Innovation, University Reform, Entrepreneurial Education and Business-Academia Partnerships

### Analytical Compendium

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I. Innovation

Innovation Policy

Innovation policy can be defined as “actions by public organisations that influence innovation processes, i.e. the development and diffusion of (product and process) innovations” (Borrás et al., 2008). Through the second half of the 20th century, there has been a gradual transformation in the cognitive paradigm in the policy area (Borrás et al., 2008): In the 1940s-60s the focus was on science and knowledge production (science policy). In the 1970s-80s the focus changed to technology development (technology policy) and since the early and mid 1990s, the focus has been on innovation policy (Lundvall & Borrás, 2005 in Borrás 2008). These changes show the general paradigmatic transformations of the contents and rationales behind policy initiatives. With the focus on science policy the perception of innovation was linear. Through the historical steps, this perception has changes to a more interactive view of innovation and today the policy instruments are not only focused on producing science but also on creating linkages and absorptive capacity (Lundvall, 2005). Innovation policy thus goes beyond science and technology and e.g. includes various areas such as infrastructure, education and R&D and tools such as demand-side instruments. According to Borrás (2008) it is problematic when e.g. the Varieties of Capitalism literature treats innovation policy as an exogenous factor not included in the innovation process and innovation system equations. Borrás argues that innovation policy is rather an important variable in the equation together with other complex interactions in the innovation system (Borrás, 2008). (“The Danish Innovation System and International Embeddedness”, pg. 16)

Innovation as a strategic priority for South African business

Innovation is a strategic priority for South African businesses (91% of South African respondent report innovation is a strategic priority for their business).

Various types of innovation are expected to drive the performance of South African businesses in the future:

• the improvement of existing products or services (mentioned by 81%, a result higher than the Global average)
• the development of new business processes to improve profitability (80%) seems to be a specific interest as it is 17 points higher than the Global average
• the development of products and services customized to local circumstances is the third largest priority at 72%, a result 19 points higher than the Global average
• Additionally 62% of South African respondents mention the development of new business models as promising way to boost future performance, this is 10 points higher than the Global average (52%) on this item (”GE Global Innovation Barometer 2013 Results – Focus South Africa”, pg. 5)

Abilities businesses must master in order to innovate successfully

To Innovate successfully South African respondents identify key abilities their businesses have to master:

• Understand customers and anticipate market evolutions (86%)
• Attract and retain innovative people (mentioned by 80% and higher than the Global average)
• Manage and take risks seems to be a strategic priority for South Africa as 78% mentioned it as a strongly needed ability to innovate, a result 18 points higher than the Global average
• Creating an environment conducive to innovation is also a priority (mentioned by 77%, a result 13 points higher than the Global average)
• Mining data inside and outside the company is as well a capability more strongly expressed in South Africa with 64% of respondents mentioning it as a key ability vs. 53% of the Global sample.

Finally the interest from South African respondents in the development of new business models is confirmed by the fact that this ability is regarded as crucial by 52% of South African respondents vs. 45% of the Global sample. (Op.cit., pg. 6)

Evaluation of the South African framework for Innovation

Overall the framework for innovation in South Africa is perceived as quite challenging for innovation by business executives from the other markets: 20% of Business executives from the 25 markets regard the South African environment for Innovation as strongly Innovation conducive. This puts the country in the 23rd position of the ranking based on this indicator. When evaluating their own market 33% of South African business executives report that their country has a strongly Innovation conducive environment overall. When asked to evaluate in more detail their environment for Innovation, South African business executives provide interesting input.

On the negative side, the items connected to government support are more negatively evaluated than the Global average and most of all in noticeable decline when compared to last year results in South Africa. This regards the ability to provide support for innovation that is efficiently organized and coordinated.

On the more positive side, South African business executives report higher satisfaction than the Global average regarding a belief that society as a whole is supportive of innovation and public-private partnerships have proved effective in supporting innovation. Both factors receive higher satisfaction rates than the Global average. (Op.cit., pg. 7)

Respondent’s policy expectations

South African business executives make Innovation a strategic priority and rely on it to drive future performance, however they demonstrate signs of anxiety that it could also set a challenge for business by increasing competition and by accelerating the lifecycle of products and services: in South Africa, 46% of respondents believe “Innovation has a negative impact on their economy” a results much higher than the global average (30%).

In this context, South African businesses expect renewed support and Innovation incentives from policymakers, particularly regarding:

• Education: 58% of respondents want to encourage a stronger entrepreneurial culture in the education system through stronger linkages between students and business savvy individuals (8 points higher than the global average) and 56% of respondent would expect decision makers to better align students curricula with the needs of business (12 points higher than the Global average)
• Creation of a financial environment that encourages the development of venture capital (51% of respondent, 13 points higher than the Global average)

Showing another evidence of a nervous environment, 48% of South African business executives also regard very favorably policies that would lead to fighting bureaucracy and red tape for companies willing to access funds and incentives allocated to innovation (in line with the Global average). (Op.cit., pg. 8)

Collaborative Innovation as the way forward

Growing trends from the barometer indicate that Innovation can start from all kind of economic actors (over 93% of South African respondents in 2013 believe that SMEs and Individuals can be as innovative as large companies).
This validates the perception that collaboration is key to innovate more successfully. 89% of South African respondents report that their firm has been increasingly looking at innovation through the collaborative angle. Furthermore, 94% of respondents agree their firm would be more successful at innovation through partnership than if their company went about it alone.

Business in South Africa would like to partner first to access new technology (91%, 12 points higher than global average), enter new markets (90%, 11 points higher than the Global average), and improve the profitability of an existing offer (83%, 14 points higher than the Global average). It should be further noted however, that all collaboration methods are attractive to South Africans when you compare to the global average.

The barriers to collaborative Innovation are also clearly identified: lack of protection of confidentiality/IP (67% - in line with the global average), fears of talent/knowledge poaching (54%, 9 points above global average) and fears over unequal revenue splits (48%, 12 points higher than the global average. Op.cit., pg. 9.

Some world class scientists and innovators out of South Africa
• Max Theiler (January 30, 1899 – August 11, 1972) was a South African/American virologist. He was awarded the Nobel Prize in Physiology or Medicine in 1951 for developing a vaccine against yellow fever. Theiler studied at Rhodes University.

• Sydney Brenner (born January 13, 1927) is a South African biologist and a 2002 Nobel prize in Physiology or Medicine laureate, shared with H. Robert Horvitz and John Sulston. Brenner was born in Germiston and graduated from Wits University.

• Elon Musk (28 June 1971), a South African born physicist attended Bryanston High and Pretoria Boys High School is the multibillionaire founder of PayPal, SpaceX and Telsa. (“From laboratories to globally competitive Addressing South Africa’s Innovation Chasm”, pg. 5)

Introducing TIA:

Mandate: “To support the State in stimulating and intensifying technological innovation in order to improve economic growth and the quality of life of all South Africans by [supporting*] the development and exploitation of technological innovations”

Vision: To be a world class innovation agency that supports and enables technological innovation to achieve socio-economic benefits for South Africa.


TIA Strategic Objectives:

• To stimulate the development and demonstration of technology based products, processes and services
• To support the commercialisation of technology innovations
• To develop an enabling environment for technology innovation and commercialization in South Africa

Underpinned by:

• The development of an enabling internal environment within TIA to successfully execute its strategy
• Facilitation of the development of innovation skills to support technology innovation and commercialisation
• Becoming a schedule 3B entity in terms of the PFMA. Op.cit, pg. 9.
The founding documents for a new, democratic South Africa adopted a more inclusive and people-driven approach to innovation. The literature and policy analysis reveals a ‘shift’ away from this approach to a more market-driven, exclusivist approach to innovation. R&D and technology-driven innovation had been institutionalised at the expense of social, cultural and indigenous innovations. This ‘shift’ limits the potential of innovation to benefit a wider segment of society. The absence of a ‘model’ of innovation that exploits the strengths of all forms of innovation runs the risk of defeating the normative intentions of the founding innovation policies of the new, post-Apartheid and democratic South Africa. The OECD, from which South Africa ‘inherited’ its notion of innovation, acknowledges the shortcomings of the technological innovation and calls for a conceptual framework that will address the shortcomings of the dominant, exclusivist notion of innovation. (“Innovation Agenda for South Africa in the 21st Century: Towards An Alternative Inclusive and Integrative Model”, pg. 19)

Like other concepts in history, the time for the current dominant concepts such as technological and technical innovation, that were once dormant but are now dominant, will come to pass. History shows that dominant concepts used by empires take about half a millennium to be replaced by other new concepts. It is possible that the new emerging superpower will use its own strengths to rule for another half a millennium. During that period, Africa needs to develop concepts of innovation that relate to and draw from its own historic, socio-cultural, moral and knowledge strengths. When such a possible future dawns, this contribution (thesis) shall have not been in vain. Op.cit., pg. 296.

