exchange in existing science structures between science and industry is both an effective and cheap way of exposing them to the dynamics of the global economy.</p> <p style="text-align: right;"><a href="#">Incubator Platform Västra Götaland, Sweden</a> <a href="#">Knowledge Transfer Partnerships, UK</a></p>
<p><b>Enhance a culture of risk taking.</b></p>	<p>Entrepreneurs are risk takers and public sector support should reflect this. By facilitating the process by which mentors can take equity stakes in the companies they support and by allowing public support agencies to take equity stakes in the firms they provide advice to, a risk culture is built into the system. Equally, growth finance should not just be in the form of debt and grants, it should also incorporate some risk for the entrepreneur and, of course, for the investor. Much of this comes over time. An interesting example is the Merseyside Special Investment fund which is a tiered fund that takes investee companies from debt finance through the growth ladder to formal venture capital. It was funded in the first instance by the European Bank for Reconstruction and Development and therefore had a public sector element within it at its outset. The fact that it works by leading entrepreneurs up the funding ladder to the next rung injects risk at appropriate points into the investee company and eliminates grant dependency.</p> <p style="text-align: right;">Merseyside Special Investment' fund, UK <a href="http://www.msif.co.uk/">http://www.msif.co.uk/</a></p>

## **Leuven, Flanders, Belgium<sup>12</sup>**

Leuven is a small town of 90 000 people located approximately 20 km away from Brussels and on the interchange between two major pan-European motorways. Historically, it has a heavy dependence on the brewery industry since the well-known brewer, Stella Artois (part of the Inbev brewery group) is based there. Other than this one large company, there is little in the way of heavy industry. Instead, it has a strong small company and service-oriented base supported by its university which was established in 1425 and which has traditionally had strong links with the local industry and community. There are 30 000 students in Leuven.

Leuven has one university, K.U. Leuven, which together with the University-Hospitals at Gasthuisberg and the inter-university MicroElectronics Centre, IMEC, ranks among the top 25 European research centres. Indeed, IMEC is one of the largest independent European research centres in the area of micro- and nanoelectronics. Importantly, these research centres are coordinated through a think-tank, Charter Leuven 2010. Charter Leuven 2010 is supported by the City authorities, regional private sector organisations and regional development agencies as well as the University and technology transfer agencies of the City and surrounding areas to provide thought leadership and a Forum for discussion around the strategic goals of creating sustainable growth and employment through innovation.

Research output from the ‘pure’ science base is testimony to the knowledge creation potential of the region with K.U. Leuven and IMEC producing respectively 3 000 and 1 000 referred papers in international scientific journals in 2003 and the University Hospitals some 11 000 articles listed in international citation indices. Of these, the highest proportion of top level publications were in biotechnology, closely followed by haematology and oncology but K.U. Leuven also has a strong research presence in social sciences and the humanities in its role as the coordinator of the League of European Research Universities since 2002. IMEC also has a strong research output in the area of Physical and Chemical applied sciences often in partnership with other Flemish Universities.

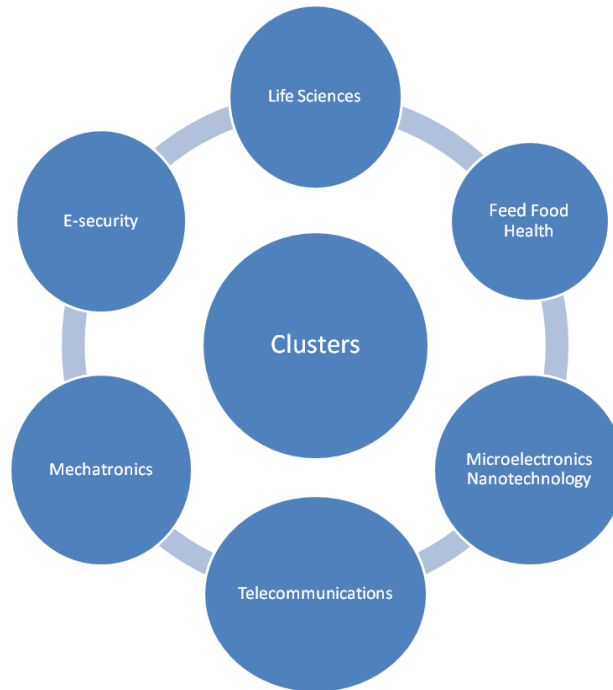
Investment in Research and Development, measured by the numbers of research grants and total research budgets in the region, is also strong. This provides a vehicle for long term investments in strategic research. IMEC, for example, spends EUR 115 million in 2003 on research and knowledge creation while K.U. Leuven spent some EUR 50 million.

All of this activity would mean little without effective technology transfer, however. Leuven’s universities and research institutes have strong and traditional links with the small company base in the region and this has created regional concentrations of public, private and research and commercialisation activity (or clusters where its ‘relative specialisation index’ is greater than 1) in the areas shown in Figure 1.

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<sup>12</sup> The description of knowledge and technology transfer in Leuven is based on Harding (2009 submitted).

**Figure 1. Clusters in Leuven**



As a result, the region has a total of more than 85 spin-outs from K.U. Leuven and IMEC alone. There are over 300 knowledge-intensive service companies in the region and the stock of spin-outs increases at approximately seven viable spin-outs a year. There are six private sector venture capital groups in Leuven, two of which are located at the University and two of which are based at IMEC. There are over 150 patent applications a year.

More than this, there is a Technology Corridor in the South of the City which, by 2010 will have three “third generation” science parks (providing accommodation, networking support, access to supply chains and clients, advice and access to finance), an innovation and incubator centre for start-ups, and research and support networks such as Leuven Inc., GOM, the regional development agency, L-SEC and DSP Valley which are sectoral specific incubators focusing on, respectively, e-security and digital signal processing.

Global companies, such as Intel, Texas Instruments, Infineon, STMicroelectronics, Philips, Samsung and Panasonic work with IMEC on specific nano-technology research platforms; ICI Europe has its European headquarters in Leuven and Sirius Communications and a number of other global telecommunications companies have research facilities based in Leuven.

Leuven is fortunate in that it is located close to Brussels and therefore has associated transport advantages, such as motorway access, a major international airport, and railway links which run across Europe, which have undoubtedly facilitated the rapid growth of the region. It also has one large local employer, Inbev/Stella, and a tradition of research in its university and HEI sector that has readily adapted to the need for rapid research commercialisation and employment growth through entrepreneurship in the region. However, there is an over-arching strategy (Charter Leuven 2010), a clear sense of where science and technology can drive regional development and, most importantly, technology transfer networks whose job it is to link research expertise with the commercial base in Leuven. Links to other universities outside of the immediate locality are also strong (for example with

the Aachen, Maastricht, Flanders triangle or the LERU links in the humanities). Above all, though, this is a small community which produces impressive research, innovation and commercialisation output that is greater than the size of the city itself would suggest simply because of the close co-ordination between the actors.

### **Medicon Valley, Denmark<sup>13</sup>**

Medicon Valley is a model of carefully co-ordinated technology transfer between the science base and commercial application. Because of the location of Copenhagen and Skane, Sweden, it provides a natural access through to the rest of Scandinavia. It is easily accessed from the Malmo port and Copenhagen has a large, international airport. Medicon Valley claims to be one of Europe's strongest life-science clusters with a heavy concentration of research capacity, large and small businesses, spin-outs, incubators and finance within a relatively small geographical area. The region has approximately 40 000 employees in jobs related to life-science.

Knowledge and technology transfer within Medicon Valley, from public sector support through to private sector investment in the form of venture capital and private equity is provided through three organisations. *Medicon Valley Alliance* is the non-profit fee-based coordinating organisation between the public sector regional development agencies, *Copenhagen Capacity* and *Region Skåne* and the private companies in the cluster. It facilitates networks and knowledge exchange between actors within the region and outside of it, for example by having cluster-to-cluster partnerships with bioregions world wide. It has 255 members, including biotech and medtech companies, pharma companies, all relevant university faculties and hospitals, as well as service providers and public organisations located in the Medicon Valley region.

Medicon Valley has twelve universities with five of these providing dedicated life-science tuition. There are 150 00 students in the cluster, 45 000 of whom are lifescience students and 2 600 of whom are PhD students in life-sciences. Including the 11 teaching hospitals, there are 32 hospitals in the cluster, 6 science parks, 6 incubators and 50 contract research and manufacturing organisations. In 2007 all the technology transfer organisations in the Copenhagen teaching hospitals were merged into one organisations and the three life science universities have similarly merged into one incubator to take advantage of economies of scale. In Skane technology transfer is organised on the basis of collaborating institutions, while in Lund, the incubator founded in 2007 now provides support for young companies for up to three years.

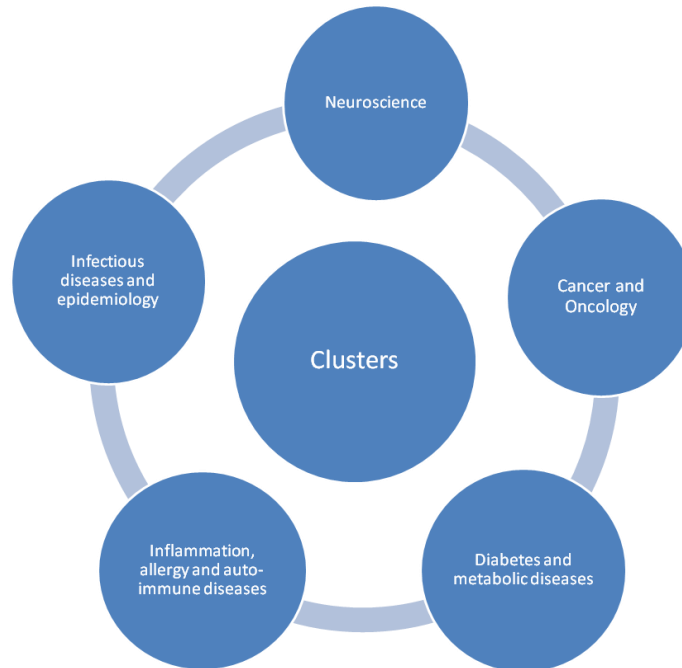
There are five clusters of activity in research around which critical mass in the form of venture capital, large company activity, professional support structures and incubation/science park support is developing (Figure 2). There are substantial numbers of global companies working within the cluster, including Astra-Zeneca, Novo-Nordisk, LEO Pharma and Ferring Pharmaceuticals but smaller start-up and spin-out companies as well as universities and research organisations also work closely with other global companies like Glaxo-SmithKline to develop specific technology licensing arrangements.

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<sup>13</sup> The description of knowledge and technology transfer in the Medicon Valley initiative is based on Harding (Harding submitted).



**Figure 2. Medicon Valley Clusters**



The Swedish government is one of the highest spenders on research and development in the world spending some 3.7% of GDP on R&D. The equivalent figure in Denmark is 2.6% of GDP. Life Science research is a priority for both governments and so research in Medicon Valley is therefore well-funded through the Danish Ministry for Science and Technology and the Swedish Government Agency for Innovation (VINNOVA). In addition to this, substantial resources are received from national foundations, like the KAW Foundation in Sweden and the Novo and Lund Foundations in Denmark. Denmark and Sweden are ranked 3<sup>rd</sup> and 5<sup>th</sup> in the world according to bibliometric measures of scientific output and around half of all the publications in these two countries are in life-sciences with a further 25% in related scientific areas. There is a centre for Clinical Research in Malmo which houses 400 researchers and it is expected that over the next two years, some 5 000 to 8 000 researchers will be working in the areas of oncology and bioinformatics in the Lund area of Sweden.

Commercialisation activity is in the form of spin-outs and licensing arrangements supported by an array of biotech investors who, in 2007, has EUR 1 billion in funds under management and had invested 120 companies in the region. The Nordic based Sunstone Capital is the largest fund and was only founded in 2007 but already has EUR 300 million in funds. The Novo Foundation invests in pre-seed projects that are of strategic importance to the Novo-Nordisk company. It is expected that between 8 and 10 companies will go public between 2009 and 2010 following the successful Initial Public Offerings (IPOs) of some 6 companies between 2006 and 2008.

The example of Medicon Valley is a case of rapid growth in the commercialisation of life science and biotechnology. It is impressive for its sheer scale but, equally the speed with which it has grown to be one of Europe's largest biotechnology clusters. This has been carefully co-ordinated through public-private sector partnerships. The Baltic and Scandinavian regions are open to the cluster which already boasts substantial local, regional (cross-border) and international links. It is the fact that the public and the private sectors have worked well alongside one another to grow the cluster in a clearly defined strategic way that has allowed it to grow so exponentially in the last few years.

## Manchester and the North West of England<sup>14</sup>

Manchester and the North West were funded under a UK government programme to promote the development of biotechnology and life-science clusters in the North West region as a whole and centred around Manchester and Liverpool in particular. Both cities to some extent have suffered from declining manufacturing sectors during the 1980's and 1990's but have had substantial resource from a combination of the UK government, the North West Development Agency and the European Bank for Re-construction and Development over the past 8 years to grow the regional economy through a new base in biotechnology. It now has some 200 biomedical companies employing a total of 20 000 staff. In addition, the region is home to the headquarters of some of the world's largest pharmaceutical companies, such as Astra-Zeneca, Ely-Lily, Aventis, Bristol Myers-Squibb and Glaxo-SmithKline, and exported some GBR 3.8 billion in bio-pharmaceutical products and services.

There are eight universities in the region one of which, the University of Manchester, is Europe's largest. It has 35 000 students including 10 000 nursing students with the majority of scientific research centres in the universities ranking '4', '5' or '5\*' (national, international or world class standards) at the last Research Assessment Exercise and nine biotechnology centres ranking at "5" or '5\*'. The University of Manchester alone has 8 000 science and technology graduates while AstraZeneca houses its own research centre in Manchester which is the largest corporate R&D laboratory for biotech and biopharma in the world. 120 biotechnology and biomedical companies are located in the region and a further dedicated 60 biotechnology companies of which 15 are internationally listed. There is over GBP 25 million in private venture capital in the region for investments in lifesciences and additional pre-seed and seed funding comes from government programmes, such as the Higher Education Innovation Fund based at the region's universities. The Merseyside Special Investment Fund<sup>15</sup> would be one example of how a publicly funded investment structure has become commercial without losing its focus on job creation over time while the Small Firms Loan Guarantee Scheme in the UK promotes lending by banks to entrepreneurs without track record or assets.

Technology transfer takes place in offices at each of the region's universities. The largest of these is UMIP (University of Manchester Intellectual Property Ltd) which was formed out of the merger of Manchester Innovation and UMIST (University of Manchester Institute of Science and Technology) Ventures. There is support for two "clusters", one around Liverpool (MerseyBio) and one around Manchester (BioNow) and the two are coordinated through the North West Regional Development Agency's Science and Technology Board, which sets regional priorities and targets.

The region functions as two closely co-ordinated clusters, one with a focus on biomanufacture and the other on biomedical research. The cluster centres run events and knowledge-exchange seminars that are cross-cutting in nature. The cluster centres also act as an online portal for jobs, news and information. (Figure 3).

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<sup>14</sup> The description of entrepreneurship and knowledge transfer initiatives in Manchester and the North East of England is based on Harding (2009 submitted).

<sup>15</sup> See <http://www.msif.co.uk> and <http://www.startups.co.uk/6678842910951765124/small-firms-loan-guarantee-scheme.html>.

**Figure 3. Research and spin-off excellence in Manchester**



### **Knowledge Transfer Partnerships, UK<sup>16</sup>**

Knowledge Transfer Partnerships (KTPs) are programmes partly funded by the UK Government that help companies access the wealth of knowledge, expertise and resources available in universities.<sup>17</sup> KTPs basically involve a graduate working on a project identified as central to a company's future commercial development. Businesses involved in KTPs need to have identified a strategically important project, with the objective of improving turnover and gaining market share, intellectual property and a competitive edge. A suitably qualified graduate – jointly supervised by the company and the University – will then work in the company for between one and three years to implement the project. This individual – known as a KTP associate – is jointly supervised by both the business and academic staff. Up to 60% of the cost of each Knowledge Transfer Partnership, including the KTP associate's salary and the academic's time, are covered by a government grant.

At the heart of each KTP is a relationship between a company and academic staff in UK Universities. University expertise is applied to a project that is central to the development of the business partner. Knowledge Transfer Partnerships enable each university to apply its wealth of knowledge and expertise to strategic business problems. KTPs are Government funded and enable UK businesses to benefit from the wide range of expertise available at each University. Each KTP is managed by a team involving staff from the University along with the Company Partner and a recently qualified graduate recruited as the KTP associate. The graduate is appointed in open competition and

<sup>16</sup> Dylan Jones-Evans (2006, submitted).

<sup>17</sup> For more information, [www.ktponline.org.uk](http://www.ktponline.org.uk).

may not necessarily be a former student of the partner institution. This ensures that the most relevant person is chosen for the programme.

For each KTP Associate on a two year Programme, regardless of the size of the company, the total budget is approximately EUR 150 000. The largest part of the funding employs the Associate and contributes to staff costs at each university for those directly involved in the partnership. On recruitment, a KTP Associate becomes responsible for management of the Project, drawing on the expertise of the academics involved in the KTP, facilitating knowledge transfer, and implementing it within the business under the supervision of, and with input from, company staff. An Associate can be thought of as an 'agent of change' who, by applying their own recent 'learning' in an appropriate discipline, is helping the company to introduce new products or processes, or to develop or improve existing products or processes.

The project is subsidised by Government but the business also contributes to the costs of the programme. In recent years, the KTP programme in the UK has moved its focus towards supporting small to medium sized enterprises and there are many examples of small firms across a range of sectors benefiting from different types of university expertise. Given the technological knowledge existing within East German universities, adapting the development of a programme such as KTP could be a 'quick win' in getting local businesses to work more closely with academic institutions. The university in the KTP programme actually employs the graduate and, depending on the complexity of the project, the KTP project can last up to three years, which enables the student to undertake a Ph.D programme. Also, another key element of the KTP process is the transfer of knowledge from the senior academics involved in the project, both as supervisor to the associate but also in providing advice directly to the company.

The advantage of Knowledge Transfer Partnerships is that it can benefit all partners. For business, KTPs deliver tangible benefits such as new products and improved processes to the business leading to increased profitability, as well as bringing an additional resource- in the guise of a KTP associate – to the organisation. For the graduate associate, KTPs prepare them for management positions in industry and, in many cases, enable them to become a valuable member of a small growing business. For universities, it can contribute to their third mission agenda by assisting strategic change in businesses by the commercialisation of their research results, and developing collaborations with innovative businesses. They may also gain ideas for further research and development projects, and enable staff to supervise and act as mentors for postgraduates working on company-based projects enhancing their own skills and knowledge, enabling them to apply knowledge and expertise to important business problems, gain experience of current business development, and generate research ideas and teaching materials relevant to business.

Two examples of successful KTPs are described below:

1. Richards, Moorehead and Laing Ltd. The partnership with Cardiff University enabled the development of a system for using wastes as cement replacements, resulting in concrete products with enhanced properties. The company reported that the partnership resulted in strategic advantages and greater ability to market and exploit opportunities in the cement/concrete industry. It has also projected increased profits of GBP 50 000 per annum for the next three years as a result of the University's expert input.
1. Physical Acoustics Ltd (PAL). The company identified the potential for commercial exploitation of acoustic emission (AE) in civil engineering in a previous research project with Cardiff University. The technique was refined through the KTP programme with the University's School of Engineering and it has been adopted by the UK civil engineering

industry for inspecting steel bridges and is now being promoted worldwide. During the Programme a technology package was created which includes procedures for bridge testing, supported by laboratory and field test results. Method statements for bridge monitoring were also developed and are incorporated into the company's quality system. This commercial system enabled PAL to establish a presence in the civil engineering market and improve its competitive position. It expects sales of the system to increase its turnover by GBP 720 000 over three years and plans to create a subsidiary to market generic non-destructive testing techniques for civil engineering and employ two additional field-testing engineers.

The main issue faced is that of ensuring that only good well crafted and relevant proposals are accepted for support. Both the company and the institution will contribute to the development of the research proposal before it goes to the funding advisor. Whilst this can take some time and cause frustration for the business, it does ensure that only worthwhile projects are approved for funding. The key to ensuring the success of a KTP application is to demonstrate, unequivocally, that university knowledge can make a significant difference to the competitiveness of the recipient business. In this respect, working closely with the KTP advisor – who is the conduit between the firm and the academic institution – is crucial in developing the final proposal.

### **Incubator Platform in Västra Götaland, Sweden<sup>18</sup>**

In places, which have high rates of start-ups, also from the research community, public policy organisations dedicated to entrepreneurship support often have the means at hand to select the best projects and to allocate resources to support them. Here the spin-out process can follow a 'business pull' strategy and benefit from high levels of innovation within the surrounding region; the region itself acts as an incubator for the spin-out companies (Clarysse et al. 2005). Instead, in local economies with low rates of entrepreneurship, universities may need to play a more proactive incubation role, in particular what concerns pre-incubation in terms of creating entrepreneurial mindsets and stimulating start-up activities.

Västra Götaland<sup>19</sup> is located in the heart of Scandinavia and is a recognised centre for Nordic transport and logistics. Half of Sweden's exports go through the region and the automotive industry, represented by Volvo and Saab, is its most important industrial activity. The harbours of Västra Götaland handle almost 50% of all Swedish goods, 20% of the Swedish food-stuffs are produced in the region and the major part of the petrochemical industry is located there. Considerable advancement has been noted in the pharmaceutical industry and in electronics, and half of Sweden's fishing industry is based in the region. Regional development is one of the key responsibilities of the regional government, including business development, public transport, communication, tourism, environmental protection, as well as linking businesses with higher education and research.

Sweden is characterised by a high level of investment in research and development and innovative activities. Entrepreneurship is thus rather opportunity-based than necessity-based. New firms are in general performing well but in an international comparison only few new Swedish firms manage to become high-growth companies or so-called 'gazelles'. This caught the attention of both

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<sup>18</sup> The description of academic entrepreneurship support in Västra Götaland is based Lindholm-Dahlstrand (Lindholm-Dahlstrand 2009, submitted).

<sup>19</sup> The Västra Götaland region was created in 1999 from the merger of three county councils, with 49 municipalities, a population of 1.5 million and sprawls 300 kilometres across all directions. Approximately half of the inhabitants of Västra Götaland (in 2008 1.557 million people) live in the Greater Göteborg area.

policy makers and researchers. There is a general belief that it would be possible to create more Swedish high-growth firms out of university-based research ideas. For over a decade, policy makers have thus tried to come up with different support tools in encouraging university technology transfer and entrepreneurship. Business start-ups are concentrated in large cities: almost every second business start-up is located in Stockholm, Gothenburg or Malmö. The characteristics of new firms differ in different regions. For example, university regions have in general more knowledge- and technology-based entrepreneurship. For example, in Västra Götaland, with two major universities, the frequency of university spin-offs in 1999 was twice as high as the national average (Lindholm-Dahlstrand 1999)<sup>20</sup>. But, as for the rest of Sweden, data show that the majority these new technology-based firms are spin-offs from private corporations (Figure 4).

**Figure 4. Origin of new technology-based firms in Sweden and Gothenburg**

<b>Origin of idea:</b>	<b>Sweden (%)</b>	<b>Gothenburg (%)</b>
University (directly)	5	10
Mix of university and private firm	12	21
Private firm	49	42
External inventor	15	8
Own idea	19	19
<b>Total</b>	<b>100</b>	<b>100</b>

Source : Lindholm Dahlstrand (1999).

The technological profile and responsiveness of a (strong) university will influence the technological entrepreneurship and profile of a region. The bias of technology-based entrepreneurship towards mechanical engineering firms in Västra Götaland is linked to the (historical) strength of the University of Chalmers in this field.<sup>21</sup> Although electronic and computer engineering represent the second and third largest categories of new technology-based firms in the region the volume and increase of Master and PhD level courses in these fields at the University of Chalmers have so far not been able to satisfy the demand in the region.<sup>22</sup> Only recently the University of Chalmers launched studies in biotechnology and biochemistry; this may explain partly the underperformance of new technology-based firms in these fields.

Creating an entrepreneurial culture and increasing the number of business start-ups are key objectives of regional policy. This includes support to different parts of the “Regional Innovation System”, including VentureCup, *Drivhuset* (Swedish for student entrepreneurship), *Ung Företagsamhet* (Swedish for entrepreneurship in schools), as well as the Incubator Platform, which will be discussed next (Figure 5).

<sup>20</sup> In Göteborg, 10% of the new technology-based firms are direct university spin-offs, 21% indirect university spin-offs based on university research, but not established until the founder(s) had gained additional working experience from employment in an existing business. Thus, existing corporations, such as for example Volvo and Ericsson, may play a critical role for technology-based start-ups. See Lindholm Dahlstrand, Å (1999) “Technology-based SMEs in the Göteborg Region: Their origin and interaction with universities and large firms”, *Regional Studies*, vol 33, no. 4, pp. 379-389, 1999.

<sup>21</sup> Lindholm Dahlstrand, Å. and Jacobsson, S. (2003) “Universities and Technology-based Entrepreneurship in the Gothenburg region”, *Local Economy*, Vol 18:1, 2003, pp 80-90.

<sup>22</sup> Lindholm Dahlstrand, Å. and Jacobsson, S. (2003) “Universities and Technology-based Entrepreneurship in the Gothenburg region”, *Local Economy*, Vol 18:1, 2003, pp 80-90.

Figure 5. Regional Innovation System for new technology based firms



Source : Västra Götaland regional government, based on Authors earlier contributions (1997, 2004).

### *The Incubator Platform*

The Incubator Platform, established in 2002, is a network which today links the eight business incubators located in the region (Figure 6 and Annex 3).<sup>23</sup> The aim is to engage incubator managers in collaboration and knowledge exchange activities. In the early period incubators had to apply every year for a renewal of the co-financing agreement.<sup>24</sup> This changed over the years and today a long-term co-financing agreement for the single incubators and the Platform is in place (Table 3). The Incubator Platform raises also own revenues from annual fees paid by the member incubators for the offered network activities; most important is *Inkubatorkompetens 2.0*<sup>25</sup> with its focus on networking and competence/skills development. The regional government holds no ownership in the incubators; this usually rests with local universities and respective city councils.

*Inkubatorkompetens 2.0* started in 2002 and is managed by *Innovationsbron Väst*, a wholly owned subsidiary of the national government organisation *Innovationsbron*<sup>26</sup>. *Innovationsbron* is the result of a re-organisation of the Swedish technology and innovation support structures in 2005 and

<sup>23</sup> Lately, the Incubator Platform expanded and included two incubators from other parts of Western Sweden, Halmstad and Jönköping; also a private incubator might join in the near future. These incubators are, however, not eligible for co-financing from the Västra Götaland regional government, which is limited to the eight incubators in the administrative region.

<sup>24</sup> All incubators are financed by a mix of public and private financial sources. There is no general model for financing the incubators; both the amount of financing and the mix of different private and public sources vary a lot.

<sup>25</sup> For more information on *Inkubatorkompetens 2.0*, see <http://www.inkubatorkompetens.com/>.

<sup>26</sup> *Innovationsbron* stands for innovation (innovations) and bridge (bron). For more information on *Innovationsbron Väst*, see <http://www.innovationsbron.se/>.

the merger of seven independent *Teknikbro*<sup>27</sup> organisations: the incubator program run by VINNOVA, and the *Industrifonden* seed fund. With this *Innovationsbron* took over the delivery of the National Incubator Programme.<sup>28</sup> The Incubator Platform collaborates closely with the National Incubator Programme and several of the by the Programme regularly awarded ten “best” Swedish Incubators<sup>29</sup> belong to the Incubator Platform.

**Figure 6. Västra Götaland’s Incubator Platform**

<b>Business Incubator</b>	<b>2008 Budget in k SEK (in EUR<sup>1</sup>)</b>	<b>2009 Budget in k SEK (in EUR<sup>1</sup>)</b>	<b>Specialisation</b>
Brewhouse Innovation	1 200 (123 000)	1 200 (123 000)	Music and movies
Chalmers Innovation <sup>2</sup>	2 000 (205 000)	2 700 (277 000)	Technology-based firms
Espira	n.a.	2 400 (246 000)	Knowledge-based firms
Framtidens Företag	1 300 (133 000)	1 700 (174 000)	Service sector and knowledge-based firms
Gothia Science Park	2 200 (226 000)	2 200 (226 000)	Knowledge/technology-based firms
Sahlgrenska Science Park	1 500 (154 000)	1 500 (154 000)	Research-based firms
GU Holding	n.a.	n.a.	Research-based firms
Innovatum	n.a.	n.a.	Media and technology-based firms
Incubator Platform	1 300 (133 000)	1 300 (133 000)	
<b>TOTAL</b>	<b>9 500 (974 000)</b>	<b>13 000 (1 466 000)</b>	

Source : VGR 2009.

Notes: <sup>1</sup> rounded, currency exchange rate as of February 2010; <sup>2</sup> includes Lindholmen Science Park.

The main objective of *Inkubatorkompetens 2.0* is to support the growth of tenant companies (annual targets are turnover of all tenant firms of SEK 1 billion (2009) and 1 000 or more people employed) through working with the incubator management in offering more and better services to foster excellence in management and growth of tenant firms. What this includes in practice is outlined below.

- Networking and competence/skills development for incubator managers is still the most important pillar with at least eight meetings organised annually thereof two intensive training sessions for incubator managers. Incubators in the Platform can also request meetings tailored to their needs and specific interests. Part of the annual programme is an international study tour.

<sup>27</sup> *Teknikbro* stands for technology (Teknik) and bridge.

<sup>28</sup> The Swedish government earmarked SEK 1.8 billion (EUR 1.9 million) for enhancing the commercialisation of research

<sup>29</sup> There are approximately between 40 and 60 incubators in Sweden; the number keeps changing. This includes privately and publicly financed incubators. Some of these incubators are very small and new, some exist for over ten years.



- Joining efforts paid off in terms of acquisition of European financing (European Regional Development Fund) for skills development activities, both for incubator managers and tenants.
- Making use of economy of scale effects, for example, in procurement or marketing and public relation activities is of great benefit for the Platform incubators and their tenants. In particular this increased attention by public policy. Joint activities also make the incubators large enough to attract interest from private financiers located outside of the region.

*Inkubatorkompetens 2.0* is a key partner of incubator managements and tenant firms in matters of personnel management and recruitment. A number of human resource development specialists work for *Inkubatorkompetens 2.0* and offer their specialised services for the incubators in the Platform and their tenant firms.<sup>30</sup> Special attention is given to gender balance. Applications of qualified women for incubator management and tenant company boards positions are particularly encouraged by *Inkubatorkompetens 2.0*. Today the share of women in these positions is very low, which is considered to have a hampering effect on firm development. A major area of work is research into factors favouring and impeding tenant firm survival and growth. Here *Inkubatorkompetens 2.0* with universities and single academics. Attracting the attention of existing and large private companies has not been a task of the Incubator Platform. This is largely done by the universities and the individual incubators.

Increased co-ordination and co-operation strengthened the performance of the incubators. Important contributions to the long-term development of the Platform and its incubators are the attraction of more private financing (business angels and formal venture capitalists) and the assistance provided in recruitment and personnel management. According to Swedish official statistics 180 active limited companies with a turnover of SEK 680 million (EUR 69.3 million) and 588 employees, emerged from Platform incubators in 2006; this corresponds to almost 70% of all firms originating from incubators in Sweden.

#### *Difficulties encountered in developing the platform*

An incubator system that functions as a first-stop-shop, in which incubator managers advice potential tenants on where to best incubate instead of competing with each other, requires a well-connected and informed platform or a network of incubators, science and technology parks and other innovation and entrepreneurship support facilities. There were two main difficulties in convincing incubator managers of likely benefits from co-operation with other incubators: competition for tenants and competition for funding. Before the establishment of the Incubator Platform the incubators saw each other as competitors in attracting research and technology-based new ventures with high-growth potentials. There was little understanding of complementarity from focusing on niches – geographically as well in terms of industrial sectors and knowledge areas). The Incubator Platform has enabled a differentiation amongst the incubators: some are still focusing on high-technology and research-based tenants, but now service firms, student start-ups, medium-growth firms and others are also welcomed tenants. Moreover the Incubator Platform became a pathway into the system: incubator managers can now assist potential tenants by suggesting alternative incubators with a more suitable focus and specialisation. The competition for limited public funding decreased over time as more long-term financial arrangements were negotiated and more private financing was attracted.

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<sup>30</sup> For 2009 it was estimated that the tenants will recruit some 200 new staff.

Having a long-term planning is important for a successful incubator system or a platform, with long-term public financing complemented by short-term project financing. A high degree of co-operation amongst incubators and well-established university-industry linkages are also important success factors. Incubators, science parks and technology centres are often used to complement each other in an incubator/technology centre system. A well integrated system can be used to attract larger private firms and investors from outside the region. Such a system can fulfil multiple roles including enhancing graduate entrepreneurship, fostering university-industry collaboration, facilitating the location of research-based firms in proximity, and increasing public-private interaction in entrepreneurship and innovation support.

## ENTREPRENEURSHIP EDUCATION

Entrepreneurship education has come a long way since the first entrepreneurship course held by Professor Myles Mace at Harvard University. The purpose of entrepreneurship education is two-fold. Contributing to the creation and development of entrepreneurial attitudes and motivations to start-up a firm is as important as developing the skills needed to successfully run and grow a business venture. Assisting the establishment of new firms is a key objective, but not the only one. Creating entrepreneurial mindsets that drive innovation in existing firms is of equal importance, yet success is much more difficult to measure.

The following key issues in strengthening entrepreneurship education in universities are discussed and illustrated with short case studies in this chapter. Box 2 gives an overview.