The approach of the MIT Production in the Innovation Economy project was, however, different from the start. We focused on only one broad question: how production capabilities here and abroad contribute to sustaining innovation and realizing its benefits within our own society. Though some members of the PIE team believe that maintaining manufacturing in the United States is valuable in and of itself, for the jobs it creates, and for national security, the PIE researchers as a group are ecumenical on this point. Our starting point of agreement, rather, is that innovation is critical for a vibrant and productive society. We have organized our research to discover what it takes to sustain innovation over time and what it takes to bring innovation into the economy. We have approached these questions from multiple angles, looking at innovation in products, in processes, in combinations of products and services; at innovation in startups, in large multinationals, in Main Street small- and medium-sized manufacturers, in European and Asian partners and competitors, in hotspots for new technologies, like the biotech cluster of Cambridge Massachusetts, in traditional manufacturing country, like Ohio, and in new manufacturing areas in the Southwest, in Arizona, in China and Germany. We started by asking: what kinds of manufacturing do we need located here in the United States—if any—to support an innovative economy? We tried in each of our research sites within the United States and abroad to trace out the concrete linkages between innovation and manufacturing and to analyze the opportunities and dangers for American prosperity in the changes that have taken place in those linkages. (“Report of the MIT Taskforce on Innovation and Production”, pg.13)

Even in the case of big disruptive innovation, there is much we can learn from ongoing relationships in which the seeds of transformation are germinating. We often imagine radically disruptive technologies as if they were comets streaking out of nowhere across the sky of established companies and landing whole new industries in place as old ones disappear. And some new industries, like Facebook, do seem to come out of nowhere. But even for most revolutionary technologies, whether in electronics or materials or information or medicine, the projects are long in the making. It took DuPont ten years to develop Wallace Carothers’ lab discoveries in polymers in 1930 into full-scale nylon production—first for nylon stockings in 1940. DuPont’s Kevlar took even longer to develop as a commercial product. Today, as we observe discoveries—in biotech, for example—moving along equally lengthy trajectories towards drugs on the market, we have the chance to learn whether in-house manufacturing or manufacturing at a nearby contractor or manufacturing anywhere in the world does better or worse in accelerating the passage from lab to customer; whether ownership of manufacturing alters the distribution of benefits; and who learns what in the process and is in the best position to apply it to bringing the next discovery to life in the world. Op.cit., pg.14.
Innovation is not all about patents. Only rarely do the novel activities of established small- and medium-sized manufacturers correspond to the OECD’s Frascati Manual and “Oslo” definitions of “research and development” as “creative work undertaken on a systematic basis in order to increase the stock of knowledge, including knowledge of man, culture and society, and the use of this stock of knowledge to devise new applications.” ("Report of the MIT Taskforce on Innovation and Production", pg.19)

Also some of the most difficult hurdles we face today in trying to move U.S. innovation into the market. Here we can only list some of these challenges:

° Vertically-integrated enterprises used to organize and pay for educating and upgrading the skills of much of the manufacturing workforce. They had the resources to do this. And long job tenure meant companies could hope to recoup their investment over the course of the employees’ careers. Many of the employees who were trained in big companies or in vocational schools they supported ended up working for smaller manufacturers and suppliers. Today, American manufacturing firms are on average smaller, and have fewer resources. They do not plan to hold on to their employees for life. They cannot afford to, or, in any event, do not, train. How do we educate the workforce we need?

° Vertically-integrated enterprises like AT&T used to support long-term basic research in centers like Bell Labs and Xerox PARC and Alcoa Research Lab, each employing thousands of scientists and engineers. As corporate structures have been resized, basic research has been drastically cut, these centers have mostly disappeared, and corporate R&D is now far more tightly linked to the near-term needs of the business units. How should we fund a strong stream of basic and pre-competitive research today? If much cutting-edge research no longer is taking place within companies—but in universities or small start-ups or in government labs—how to propel these innovations through to commercialization? How to diffuse new technologies into established companies?

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° Big American corporations used in effect to provide public goods through spillovers of research, training, diffusion of new technology to suppliers, and pressure on state and local governments to improve infrastructure. These spillovers constituted “complementary capabilities” that many others in the region could draw on, even if they had not contributed to creating them. As the sources of these “complementary capabilities” have dried up, large holes in the industrial ecosystem have appeared. How can these capabilities be recreated and sustained in order to maintain a terrain favorable for innovation? ("Report of the MIT Taskforce on Innovation and Production", pg. 26)

Everyone seems to think Europe needs some innovation. Innovation to improve a broken financial system, innovation to shore up the Eurozone, innovation to boost economic growth. So we have a profusion of agencies, indices and think tanks competing to offer ideas. The UK produces an innovation index. The EU an innovation scoreboard. The OECD an innovation strategy. ("Innovation and Intangible Investment in Europe, Japan and the US", pg. 2)

In this section we document at least four broad approaches to measuring innovation and show they seem to indicate very different cross-country rankings. Ibidem.

**Innovation output indicators**
There are two main approaches here. First, innovation surveys. Eurostat mandates all signatory countries to survey businesses asking them to self-report how innovative they are on the Community Innovation Survey. A typical question on the survey is, for example, “Over the last three years, did this business introduce new or significantly improved goods? New or significantly improved services? (this wording is taken from the UK survey). A second approach is to use indicators such as patents, trademarks or copyright as an indicator of innovation output. Other indicators are items such as published scientific articles. Op.cit., pg. 3.

**Innovation Inputs**

The main approach here is **R&D spend**, which is measured in many countries more or less according to standard accounting rules: typically summing wages of R&D workers and their use of materials and capital (such as laboratories). The latest SNA (2008) mandates countries to capitalise R&D in their national accounts, which will lead to an explicit R&D account. Op.cit., pg. 4.

**Innovation inputs and outputs combined: the EU scoreboard method**

This method is a kind of multiple indicators method exemplified in the multi-year, multi-country EU innovation scoreboard. It is a weighted average of 24 indicators for each EU country, with the indicators ranging from GDP, R&D spend, ICT spend, exports of high technology products and broadband penetration. Op.cit., pg. 5.

We have set out an approach to innovation measurement and policy, based on intangible investment. We have attempted to distinguish between productivity growth and innovation the latter being made up of investment in the commercialization of new ideas and the use of free ideas. We have implemented the approach by producing harmonized estimates of intangible capital for Europe and the US. The new growth accounting results are the broadest available results for Europe to date.

Drawing this together we have the following. First, the UK, like the US now has **more intangible investment than tangible investment**, and other EU countries are following. That is to say, future investment will look much more intangible than tangible. Second, this investment is important for growth. In the US, capital deepening is 65% of growth and intangible investment is now 50% of capital deepening. EU countries will be catching up to this level. Op.cit., pg. 31.

**A hybrid system** was used in Japan at this time because patents and prizes had complementary characteristics. Patents formally protected intellectual property rights, and prizes spurred competition and diffused technological knowledge. Although the non pecuniary nature of the prizes meant they were not used to reimburse inventors for the costs of research and development, the certification of new technologies by judges through the prize system did confer indirect monetary benefits. Advertising and generating potential user awareness were important for the commercialization of innovation. Op.cit., pg. 7.

In the **Japanese hybrid system**, prize winners did not cede their patent rights, and neither was a buyout option available. In the language of Kremer and Williams (2009), prizes represented a “voluntary” not a “mandatory” mechanism. Local governments provided funding, and judges decided ex post on merit-based awards, the purpose of which was to incentivize inventors and diffuse useful knowledge in an environment where patent protection was also available. Ibidem, pg. 7.