### Box 2. Key issues in entrepreneurship education

<p><i>Strategically anchor entrepreneurship education.</i></p>	<p>Assigning a member of the top-level university management to take over responsibility for the development of entrepreneurship education, including goal and policy definition, degree of curricular integration, resources, dedicated research, evaluation, enhances the role entrepreneurship in relation to teaching and research. To create a broad basis for this the establishment of a 'strategic' committee, including all the key people acting within the university has proven to be useful.</p> <p>Entrepreneurship education should be organised in a dynamic way, taking into account research and real-business needs. To ensure this regular performance assessment exercises should be conducted, including regular feedback sessions with people from the business community, alumni entrepreneurs and students and to track and survey alumni with entrepreneurial careers.</p> <p style="text-align: right;"><a href="#">Rensselaer Polytechnic Institute, US</a></p>
<p><i>Incentivise and reward entrepreneurship education.</i></p>	<p>Rewarding those who are designing and implementing innovative and high quality teaching and pedagogical material, and those who are sharing and/or instigating the dissemination of ideas and good practice will promote continuation of activities and encourage others to join.</p> <p>Well-publicised yearly awards on the 'Best Entrepreneurship Innovative Pedagogy' and the 'Best Entrepreneurship Professor' for students to vote is a soft incentive that can stimulate more involvement by professors and teaching staff in entrepreneurship education and also raise the awareness of entrepreneurship amongst students. Reducing the teaching load for those involved in 'strategic' entrepreneurship activities, such as entrepreneurship ambassadors and mentors should be considered.</p>
<p><i>Expand and tailor the offer in entrepreneurship education and increase take-up rates.</i></p>	<p>Ideally all students across the campus should have access to a wide range of entrepreneurial learning opportunities inside and outside courses of study. The focus is on developing entrepreneurial graduates who are self-confident, capable, experienced and motivated to think and act entrepreneurially.</p> <p>With suites of courses, the offer in entrepreneurship education could be expanded and tailored to different student interests and needs. The entrepreneurship education offer should be widely communicated and publicised within the university using posters, guerrilla marketing techniques, and the university's website. Collaboration amongst different local universities and other higher education institutions should be promoted to allow student participation.</p> <p style="text-align: right;"><a href="#">Cambridge Centre for Entrepreneurial Learning, UK</a></p>

<p><i>Turn students into partners and creators of activities.</i></p>	<p>Students add immense value if given the opportunity and support to act. Successful examples include the creation of a student run entrepreneurship club, such as CUTEC, Cambridge University Technology and Enterprise Club, running a 'Start-Up Cafe' on campus, and the introduction of paid student entrepreneurship interns, which work across the campus to promote and support entrepreneurship actions and to carry out applied entrepreneurship research.</p> <p><a href="http://www.cutec.org/">http://www.cutec.org/</a></p>
<p><i>Invest in human resources for entrepreneurship teaching.</i></p>	<p>Entrepreneurship support in universities, in particular entrepreneurship education, is demanding reinforcement and development of existing human resources and employing new staff. It is important to build and expand linkages between research and teaching, for example by getting doctoral students to work on an entrepreneurship education related research topic. Inviting international visiting entrepreneurship professors on a regular basis strengthen the research base, the teaching students, and training 'trainers' efforts. On a regular basis organised entrepreneurship educator development programmes and workshops, careers adviser awareness programmes, and faculty deans' and directors' development programmes and workshops promote a university's entrepreneurial spirit.</p> <p>International Master of Entrepreneurship Education and Training, Denmark</p>
<p><i>Create a regional resource centre for entrepreneurship education</i></p>	<p>An 'entrepreneurial' pedagogy seeks to enhance entrepreneurial capacities and capabilities amongst students by giving them more autonomy and responsibilities in the learning process through experiments and reflexive learning and a greater application of collective and co-operative learning. A regional resource centre, providing an on-line information system of pedagogical practices freely accessible for teachers, researchers, students and other organisations involved in entrepreneurship education, could greatly contribute to the development of a more entrepreneurial learning environment. Its task could be to produce innovative and pertinent teaching material (case studies, videos, games, course contents, syllabi, etc.), and to organise regular events, also using on-line services, targeted at different and mixed audiences to enhance communication on, and exchange of, new and innovative approaches in entrepreneurship education.</p> <p>Observatory of Pedagogical Practices in Entrepreneurship, France</p>

### The French Observatory of Pedagogical Practices in Entrepreneurship<sup>31</sup>

The Observatory of Pedagogical Practices in Entrepreneurship, *Observatoire des Pratiques Pédagogiques en Entrepreneuriat* (OPPE)<sup>32</sup>, functions as resource centre for professors, educators, higher education institutions and entrepreneurship support structures. Its main goal is to promote and enhance an entrepreneurial spirit within the education system OPPE is an information data base on entrepreneurship education in secondary and higher education that facilitates development of and learning from good practice in teaching methods, contents and pedagogical tools. OPPE was founded in 2001 by the French ministries of research, education, economy, industry and SMEs, the French Agency for the Creation of Enterprises, *Agence pour la Création d'Entreprise* (APCE), *Académie de l'Entrepreneuriat*, the academic association of entrepreneurship, DIESE, the French external corporate venturing association, and universities, engineering and business schools, such as CPU and CDEFI. The conceptual development phase lasted for two years and included intensive collaboration between

<sup>31</sup> The description of the French Observatory of Pedagogical Practices in Entrepreneurship is based on Fayolle (2009, submitted).

<sup>32</sup> <http://entrepreneuriat.net>.

the founding partners. OPPE's annual budget is approximately EUR 150 000; two full-time staff are involved. Scientific working groups exist in various fields and benefit from the contribution of numerous professors.

OPPE provides on-line information on around 300 entrepreneurship education initiatives in higher education, more than 100 entrepreneurship education actions in secondary education and 30 initiatives that involve secondary and tertiary education institutions. Also, more than 30 on-line pedagogical tools are downloadable. On a yearly basis, OPPE organises conferences to generate and develop new pedagogical ideas and to facilitate networking amongst professors, educators and other stakeholders; on average 150-200 people attend these events. OPPE also manages relationships with international structures dealing with similar topics such as *FREE pour entreprendre*<sup>33</sup> in Belgium and *OFQJ*<sup>34</sup>, a French-Québécois initiative for education and skills development of the 18-35 years-old. For researchers OPPE offers more than 300 online academic references on entrepreneurship education as well as a specific research area on the entrepreneurial intentions of students.

OPPE has contributed to greater attention to and take up of entrepreneurship education in secondary and tertiary education institutions. The political leadership was crucial for establishing and promoting strategic embedding of entrepreneurship promotion in education. The partnership of education institutions and entrepreneurship support providers helped to advance integration of entrepreneurial mindset creation, skills development and business start-up support.

### **International Master of Entrepreneurship Education and Training, Denmark<sup>35</sup>**

The International Master of Entrepreneurship Education and Training (IMEET) is not a traditional degree in entrepreneurship.<sup>36</sup> It is a top-level practice in teaching the entrepreneurship teachers, providing a solid knowledge of entrepreneurship and the pedagogical competencies to teach entrepreneurship. IMEET, initiated by IDEA<sup>37</sup>, the International Danish Entrepreneurship Academy, is based at Aarhus School of Business and is developed and offered in partnership with European higher education institutions. Key partners are Copenhagen Business School, Helsinki School of Economics, University of Southern Denmark, the Danish University of Education, Kingston Business School and University of Rostock. IMEET has a three-fold vision, which is worth citing here<sup>38</sup>:

1. Facilitate a first-class learning forum for educating an elite of teachers, trainers and consultants in entrepreneurship in Europe
2. Create a network-based faculty of prestigious international partners consisting of teachers and researchers dedicated to the development of best practices and advancing competence in and mastering of entrepreneurship learning methods
3. Give birth to a new generation of change agents promoting the agenda of entrepreneurship in teaching and consulting

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<sup>33</sup> <http://www.freefondation.be/fr/index.asp>.

<sup>34</sup> <http://www.ofqj.org/qui-sommes-nous/index.html>.

<sup>35</sup> The description of this initiative is based on the contribution of Alain Fayolle (Fayolle, 2009 submitted).

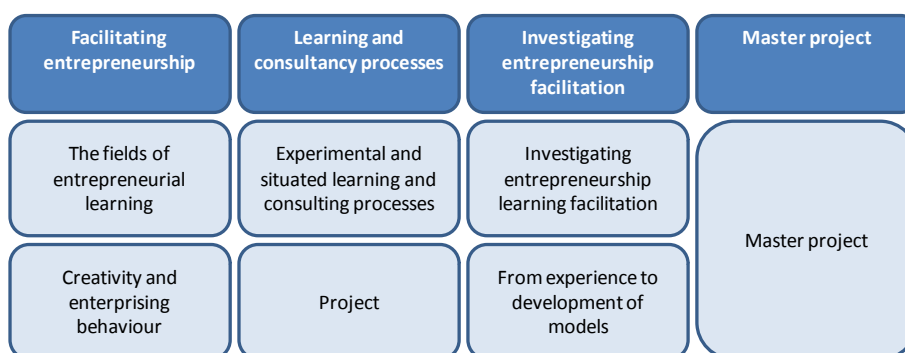
<sup>36</sup> For more information on IMEET, see <http://www.imeet.asb.dk>

<sup>37</sup> IDEA has 75 partners from higher education institutions in Denmark. For more information, see <http://www.idea-denmark.dk>.

<sup>38</sup> <http://www.asb.dk/article.aspx?pid=21302>, accessed 19 March 2010.

The Master programme is organised in four semesters with six modules and a master project for a total of 60 ECTS (Figure 7). A scientific advisory board of internationally highly-renowned experts in entrepreneurship education develops the curriculum. The first programme was organised in 2007 at the University of Aarhus with 18 students from Denmark, the Netherlands, and the United Kingdom. All of them were educators at higher-educational institutions, business advisors or consultants. Teaching and pedagogical module development topics include: Fields for Learning Entrepreneurship, Creativity and Enterprising behaviour, Experimental situated learning, and Project Work. Teaching sessions are planned to take place in Denmark, United Kingdom, Finland and the Netherlands.

**Figure 7. International Master of Entrepreneurship Education and Training**



Source: International Master of Entrepreneurship Education and Training information brochure, downloadable <http://mediatek.asb.dk/brochures/videreuddannelse/imeet/pageflip.html>; accessed 19 March 2010.

IMEET is an important instrument to create a pan-European network of entrepreneurship education experts with the capabilities to develop and deliver entrepreneurship skills programmes, and to innovate business advisory services. It is a timely response to a widely acknowledge dearth in Europe of qualified human resources and innovative methods in teaching students, engaging in research on entrepreneurship education issues and advising or supporting nascent entrepreneurs and established firms. Despite high interest in the programme participation, few universities have the financial resources to send faculty members on this programme.<sup>39</sup>

### **The Cambridge Centre for Entrepreneurial Learning<sup>40</sup>**

The main mission of Cambridge Centre for Entrepreneurial Learning (CfEL) is to promote an entrepreneurial culture at the University and to spread the entrepreneurial spirit amongst students.<sup>41</sup> CfEL is quite different from a classical entrepreneurship centre as it's essential focus is on planning and implementing entrepreneurship courses, within the whole University, using a specific philosophy and a well-thought learning approach. CfEL was established in 2003 as a not-for-profit organisation, resulting from the division of two units formerly belonging to the University of Cambridge Entrepreneurship Centre founded in 1999. Teaching and training moved to CfEL (part of Cambridge Judge Business School), and Cambridge Enterprise became the office for university-industry relations and knowledge transfer alongside with the Technology Transfer Office and the University Challenge Fund.

<sup>39</sup> The tuition fee for the 2008/2009 edition was EUR 13 400.

<sup>40</sup> The description of the Cambridge Centre for Entrepreneurial Learning is based on Fayolle (2009 submitted).

<sup>41</sup> For more information on CfEL, see [www.cfel.jbs.cam.ac.uk](http://www.cfel.jbs.cam.ac.uk).

CfEL has nine full-time staff to plan and organise entrepreneurship courses, including a director, programme managers, a centre manager and administrative staff. The actual delivery of entrepreneurship courses is largely taken care of by some 200 entrepreneurs and practitioners (entrepreneurs, venture capitalists and business angels, bankers, etc.). A broad recruitment package includes a website, brochures, posters, and a series of information events. Close collaboration with the different departments allows circulation of information to student mailing lists and the organisation of tailored information events.

The overall objective of entrepreneurship education is to develop self-confidence and self-efficacy amongst students. Entrepreneurship is understood as a set of skills, attitudes and behaviours rather than just venture creation: “We don’t teach how to write business plans – we stopped doing that 4-5 years ago. Instead, we have things to do with confidence, career choices, we have things to do with opportunity recognition. So we are genuinely dealing with entrepreneurship education and not business studies made simple”, so Dr. Vyakarnam, CfEL’s director. Teaching methods range from lecturing, video and online assignments, to problem-based learning, project work on real technologies, entrepreneurs in the classroom. The main strength of this approach is its clear focus on the development of entrepreneurial skills, attitudes and behaviours through an entrepreneurial pedagogy. This means a ‘people approach’ focusing more on soft skills (developing student self-confidence, self-efficacy, helping students to understand the why and the when of becoming an entrepreneur, learning to deal with uncertainty, learning by trying, trial and error, learning from mistakes and failures) in contrast to a ‘how to approach’ focusing more on the (business administration) skills and tools to develop a (successful) business plan.

The achievements of 10 years of entrepreneurship education at the University of Cambridge are summarised below:<sup>42</sup>

- 12 000+ participants
- 165+ programmes and events completed, 60+ University of Cambridge Undergraduate and Postgraduate entrepreneurial courses delivered
- 140+ business ventures created by CfEL alumni
- 350+ entrepreneurs and practitioners have contributed to CfEL activities
- 14 business plan competitions organised with Cambridge University Entrepreneurs (CUE)
- Advanced Diploma in Entrepreneurship –first accredited entrepreneurship course at the University of Cambridge

#### *Advanced Diploma in Entrepreneurship*

Started in 2009 by the Institute of Continuing Education (Division of Professional Studies) and CfEL, the Advanced Diploma provides a highly practical programme designed specifically for entrepreneurs. It is organised as part-time programme over the duration of 15 months between 27 months and leads to the qualification of Advanced Diploma in Entrepreneurship awarded by the University of Cambridge. The programme has four distinct components (Figure 8).

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<sup>42</sup> <http://www.cfel.jbs.cam.ac.uk/about/achievements.html>, accessed 23 March 2010.

**Figure 8. Advanced Diploma in Entrepreneurship**



Source : CfEL website, author's own presentation.

The Advanced Diploma addresses people who are either considering embarking on an entrepreneurial career pathway or have taken the first steps in starting-up a business (new technology, social enterprise, opportunities in the arts or creative media, taking an innovation forward within a larger or more established firm). Sponsorships by employers or other organisations are possible.

### **Formal entrepreneurship education in the US<sup>43</sup>**

In the US system of higher education, standard curricular design calls for a set of core knowledge modules to be taught to students, followed by optional (or elective) courses that cover specific topics in greater depth. Because entrepreneurship programmes generally reside in business schools, the range and depth of course offerings are significantly greater than that of programs in the Berlin universities studied. The combination of a core+elective design pedagogy allows students to pick up a set of common skills and understandings while afford them the ability to specialize in areas of interests in order to build expertise. In short, core courses convey basic knowledge for proficiency and elective courses offer advanced knowledge for mastery.

The basic philosophy of curricular design rests on a set of overall learning objectives that include concepts, attitudes, skills, and techniques related to entrepreneurship. The focus of learning is on what should a student know about entrepreneurial opportunities and the differences between managing established companies and entrepreneurial companies, the activities that they be comfortable when starting a company (application for licenses and patents, engaging and negotiating for business services, sourcing for inputs and manufacturing capacity and the like), and the behavioural and cognitive outcomes for and from engaging in entrepreneurship such as risk taking, desire for self-regulation, managing emotional loss, recovery from failure, and so on. These learning objectives in turn drive the pedagogies such as case studies, lectures, simulations, business plan competitions, and student consulting projects that model the entrepreneurial process (from opportunity identification to business launch to business harvest), and behaviours (organising, negotiating, networking, motivating, and failure recovery).

The curricula of the leading US programmes, such as the one organised at Stanford, MIT, and Johns Hopkins, are sensitive to the local industries from which student projects and new business ideas emanate. For example at Stanford University, entrepreneurship courses in technology commercialisation focus on the software and ICT sector, whereas those at MIT include advanced

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<sup>43</sup> The presentation of description of formal entrepreneurship education is based on Phan (2009 submitted).



manufacturing and biotechnology, while those at Johns Hopkins focus on healthcare services, biotechnology, and ICT.

In entrepreneurship curricula, typical core knowledge modules are opportunity recognition, business planning, entrepreneurial marketing and finance (Figure 9).

**Figure 9. Core knowledge modules in US entrepreneurship curricula**



Source : Author.

Elective courses may fall into one of three or more clusters such as marketing, human resource management and financing, which have high take-up rates (Figure 10).

**Figure 10. Electives in US entrepreneurship curricula**

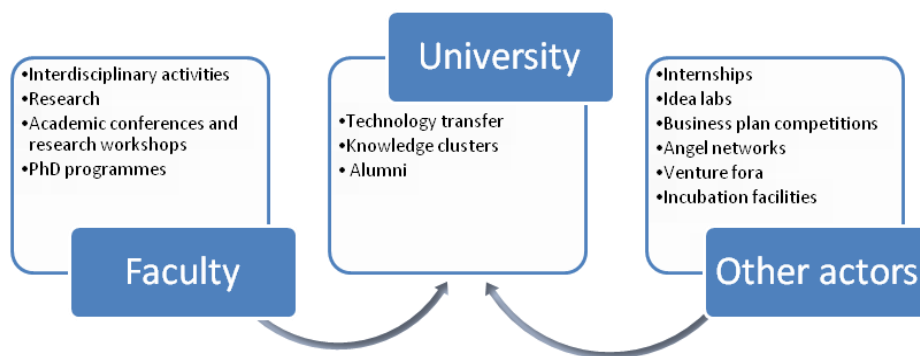


Source : Author.