Using new data on patents and prizes from Japanese prefectures during a formative stage of economic development, this article has shown that complementary mechanisms to patents can provide important incentives for innovation. Prize competitions encouraged inventors to disclose and diffuse useful knowledge at a time when Japan was attempting to reduce its reliance on foreign technologies. Organized meetings among inventors (the kowakai and shudankai) created a mechanism for technology diffusion and the spread of best-practice ideas. Prizes provided an economically important boost to patents, especially when they were held in less developed areas, and they also induced spillovers
through their impact on new technology formation in adjacent prefectures. **Prizes** did not directly compensate inventors for the costs of developing new ideas. They were **mostly non pecuniary**, and inventors could also pursue patents. The design of the prize competitions contrasts sharply with modern proposals, which assume inventors are incentivized by monetary prize awards.39 Medal prizes in the Meiji era worked because judges certified new technologies, prizes could be used as a form of advertising, and they provided strong approbation for inventors. Relying on a **complementarity between patents and prizes** simplified the provision of public incentives for innovation. It avoided the complex task of calculating the monetary value of prizes to appropriately reward inventors in the absence of patents. Op.cit., pg. 24.

**Innovation as a strategic priority for South Korean business**

Innovation is a strategic priority for South Korean businesses (95% of South Korean respondents report innovation is a strategic priority for their business).

Various types of innovation are expected to drive the performance of South Korean businesses in the future:

- The improvement of existing products or services (mentioned by 71%)
- The development of entirely new products (mentioned by 55%)
- Additionally 51% of South Korean respondents mention the development of new business model as the third most promising way to boost future performance, this is in line with the global average (52%) on this item. (“GE Global Innovation Barometer 2013 Results – Focus South Korea”, pg. 5)

**The abilities which businesses must master in order to innovate successfully**

To Innovate successfully South Korean respondents identify key abilities their business has to master:

- Develop new technology (70%), this seems to be a specific area of interest from South Korean business as the result in this market is 4 points higher than the Global average
- Understand customers and anticipate market evolutions (60%)
- Attract and retain innovative people (60%)
- Identify and work collaboratively with business partners (72%)
- Mining data inside and outside the company is a lower priority than the global average with 24% of respondents mentioning it as a key ability vs. 53% of the global sample.

Finally the interest from South Korean respondents in the development of new business models is confirmed by the fact that this ability is regarded as crucial by 41% of respondents vs. 45% of the global sample. Op.cit., pg. 6.

**Evaluation of the South Korean framework for Innovation**

Overall the framework for innovation in South Korea is perceived as conducive for Innovation by business executives from the other markets: 70% of Business executives from the 25 markets regard the South Korean environment for Innovation as strongly Innovation conducive. This puts the country in the 4th position of the country ranking based on this indicator. Yet, when evaluating their own market only 51% of South Korean business executives report that their country has a strongly Innovation conducive environment overall.

When asked to evaluate in more detail their environment for Innovation, South Korean business executives provide interesting input.

On the negative side, the items connected to Universities are more negatively evaluated than the Global average and most of all in noticeable decline when compared to last year results in South Korea. This
regards local universities and schools provide a strong education model for tomorrow's innovative leaders.

On the more positive side, South Korean business executives report higher satisfaction than the Global average regarding a belief that the speed at which innovative products are brought to market is adequate. Op.cit., pg. 7.

**Respondent’s policy expectations**

South Korean business executives make Innovation a strategic priority and rely on it to drive future performance, in fact: in South Korea, only 18% of respondents believe “Innovation has a negative impact on their economy” a results that is lower than the global average (30%).

In this context, South Korean business expects renewed support and continued Innovation incentives from policymakers, particularly regarding:

- Business confidentiality and trade secrets: 24% of respondents want to ensure they are adequately protected.
- Creating a financial environment that encourages the development of venture capital (22% of respondents).

Showing further evidence of the interest in new development, 21% of South Korean business executive also regard very favorably policies that would create more incubators and facilities for start-ups. Op.cit., pg. 8.

**Collaborative Innovation as the way forward**

Growing trends from the barometer indicate that Innovation can start from all kinds of economic actors (over 92% of South Korean respondents in 2013 believe that SMEs and Individuals can be as innovative as large companies – this is 22 points higher than global average).

In fact, 90% of South Korean respondents report that their firm has been increasingly looking at innovation through the collaborative angle. While this figure is lower than the global average it still represents over half of all South Korean respondents. Furthermore, 96% of respondents strongly agree their firm would be more successful at innovation through partnership than if their company went about it alone.

Business in South Korean would like to enter new markets (53%), access new technology (51%), and scale up (78%). It should be noted, however, that these desires are less strongly expressed than in other markets.

The barriers to collaborative Innovation are also clearly identified: lack of protection of confidentiality/IP (65% - in line with the global average), and lack of trust in partners (52% - which is 5 points higher than the global average). Op.cit., pg. 9.

**One Major US – Japan Difference**

Open innovation in Japan tends to be done like outsourcing:

- Large companies look for an external partner to fill a particular niche in the supply chain
- Keiretsu affiliation is often the result of first sales from small company to large company.

Open innovation in the U.S. tends to border on (strategic) disruption of current company business:

- CTO is often independent office from R&D division
- CTO provides independent views directly to CEO
Top-down major decisions about strategy meet bottom-up innovations that may be independent of existing R&D activities ("Toward a New Model for Japanese Innovation: Implications from the U.S. Model", pg. 21)

Some factors of comparing national innovation systems – 1

- Flow of capital
- Flow of people: Employment patterns of workers
- Flow of ideas: Knowledge transfer

Some factors of comparing national innovation systems – 2

Infrastructure factors:

- Degree of macro-economic development; speed of growth
- Sector-internal characteristics
- National policy objectives

Fierce global competition

The EU faces a significant innovation gap, US and Japan outpace the EU in research and innovation performance but some of the best performing countries are to be found in Europe. The EU's historical leadership in top-level science has eroded, China has taken over EU's lead in the number of researchers, US leads top universities ranking, our trading partners invest more in higher education. Access to tertiary education is also broader, China is enrolling more students than EU, US and Japan combined, private global actors are setting the pace. ("Background On Innovation In Europe", pg. 3-12)

EU challenges

Strong variation in performance across Member States: National R&D targets vary significantly, if delivered, national targets will push up R&D investment close to the 3% EU target, but such an increase remains modest compared to global trends. Lagging private R&D explains a large part of the EU gap, high-tech sectors drive R&D investments and the EU economy is less high-tech than that of US and Japan, young innovative firms contribute less to total R&D in Europe. Op.cit., pg. 14-22.

European Innovation Partnerships

- Tackle major societal challenges whilst creating new business opportunities for EU industry;
- Set concrete targets (e.g. raising our citizens’ healthy life years by two in 2020) behind which policy makers and the public can rally;
- Join up all key players from researchers, businesses to end users and remove bottlenecks so that good ideas can be translated into successful innovative products or services;
- A pilot partnership on active and healthy life has been launched. Over the last 40 years the welfare gains associated with improvements in life expectancy totalled at least 29–38% of GDP;
- Other innovation partnerships (e.g. on energy, raw materials, sustainable agriculture, water) are under consideration. ("Background on Innovation in Europe", pg. 33)

Globalisation brings changes and challenges to innovation systems in both the industrialised and developing countries. The Asian countries have entered the global innovation scene and the Western countries’ positions have been challenged. The globalization processes have increasingly started to change from international exploitation of nationally produced products to global generation of innovation. These new patterns indicate that interdependence and interaction are increasingly important words. The patterns of innovation activities are shifting and so are the boundaries between local, national, regional and global innovation (Altenburg et al. 2006, Chaminade and Vang 2006, Parthasarathy and
As a result of the climate threats, untenable energy consumption aggravated by the population explosion and consequently the growing interest in sustainable development, Danish "cleantech" has become an important industry and a promising growth industry both nationally in Denmark and abroad. Cleantech represents more efficient and cleaner technologies, which are the key to efficient energy use – a prerequisite for a sustainable energy policy in e.g. Denmark. Stern (2008) argues that emission reduction must include a large spectrum of CO2 emitters and not only focus on one or two of the emission culprits. The cleantech industry accommodates reductions of the damaging outcomes of all the culpable energy emitters and the cleantech technologies range from waste treatment, sustainable energy production and use to business models, which provide long-term solutions to the climate challenges. Op.cit., pg. 5.

The Danish National Innovation System

Denmark has a long tradition of an industrial focus on agriculture and Denmark’s process of catching up with the leading industrialised economies in the late 19th to the early 20th century was highly influenced by early specialisation in agriculture and services (Christensen et al. in C. Edquist & Hommen, 2008a). Partly due to this early specialisation, Denmark developed strong low and medium tech industries especially within food. However, the previous relative high share of Danish manufacturing value-added within especially low-tech but also within low-med tech is decreasing: from 1990 to 2000 Danish low-tech manufacturing value-added (as a change in percentage share) has decreased from -4.7 to -6.8, while low-med tech has decreased only little from 0.9 in 1990 to 0.3 in 2000, med-tech has increased slightly from 1.1 to 1.5. At the same time high-tech value-added has increased from 2.7 to 5.0 (C. Edquist & Hommen, 2008a). The most important high-tech industries in Denmark are pharmaceuticals and the medical industries. Op.cit., pg. 25.

According to Christensen et al. (2008) Denmark’s geographical proximity has given rise to spillovers and spin-offs, which characterise innovation in Denmark. Innovation in Denmark is characterised by a majority of SMEs majorly undertaking incremental innovation interconnected with learning by using and learning by interacting (Christensen et al. in C. Edquist & Hommen, 2008a) and consequently a large degree of open/user-driven innovation. The Danish flexicurity model has for many years been supporting and fertilising this interactive learning and innovation in Denmark. Op.cit., pg. 27.

Lack of capital is however an issue for Danish companies. The percentage of companies which identified the lack of venture capital as the main barrier to R&D&I. Figure 6 increased 5 percentage points from 2009 to 2010 (from 29 % to 34 %) (Forsknings- og Innovationsstyrelsen, July 2010). As shows, Lack of qualified employees was the most significant barrier to R&D and innovation before the financial crisis, while the second most significant barrier was Lack of venture capital. However, during the financial crisis in the spring 2009 this picture has turned upside down so that lack of venture capital was indicated as the most significant barrier. Op.cit., pg. 32.

For decades, Danish production has been under pressure from countries competing on low wages and higher production levels. As a consequence, the Danish companies have moved all or part of their production abroad (mainly to Eastern Europe and Asia), while they have kept their R&D activities in Denmark (Forsknings- og Innovationsstyrelsen, July 2010). As it can be seen in appendix 13.10 on extramural R&D in Denmark, this picture is, however, changing and companies are increasingly moving research activities abroad as well. The most dominant impacts of globalisation in relation to innovation activities will be outlined briefly below. Op.cit., pg. 33.

In addition to the national Danish initiatives and policies, EU policies and goals are also influencing the Danish innovation system. Along with the member countries’ implementation of a wider perspective on innovation policy, the EU has launched several major initiatives in this direction. For example, the ERA (European Research Area) and the Lisbon Strategy were launched in 2000 with the aims of facilitating the flow of research and innovation across national borders (European Commission, June 2010) and to
coordinate national economic policies (European Commission, March 2010). Overall, the purpose of these actions is to make Europe the most innovative and competitive region in the world by means of social cohesion and coherence. The EU can be defined as a supra-national innovation system that influences the national innovation systems (across national boundaries) but which also is influenced by the member states: “The Seventh Framework Programme is also part of the Danish innovation system, because we are helping to support it… We help fund some programs, which Danish companies can apply for” (Windmüller, Personal communication, August 8, 2010). In order to provide active support and facilitate the support that Danish researchers and companies can get form the EU, DASTI has implemented schemes which advice the interested parties on how to apply (e.g. Eurocenter). Op.cit., pg. 36.

The case indicates that the politically determined objectives in the Danish globalisation strategy are not achieved by the market and companies. The case study in combination with the description of the Danish cleantech industry thus draws our attention to system failures in the Danish innovation system, in particular: inefficient and sporadic network activities; bureaucracy and ignorance about the offers in the Danish innovation support system; and lack of access to financing. These system failures all call for policy intervention in order to mitigate the problems. Below, the case findings’ implications for policy and further research will be outlined. Op.cit., pg. 73.

The more specific implications for policy that can be drawn from this thesis are fivefold:

1) More focus on facilitating knowledge transfers and spill-overs
2) Facilitate collaboration between SMEs and larger companies
3) Establish various effective, structured networks and matchmaking schemes
4) Facilitate the interactive learning and incremental innovation

Design thinkers look for work-arounds and improvise solutions and find ways to incorporate those into the offerings they create. They consider what we call the edges, the places where “extreme” people live differently, think differently, and consume differently. (“Design Thinking for Social Innovation”, pg. 4)

Although it is true that designers do not always proceed through each of the three spaces in linear fashion, it is generally the case that the design process begins with the inspiration space – the problem or opportunity that motivates people to search for solutions. And the classic starting point for the inspiration phase is the brief. The brief is a set of mental constraints that gives the project team a framework from which to begin, benchmarks by which they can measure progress, and a set of objectives to be realized—such as price point, available technology, and market segment. Op.cit., pg. 5.

The second space of the design thinking process is ideation. After spending time in the field observing and doing design research, a team goes through a process of synthesis in which they distill what they saw and heard into insights that can lead to solutions or opportunities for change. This approach helps multiply options to create choices and different insights about human behavior. These might be alternative visions of new product offerings, or choices among various ways of creating interactive experiences. By testing competing ideas against one another, the likelihood that the outcome will be bolder and more compelling increases. Op.cit., pg. 6.

The third space of the design thinking process is implementation, when the best ideas generated during ideation are turned into a concrete, fully conceived action plan. At the core of the implementation process is prototyping, turning ideas into actual products and services that are then tested, iterated, and refined. (“Design Thinking for Social Innovation”, pg. 7)
As Yasmina Zaidman, director of knowledge and communications at Acumen Fund, puts it, “The businesses we invest in require constant creativity and problem solving, so design thinking is a real success factor for serving the base of the economic pyramid.” Design thinking can lead to hundreds of ideas and, ultimately real-world solutions that create better outcomes for organizations and the people they serve. Ibidem.

In recent decades, there have been significant changes in the place of scientific knowledge in the U.S. economy, the innovation strategies pursued by large U.S. corporations, and the federal government’s technology policies. (“Where Do Innovations Come From? Transformations in the U.S. National Innovation System, 1970-2006”, pg. 3)

In the 1960s and 1970s, many observers came to see that scientific knowledge was becoming ever more central to economic activity. Some regarded the growing visibility of mainframe computers in the U.S. economy as emblematic of the importance of technical expertise, and they correctly predicted a further intensification of the economy’s dependence on highly specialized forms of scientific and technological training. A series of breakthroughs in molecular biology in the 1960s and 1970s helped drive innovation in the pharmaceutical and agricultural technologies industries. Subsequent recent advances in material sciences—often relying on the manipulation of compounds at the molecular level—began reshaping how familiar products such as airplanes, automobiles, construction materials, and textiles are made. And the development of semiconductors and a host of related information technologies began driving what later became the information technology revolution of the 1990s and 2000s. Ibidem.

In the first two decades after World War II, many economic sectors of the U.S. economy were dominated by small numbers of large entrenched corporations. AT&T enjoyed a monopoly over virtually the entire telephone industry, and the “Big Three” auto companies were paralleled by the three broadcast networks that accounted for the great bulk of television advertising dollars. In this era of “oligopoly capitalism,” competition by foreign firms for the huge domestic U.S. market was relatively insignificant because few of these firms were able to operate on a scale similar to that of U.S. big business. Op.cit., pg. 4.

These findings suggest that the U.S. federal government’s role in fostering innovation—both in terms of organizational auspices and funding—across the U.S. economy has significantly expanded in the last several decades. But the federal government’s role is not to act as the agent of centrally planned technological change. Op.cit.,pg. 18.