## A University Level Entrepreneurship Curriculum

All of the available research suggests that the successful implementation of university based entrepreneurship calls for a university level *curriculum* that takes an affirmative training and development approach to encourage, support, and accelerate start-ups as illustrated in Table 11. In this approach, faculty members who have an interest in entrepreneurship are identified and encouraged to include questions of entrepreneurship, innovation, and value creation in their research programmes. The targets of the research and instructional activities, which is expressed in the curriculum (Figure 1), are the entrepreneurship stakeholders that impact or are impacted by the university's entrepreneurship initiatives.

**Figure 11. Example of a Complete University Entrepreneurship Initiative**



Source : Author.

Figure 11 illustrates the elements of an entrepreneurship initiative that takes the most commonly encountered elements in US business schools and adapts them to a university wide context. The curriculum is broad in scope, in terms of who participates in the creation and dissemination of knowledge regarding entrepreneurship, but also provides in-depth coverage. Here, the continual creation of new knowledge regarding university start-ups resides with the faculty researcher. Thus, incentives should be created for faculty within the university to expand their research domains to include questions related to innovation and entrepreneurship from technical and managerial perspectives. In this model, universities should consider establishing a formal programme that allows successful faculty entrepreneurs to serve as role models and mentors for other faculty members, students, and post-docs who wish to engage in new venture creation. The implication of such an initiative is that the entrepreneurship curriculum must be driven from the top of the hierarchy and embedded in the institutional priorities, design principles and measurement systems of the university.

In this model, the cadre of faculty conducting research on entrepreneurship is responsible for the creation of courses and training programmes. This closes the loop between knowing and doing. A standard academic curriculum is focused on knowledge acquisition. In contrast, to be immediately useful, the design principle for the training and educational programmes should be based on a process perspective, that is, the new venture start-up cycle. It must thus be oriented towards overcoming problems entrepreneurs face in developing a successful commercial venture. Note that courses can be created and taught by any faculty from across divisions of the university with the appropriate experience or knowledge set. Entrepreneurship programmes should be managed by top-level university administrators. Many US universities have created top-level administrative positions in entrepreneurship (e.g., a Vice Provost for Entrepreneurship), highlighting the importance of these

initiatives within the university, and also sending an important signal to faculty members and donors that the university places a high value on such activities.

The primary role of entrepreneurship programmes is training the 'soft drivers' of business venturing. Research has shown that successful entrepreneurs have cognitive routines that allow them to recover quickly from failure. Fear of failure, whilst always present, does not represent a hindrance to the desire to start-up new ventures. Research has also revealed that serial entrepreneurs are on average more successful, which suggests the importance of learning and knowledge accumulation of the 'how to' aspects of new venture creation. Therefore, entrepreneurship courses should focus both on the mechanics of starting a venture and the economic/strategic implications of the technologies being commercialised.

The role of the university in the implementation of an entrepreneurship curriculum is to create organisational structures such as a venture forum, incubator or technology park, and so on, in which technology transfer activities are given an institutional context and recognition. More importantly, as the research has shown, attention must be paid to organisational design issues. For example, if the university is serious about increasing the rate of start-up activity, then the level at which transfer activities should be resourced and monitored counts. Thus, the entrepreneurship curriculum must be institutionally embedded throughout the university, in order to maximise its impact on the effectiveness of the technology transfer process. More specifically, such initiatives cannot be primarily driven by faculty members, business or related schools with entrepreneurship programmes, or individual stakeholders.

Because the problem is multi-level in nature and involves the simultaneous actions of multiple stakeholders, it must be addressed from the highest strategic level of the university. Thus, specific boundary spanning roles must be assigned to the business school. Such a top-down driven approach attenuates the possibility of role conflict and information gaps caused by the ad-hoc or organic design typically encountered in an academic environment. Appropriate incentives should be designed for faculty members, who constitute the source of invention disclosures, the critical input in university entrepreneurship. A conflict of interests is generated by the traditional academic reward system, which is focused on peer reviewed publication of (generally) primary research, and the technology transfer reward system, which is focused on revenue generation from (generally) applied research. Again, this dilemma can only be solved at the highest level of university governance. In a sense, the university can view the faculty member as an agent of its strategic intent. When an agent is exposed to a conflict of interest generated by the conflicting goals of the principal, only the latter can resolve it.

In conclusion, for university technology transfer to be productive in the creation of spinouts, the university must adopt a strategic approach to the commercialisation of its intellectual property portfolio. Such an approach begins with establishing clear priorities at the university level, combined with appropriate organisation design choices focused on eliciting an ample supply of invention disclosures. It also entails changing incentives to encourage entrepreneurial behaviours and establishing a university level process-based educational curriculum for all stakeholders engaged in the technology transfer process.

#### *'Entrepreneurship Now!'*

'Entrepreneurship Now!' is a hypothetical programme that takes into account above recommendations for a complete university entrepreneurship initiative. It has been designed according to the context for entrepreneurship support at the reviewed Berlin universities as presented earlier in this report.

To launch ‘Entrepreneurship Now!’, a university wide marketing campaign is organised. Note that the viral aspect of the process is more important than the actual winning of business plans and therefore, the marketing and promotion of the programme should exploit Web 2.0 strategies and student word-of-mouth. Specific attention and marketing effort should be directed at student opinion leaders on campus. Students who are currently engaged in entrepreneurial activities on campus are included in the selection panel. ‘Entrepreneurship Now!’ is limited to a cohort of 50 students who commit to staying with the program throughout their university course of study. Entry to the program will be by application only; the following entry criteria apply:

1. Students with a lot of extracurricular activities are preferred candidates.
2. Grades are de-emphasised with a preference for B-average students that have taken a wide variety of classes (these tend to be more curious, adventurous, and likely have an entrepreneurial orientation).

Selected students should be asked to complete an assessment instrument such as the Entrepreneurial Mindset survey<sup>44</sup> or the Myers-Briggs Type Indicator in order to place them in start up teams that maximise combination of diversity of experience and personality type.

Students will be required to take the following classes in preparation for their foray into entrepreneurial venturing.

1. *Opportunity Identification*. This is a standard class on environmental scanning, ideation, and translation to commercial application. The result of this class is a feasibility study for a commercial idea.
2. *Entrepreneurial Finance*. This class is designed to acquaint students with financial statements from a small business perspective, sources of entrepreneurial financing (banks, friends and family, venture capital, vendor financing), risk management, and forecasting.
3. *Entrepreneurial Marketing*. This class is designed to acquaint students with concepts in viral marketing and selling, market research on a tight budget, and product design and positioning.

Student teams will be required to attend weekly IdeaLabs in which they practice the process of ideation and opportunity scanning. In these sessions, they will practice using the tools for market research and financial analysis to conduct quick opportunity assessments in order to become acculturated to the habit of thinking entrepreneurially. In addition to the IdeaLab, students will be given the opportunity to participate in formal venture capital networks in which business ideas are presented, to become acquainted with the skill of making elevator pitches. Such venture forums can be augmented by technology ‘dating’ events, akin to the ‘ideas and beer’ events held around Berlin, in which bi-weekly brownbag sessions pair teams of scientists who present their research with teams of ‘Entrepreneurship Now!’ students to discover business opportunities.

Entrepreneurship education and start-up support is organised hand-in-hand. ‘Entrepreneurship Now!’ activities are closely linked with business plan competitions organised at a regional level. In particular the Opportunity Identification course prepares students for participation. Students are assigned to mentor-professors one year ahead of the competition. ‘Entrepreneurship Now!’ students will be given priority in the assignment of incubator space. This will highlight their status and it will

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<sup>44</sup> <http://www.amazon.com/Entrepreneurial-Mindset-Continuously-Opportunity-Uncertainty/dp/0875848346>.

ensure an 'end to end' process so that any student joining the program will be assured of support to the launch and post-launch of their business.

In the final analysis, even if students who graduate from this program do not start businesses, their experience will become the basis for rumours, stories, and conversation around campus. This viral effect is more likely to be effective at infusing the entrepreneurial imperative on campus than broad programmes or public policy support activities.

## UNIVERSITY ENTREPRENEURSHIP SUPPORT SYSTEMS

University entrepreneurship support has its limits. It prepares students for future intrapreneurial and entrepreneurial careers and promotes the commercialisation of research results. Entrepreneurship education activities and hands-on start-up support are key activities. For these to be effective, close co-operation and integration of university internal and external support infrastructure and services is important.

In this chapter, the following key issues in university entrepreneurship support are discussed and illustrated with short case studies. Box 3 gives an overview.

<b>Box 3. Key issues in university entrepreneurship support</b>	
<i>Take stock of existing university entrepreneurship support and develop a joint strategy.</i>	<p>Support systems for academic entrepreneurship and spin-offs in general include both university internal and external components. A concerted approach is needed to take stock of the range of activities, the people behind and the resources devoted, to identify areas of overlap as well as potentials for synergies and untapped resources. The aim should be to develop a shared and well-communicated vision and to implement a joint strategy to promote academic entrepreneurship and spin-offs. Such a strategy should be linked with the wider economic development strategy and incentives for synergies at project level established, in order to alleviate goal conflicts and tensions in the system.</p> <p style="text-align: right;"><a href="#">Rensselaer Polytechnic Institute, US</a></p>
<i>Incentivise and reward entrepreneurship support.</i>	<p>Introducing an entrepreneurship-related incentive and reward system will require a pro-entrepreneurship positioning of the university leadership; political backup can facilitate this. At present, the universities' budgets are affected by the number of students, the degree of scientific excellence and other aspects, all not directly related to entrepreneurship. Monitoring the impact of entrepreneurship support on entrepreneurial behaviour of graduates and spin-off activities of members of the university community will help to advocate for the introduction of a reward and incentives system.</p> <p style="text-align: right;"><a href="#">Chalmers School of Entrepreneurship, Sweden</a></p>
<i>Make transition from university internal to external support easy.</i>	<p>University entrepreneurship support has its limits. It prepares students for future intrapreneurial and entrepreneurial careers and promotes the commercialisation of research results. Hence, entrepreneurship education activities and hands-on start-up support are key activities. Close co-operation and integration of university internal and external support infrastructure and services is an important success factor. Getting in private actors contributing to university entrepreneurship support as early as possible is crucial in exposing would-be-entrepreneurs and support providers to the 'world of business'.</p> <p style="text-align: right;"><a href="#">University of Linköping, Sweden</a></p>
<i>Increase the financial self-sufficiency of university internal entrepreneurship support.</i>	<p>On the long-run the goal should be a high degree of self-sufficiency of the university internal entrepreneurship support system. This involves a broader funding base, including more private financing and less dependency upon time-limited public funding. Activities to this end are different for each university and may range from revenues from licences and the sale of shares in spin-off companies to entrepreneurship training courses and business consultancy. Basic funding of overhead costs for support infrastructure and staff from university budget will help to counter the uncertain and infrequent nature of these revenues. It will also acknowledge the relevance of entrepreneurship support.</p> <p style="text-align: right;"> <a href="#">Chalmers School of Entrepreneurship, Sweden</a>  <a href="#">University of Linköping, Sweden</a>  <a href="#">University of Twente, Netherlands</a> </p>

## **Chalmers School of Entrepreneurship: Education and Incubation = Encubation<sup>45</sup>**

Chalmers University of Technology (Chalmers) is one of the two universities located in the city of Gothenburg. The other one is University of Gothenburg. With its nine faculties and schools – Arts (with five schools), Social Sciences, Medicine, Odontology, and Science – University of Gothenburg offers a comprehensive selection of study programmes and the largest number of single courses at Swedish universities.

Chalmers is one of the oldest and largest higher education institutions specialising in science and technology in Sweden. Bachelor, Master and doctoral degrees are offered. Research activities include all main engineering sciences as well as technology-related mathematical and natural sciences. Some 2 500 employees work in 16 departments. It is estimated that over a thousand research projects are conducted on an ongoing basis and more than 2 700 scientific articles and research reports are published every year. Some Chalmers departments are co-organised with the University of Gothenburg. The annual turnover is around SEK 2.2 billion (2007); two-thirds are spent on research.

In 2000 the position of a vice-president responsible for external relations was established, this was followed in 2002 with a strategic decision to fully integrate within a decade the processes of knowledge transfer and commercialisation with Chalmers' research and education activities. This was based on the understanding that future excellence will depend upon the ability to develop synergies between scientific claiming (e.g. publications) and commercial claiming (e.g. patents). The Chalmers strategies for 2004-2007, and 2008-2015, reflect this direction and laid down the objective that development of Chalmers innovation system should primarily be realised through private financing.

There is a long history of successful spin-offs from Chalmers. Since 1960 more than 300 university spin-off companies have been born at Chalmers. Further developing the pioneering approach by Professor Torkel Wallmark and others started in the early 1960s, Chalmers School of Entrepreneurship (CSE)<sup>46</sup> was established in 1995. The Department of Technology Management and Economics at Chalmers, decided to create a school that would arrange partnerships between inventors with ideas and students with the drive to become entrepreneurs. It became apparent that most of the existing entrepreneurship support was focused on teaching entrepreneurship, rather than actually developing entrepreneurs. This gave CSE a dual mission: developing entrepreneurs and creating technology ventures. A good breeding ground for this organisational innovation existed, thanks to the constructive engineering culture and the high appreciation of research commercialisation.

Entrepreneurship education and research activities developed quickly. Already in 1997 CSE launched a one-year Master programme in entrepreneurship for engineering students. This developed over the years into a two-year programme with elective and compulsory courses, an 'innovation project' and a master thesis. Courses include for example Intellectual Property Strategies, Technology-based Entrepreneurship, Design of Technological Innovations and Markets. Every year some 15-20 students are recruited through an interview process where traits and abilities, such as motivation, teamwork, responsibility, leadership and communication, are analysed. In autumn 2008, 37 new students were admitted to CSE and GIBBS, which is the largest batch to date.

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<sup>45</sup> The presentation of Chalmers School of Entrepreneurship is based on Lindholm-Dahlstrand (2009 submitted).

<sup>46</sup> For more information on history and current activities, see joint web portal Chalmers School of Entrepreneurship (CSE) and Göteborg International Bioscience Business School (GIBB): <http://www.entrepreneur.chalmers.se/>.

Chalmers has not (yet) designed an entrepreneurship education that will have some impact on all its students. A bottleneck exists because of the relative high costs of the system and limitations to the number of admitted students.

Today, in 2009, CSE sees itself in its four stage of development:

**1st generation (1997–2000)** Special project and student recruitment processes were developed along with project-based pedagogy located in the incubator environment of ChalmersInnovation. This version was a final-year education for engineering students.

**2nd generation (2001–2004):** CSE became a 1.5 year Swedish master-level programme recruiting broadly from all over Sweden, and a special Holding&Incubation company was started together with AB ChalmersInvest.

**3rd generation (2005–2007):** Start of the sister school GIBBS (Gothenburg International Bioscience Business School, linked to the Sahlgrenska Academy at the University of Gothenburg ) – best described as a bio-entrepreneurship school. International students not speaking Swedish were admitted to GIBBS. During this period, CSE also received a major private donation from the Hans E. Olsson Foundation.

**4th generation (from 2007 on):** With the introduction of the Bologna Process CSE and GIBBS became more international in their recruitment and introduced more elective courses from Chalmers, University of Gothenburg and other universities. Both CSE and GIBBS offer now two-year Master programmes on entrepreneurship. In the beginning of 2009, CSE Incubation and Holding were renamed into Encubator AB.<sup>47</sup>

GoINN (Gothenburg Innovation) was launched during 2008, a joint eight-year project between Chalmers and the University of Gothenburg aimed at developing interacting innovation systems. The project is being financed by VINNOVA, Innovationsbron and Region Västra Götaland. Through GoINN, researchers will receive independent advice and assistance in utilising the innovation system optimally. Two senior innovation advisors from the fields of bioscience and information technology have been recruited to the project. At the turn of 2009, the GoINN consortium included Chalmers Innovation, CIP Professional Services, CIT Chalmers Industriteknik, the CSE and GIBBS schools of entrepreneurship, GU Holding and Sahlgrenska Science Park, as well as the universities themselves, of course.

#### *Education and Incubation = Encubation*

CSE is both an educational platform, where entrepreneurship skills can be acquired and a pre-incubator to developed early-stage business ideas and to start-up a company (most students start a legal company during the project-year). Core to this is a network that brings together innovative individuals, universities and firms interested in developing and commercialising early stage technology based ideas with high market potential.

The early stage high-tech ideas are provided from researchers and innovators, who can follow their idea and grow in partnership with the student team and an international network of experienced business people, venture capitalists and others, and supported with coaching and advice from CSE. When participating as an idea provider, university researchers and other inventors, get an opportunity to test their invention in a one-year innovation project at CSE. If a limited company is founded after

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<sup>47</sup> For more information on the encubator approach, see <http://encubator.com/about/encubator>.



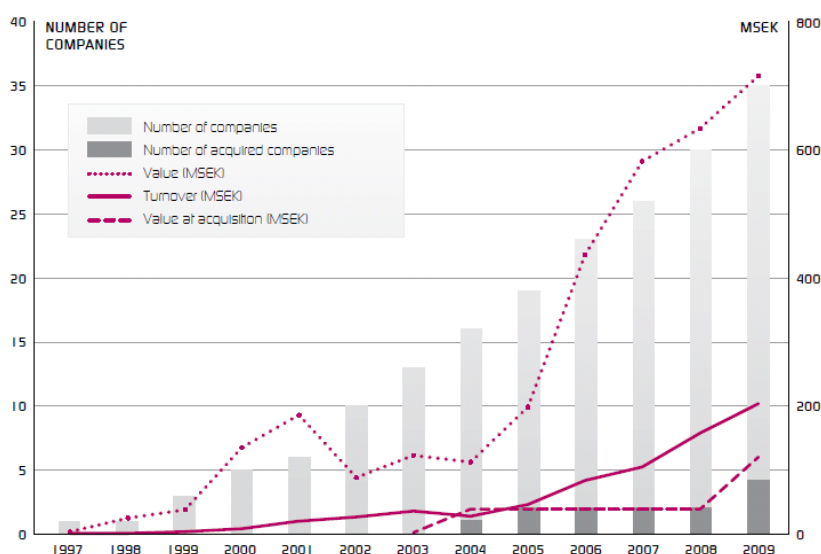
the project-test period the idea provider will have a share in the new venture. IP agreements play an important role in CSE; a collaboration agreement is signed between CSE and the idea provider.

Since the start of Chalmers School of Entrepreneurship (CSE) in 1997, and the inclusion of Gothenburg International Bioscience Business School (GIBBS) in 2005, 43 companies have been ‘incubated’ out of the schools. 35 are still in business with a total turnover of SEK 203 million (EUR 21 million), a value of SEK 714 million (EUR 74 million), and employ 312 people. In total, the venture capital attracted amounts to SEK 240 million (EUR 25 million).<sup>48</sup> (Figure 4). A venture project at CSE or GIBBS is terminated if a lack of commercial potential is identified, something that happens approximately five times per year (i.e. 5 out of 20 projects in the educational programme).

CSE and Encubator AB have been financed since 2005 only from external sources, both public and private, thereby fully complying with the above mentioned strategy of Chalmers University. Innovationsbron and Region Västra Götaland have been the key financiers of Encubator AB. Since 2005 the Hans E Olsson Stiftelse and Elof Hanssons Stiftelse foundations Gothenburg BIO, NUTEK, the European Union and InnovationsKapital have been won as new donors.

In the 2009 new Swedish research and innovation law, Chalmers was appointed to establish one of seven innovation offices in Sweden. These are expected to play an important role when Swedish universities and university colleges obtain a clearer responsibility for the utilisation of their research.

**Figure 12. CSE Portfolio progress, 10 years of activities**



**Source:** Encubator (2009), available from Internet at [http://encubator.com/sites/default/files/uploads/776/Encubator\\_Progress\\_Report\\_2009.pdf](http://encubator.com/sites/default/files/uploads/776/Encubator_Progress_Report_2009.pdf) (3 March 2010).

CSE is an interesting example of an integrated approach to university entrepreneurship support, that is, how education can be incorporated into start-up support in the form of incubation. Today, CSE might serve as a learning illustration of an ‘Encubation’ process, that is, a combined Master-level

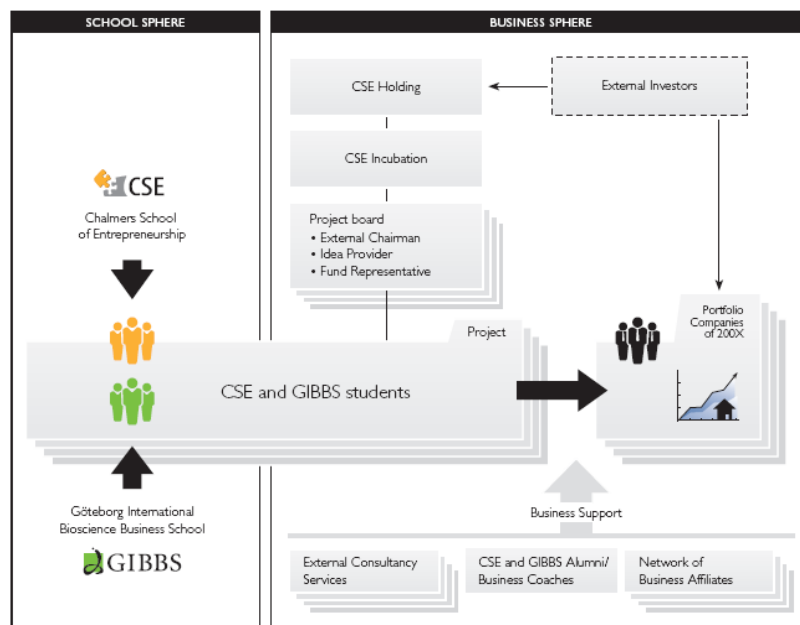
<sup>48</sup> Figures from Encubator (2009), Encubator realizes ideas in cooperation with Chalmers School of Entrepreneurship & Göteborg International Bioscience Business School. Available from Internet at [http://encubator.com/sites/default/files/uploads/776/Encubator\\_Progress\\_Report\\_2009.pdf](http://encubator.com/sites/default/files/uploads/776/Encubator_Progress_Report_2009.pdf) (3 March 2010)

education and an incubator. CSE and GIBBS support each other in this endeavour as Figure 4 illustrates.

The integrated approach is based on two pillars. First, specialised masters programmes are offered at Chalmers and Sahlgrenska Academy (the faculty of health sciences at the University of Gothenburg). Faculty members from Chalmers’ Technology Management and Economics department, the School of Business, Economics and Law at the University of Gothenburg and at the Sahlgrenska Academy collaborate closely with industry representatives and consultants in firm management and development, intellectual property and legal issues. Second, CSE and GIBBS have a structured and focused business environment (a pre-incubator) run under the professional management of Encubator AB. The projects are offered physical support infrastructure (e.g. office space) as well as experience and access to networks involving business experienced Encubator AB board members and business people.

The ‘encubation’ process has had a strong positive effect on developing the actors in the innovation system of Chalmers and the region. The Drivhuset (‘Greenhouse’) in Gothenburg has helped to start up 156 new companies in 2008 (compared with 132 in 2007, 114 in 2006, 120 in 2005 and 86 in 2004). Around 3,000 students participated in a variety of activities and events including project management seminars leading to certification, a bookkeeping course, a selling seminar and coursework on how to start your own business. In 2008, Drivhuset, in partnership with Venture Cup West, ran a campaign (SPIRA project) to motivate more women to start their own enterprises; participation rate of women who started their own businesses with the help of Drivhuset was around 61% (2008).

**Figure 13. The two spheres of Encubation: School and Business**



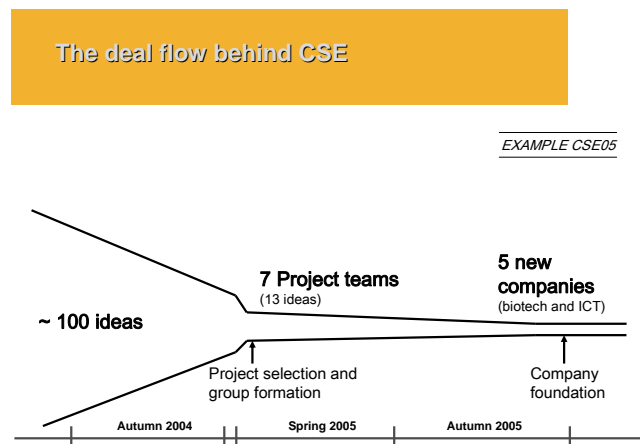
Source : CSE Progress report 2007.

The process, as shown in Figure 6 below, starts with an assessment of the idea. The resulting projects will get support by an action-oriented pedagogy as well as by a large, actively engaged

network of professors, researchers, entrepreneurs, expert advisers and other experienced individuals. CSE, GIBBS and Encubator AB evaluate more than 150 ideas per year. 30 of these ideas are assessed more carefully and 20 contractually linked to Encubator AB (see illustration in Figure 6). The project team get an office and access to meeting space, all fully equipped with computers, internet and telephone connections for the period of project development (average one year). The projects receive EUR 2 600 and the possibility to request additional funding up to EUR 7 900 to cover, for example, visits to customers and trade fairs. Often projects apply (successfully) for venture capital or other sources of financing available in the region.

Disclosure and ownership issues related to intellectual property are very important for a successful integration of education and incubation into a university entrepreneurship support system. In Chalmers there is a binding contractual agreement between (1) the researcher(s) providing the idea for the venture, (2) the student team developing the venture, and (3) the business developer assisting the venture development during the pre-incubator. The researcher as an idea provider is important to ensure engagement of the venture team into the learning process and for a continued development contribution of the venture idea. If a company is created at the end of the education process, all of the above mentioned parties will hold a share in the new venture, with a certain percentage allocated for future engagement of external business development experts such as patent authorities, management consultants, legal advisors and technical specialists, and the highly active alumni network (CSE Progress report 2007).

**Figure 14. The deal flow behind CSE**



Source : Mats Lundqvist, Director of CSE made available through author.

### *Financing new ventures*

Since 1998 ChalmersInvest, a wholly owned incorporated company of Chalmers University, has made seed equity investments in university spin-off companies in the entire Gothenburg region. ChalmersInvest owns equity, directly or indirectly, in at present more than 40 companies. ChalmersInvest is in the process of attracting more external capital from private investors, large private corporations in addition to the several private and public financing organisations in and around Gothenburg. For example, KTH Chalmers Capital fund has established itself as a leading investor, and is one of the largest privately financed Swedish venture capital companies focusing on technology

investments at an early phase. The close collaboration with ChalmersInvest, allowed CSE to link with external private venture capital investors.

In 2000 ChalmersInvest and CSE pioneered investments (pre-seed investments) during pre-incubation, creating what now is Encubator Holding. Since 2006, CSE Holding & Incubation (today Encubator Holding), has own resources to develop projects at very early stage (already during the innovation-project phase) before these projects are included in the pre-incubator or in another incubator, such as, for example, Chalmers Innovation or one of the incubators part of the above described Västra Götaland Incubator Platform.

Over the years Chalmers gained experience in how to balance its own and others' interests in the new ventures. The levels of the incubators' own equity are today relatively standardised at 20% to 25% in pre-incubation start-ups and between 0 to 5% in existing firms that join Chalmers Innovation. Important to note is that there is no increased liability in having higher stakes in Swedish incorporate companies, such as it is for instance in the US when exceeding 5%. ChalmersInvest made some very profitable exits when Chalmers' spin-off firms have been bought by corporations abroad. Every exit is carried out case by case. However, Chalmers three equity-taking entities (ChalmersInvest, Chalmers Innovation and Encubation Holding) have the mission of operating in the so-called early 'valley of death', implying that an early exit is often favoured and thereby bringing back money to operate in these early stages. The whole idea with taking equity is to limit the need of public financing. Chalmers Invest has used parts of its profits in exits to invest in Chalmers' innovation support system. The goal of Encubator Holding is to be profitable on the long run through re-investing profits made from exits.

### **The Entrepreneurship Project at the University of Linköping in Sweden<sup>49</sup>**

Linköping is a medium-sized Swedish town with around 150 000 inhabitants, a few hours by car away from Stockholm. The University of was founded in the late 1960s and became over time one of Sweden's larger academic institutions.<sup>50</sup> Already in the early 1980s key people from the University of Linköping, the City and the region came together to develop a strategy of how the University of Linköping can best contribute to economic and employment development in the region. The main objective guiding the strategy and the measures that have been developed is to promote entrepreneurial thinking and to enhance business start-up and growth.

Entrepreneurship support developed in four phases (Etzkowitz and Klofsten, 2005):

2. Inception (1980-85); key actors discuss entrepreneurship support and come to an agreement over a long-term effort that puts the university at the centre.
3. Implementation (1986-94); various mechanisms like support programmes and institutions/organisations are created.
4. Consolidation and adjustment (1995-2000); results, experience and evaluations lead to a change in some of the mechanisms and the establishment of several new ones.

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<sup>49</sup> by Magnus Gulbrandsen.

<sup>50</sup> The University of Linköping has four faculties: Arts & Science, Health Sciences, Science & Engineering, and Educational Sciences.

5. Self sustaining growth (2001-); more emphasis can be placed on supporting actual entrepreneurship rather than changing the culture, and the Linköping region is no longer dependent upon outside funding for its entrepreneurial support structure.

Different elements of the technology transfer and entrepreneurship support structure include the technology transfer office, venture zone for students and seed financing, an entrepreneurship centre and an entrepreneurship project centre, business incubation facilities, regional development innovation bridge and innovation bridge, two science parks, and two networking organisations. The linkages between these different support mechanisms are well thought out, and the university has a hand in many of them. Firms and would-be-entrepreneurs are targeted in a four-phase approach which includes tailored financial support or access to financing, coaching and mentoring, and networking.

The aim is to ensure systematic and continuous entrepreneurship support combining education and start-up support. The Centre for Entrepreneurship<sup>51</sup> organises the Entrepreneurship and New Business Development Programme with 12 different entrepreneurship courses from undergraduate to the PhD level, offers a range of start-up support services and is active in entrepreneurship and innovation research.<sup>52</sup> Networking initiatives have been going on for more than 20 years. The networks have so-called management leaders which are 'mentors' who organise inter-firm linkages rather than play an active role themselves. An example of this is a network of electronics companies that have spun out of various organisations in the Linköping region. The network organisation offers courses, advice and technology transfer assistance particularly related to this industry, but also with the aim to put the companies in touch with one another.

The entrepreneurship support system seems to be oriented more towards creating a large portfolio of spin-off companies than a smaller number of high-growth ventures. Up to now 500 start-ups have been supported of which 10 percent have more than 10 employees. In the Linköping city area 133 businesses start-ups were counted between 1993 and 2005. 110 of these are still active.<sup>53</sup>

A particular strength of the system is its holistic approach integrating entrepreneurship into teaching and research activities. Student-oriented and teaching-based initiatives (entrepreneurship centres, student-oriented incubators, business plan competitions, etc.) are at the heart of a large and complex structure aimed at promoting entrepreneurship-fuelled regional economic development. The Linköping system can be considered a successful combination of entrepreneurship and technology transfer: clear linkages exist between regular forms of university-industry relations and entrepreneurship.

The Linköping entrepreneurship support model is considered a success. Its development is very dynamic. Many of the mechanisms have changed rather dramatically over the years, and new ones have been added to cater for special needs of the entrepreneurs across different phases and industries. There is a strong emphasis on idea generation and development rather than early business start-up promotion. Related to this is the well-developed networking and learning dimension in

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<sup>51</sup> For an overview of the mission and activities of the Centre for Entrepreneurship, see [www.oecd.org/secure/pdfDocument/0,2834,en\\_21571361\\_38013663\\_39135653\\_1\\_1\\_1\\_1,00.pdf](http://www.oecd.org/secure/pdfDocument/0,2834,en_21571361_38013663_39135653_1_1_1_1,00.pdf).

<sup>52</sup> For more information on the Entrepreneurship and New Business Development Programme (ENP), see <http://www.iei.liu.se/externt/cie/enp?l=en>.

<sup>53</sup> Around two-third (44) of the 133 Linköping city area based start-ups are sole proprietorships with varying turnover, 40 are tiny firms with less than 10 employees and a turnover between SEK 3 million and 14 million. The remaining 26 firms have more than 10 employees and turnovers of more than SEK 5 million.

entrepreneurship support. The starting point is that firms and entrepreneurs can learn a lot from one another, but that this needs various forms of support (being geographically close to each other, that is, for example, being co-location in a science park is not sufficient). With the network management leaders Linköping has taken coaching and mentoring a step further in terms of clear entry and pathways in the entrepreneurship support system.

A possible caveat to sustainability and scale lies in the fact that the system relies on certain ‘key’ individuals and their personal networks and experience. This is the case in most university based or university linked entrepreneurship support systems. Yet, in a system that aims to be as holistic and integrated as Linköping, reliance on individuals instead of greater institutionalisation of entrepreneurship support may be a barrier to integration and co-ordination.

### **Taking Knowledge further: the University of Twente in the Netherlands<sup>54</sup>**

The discussion of the approach followed in Twente in the Netherlands is meant to illustrate how an entrepreneurial academic institution can manage to contribute to a high number of small start-ups and employment opportunities. This is achieved by encouraging research-based university spin-offs as well as a high number of student start-ups, which is in the literature also described as ‘low selective model of spin-out activity’ (Clarysse et al 2005)..

The University of Twente (UT) was founded in 1961 in Enschede, the largest town of the region of Twente, and close to the German border. It developed from a purely technical university to one that also offers social and behavioural sciences. Today, UT has approximately 850 research staff and 8 800 students, with some 750 PhD students. UT is strongly embedded in the region. Twente, in the 1960s, was a textile region and when the textile industry declined this led to massive unemployment. UT deliberately chose to play a major role in the rejuvenation of the region by engendering an entrepreneurial climate. Already in the early 1970s the university increased its technology transfer activities and established in 1979 a technology transfer office and introduced entrepreneurship education activities in the early 1980s. Inexhaustibly advocated by Professor Van den Kroonenberg, former rector of the university in the mid 1980s, the entrepreneurial approach – at that time a rather unpopular vision – gradually transformed the entire organisational culture (van der Heide, van der Sijde (2008). Today, UT’s mission is to be an entrepreneurial (technical) research university, achieving internationally recognised excellence in research and teaching, and stimulating economic and social development through valorisation and commercialisation of research in the region. Over time a rich and well-connected entrepreneurship support infrastructure was established offering tailored support for students (TOP and the BTC-Twente incubator) and for researchers and professors (HTT, Kennispark). For a long time the region presented itself as ‘Twente – where innovation is tradition’.

Universities in the Netherlands follow three routes in exploiting the results of research and in contributing to regional innovation (vsn der Sijde 2006):

- **Route 1:** Co-operation with industry (e.g. contract research, joint research, strategic alliances, joint ventures);
- **Route 2:** Patents and licences;
- **Route 3:** Creation of spin-off companies.