The largest federal government program that fits this venture capital model is the Small Business Innovation Research (SBIR) program. In 2004, the SBIR program gave out more than $2 billion for some 6,300 separate research projects. The success of programs such as SBIR helps to explain what is perhaps the most surprising turn in federal innovation policy of the last decade. Op.cit.,pg. 19

Although this explicit turn towards venture capital by U.S. government agencies is understandable, it will not, by itself, solve what we see as the main weaknesses in the current system of federal support for innovation in the United States. In our view, the system of federal support for innovation has enormous strengths, but it also suffers from three major, interconnected weaknesses. First, the system carries decentralization to an unproductive extreme. Under current arrangements, it is entirely possible that five different government agencies might be supporting 30 different teams of technologists working on an identical problem without a full awareness of the duplication of efforts. This situation is a particular problem if different groups are unable to learn from each other in a timely fashion. Second, because the importance of the federal role in fostering innovation is not widely recognized, federal programs in support of innovation lack the broad public support that would be commensurate with their economic importance. Third, the budgetary support for the current system is inadequate and uncertain. Funding for more collaborative research and commercialization efforts are relatively limited, and total federal levels of R&D spending have been declining in real terms since 2003. These declines put the entire U.S. innovation system at risk. Ibidem.
**India** is increasingly becoming a top global innovator for high-tech products and services. Still, the country is underperforming relative to its innovation potential—with direct implications for long-term industrial competitiveness and economic growth. About 90 percent of Indian workers are employed in the informal sector, and this sector is often characterized by underemployment, as well as low-productivity and low-skill activities. Although India has the benefit of a dynamic young population—with more than half of the country’s population under 25 years old—only 17 percent of people in their mid-20s and older have a secondary education. To sustain rapid growth and help alleviate poverty, India needs to aggressively harness its innovation potential, relying on innovation-led, rapid, and inclusive growth to achieve economic and social transformation. ("Unleashing India’s Innovation, Toward Sustainable and Inclusive Growth", pg. 15)

To **strengthen commercialization of knowledge**, India should foster increased collaboration between R&D institutes, universities, and private firms. Seven **areas of reform**:

1. Strengthening incentives for commercialization of publicly funded R&D
2. Improving support infrastructure for India’s IPR regime
3. Supporting technology transfer offices and a patent management corporation
4. Promoting greater mobility. Mobility of personnel between public R&D labs, universities, and industry should be encouraged through competitive awards with generous stipends.
5. Expanding science and technology parks and technology incubators
6. Broadening SPREAD and creating an appropriate “fund of funds.”
7. Setting up a Global Research and Industrial Partnership (GRIP) program.

Op.cit., pg. 97

**Technological innovation** is one of the least studied but most critical sources of productivity growth. Indeed, economic historians are currently changing our understanding of human history, placing greater emphasis on the role of technology and the associated institutional innovations. Technological innovation has played a critical role in spurring growth in the industrial countries. But lessons derived from these experiences have not been applied in developing countries, where technological change remains a marginal part of national growth strategies. The Goals offer an opportunity for the international community to plug this policy deficit. ("Innovation: Applying Knowledge in Development", pg.53)

The diversity of political experience, resources, and constraints in both developed and developing countries means that the creation of advisory mechanisms cannot be guided by a one-size-fits-all mentality. To create and implement successful science advisory policies and mechanisms, policymakers need to tailor their systems to their countries’ needs and available resources. Op.cit., pg. 185.

International institutions urgently need to realign their activities to reflect the technological requirements for implementing the Goals. This effort will not only help deploy available financial and other resources to meet the Goals, it will also help identify gaps in available resources. These efforts need to be undertaken in the context of a better understanding of the sources of economic growth. The five-year review of the implementation of the Goals in 2005 offers a unique opportunity to start this reconceptualization process. Op.cit., pg. 203.

There are **three primary sources of technological and scientific innovation**. The first is **government**, which can act as a facilitator and promoter of technological learning. The second is **institutions of higher learning**, which create indigenous capacity in relevant fields. The third is **enterprises**, the engines of economic change, where technological capabilities of economic importance accumulate. Op.cit.,pg. 204.

Efficiency and intensity of innovative activity in an economic area does not only depend on entrepreneurial decisions. It also relies on institutional setting, the public research activities as well as access to capital and a skilled work force. The National Innovation Systems (NIS) approach analyses innovative activity in this broad sense. The focus is not solely on the number of introduced process and product innovations in a country, but the research and development efforts by business firms and public
In comparison to other Industrialising countries, Brazil has quite substantial R&D expenditures in absolute terms. However, upon closer examination, their R&D to GDP ratio has remained constant during the 1980s (Dahlman and Frischtak 1993). In contrast, Korea’s ratio rose from 0.77 to 1.95 in the same period. Also, whilst Brazil’s economy is twice the size of Korea’s, in absolute terms, the R&D expenditure is almost the same and in recent years, Korea’s is doubled that of Brazil’s. The trend continues into the twenty-first century: Etzkowitz and Brisolla (1999) state that whilst the Korean target is to spend 5% of its GDP on R&D, Brazil’s aim never rose above 1.5-2% - even during its most prosperous years.

The Government performs the majority of Brazilian R&D. In 1982, the Government funded 67% of the R&D, 22% by private firms, 5% from foreign investment and 8% by others. The trend remained in Brazil: in 1995, 69% of R&D was funded by the Government, 22% by private firms and 9% by other firms which includes state owned firms (Alcorta and Peres 1998). Whilst Korea was at first in a similar position, it managed to shift towards private funding.

One of the main failings of R&D financing in Brazil has been the lack of direction and specialization in research. As Alcorta and Peres (1998) state, “this diversity and fragmentation did not allow firms to concentrate their limited technological, marketing and financial resources in a smaller set of key products that could have been competitive in international markets ... the lack of firm, industry and intra-industry specialisation seems to be one of the major limitations to Brazil’s industrial development.” Op.cit., pg. 4.

In drawing conclusions out of the comparison between South Korea and Brazil it has to be repeated that there is no such thing as a fully fledged institutional framework that incorporates all possible interdependencies between different institutions. The above approach has mainly highlighted differences in the characteristics of two countries, which in the 1980s were seen as equal in development. The systemic approach to innovation is by established as a useful framework to study technical change and its determinants, but, it is arguable whether generalisations can be drawn and whether Brazil, had it copied the Korean NIS, would have had similar success. Op.cit., pg. 8.

However, the fact that in low- and middle-income countries only fragmented innovation systems were empirically found does not irrevocably imply that the NIS framework is useless in these context. Alcorta and Peres (Alcorta 1998) do not refrain from using the NIS approach and whilst there are weaknesses within the Chang and Shih framework, it still proved a useful and insightful tool to analyse the South Korean and Brazilian NISs. Through their framework, we analytically discussed ten aspects of the NIS and we hope that through similar studies, wider public policy implications can be drawn. Hence, governments of industrialising countries can learn and improve their economic progress. Ibidem.

Industrial strategy of South Korea and R&D advancement processes were examined under three processes: imitation, transformation and innovation. The transformation process S. Korea went through in 1980s.

- S. Korea focused on labor intensive and low-technology sectors in 1960s and switched rapidly to technology intensive sectors in the 1970s and 1980s.
- In the period between 1960 and 1980 named as the imitation process, technology transfers were predominant in S. Korea while beginning with 1980s improving the R&D capacity was a priority area.
- In S. Korea this process was accompanied with efforts to change the export composition and to switch to technology intensive sectors. The technological content of the export goods indicate that medium-technology products gained dominance in S. Korea in 1990s.
Analysis of the composition of R&D expenditures by public and private sector reveals that the country was experiencing the transformation in the 1980s.

With the transformation S. Korea experienced in 1980, private sector started to carry out a substantial proportion of R&D, which by facilitating product development and commercialization, contributed to the international competitiveness of the private sector. Furthermore, in S. Korea development activities constitute a large proportion of overall R&D activities which accelerates the introduction of new products to the market. In the recent years policy focus in S. Korea has shifted towards turning the R&D system into an integrated innovation system and expanding basic research to secure the sustainability of economic growth.

One of the most prominent factors that accelerate economic growth and development in developing countries is technology, product and process development in tandem with needs. This phenomenon can be observed in S. Korea in practice. Particularly beginning with 1990s, S. Korea implemented policies encouraging research in line with the needs of the country and the industry.

Another factor that contributed to S. Korea’s high pace in development contest through technological structuring and development was that R&D policies were implemented with strategic decisions in selected target sectors. Policies tailored for target sectors can give quicker results. Major breakthrough S. Korean ICT sector has experienced in terms of exports and competitiveness is an example to this. It is also observed that recently effort is made to monitor developments in the world closely and increase investments in and attach strategic priority to the nanotechnology and biotechnology sectors.

“To what South Korea Owes Success in Innovations?”, pg. 11-12.

II. Building Skills for Knowledge Economy through University Reforms

1.) Challenges of Education & Training for Future Labor Market

The employment rate for those with high skill levels across the EU as a whole is approximately 85 %, for medium skill levels 70 % and for low skill levels it stands at 50 %. And yet, it is an inconvenient truth that, despite progress in recent years, much of Europe is still not sufficiently skilled. Nearly one third of Europe’s population aged 25-64 – around 77 million people – have no, or low, formal qualifications and only one quarter have high level qualifications. Those with low qualifications are much less likely to upgrade their skills and follow lifelong learning. (New Skills for New Jobs: Action Now, pg. 4)

Future demographic trends will add further pressure to tackle this challenge. Fewer and fewer young people will graduate from schools and universities, and the only growth of the labour force is likely to be amongst those aged over 50. The numbers of over-65s in relation to those aged 15-64 will increase from 26 % in 2008 to 38 % by 2030. Clearly, with an increasing old-age dependency ratio, those in work also need to become more productive in order to support those outside the labour market. (Ibid.)

Worryingly, the latest figures show that 14.9 % of pupils leave school early with several countries suffering from extremely high drop-out rates; the performance in reading literacy is actually deteriorating. This is not only unacceptable but means that we are way off meeting the 10 % European target of early school leavers. We are, indeed standing on a ‘burning platform’. Europe aims to be amongst the most highly skilled regions in the world, yet many European countries are not even in the top 20. (Op.cit, pg. 8)
According to recent research, the **reform of an education system** providing adequate skills for all citizens **could increase GDP by as much as 10% in the long term**. A better-trained workforce also benefits the economy as a whole and increases its competitiveness. It makes it easier for enterprises to adopt new technologies, innovate in products and services, processes or work organisation. Companies that train their staff are 2.5 times less likely to go out of business compared to those that do not. The lack of foreign language skills, and not just English, in small and medium-sized European enterprises alone results in a loss of more than €100,000 per year for each business on average. *(Op.cit, pg. 11)*

The crisis is also accelerating the pace of economic restructuring, which will have a lasting structural effect on the volume and pattern of skills demand. Some industries will not bounce back to pre-crisis growth levels and sectors like car manufacturing, steel production, construction and other industries that are experiencing temporary plant closures may eventually face permanent job losses. At the same time, the crisis will breathe new life into other sectors. New investments in job creation, also supported through stimulus packages, will create new jobs, with potentially radically **different skill needs**, for example, in **low carbon sectors**, **care of the elderly, life/biosciences** and some **professional/business services**. Anticipating future challenges and establishing early warning systems should become a priority as and when labour demand will be revitalised, the composition of jobs and skills needs will have changed, with new drivers of growth in jobs and sectors that do not exist today. *(Op.cit, pg. 14)*

At the same time the “academic arms race” to belong to the world’s top institutions has been intensified rather than weakened by this process. Several thousand European higher education institutions now pursue the financially impossible and possibly **self-destructive strategy to reach an unobtainable worldclass status as research universities**. This contrasts strongly with the United States where among a similar global number of higher education institutions only about 100 to 150 institutions **deliver substantial numbers of doctoral degrees and are considered to be research universities**. International rankings of universities based on research excellence clearly demonstrate the effectiveness of the concentrated US approach. *(The Coimbra Group and European Higher Education after Bologna 2010, pg. 5)*

The **active population of the EU (25-64 years) has lower levels of higher education attainment** than its main competitors in the global economy. The average level of higher education attainment among the active population in the EU is 21%, significantly lower than in the US (38%) and Japan (36%). Figure 1 gives the graduation rates for various OECD countries.

Furthermore, in comparison with its most important competitors, higher education institutions in the EU attract a lower proportion of secondary school leavers, implying that higher education in Europe is still not an attractive option for a significant part of pupils having completed upper secondary education. About 25% of young people aged 18-24 years were enrolled in higher education in EU 25 in 2002, a much lower share than in the USA (37.7%). In the USA, tertiary students start to study on average at an earlier age than in Europe. Almost 40% of 18-year-olds in the US participate in higher education, compared to about 15% in the EU.

However, the **EU is catching up**. Despite low birth rates in the 1980s, the number of higher education students in Europe is increasing as a result of a growth in enrolment rates. The number of higher education students increased in the EU in the period 1997 to 2002 by 16% or on average by 3.1% per year, compared to an annual growth of 2.2% in the USA and only 0.1% in Japan. *(Higher Education Reform and the Renewed Lisbon Strategy: Role of Member States and the European Commission, pg. 5)*

The EU-25 devotes a much lower share of its wealth to the financing of tertiary education than the US. In 2001, the EU spent 1.3% of its GDP on the financing of tertiary education compared to 3.3% in the US and 1.2% in Japan. Although public funding of tertiary education is also higher in the US than in the EU, the most striking difference between the two regions concerns private expenditure. In relative terms, **private expenditure on higher education is nine times higher in the US than in the EU**. Table 4
indicates that the difference between the EU and the US is less marked when one considers all levels of education.

Within the EU, the Scandinavian countries have the highest share of tertiary spending in GDP (most of this spending being public). While Germany, France and the UK spend a bit more than 1%, Italy has an even lower share. Similar gaps show up in yearly spending per student. While the EU is spending on average 8,600 euro per student, the US is spending on average 20,000 euro. For example, the Ivy League universities now charge more than 40,000 US dollars including board.

This spending gap between the EU and its major international competitors can be correlated to the financing mode of higher education. In the EU most of the financing of higher education is public funding, where the State is seen as the provider of education services as public goods with education being mostly ‘free’ with low fees and low private funding through foundations and donations. While in the EU private spending on higher education represents on average 0.1% of its GDP, this is 1.4% in the US (0.8% in the OECD).

The percentage of funding for tertiary education coming from private sources varies widely across countries, from less than 4% in Denmark, Finland, Greece, Norway to more than 50% in Australia, Japan and the United States, and even above 80% in Korea. In some countries, tertiary institutions are now relying more heavily on private sources of funding than they did in the mid-1990s. (Op.cit, pg. 9)

Work in the context of the Bologna process is bringing about a convergence in the structure and length of degree programmes towards the Anglo-Saxon degree system. The advantages of the Bologna reforms towards introducing system of Bachelor and Master degree programmes in Europe are:

- **Reduce the risk of choosing the wrong study**, encourages students to **take more demanding studies** and to **finish their studies more quickly**. The Bologna reforms allow students to wait in the presence of uncertainty with regards to their capacities, interests and job market circumstances.

- **Stimulate students to combine different studies**. Much of technological and economic progress in contemporary society occurs in the twilight zone between different disciplines.

- **Engender competition** between a larger number of shorter degree programmes. If students are unhappy with a particular degree programme, they will vote with their feet and go to another programme. The reforms boost international exchange and fuel competition.

- **It makes the European system compatible with systems of higher education found in UK, US, Canada, Australia, New Zealand, India, Pakistan and much of Asia and Latin America**. This enhanced transparency encourages European universities to compete on a global scale. (Op.cit, pg. 21)

The projected skills profile for the EU 25 workforce shows a significant increase in the percentage of workers who will need high level qualifications (Tertiary, ISCED 5-6) a significant decrease in demand for workers with low level qualifications (Lower secondary, ISCED 0-2, 3c) and a moderate increase in the demand for Medium level qualification (Upper secondary, ISCED 2-3).

One of the key objectives of the Bologna Declaration is the **“promotion of mobility by overcoming obstacles to the effective exercise of free movement”** (European Ministers for Education, 1999). At the London Summit in 2007, mobility was designated as a key priority for the Bologna Process until 2009. EU mobility programmes such as Erasmus have been provided support across Europe for students wishing to spend a period of study aboard. However, there has been a low level of outward student mobility from the UK compared to other countries. Only about 1% of UK students spend a period of time abroad as part of their studies. **Outward mobility is also declining** – in 2002/03 the number fell to only 7,956 compared with 11,988 in 1994-95 (HEFCE, 2004). Many factors affect the mobility (or lack of) of UK students such as lack of knowledge about mobility schemes, lack of a tradition of mobility, social factors, language barriers, lack of opportunity/support offered by the institution and family/work
commitments. The real benefits of mobility have been highlighted in research e.g. personal development, higher levels of achievement, employability and this poses challenges for institutions to fully support the student and staff experience in this area. (*The Bologna Process: Supporting the internationalisation of higher education in the UK*, pg. 3)

The 45 countries that participate in the Bologna Process are extraordinarily diverse, even considering only the crudest economic and statistical indicators. The countries range in population from less than 1 000 individuals to over 140 million, in the number of public higher education institutions from 1 to over 1 200, and in student numbers from 330 to more than 8.5 million. Seven of the top ten world economies ranked by GDP per capita are part of the Bologna Process, but one participating state came in 136th out of the 181 world economies, and another five are found below 100th place. As well as this immense spread of quantitative factors, there are also very significant differences in social and political culture and in the systems and structures of education in the different states. (*Key issues for the European Higher Education Area– Social Dimension and Mobility*, pg. 12)