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<sup>54</sup> The presentation of entrepreneurship support at the University of Twente is based on Asa Lindholm-Dahlstrand (Lindholm-Dahlstrand 2009, submitted).

Most often used by UT is Route 1 - co-operation and the spin-off route. In 2008, five UoT spin-offs were included into the ranking of Deloitte's Technology Fast 50. In 1996 intellectual property rights on inventions made by university professors and researchers changed in the Netherlands. Whereas ownership before was with the inventor, intellectual property rights have been now transferred to the university that employs the inventor. Universities are, however, allowed to set the framework conditions for IP ownership. Even though applications for patents and licences are at a regional level higher in Twente than any other Dutch region, Route 2 is hardly used by UT, and it is also not part of the UT's strategic plan. In 2006, UT held a small number of patents, whereas the majority of patents were the result of industry contract research (Sijgers et al 2006).<sup>55</sup> The interests of the UT are managed by Holding Technopolis Twente (HTT), which is also actively scouting opportunities.

### *Taking knowledge further*

Knowledge valorisation is presented on UT's website as the third core activity, besides education and research. UT management, through its Executive Board, is a stakeholder of both the Kennispark and Nikos. The Executive Board has the primary responsibility for UT's entrepreneurial infrastructure (incubator facilities, spin-off support, HTT) and is advised by the directors of Nikos and Kennispark. The motto is "Taking Knowledge Further". Technology transfer and entrepreneurship support at UT is a well developed system fully integrated in the wider regional support system (Figure 15).

It has taken Twente region some 25 years to transform itself into an entrepreneurial region. UT has played an important role in this transformation. With its "low selective model" it has managed to create a high number of graduate start-ups and new jobs. With time, the entrepreneurial UT has also managed to create some high growing research-based start-ups. UT's taking knowledge further activities contribute to (Mac Gowan et al 2008; Kennispark 2008):

- New competencies amongst students, researchers and professors (100 students per year in the MA courses)
- New companies (600 companies in 25 years and recent trend of 20-25 new companies per year)
- New business development and growth,
- New jobs (companies established through TOP create on an average 6 new jobs).

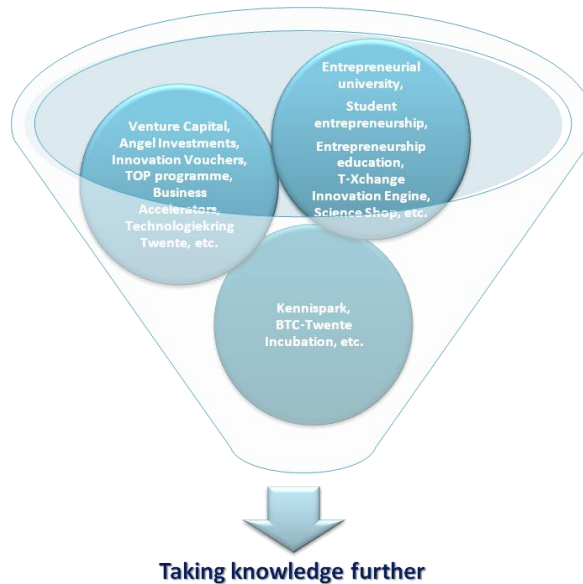
Because of the existing and continuously added possibilities (also provided by new companies), spin-offs locate close to UoT. The ultimate objective of entrepreneurship support at UoT is to "create economically viable companies that stay in the region, make the environment attractive and also create contract research spill-overs" (Clarysse et al. 2005, 215). This is a key contribution to local development. Jobs resulting from spin-off and technology transfer activities in 2007 accounted for 4 975 (not including UT jobs), with 306 new jobs created and an increase of 6.6% compared to 2006. In 2007, five UT spin-offs entered the fast growers list of Deloitte's Technology Fast 50 (Kennispark 2008):

A trigger for spin-off activities is the general acceptance amongst researchers, professors and graduates that starting your own business is an attractive idea. Students and researchers are more ready to take risks than professors. As a result, many of the spin-out projects are by end-of-contract researchers and students who have just graduated. By 2007, 600 spin-off companies were counted. (Kennispark 2008).

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<sup>55</sup> The 2004 UT Annual Review reports 5.4 patents per 100 full time researchers, 5.9 in 2003 and 3.2 in 2004. Evidence suggests that, in general, Dutch universities do not actively patent their knowledge.

**Figure 15. Taking knowledge further**



Source : OECD, based on Kennispark (2008).

The TOP Programme, Temporary Entrepreneur Positions programme (Tijdelijke Ondernemers Plaatsen, TOP) has been since two decades an important source of support for graduated and graduate students. Start-up entrepreneurs with innovative ideas that connect to one of the research groups at the University of Twente can receive during the first business year monetary support in form of an interest-free loan of € 20 000. Furthermore counselling, coaching and networking activities are organised, and TOP fellows can locate for one year at no costs in one of the participating incubation facilities. In 2007, 21 people were awarded a TOP position, fourteen of these can be qualified as beginning techno-entrepreneurs. Unfortunately, one of the TOP companies ceased its activities in 2007. In early 2007, the TOP programme was aligned with the SKE Programme, Subsidy Programme of Knowledge Exploitation (Besluit Regeling Subsidieprogrammema Kennisexploitatie.), which provides loans of up-to € 1 million (Kennispark 2008).

Entrepreneurship education is considered important. It is closely linked with entrepreneurship research. Nikos, the Dutch Institute for Knowledge Intensive Entrepreneurship provides a wide range of undergraduate and graduate courses, supervises projects and offers training programmes for non-university students. Core activities include:

- Research into entrepreneurship and networking.
- Teaching entrepreneurship at the undergraduate, graduate and post graduate levels.
- Consultancy services and training, mainly for high-tech ideas and ventures.
- Implementing business development support projects focusing specifically on knowledge-intensive entrepreneurship in new or established companies, universities and regions (for example the TOP programme).



A suite of courses allows tailored entrepreneurship teaching. At the undergraduate level there is the Minor Entrepreneurship programme for all students. It comprises a three months (20 EC) programme, which includes courses on market-oriented entrepreneurship, financial management, business law, “become your own boss” (writing a business plan for your own company), or “managing an SME” (support writing a business plan for an existing company). In 2007, UT started a Master on Innovation & Entrepreneurship where students have the opportunity to enrol in a two-year double degree MSc in collaboration with the Aalborg University in Denmark. In the 2006–2007 academic year, 26 students finished their Minor in Entrepreneurship and 13 did their Master’s in the Innovation & Entrepreneurship track. These numbers went up to 39 and 19, respectively, in the 2007–2008 academic year (Kennispark 2008).

Entrepreneurship is widely stimulated through extra-curricula activities. There are Faculty Clubs where entrepreneurs and researchers regularly meet. For students interested in starting-up their own company while studying, the “University Student Entrepreneurs” group is an important partner. It is a student union run network of like-minded students that provides access to incubation facilities. Together with Nikos an extra-curricular course called ‘Skills Certificate in Entrepreneurship’ is offered. Participating students can locate in incubation and workshop facilities for lower fees. Research institutes and individual researchers are also members of regional entrepreneurs associations, such as the Industrial Circle Twente ([www.ikt.nl](http://www.ikt.nl)) and the Technology Circle Twente ([www.tkt.org](http://www.tkt.org)).

#### *Incubation and location facilities*

There are two Science Parks in Twente region: Business&Science Park (BSP) in Enschede and Kennispark Twente.

BSP has a size of approximately 40 hectares and hosts around 200 companies. UT plays an active role in the park through an intense cooperation with science companies, including facility and laboratory sharing and exchanges of personnel. The combination of university study, high tech knowledge-based industry, and business services generates both ideas and jobs and has proven to be a very strong magnet for like-minded companies and investors. BSP hosts the oldest business incubator in the region, the BTC Twente (Business & Technology Centre Twente), with 85 tenant firms in 2007. Success factors are its policy of “easy in” and “easy out” and the offer of more space within the building once a tenant firms expand (van der Sijde 2006, Kennispark 2008). BTC Twente stimulates formal and informal contacts between tenant firms and the 200 BSP companies; the management also acts as coach for the tenant firms.

Kennispark was founded by UT, the municipality of Enschede and the Regional Development Agency Oost N.V. It also acts as central umbrella organisation for technology transfer, handling IP protection and spin-off support. The target is to create 10 000 new knowledge intensive jobs in Twente by 2020 (Kennispark 2008). The Kennispark has as a main task to scout (via so-called business accelerators) and develop business ideas and activities that lead to patents and/or new research spin-offs. Business accelerators are persons who fulfil, for a certain (technological) domain, scouting and screening activities, patent strategy, preparing business start ups, fund raising and similar activities. UT research institutes set up business accelerators to shorten the time-to-market of new products by means of specific support of entrepreneurial employees or by finding companies that will market technological innovations. Matchmaking and specific business support are key activities (van der Heide and van der Sijde 2008).

## Financing

Venture capital and business angel activities are under development. Only 4% of all spin-outs receive private venture capital (Clarysse et al 2005, van der Sijde 2006). Participation Company East Netherlands NV (PPM Oost NV), who invests in companies in the provinces of Gelderland and Overijssel is one of the few VC. PPM OOST NV invests mainly in high-tech and mature companies. In 2006 PPM Oost had invested in 60 companies with a capitalization of EUR 48 million. UT is one of the shareholders. Some banks have ‘matching services’, (matching ‘capital’ with ‘companies’), and on an irregular basis, meetings between (informal) investors and companies are organised, such as ‘Seventh Heaven’, an initiative of the Dutch informal investors network (NBIB) organised in collaboration with TOP. UT is very active in advancing venture capital and business angel activities. Drienerlo Investments BV is an example of this. The founders are successful UT alumni who have been since early 2007 investing their own capital in technology companies in Twente, and especially in UT spin-offs. Their UT background allows them to ‘speak the language’ of the budding spin-off entrepreneurs better than many other investors (Kennispark 2008). Nikos is organising a network of informal investors in Twente (van der Sijde 2006).

Public financing programmes compensate for the gap in private financing and for high transaction costs, spillages, uncertainty of R&D results. Spin-off companies are selected at a very early stage and coaching is focused upon this stage (Clarysse et al. 2005). The consequence of this low-selective model is that a large number of businesses is selected, many of which will be small and with low levels of capitalisation. It is common that public money is granted to these early stage projects. Much of the financing comes from European Social Fund and is given to spin-offs in the form of loans, typically regarded as a means of subsistence rather than spin-off capital. The Dutch Ministry of Economic Affairs has established some general instruments to promote and stimulate co-operation between industry and higher education, for example: *Innovation-Oriented Research Programmes*, which promote technical-scientific research and its application by business and stimulate companies and research institutes to develop joint knowledge investment plans; and *Open Technology Programme* of the research foundation STW (Foundation for Technical Sciences), which stimulates high-quality university research projects with high user involvement and good prospects for utilisation and research yield (van der Sijde 2006). Senter/Novem, a government agency for sustainability and innovation, is in charge of a number of financial instruments. The *Techno Partner* programme, for example, provides seed financing and runs an information platform to alleviate the asymmetric information dilemma in high-tech financing. *Techno Partner* is a joint project of the Ministry of Economic Affairs and the Ministry of Education, Culture and Science. It does not subsidise individual businesses, but encourage investors to get involved in promising and innovative businesses. If the business plan is good, *Techno Partner* doubles its contribution, in order to limit the risk for the investors.

### **Rensselaer Polytechnic Institute in Troy, New York<sup>56</sup>**

Rensselaer Polytechnic Institute (RPI) is the oldest engineering research university in the United States located in Troy, NY. Entrepreneurship is considered a way of life that springs from fundamental education and research programs. RPI’s educational programmes work to infuse understanding and encouragement of entrepreneurship through all schools and programmes. Specifically:

1. RPI’s fundamental research activity in technological entrepreneurship and the management of innovation occurs in the Schools of Engineering, Business and Arts and Sciences.

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<sup>56</sup> The presentation of entrepreneurship support at Rensselaer Polytechnic Institute is based on Phan (2009, submitted).

2. The Lally School of Management and Technology (the business school), with its partners in Engineering and Science, teach the fundamentals of entrepreneurship to students across all disciplines as part of a general curriculum requirement for first year undergraduate students.
3. The Lally School of Management and Technology has a venture capital and angel investing mentor programme in which students interested in the development of new enterprise or in a career in venture capital can take classes and participate in the decision making activities of a venture fund, to understand the private equity and capital raising process.
4. The School of Engineering and the Lally School of Management and Technology co-teach innovation related courses such as Introduction to Engineering Design, Inventors Studio, and Multidisciplinary Design Laboratory; co-manage programmes such as Product Design and Innovation; and participate in competitions, such as the Formula SAE car project.
5. Students are provided with opportunities to work in settings where technology is being commercialised, such as entrepreneurial faculty projects and internships.

There are several key players that make the entrepreneurship support ecology at RPI work. Their roles and functions are briefly described below.

#### *Vice-Provost for Entrepreneurship*

The Vice-Provost for Entrepreneurship is a senior cabinet post that demonstrates the central administration's commitment to entrepreneurship. The Vice-Provost, who reports to the Provost, advocates a compelling vision and executes a plan to infuse entrepreneurship throughout the university community. The Vice-Provost fosters a culture of integration and support for a technological entrepreneurship continuum. Harnessing a combination of thought leadership and strong administrative skills, the Vice-Provost develops entrepreneurship learning experiences throughout the curriculum as an integral part of Rensselaer's overall academic programmes. This position, the first of its kind in the United States, demonstrates central administration's dedication to entrepreneurship and the level of commitment exists for integrating entrepreneurship across the curriculum.

#### *Office of Intellectual Property and Technology Commercialisation*

As one of the top 40 research institutions in the United States research is RPI's major driver for science and technology transfer, invention, and innovation. Technological entrepreneurship completes the technology lifecycle – from discovery to the creation of impact in the global marketplace. With a track record of developing new enterprises, some 30 spinoff companies from RPI in the past five years, and with an expanding research base, RPI cultivates a campus culture that provides the spirit and motivation for inventors to pursue commercialisation and entrepreneurship.

The tasks of the Office of Intellectual Property and Technology Commercialisation (OTC) are to:

1. Increase awareness of intellectual property, preserving its value in research agreements and maximising its value under shared equity arrangements and licensing agreements, covering intellectual property developed in research and materials developed for distance education.
2. Define intellectual property policies that encourage entrepreneurship and allow the university to take equity positions in new ventures as appropriate.
3. Ensure that intellectual property policies have adequate and appropriate conflict of interest and conflict of commitment provisions.

4. Develop awareness and an appropriate support infrastructure for intellectual property rights policies and incentives.

#### *The Severino Center for Technological Entrepreneurship*

Established in 1988, the Severino Center for Technological Entrepreneurship (SCTE) creates a platform for budding successful entrepreneurs to make the transition to sustainable growth by recognising that technology has and will transform the way that human beings labour, live and learn. Through outreach programmes, education, and research, SCTE responds to the call of the new economy for new and rapid thinking. It acts as clearinghouse for data, research papers, and academic conferences that encourage collaboration between faculty from engineering, science, economics, and business. Historically, SCTE is the first point of contact that students have with entrepreneurship. It functions as funnel that channels students toward new ventures and 'feed' the RPI Incubator and the RPI Technology Park.

#### *RPI Incubator*

Since its inception, RPI Incubator's mission has been 'giving life to new ideas'. It is rooted in the firm belief that ideas both come from RPI and are drawn to it. It is the Incubator's goal to augment RPI's special role of providing a fertile environment for the growth and development of new ideas, and additionally to create opportunities for the application and further evolution of those ideas into the greater community through the channels of commercial activity. This greater mission encompasses three core objectives: (i) enrichment of the academic environment, (ii) technology transfer and commercialisation, and (iii) regional economic development.

#### *Rensselaer Technology Park*

Rensselaer Technology Park is located in New York's Capital Region at the confluence of the Hudson and Mohawk Rivers and the intersection of major East/West and North/South highways that provide access to markets and people. A three hundred mile radius encompasses a population in excess of 50 million people and an approximate three hour drive reaches major markets in New York City, Boston, and Montreal. The area is also served by the Albany Park, Amtrak and Conrail railroads, and the Albany International Airport. At present there are over 50 tenants with over 2 200 employees representing a wide diversity of technologies ranging from electronic to physics research, from biotechnology to software.

A fundamental objective of the Park is to develop interactions between tenant companies and the university. Such interactions enrich the educational environment of the university and help the companies stay on the leading edge of their technologies. All companies in the Park automatically become members of the 'Venture Affiliates of RPI'. Building a synergistic environment is a responsibility shared by all members of the Park staff. The development of the Park is not focused on a singular technology or specific industries. On the contrary, the objective of the Park is to attract a broad diversity of technologies reflective of the varied technological strengths of the RPI.

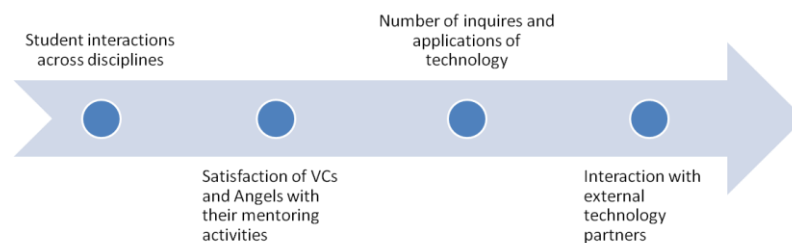
#### *Faculty engagement and evaluation methods*

Many of the barriers that prevent faculties of different disciplines from working together on entrepreneurship can be traced to the lack of communication. The entrepreneurship support ecology at RPI seeks alleviate these barriers by nurturing commitment by all those involved, technologists, financiers, management, and entrepreneurship faculty to develop a university wide effort for entrepreneurship. Most important in developing linkages is the authority and commitment from central

administration. Thus, when all sides of the equation understand both the role and the value that different disciplines bring to the table the university enjoys a high degree of participation from its faculty. Within each School there are at least two faculty members, who are respected by their peers for high quality research and teaching and who champion the entrepreneurial cause across the university. These people meet on a regular basis to discuss new initiatives, propose new research grant opportunities, and advocate privately and publically for entrepreneurship within the university and in the Upstate New York Region. They are the centre of gravity for other entrepreneurship-interested scholars from universities and colleges in the region.

An evaluation system to measure the performance of entrepreneurship support activities and people involved is in place and includes several measurement criteria (Figure x). First, is the quality of the interaction between management students and technology students. Using questionnaires, the quality of the experience that students have in their interactions across the disciplines are assessed annually. Second, is the satisfaction that the VCs and Angels have with their mentoring activities. The quality of their interaction is imperative to the development of the programme. Again, questionnaires are utilised to develop a quantitative assessment of these interactions. Third, is the activity in the Office of Technology Commercialisation (OTC). Better interactions with the university research community will improve the flow of technology to the OTC and the interest in technologies that currently exist in the OTC. The number of inquires and applications of technology from the OTC are utilised as the chief measure of success. Finally, the interaction with RPI's technology partners and funding providers foster a system that commercialises more student and faculty operated ventures. Therefore the number of spinoffs over a five year period is used as evaluation criteria.

**Figure 16. Evaluation of entrepreneurship support activities at RPI**



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## ANNEX 1 ACTION PLAN BERLIN

This Action Plan is the result of an OECD review of current entrepreneurship education and start-up support practices at three universities in Berlin: the Freie Universität, the Technische Universität and the Beuth Hochschule Berlin. It summarises policy recommendations presented in the synthesis report “*Strengthening Entrepreneurship and Local Economic Development in Eastern Germany: Youth, Entrepreneurship and Innovation. Synthesis report Berlin*” discussed with the Berlin Senate Administration for Economics, Technology and Women’s Affairs and its key local partners in May 2009.

The Action Plan contains contributions from Alain Fayolle, Professor for Entrepreneurship at EM Lyon (France), Magnus Gulbrandsen, Research Director at the Norwegian Institute for Studies in Innovation, Research and Education (Norway), Andrea-Rosalinde Hofer (OECD), Philip Phan, Professor and Vice Dean for Faculty and Research at Carey Business School, Johns Hopkins University (US) and Jonathan Potter (OECD).

### Entrepreneurship education practice

<p><i>Strategically anchor entrepreneurship education within universities.</i></p>	<p>A greater strategic anchoring of entrepreneurship education is needed to increase its performance and impact. This might be achieved through the following actions:</p> <ul style="list-style-type: none"> <li>• Assign a member of the university board (president or vice-president) to take over responsibility for the quantitative and qualitative development of entrepreneurship education in all its key dimensions: policy and goal definition, level of integration, resources, dedicated research, improvements, progress indicators, etc.</li> <li>• Establish a ‘strategic’ committee, including all the key people acting within the university as teachers, researchers or ‘consultants’ in the field of entrepreneurship, to define a strategy and monitor its implementation.</li> <li>• Agree a framework to assess the short-term impact of entrepreneurship education, including regular feedback sessions with people from the business community, alumni entrepreneurs and students and to track and survey alumni with entrepreneurial careers.</li> </ul>
<p><i>Incentivise and reward entrepreneurship educators.</i></p>	<p>There is a need for strong incentives to increase the commitment of faculty members in entrepreneurship education. It should be envisaged to:</p> <ul style="list-style-type: none"> <li>• Reduce the teaching load for those involved in ‘strategic’ entrepreneurship activities, such as entrepreneurship ambassadors and mentors.</li> <li>• Reward those having designed and implemented innovative and high quality teaching and pedagogical material, and those who shared and/or instigated the dissemination of ideas and good practice.</li> </ul>
<p><i>Support professors in promoting an entrepreneurial spirit.</i></p>	<p>To support potential entrepreneurs, the involvement of professors is needed. Changing mindsets cannot be achieved through promotion campaigns alone. Professors’ actions are likely to have an important impact on the proportion of people coming into entrepreneurship programmes. A culture of entrepreneurship support needs to be promoted across the whole teaching faculty.</p>



<p><i>Invest in human resources for entrepreneurship teaching.</i></p>	<p>There is a need to reinforce and develop current human resources in entrepreneurship research and education. This could be achieved through:</p> <ul style="list-style-type: none"> <li>● Creating, in the short term, at least one entrepreneurship professorship position, while paying great attention to the applicants' profiles and their entrepreneurship credentials and qualifications.</li> <li>● Encouraging professors in entrepreneurship-distant disciplines to participate in workshops and seminars on entrepreneurship education.</li> <li>● Building and expanding linkages between research and teaching, for instance, by getting doctoral students to work on an entrepreneurship education related research topic.</li> <li>● Inviting international visiting entrepreneurship professors on a regular basis to strengthen the research base, to teach students, and to train teachers.</li> </ul>
<p><i>Progressively integrate entrepreneurship courses into curricula.</i></p>	<p>With suites of courses, the current offer in entrepreneurship education could be expanded and tailored to different student interests and needs. In the short to medium-term, the objective should be to offer at least one entrepreneurship course to all students. The long-term objective should be progressively to integrate entrepreneurship courses into curricula.</p>
<p><i>Advocate the use of 'entrepreneurial' pedagogies across disciplines.</i></p>	<p>Innovative and original methods in teaching entrepreneurship can also be relevant for developing 'entrepreneurial' pedagogies and spreading their application across faculties. An 'entrepreneurial' pedagogy aims to enhance entrepreneurial capacities and capabilities amongst students by giving them more autonomy and responsibilities in the learning process through experiments and reflexive learning and a greater application of collective and co-operative learning. In the long term this will, along with other factors, contribute to the development of a more entrepreneurial learning environment.</p>
<p><i>Undertake outreach activities across faculty to increase take-up rates.</i></p>	<p>The entrepreneurship education offer should be widely communicated and publicised within the university, making use of the entrepreneurship centres as first-stop-shops and existing university websites. Facilitating the establishment of student entrepreneur 'clubs', where internal and external people with an interest in entrepreneurship meet and exchange, can increase interest and awareness amongst students.</p>
<p><i>Create soft incentives to spread an entrepreneurial spirit.</i></p>	<p>Well-publicised yearly awards on the 'Best Entrepreneurship Innovative Pedagogy' and the 'Best Entrepreneurship Professor' for students to vote is a soft incentive which can stimulate more involvement by professors and teaching staff in entrepreneurship education and also raise the awareness of entrepreneurship amongst students.</p>
<p><i>Create a resource centre for entrepreneurship education.</i></p>	<p>A resource centre for entrepreneurship education could facilitate the exchange and discussion of pedagogical practices, innovative methods and ideas amongst Berlin universities. Such a resource centre could:</p> <ul style="list-style-type: none"> <li>● Gather pedagogical practices and material currently in use in Berlin and establish contacts to good practice initiatives overseas.</li> <li>● Create an information system of pedagogical practices and make it freely accessible for teachers, researchers, students and other organisations involved in entrepreneurship education.</li> <li>● Produce innovative and pertinent teaching material (case studies, videos, games, course contents, syllabi, etc.) and make it available electronically.</li> <li>● Provide training for teachers based on regional, national and international expertise.</li> <li>● Organise regular events, also using on-line services, targeted at different and mixed audiences to enhance communication on, and exchange of, new and innovative approaches in entrepreneurship education.</li> </ul>

## Start-up support practice

<p><i>Review the flexibility and responsiveness of existing government programmes.</i></p>	<p>The objective of a programme review should be to improve the effectiveness of existing programmes by reducing the friction which programme rules inevitably create for programme beneficiaries. Programmes need to be flexible and responsive to ensure that opportunities are capitalised upon. Roundtables between programme users and programme administrators are particularly useful since such direct feedback tends to drive action.</p>
<p><i>Take stock of existing university entrepreneurship support initiatives.</i></p>	<p>To improve the effectiveness of the already significant entrepreneurship support activities, a concerted approach should be launched to take stock of the range of activities, the people behind and the resources devoted. An assessment of current practice will also bring to light areas of overlap and potential for synergies in graduate entrepreneurship support. Shared premises for founders, for instance, facilitate teambuilding and networking based on entrepreneurial interests and increase the scale and scope of incubation services.</p>
<p><i>Develop a consensus-based strategy to strengthen graduate entrepreneurship.</i></p>	<p>Public policy has been a key driver for graduate entrepreneurship. This should be built upon with a shared and clearly-communicated vision for graduate entrepreneurship across Berlin universities, translated into a Berlin-wide strategy. It is important that university internal and external entrepreneurship support providers have a clear and shared understanding of who does what. Clear linkages with key economic development strategies should also be visible and synergies at project level incentivised, in order to alleviate goal conflicts and tensions in the system. A committee involving all universities, business support organisations and programme administrators at the government level would be a useful vehicle to design and implement such a strategy.</p>
<p><i>Incentivise and reward entrepreneurship support.</i></p>	<p>At present, the universities' budgets are affected by the number of students, the degree of scientific excellence and other aspects not directly related to entrepreneurship. Introducing an entrepreneurship-related incentive will require political backup but there is not yet a fully-exploited potential for pro-active university leadership as far as the internal budget allocation is concerned. Professors could be rewarded for their engagement in entrepreneurship support (number of students mentored, participation in start-up teams, as well as commercialisation of research results through students, graduates and young researchers). Faculty champions of entrepreneurship could be accorded higher status by the university administration, for example, through the establishment of endowed chairs of entrepreneurship. Long-term basic funding to cover overheads and some personnel costs should be allocated from the university budget for the entrepreneurship support structure. Regulations on entrepreneurial activities by academic staff using equipment and office space could be reviewed. Finally, monitoring spin-off companies and their growth provides a better estimation of the volume of contract research and other potential economic returns from these companies; such figures may constitute a strong incentive for the universities.</p>
<p><i>Increase the financial self-sufficiency of university internal entrepreneurship support.</i></p>	<p>The university internal entrepreneurship support system should become less dependent upon time-limited public funding and more self-sufficient or based on a broader funding base, including more private financing. Activities to this end are probably different for the different universities. For the most active technology transfer office-like entrepreneurship centres, becoming partly self-sufficient through licensing income and sales of shares in spin-off companies could be a possibility. For centres with a less commercial orientation, developing courses and offering consultancy against payment might be an alternative. However, all entrepreneurship centres should receive basic financing from their university. This can counter the uncertain and infrequent nature of payments from licenses. In addition some public support is justified because of the wider public benefits of entrepreneurship activity by graduates.</p>
<p><i>Review the contract research regimes of universities.</i></p>	<p>The universities have strengths in contract research relations with industry, which should be seen as a core source for entrepreneurial ideas and starting points. Universities will need to take a lead by analysing their own contract regime (the review panel assumes that the firm owns all the rights to collaborative research</p>

	<p>results) in order to open up entrepreneurial opportunities which universities can exploit if firms are not interested in certain ideas emerging from collaboration. The contract regime might be altered in order to influence the attitude of young researchers (recognising entrepreneurial opportunities within contract research projects) and that of the partnering firm (entrepreneurship as a way to solve its problems and a source of future revenues through the spin-offs in which they invest).</p>
<p><i>Plan a transition from university internal support to external support over the life time of entrepreneurial projects.</i></p>	<p>The transition from one support phase to another should be smooth and not hindered by regulations. Getting in private actors as early as possible is very important. The entrepreneurship centres and the incubation facilities also need ideas and plans for later phases of entrepreneurial projects when private financing and business support organisations take over. More meeting places for university graduate entrepreneurs and venture capital companies and business angels could be a concrete activity to this end.</p>
<p><i>Use entrepreneurship education as a lever for entrepreneurship support.</i></p>	<p>It is important that formal entrepreneurship education at Berlin universities, which appears to be the weakest component of the ecology, is designed to leverage entrepreneurship support activities. The objective is to create an internal culture in which student, graduate and professor entrepreneurs are celebrated as role models exemplifying the entrepreneurial spirit of a university.</p>
<p><i>Increase the emphasis on entrepreneurship in cultural industries.</i></p>	<p>Berlin's cultural industries are strong. This should be built upon with more collaboration between technical and artistic higher education institutions, and between museums, theatres, etc. Specifically tailored entrepreneurship education and support activities could be developed for this sector, which presents certain different challenges for entrepreneurship than technology sectors – even if only to increase the visibility of cultural entrepreneurship as a priority.</p>

## ANNEX 2 ACTION PLAN ROSTOCK

This Action Plan is the result of an OECD review of current entrepreneurship support strategies, structures and practices at the University of Rostock. It summarises policy recommendations presented in the synthesis report “*Strengthening Entrepreneurship and Local Economic Development in Eastern Germany: Youth, Entrepreneurship and Innovation. Synthesis report Rostock*” discussed with the Ministry of Economics and Labour of Mecklenburg-Vorpommern and its key local partners in February 2009.

The Action Plan contains contributions from Paul Hannon, Director of Research and Education at National Council for Graduate Entrepreneurship (UK), Rebecca Harding, Delta Economics Ltd and is Chief Policy Advisor to the All Party Parliamentary Group on Entrepreneurship (UK) Andrea-Rosalinde Hofer (OECD), Åsa Lindholm-Dahlstrand, Professor for Entrepreneurship at Halmstad University (Sweden), and Jonathan Potter (OECD).

### Entrepreneurship education practice

<p><i>Institutional capability development in entrepreneurship education.</i></p>	<p>To deliver a shared vision will require investment in developing the capability of educators and key staff in applying entrepreneurial behaviours and actions should be recognised:</p> <ul style="list-style-type: none"> <li>● Link up with national and international networks of entrepreneurship professors and educators.</li> <li>● Develop the chair for entrepreneurship which is under establishment.</li> <li>● Run entrepreneurship educator development programmes and workshops.</li> <li>● Provide careers advisers awareness programmes.</li> <li>● Run faculty deans’ and directors’ development programmes and workshops.</li> <li>● Develop further courses, especially for postgraduates.</li> </ul>
<p><i>Promote and embed entrepreneurial learning opportunities.</i></p>	<p>All students across the campus should have access to a wide range of entrepreneurial learning opportunities inside and outside subject courses of study. The focus is on developing entrepreneurial graduates who are self-confident, capable, experienced and motivated:</p> <ul style="list-style-type: none"> <li>● Provide examples of entrepreneurship relevance across all faculties/institutes.</li> <li>● Provide entrepreneurial venture simulations – games, online, experiential.</li> <li>● Provide socially-oriented entrepreneurial learning opportunities.</li> <li>● Promote a common learning outcomes framework to shape curricula design and delivery.</li> <li>● Embed entrepreneurial learning opportunities in all disciplines for undergraduate and postgraduate students.</li> <li>● Promote and support entrepreneurial practices.</li> </ul>
<p><i>Enhance active involvement by students.</i></p>	<p>Possible activities are:</p> <ul style="list-style-type: none"> <li>● Create a student entrepreneurship club.</li> <li>● Introduce student entrepreneurship interns, i.e. students working across the campus to promote and support entrepreneurship actions.</li> <li>● Run collaborative events with the Careers Office.</li> <li>● Establish a student ‘Start-Up Cafe’ on campus.</li> <li>● Create online support for the student entrepreneur community.</li> </ul>