Academic Rankings of Universities

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<th>Rank</th>
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<th>THES</th>
<th>Webometrics</th>
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<td>Top 20</td>
<td>17 US 2 EUR (UK)</td>
<td>13 US 4 EUR (UK)</td>
<td>20 US 0 EUR</td>
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<tr>
<td>Top 200</td>
<td>90 US 79 EUR</td>
<td>57 US 80 EUR</td>
<td>106 US 61 EUR</td>
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<td>Top 500</td>
<td>159 USA 210 Europe</td>
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(*European Higher Education: Key Trends and Challenges*, pg. 9)

EU 25 Labour force (15-64) qualifications profile and projected change from 2000-2020

![EU 25 Labour force qualifications profile](image)

(*Towards a coherent tertiary education approach*, pg. 19)

During 2005 these ambitions were seriously constrained by severe obstacles in achieving a political agreement on the new EU Treaty (the so-called 'European Constitution'), a process that was temporarily halted after French and Dutch referenda failed to gain a majority in favor of the new Treaty, and on the new EU budget. Under the UK presidency of the European Union, the Hampton Court Summit failed to
make the intended budget shift from an ‘agricultural’ to a ‘knowledge’ Union. Instead of the originally planned EUR 132 billion, a total of EUR 72 billion was attributed to all activities under the heading of competitiveness, growth, and employment.

This included a total (seven-year) budget of 7.5 billion Euro for the newly (2007) established European Research Council (ERC), set up to fund innovative, groundbreaking basic research, with competitive funding awarded based on peer review (as with the National Science Foundation allocations in the US). And a seven-year budget of 50.5 billion Euro was established for the EU’s 7th Framework Programme for R&D, which is twice the financial volume of its predecessor (FP6). In comparison: This is a slightly larger budget than the US NSF budget on a yearly basis (6.2 billion USD for 2007), although it represents not even four percent of the total of national R&D (private plus public) budgets of the member states together. Important, therefore, are the bottom up dynamics that are emerging at the same time through the network of national research councils (ERA-NET), which strives on a voluntary basis for more cooperation between them through transparent peer review, aiming to avoid overlap between national research agendas and pushing for joint calls for proposals (yet still very infrequent). It is expected that the EC may top up such common budgets as to provide a greater incentive to move toward “single pot” funding. Initiatives for such cooperation also emerge on a regional basis, as for instance between the Nordic countries (the NORIA initiative, see below), which may further encourage this type of bottom-up dynamics. (*European responses to global competitiveness in higher education, pg. 10*)

It is widely recognised in EU reports that our school systems can do much more to stimulate the entrepreneurial mindsets of young people. Learning-by-doing programmes encourage innovation and foster the changes of attitude and behaviour that this new century is demanding. These programmes can be successfully applied at any level of the curriculum, from pre-school upwards.

The ‘mini-company’ is one best practice in entrepreneurship education that is highly adaptable with proven results in many countries around the world. The method involves a clear set of steps and learning outcomes. Educators guide their students as they set up their enterprise, come up with an idea, raise capital through shares, produce their product and take it to market. The students are mentored by adult volunteers from the local business community. At the end of the exercise, students liquidate the company. Annual competitions reward team success in a variety of areas, but also test individuals’ knowledge and understanding of the process. The method emphasizes experience and interaction with others (teaming) as a way of learning. It favours the application of knowledge in new ways, the improvement of transversal skills such as problem-solving and decision-making together with the development of other aspects of our development such as creativity, innovation and self-confidence.

The mini-company approach responds to our need to bring the education and business communities closer together. It exposes young people directly to real world situations, empowering them with the skills to cope with complex problems and allows them to better understand the connection between their studies and the world outside. Studies show that employability and career satisfaction is improved: 15% of past participants between the age of 21 and 29, and 26.6% aged 29 or over, have started their own business. The EU average start-up rate is between 6 and 10%. Mini-companies are globally recognized and running in 125 countries (37 in Europe). (*New Skills for New Jobs: Action Now, pg. 26*)

In Germany, the government decided in 2004 to create top universities and research institutes that can compete with the global premier league. The idea was to achieve this through nationwide competition among universities to identify the best research universities and provide them with extra funding to become "elite institutions" or "lighthouses" able to compete on a global level. A budget of 1.9 billion Euro was earmarked for 2006–2011 (Kehm 2006). In 2003, the Dutch government established an innovation platform, chaired by the prime minister, following the example of Finland. Although already initiated in a bottom-up way, the innovation platform and the Ministry of Economic Affairs encouraged with a 50 million Euro grant the formation of a federation by Delft University of Technology, Eindhoven University of Technology, and Twente University. Today the initiative is well underway and has established a joint graduate school, joint accreditation, a common framework for the quality assurance of research, and a
common scheme for research chairs. On this basis it recently engaged in the joint recruitment of 30 new professors to lead the five new joint centers of excellence that have been established (3TU 2005).

Responses from the institutional level can be illustrated by the establishment of the League of European Research Universities (LERU18). LERU was founded in 2002 by a group of 12 European research-intensive universities concerned with the question of how to ensure that more of our European universities join Oxford and Cambridge at the top of the world university rankings. In their view, the European universities need greater autonomy to respond rapidly to challenges and opportunities, combined with much greater investment to ensure that the best compete at the highest international levels of excellence. Another example concerns the 2004 merger of UMIST and the Victoria University of Manchester to create the U.K.’s largest single-site university: the University of Manchester, in order to match the leading universities in the world, i.e., to become one of the top 25 strongest research universities in the world by 2015. The examples presented above illustrate responses to global competition and clearly indicate the important role that international rankings of universities play in this respect. All of these responses have both cemented the role of the rankings themselves and further intensified competitive pressures. *(European Responses to Global Competitiveness, pg. 17)*

**Institutional planning has evolved and matured in the United States** over recent decades. In fact, the progress that has been made is so significant compared with many higher education systems throughout the world that a disconnect has materialized. Internationalization has brought students, scholars, institutions and other partners together throughout the world in meaningful ways. This must also occur within the arena of planning. It is important for those in the United States who are fully engaged in advancing institutional planning to recognize the enormous chasm that separates their progress with the neophyte aspirations of some other countries. European countries are at different stages of development, but virtually all of them recognize the merits of properly executed institutional planning. Many are struggling to find ways to turn their aspirations into realities. This does not mean that those well-versed in the process can simply parachute into other countries and transform them through lock-step consulting approaches. It’s not that simple. In fact, a few failed attempts to introduce planning in other countries can change optimism into pessimism very quickly and curtail further interest.

First and perhaps most important, as a general rule, **European higher education is a bit distrustful of the American system**. Many Europeans view U.S. involvement abroad in higher education not as an effort toward “internationalization” but rather “Americanization”. They consider U.S. higher education clearly the strongest in the world, but also excessively homogenized so that it is hard to differentiate the majority of institutions one from the other. **Mission drift and an overzealous affinity for a market-driven mentality** are seen as driving forces Europeans are not sure they want introduced into their systems (Machado, et. al., 2005). It should be pointed out that the market is becoming a force in Europe, but it is confronting obstacles from the lingering welfare state that are impeding its progress.