## Start-up support practice

<p><i>Take stock of existing university entrepreneurship support initiatives.</i></p>	<p>To improve the effectiveness of entrepreneurship support, a concerted approach should be launched to take stock of the range of activities, the people behind and the resources devoted. An assessment of current practice will also bring to light areas of overlap and potential for synergies in graduate entrepreneurship support. Shared premises for founders, for instance, facilitate teambuilding and networking based on entrepreneurial interests and increase the scale and scope of incubation services.</p>
<p><i>Build guidance and leadership.</i></p>	<p>Regional government will need to increase guidance and leadership through creating policy frameworks linked to specific short- and medium-term goals which are clearly supported through dedicated funding mechanisms.</p> <p>University leaders and senior management will need to provide guidance and leadership which clearly sets out what becoming an entrepreneurial university means, its purpose and relevance, the journey required, and how educators, staff and students/graduates will be supported to deliver a shared vision and set of outcomes.</p> <p>The criteria list in Annex 4 can be helpful for these.</p>
<p><i>Build an entrepreneurial eco-system and enhance stakeholder engagement.</i></p>	<p>Building an entrepreneurial eco-system around the students and university should ensure the meaningful engagement of a wide range of stakeholders who share in the risks and rewards. This could:</p> <ul style="list-style-type: none"> <li>• Provide academic positions in local businesses/industries.</li> <li>• Establish university teacher/researcher status for selected entrepreneurs.</li> <li>• Seek more opportunities for business-university collaborations which support and deliver mutually beneficial agreed outcomes and targets.</li> </ul>
<p><i>Increase private sector collaboration in university entrepreneurship support.</i></p>	<p>In order to move away from short-term public funding it is important to develop links with private actors (industrial firms, financing). The low level of private financing is a major weakness. There is, in general, a low interaction between the public and private sectors, something that is also reflected in a low level of university-industry linkages. Interaction between public and for-profit private actors needs to be increased.</p>
<p><i>Create a platform of incubation and technology transfer.</i></p>	<p>Incubators, science parks and technology centres are often used to complement each other in an incubator/technology centre system. Project financing of incubation initiatives might work for specific purposes and in a short-term perspective but when organising an incubator system or platform it is important that this is based on a long-term perspective.</p> <p>This means that long-term public financing needs to be in place, complemented by short-term project financing. If an incubator system or platform is to function well, its different components will need to co-operate and learn from each other, instead of competing for the same short-term financing.</p> <p>Rostock already has a broad range of initiatives in place. The TechnoStartup network could be further developed into a platform building on the existing initiatives and their strengths.</p>
<p><i>Maintain traditional sectors while ensuring knowledge transfer with the emerging knowledge intensive sectors.</i></p>	<p>Policy in the region has focused substantially on developing new partnerships between higher education institutions and commercialisation organisations in emerging technologies, particularly medical technologies. This should not be done at the expense of more traditional sectors which provide both the supply chain and a source of applied research and innovation to the “newer” sectors. Support for the traditional sectors also maintains a level of employment and demand in the region that is critical to the long term sustainability of a science and innovation-based economy and workshops that bring traditional and new sectors and innovators together provides the potential for substantial development in the future.</p>
<p><i>Build for the long term.</i></p>	<p>Knowledge transfer happens only over the long term and on a systematic, strategic basis. Yet project funding has hitherto been on relatively short timescales, project-based and often un- or under-evaluated in the reviewed universities. Any further support for technology transfer should be long-term and strategic in nature and supported by proper and regular evaluation processes, looking also beyond the limits set by the economic system surrounding the university.</p>

### ANNEX 3 VÄSTRA GÖTALAND INCUBATOR PLATFORM

The following provides a brief description of the main incubators participating in the Västra Götaland Incubator Platform.<sup>57</sup>

**Chalmers Innovation (CI)** is a business incubator that supports high-tech business ideas and rapid growth companies from universities, colleges and industrial spin-outs. It was founded in 1997, and opened for tenants in 1999, thanks to a generous donation from the Sten A. Olsson Foundation, which allowed for the establishment of an incubation facility in proximity to Chalmers University of Technology. Since then CI has located 82 companies with a total turnover of SEK 287 million in 2007 and a total investment of over SEK 800 million from venture capitalists and business angels. Every year around 120 business ideas are evaluated at Chalmers Innovation of which some 10 new, growth-oriented companies are accepted. The success of most high-tech start-ups often depends on external financing at some point during the development process, which is why Chalmers Innovation has developed and maintains good relationships with venture capitalists and business angels. Being a tenant company is perceived as hugely increasing the chances to attract venture capital. CI itself takes equity in the tenant firms. Hence, CI is both an investor in ideas and a business incubator that supports high-tech business ideas and rapid growth companies. In a so called pre-incubator, Chalmers Innovation can invest up to SEK 300 000 in outstanding business ideas to get the business started. After this, in the incubation phase, CI can invest another SEK 300 000.

See: <http://www.chalmersinnovation.com/>

**Lindholmen Science Park inc. (LSP)** was established by Chalmers University of Technology and Gothenburg City in 1999. Today its shareholders also include the University of Gothenburg, the Swedish Road Authorities, and corporations such as Ericsson, Telia Sonera, AB Volvo, Volvo Cars, and others. The main focus is the creation and expansion of a regional ICT cluster with three main areas of expertise: mobile data communications; intelligent vehicles and transport systems; and, media and design. Approximately 7 500 people work in the Lindholmen area and almost the same amount of students, professors and researchers connected to the Lindholmen Campus (part of Chalmers University). There is an important networking component attached to LSP including tenants, outside firms and corporations, public organisations and academia and HEI spin-offs. Chalmers Innovation (CI) is managing the incubator.

See: <http://www.lindholmen.se/>

**Sahlgrenska Science Park (SSP)** is financed by and accountable to the Business Region Gothenburg, VGR and Gothenburg University, and closely co-operates with GU-Holding, Gothenburg Bio and Innovationsbron Väst. SSP has incubator facilities and a business park and is located in central Gothenburg, next to Sahlgrenska Academy and several other research institutes at the University of Gothenburg, and within walking distance of Sahlgrenska University Hospital. The business park provides laboratory space, office and conference facilities for researched-based

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<sup>57</sup> Information provided by Asa Lindholm-Dahlstrand (Lindholm-Dahlstrand, 2009 submitted).

companies with medical applications and offers the advantages of being close to the hospital facilities and research centres at the University and having access to the park's other services, contacts and networks. In the incubator area (innovation centre). SSP provides researchers and innovators in academia and other areas with evaluation of business ideas focusing on medical applications and assistance with the development and financing of these ideas. The centre provides premises for consultants, service providers, investors and institutional actors focusing on medical applications. The incubator activities at SSP cover the earliest phases of development, forming the foundation for the projects' commercial advancement. Companies focusing on medical applications and knowledge around the healthcare sectors can locate in SSP or in the partnering Biotech Centre.

See: <http://www.sahlgrenskasciencepark.se/>

**Framtidens Företag** started in 1999 as a project at the University of Gothenburg. The rector of the University decided to use some available facilities in central Gothenburg for incubation purposes in co-operation with the student-entrepreneurship-initiative "Drivhuset". This resulted in some ten student-companies moving in as tenants. The incubator received public funding and was able to resource private companies paying a membership (including a local bank). Framtidens Företag became known as *the* student-incubator in Gothenburg, and developed relationships with the Entrepreneurship Schools of the universities of Gothenburg and Chalmers. Today the VGR co-financing of Framtidens Företag includes a financial support for co-locating the School of Entrepreneurship of the Gothenburg University Business School.

See: <http://www.framtidensforetag.nu/>

**ESPIRA** is an incubator with links to the Borås University College in the small town Borås. ESPIRA was started in the early 2000's and received public support from the (former) Technology-bridge organisation. ESPIRA has largely been developed by a manager recruited from Framtidens Företag. ESPIRA focuses on knowledge-based firms, including services. Many of the tenants are student-entrepreneurs. Incubation period is 2-3 years.

See: <http://www.espira.se/>

**INNOVATUM** is a science park linked to University West in the town of Trollhättan. This area is characterized by media and film-making activities and has with SAAB Cars and VOLVO Aero the presence of key proponents of the Swedish automotive industry. Tenants are selected from the areas of audio-vision technology, energy- and environment, and production technology. A pre-incubation period of six months is devoted to the formulation of a business plan. After the completion of this phase a tenant can enter the Incubator for a period of up to three years. INNOVATUM has established a network to assist tenants with financing, including contacts to public seed financing, banks and business angels. Further information:

See: <http://www.innovatum.se/>

**Gothia Science Park, GSP**, located at the University of Skövde, is a combination of a science park and an incubator for start up firms, which allows tenants to both get started and to continue to grow. GSP has financing from the National Incubator Programme; by which it has been rewarded as a successful Science Park/Incubator. In 2009 additional 11 500 square meters of premises will be build, making it one of the larger members of the VGR Incubator Platform. The GSP Incubator uses its seed financing company Gothia Invest who offers tenants financing in exchange of equity. Gothia Invest can offer public seed financing of up to SEK 200 000 for a project/tenant. Per annum Gothia Invest makes 3-5 investments in GSP. Further information:

See: <http://www.gsp.se/>

**Brewhouse Innovation** started its incubation facilities in 2004 with a focus on the creative industries. The building is situated in the middle of Gothenburg 's entertainment and events district and is a well-known meeting place and creative centre for music, film and media production Originally Apotekarnas soft drinks bottling plant, the 1935 building was first converted into the Ethnography Museum, subsequently into the Industry Museum before it finally became what is today Brewhouse. The property developer (Higab group) worked very closely with some of the future tenants to meet their needs. Today about 70 firms are housed in the building that offers recording studios, music schools, conference facilities, a restaurant and Stena Arena, a flexible auditorium with professional lighting and sound and image facilities for all kinds of events. The incubator space is located on the second floor and provides an inspiring, open work space. Brewhouse Innovation was initiated by Business Region Gothenburg , VGR and “Innovationsbron” to provide a conducive and supportive environment for entrepreneurs in the creative industries, where networking and exchange is crucial for idea development. Further information:

See: <http://www.brewhouseinnovation.se/>

**GU Holding**, founded in 1995 by, Gothenburg University (as part of the national Swedish programme for establishing University Holding companies) is a holding company fully owned by the University of Gothenburg that enhances company start-up and growth based on leading edge competency and research from the University of Gothenburg . Although it doesn't call itself an incubator, it is part of the National Incubator Programme. To date GU Holding has financed and initiated over 30 companies and a number of projects. By active support from the owners, added value is created in the portfolio companies in order to ensure business, market and technological development, as well as in the area of intellectual property rights, managerial and organisational structures, and financing. GU Holding provides project and start-up capital along with business competency to add value to and efficiently develop new businesses based on academic leading edge competency and research results. The aim is to create successful growth companies. All projects must be commercially viable, and business ideas and inventions must meet high standards. GU Holding turns to people who are (i) employed researchers at the University of Gothenburg ; (ii) scientists; or, (iii) have ready business plan and concept. Additionally, GU Holding offers a flexible incubation model whereby companies locate in GU Holding's facilities and at preferred stage move over into "virtual"/non-physical incubation, and use the services while being located elsewhere. Over 13 years GU Holding has, invested SEK 56 million in 40 new companies, who where able to attract together SEK 480 million from business angels, venture capitalists and other financing sources, counting more than 9 times the GU seed capital. Today, these companies employ over 200 people and generate a total annual turnover of SEK 400 million.

See: <http://www.holding.gu.se/>



## ANNEX 4 CRITERIA LIST OF GOOD PRACTICE

The criteria list of good practice, established from the literature and case study work, is an attempt to define what constitutes good practice in university entrepreneurship support. It is directed at those who are designing strategies and infrastructure for academic entrepreneurship support and those who are active in entrepreneurship education and start-up support at universities and their partner organisations. The aim is to advise also those involved in the design of public policy interventions.

It can also be read as a 'tool', which allows universities to self-assess and re-orient (i) their strategy in supporting entrepreneurship, (ii) their pool of financial and human resources, (iii) the support structures they have established, (iv) their current approaches in entrepreneurship education and start-up support, and (v) their evaluation practices.

### Box 4. Criteria list of good practice in university entrepreneurship support

<b>Strategy</b>	<b>Principles</b>
	<ol style="list-style-type: none"> <li>1. A broad understanding of entrepreneurship is a strategic objective of the university, and there is top-down support for it.</li> <li>2. Objectives of entrepreneurship education and start-up support include generating entrepreneurial attitudes, behaviour and skills, as well as enhancing growth entrepreneurship (both high-tech and low-tech).</li> <li>3. There are clear incentives and rewards for entrepreneurship educators, professors and researchers, who actively support graduate entrepreneurship (mentoring, sharing of research results, etc.).</li> <li>4. Recruitment and career development of academic staff takes into account entrepreneurial attitudes, behaviour and experience as well as entrepreneurship support activities.</li> </ol>
<b>Resources</b>	<b>Principles</b>
	<ol style="list-style-type: none"> <li>1. A minimum long-term financing of staff costs and overheads for graduate entrepreneurship is agreed as part of the university's budget.</li> <li>2. Self-sufficiency of university internal entrepreneurship support is a goal.</li> <li>3. Human resource development for entrepreneurship educators and staff involved in entrepreneurship start-up support is in place.</li> </ol>
<b>Support Infrastructure</b>	<b>Principles</b>
	<ol style="list-style-type: none"> <li>1. An entrepreneurship dedicated structure within the university (chair, department, support centre) is in place, which closely collaborates, co-ordinates and integrates faculty-internal entrepreneurship support and ensures viable cross-faculty collaboration.</li> <li>2. Facilities for business incubation either exist on the campus or assistance is offered to gain access to external facilities.</li> <li>3. There is close co-operation and referral between university-internal and external business start-up and entrepreneurship support organisations; roles are clearly defined.</li> </ol>

<b>Entrepreneurship education</b>	<b>Principles</b>
	<ol style="list-style-type: none"> <li>1. Entrepreneurship education is progressively integrated into curricula and the use of entrepreneurial pedagogies is advocated across faculties.</li> <li>2. The entrepreneurship education offer is widely communicated, and measures are undertaken to increase the rate and capacity of take-up.</li> <li>3. A suite of courses exists, which uses creative teaching methods and is tailored to the needs of undergraduate, graduate and post-graduate students.</li> <li>4. The suite of courses has a differentiated offer that covers the pre-start-up phase, the start-up phase and the growth phase. For certain courses active recruitment is practiced.</li> <li>5. Out-reach to Alumni, business support organisations and firms are a key component of entrepreneurship education.</li> <li>6. Results of entrepreneurship research are integrated into entrepreneurship education messages.</li> </ol>
<b>Start-up support</b>	<b>Principles</b>
	<ol style="list-style-type: none"> <li>1. Entrepreneurship education activities and start-up support are closely integrated.</li> <li>2. Team building is actively facilitated by university staff.</li> <li>3. Access to private financing is facilitated through networking and dedicated events.</li> <li>4. Mentoring by professors and entrepreneurs is offered.</li> <li>5. University-internal entrepreneurship support is closely integrated into external business support partnerships and networks and maintains close relationships with firms and alumni.</li> </ol>
<b>Evaluation</b>	<b>Principles</b>
	<ol style="list-style-type: none"> <li>1. Regular stock-taking and performance checking of entrepreneurship activities is undertaken.</li> <li>2. Evaluation of entrepreneurship activities is formalised and includes immediate (post-course), mid-term (graduation), and long-term (alumni and post-start-up) monitoring of the impact.</li> </ol>
<i>Source: OECD 2009.</i>	

## **ABOUT THE OECD**

The Organisation for Economic Co-operation and Development (OECD) is a unique forum where the governments of 30 market democracies work together to address the economic, social and governance challenges of globalisation as well as to exploit its opportunities. The OECD's way of working consists of a highly effective process that begins with data collection and analysis and moves on to collective discussion of policy, then decision-making and implementation. Mutual examination by governments, multilateral surveillance and peer pressure to conform or reform are at the heart of OECD effectiveness. Much of the material collected and analysed at the OECD is published on paper or online; from press releases and regular compilations of data and projections to one-time publications or monographs on particular issues; from economic surveys of each member country to regular reviews of education systems, science and technology policies or environmental performance. For more information on the OECD, please visit ([www.oecd.org/about](http://www.oecd.org/about)).

### **The OECD Centre for Entrepreneurship, SMEs and Local Development**

The OECD Centre for Entrepreneurship, SMEs and Local Development (CFE) was created in 2004 in recognition of the need to take an integrated approach to development. The CFE works together with national, regional and local governments of OECD member countries and several non-Member economies in fostering the development of an entrepreneurial society, and assists governments and their civil society and business partners in designing and implementing innovative policies to promote sustainable growth, integrated development and social cohesion. Within the OECD, the CFE successfully strengthens synergies between the work of different OECD directorates on entrepreneurship, SMEs and local development. For more information on the Centre for Entrepreneurship, SMEs and Local Development, its areas of work and current activities, please visit [www.oecd.org/cfe](http://www.oecd.org/cfe).

### **The OECD Programme on Local Economic and Employment Development**

The Local Economic and Employment Development Programme is the "local" pillar of the CFE. It is a Co-operative Action Programme that, since 1982, has been dedicated to the identification, analysis and dissemination of innovative approaches and good practices in stimulating local economic growth, creating more and better jobs, enhancing social inclusion, and fostering good governance at local level. It is one of few OECD bodies that is open to both Member and Non-Member economies as well as international organisations. To increase collaboration with initiatives local, the LEED Programme established a Partners Network in 1990. It's LEED's worldwide network of regional and local governments, development agencies, business and non-profit organisations, private sector and foundations that work towards achieving sustainable economic and employment development. At present, 100 organisations formally partner with the Network and over 2 600 participate in the activities of its four fora (the Forum on Partnerships and Local Governance, the Forum on Entrepreneurship, the Forum on Social Innovation and the Forum on Investment Strategies and Development Agencies). For more information on the LEED Programme, its four areas of work, and the Partners Club, please visit [www.oecd.org/cfe/leed](http://www.oecd.org/cfe/leed).

## **The OECD LEED Trento Centre for Local Development**

The OECD LEED Centre for Local Development was established in 2003 by the OECD, the Italian Government and the Autonomous Province of Trento in recognition of the need to build capacities for local development. The Centre builds on the LEED Programme's longstanding commitment to provide assistance in the design, implementation and assessment of local development strategies, and its expertise on entrepreneurship, social inclusion, evaluation and local governance. Its three main objectives are:

1. Improving dissemination of good practices in designing, implementing and evaluating local development strategies, and to stimulate and guide a "learning from each other" process between OECD Member and non-Member countries;
2. Strengthening ties between those designing and those implementing policies, and academia; and,
3. Enhancing participation in local development policy processes and action.

Since 2003 over 5 300 policy makers and practitioners have benefited from the Trento Centre's capacity building activities. For more information on the Trento Centre and its activities and events, please visit [www.trento.oecd.org](http://www.trento.oecd.org).