Second, the planning expertise from the business sector is more established and mature than that found within higher education. The business sector could probably make meaningful contributions to planning in European higher education institutions with a little additional effort. That effort would involve learning the obvious and subtle differences between the cultures of business and higher education. This should start with a grasp of the nuances found within the States, then be followed by an examination of Europe. Ultimately, and before networking with Europe, one would be advised to examine the higher education culture within the specific country they will engage. The diversity between countries in Europe is far greater than that between states in the U.S. With this preparation would come a cultural sensitivity that would be well-received abroad. *(The struggle for strategic planning in European higher education: the case of Portugal, pg. 14)*

It is both lack of knowledge about and visibility of the current and future supply and demand of skills, and the inertia of education and training systems alongside labour market failures, that prevents a better match between supply and demand, i.e. between the skills we have available and those that are required by the labour market. Too many individual education and training decisions are made in the absence of
competent career guidance and counselling, with a lack of understanding of people’s strengths or of the real dimensions and opportunities of different careers, labour market realities and employment prospects – a situation which often leads to inappropriate training and career choices. (*New Skills for New Jobs: Action Now*, pg. 12)

There are also too many schools, training programmes and tertiary education institutions where the content of the curriculum and teaching methods could do much more to prepare people for the world of work. Too many vocational training programmes focus too much on obsolete skills and knowledge and too little on transversal key competences. During the last decade education and training systems in Europe have become more relevant and responsive to the needs of society, but the extraordinary potential of skills development to contribute to sustainable growth is not yet fully harnessed. (*Ibid.*)

Some progress has been made since 1999, but many challenges remain. Among the obstacles to mobility, issues relating to immigration, recognition, insufficient financial incentives and inflexible pension arrangements feature prominently. We recognise the responsibility of individual Governments to facilitate the delivery of visas, residence and work permits, as appropriate. Where these measures are outside our competence as Ministers for Higher Education, we undertake to work within our respective Governments for decisive progress in this area. At national level, we will work to implement fully the agreed recognition tools and procedures and consider ways of further incentivising mobility for both staff and students. This includes encouraging a significant increase in the number of joint programmes and the creation of flexible curricula, as well as urging our institutions to take greater responsibility for staff and student mobility, more equitably balanced between countries across the EHEA. (*Towards the European Higher Education Area: responding to challenges in a globalised world*, pg. 2)

**Increased transparency** in the European higher education systems without imposing uniformity is the major challenge for the Bologna signatories. The common three-cycle structure and the ECTS credits are the technical answer to the need for transparency. The Dublin descriptors and the European Qualification Framework, presently in its implementation process in individual countries, are the answer to the need for comparable levels within this framework, leaving room for a wealth of diversity in study programmes.

Learning outcomes have become one of the basic building blocks of the Bologna Process to promote student-centred outcomes-based learning, although a major effort has yet to be done in defining them in an appropriate manner. The topic of learning outcomes has become one of the foremost challenges to universities, with their focus on the achievements of the learner rather than the intentions of the teacher. As such learning outcomes are at the heart of a paradigm change impacting on all sectors of European education. What seems to be forgotten in the competitive struggle or ‘academic arms race’ is that learning outcomes used to be at the heart of the “universitas” concept, not the class room teaching to which many higher education institutions have turned in desperation over exploding student numbers in the last decades of the 20th century. The attention needs to be shifted from the purely structural issues to concentrate on the in-depth details of learning outcomes, which are in turn linked to the contents of a given subject area. Flexibility and transparency are not guaranteed by mere structural measures or by broad descriptions of study programmes. Quality is not guaranteed by assessments of structural changes or by short curriculum presentations. (*The Coimbra Group and European Higher Education after Bologna 2010*, pg. 4)

**Educate more people, with a more diverse background**

When we look at the social dimension and life long learning, this means that higher education institutes have to educate not only more people, but also more people with a different background in respect to age, culture and experience in education and working life. This leads to a substantial shift of paradigm for higher education institutes in education tasks both in content and quantity.

The first main question the Bologna Process therefore should address is:
how to support the higher education institutes in Europe in such a way that they can accommodate their education in relation to a more diverse student population, and to a more differentiated qualifications framework, while at the same time maintaining the level and quality of higher education and increasing output. (Educating the new European Professional towards Bologna 2020, pg. 3)

Fast changing professional practice and globalisation

When we look at the demands for innovation and employability, this means a pressure on higher education institutes in two ways: providing a continuous translation of new knowledge for professional practice due to the concept of ‘half-life’ and globalisation of the labour market; and as a consequence keeping the team and competences of lecturers and professors up-to-date. The second main question the Bologna Process therefore should address is:

- how the different and complementary roles of higher education institutes in fundamental or practice-oriented research should be supported in order to guarantee an optimal alignment with professional practice (business, industry, SMEs, public sector, knowledge institutes) and innovative demands from society.
- how to keep the staff in line with newly required competencies. (Ibid.)

The progress made in the different member states is of course different following from the fact that the beginning of the memberships dates back to different years. Also the speed of progress is different. But more or less every country tries its best. As far as Germany is concerned we can realize a lot progress but nevertheless also some opposition in the universities against several goals of the Bologna Process. Some professors predict a process of downgrading quality of the higher education system. Some professors fear the change to a qualification/learning outcomes oriented system, the bureaucracy of the quality assurance methods and the competition with other countries and systems. Some of them fail to notice the possibility of getting more flexibility in the study programmes of the two cycle structure as well as in the combination of learning phases than in the diploma study programs. And in some parts they do not accept the necessity of more cooperation between higher education and industry, the necessity of improving the quality of teaching and learning. (Enhancing the Attractiveness and Competitiveness of European Higher Education on a Global Scale: Future Challenges in Shaping Student Affairs & Student Developments, pg. 3)

How should fees be set? There is evidence that unobserved heterogeneity is at least as important as observable variations in attendance and inputs as class size and number of teaching assistants (e.g., Martins and Walker, 2006). Peer effects are important in higher education (e.g., Sacerdote, 2001; Williams and Zimmerman, 2003). Education is a ‘customer-input technology’, since students are both consumers and co-producers of education. Selecting and attracting the smartest students thus generates a positive feedback loop as it raises the quality and reputation of the institute and thus increases further demand. Having high-quality students improves academic excellence all round and makes it possible to attract much better employees/professors and funding from sponsors and the state.

Without peer group or reputation effects, profit maximizing universities set prices to a mark-up on marginal cost. The mark-up should be particularly high for courses with low price elasticity of demand (e.g., courses followed by local students or courses for which not many substitutes exist). Most students go to their local university, perhaps as they prefer familiar surroundings. The optimal tuition fees are higher for such students, because their price elasticity of demand is lower. If peer group and reputation effects matter, tuition fees are higher for the less able or less motivated students and lower for the smart students (cf., Rothschild and White, 1995). Hence, universities should award scholarships or give discounts to the brightest students, especially if they come from less privileged backgrounds. By selling
below cost, universities induce permanent excess demand for their courses and can thus select the smartest students and pursue excellence.

Unfortunately, the **European system** with its sometimes not very helpful emphasis on equality, implicitly entails cross subsidies from the smart to the less able students. Europe thus still has a long way to go in this respect. Of course, the main problem with tuition fees in Europe is that they are set centrally and do not vary according to demand and supply or to meet the special needs of universities. Typically, fees are too low and too undifferentiated, thus encouraging ‘fun seeking’ students and an enormous mismatch of students to courses. (**Higher Education Reform and the Renewed Lisbon Strategy: Role of Member States and the European Commission, pg. 16**)

Enhanced institutional autonomy has meant higher levels of accountability as well as more stringent and detailed procedures for quality assurance at the state as well as institutional levels (‘the rise of the evaluative state’). Opponents of this trend speak of an audited society or evaluation disease, hinting at an overkill of monitoring and reporting requirements (for institutions as well as within institutions). Greater accountability also means that higher education institutions have to redefine the ways in which they inform their stakeholders about their performances. Additional demands are placed on the academic leadership, which in turn requires new modes of communication with and assistance from the decentralized units (faculties, schools, institutes, departments). The oversight of the higher education institution’s primary activities has been increasingly centralized within the institutions, with new lines of reporting and new rules and procedures for academics to ensure the quality of the higher education institution’s primary processes –teaching and research. In many cases this has led to a further rationalization of higher education institution’s decision-making structures and in many cases also has implied putting in place new ‘hierarchies’ in which institutional leadership holds a central role. For example, there has been a considerable increase in the number of mid-level management positions in European higher education institutions in the past two decades as well as the establishment of quality assurance mechanisms and systems within the higher education institutions (Kehm and Lanzendorf, 2006). Generally speaking, what one sees is the devolution of authority from the state level and at the same time centralization tendencies within higher education institutions when it comes to accountability measures such as quality assurance. In many respects deregulation has become re-regulation at another level within the higher education system. (**Higher education governance reforms across Europe, pg. 13**)

After nearly ten years of developing the European Higher Education Area with the hope that many more citizens will benefit from higher educational experiences outside their home country, it is perhaps surprising to discover that so little is known and understood about the reality of student mobility, nor of the real incentives and disincentives to mobility. Many countries still gather data only on nationality of students rather than tracking movement between countries for the purpose of study. With the current information deficit it is also difficult to assess the impact of the introduction of the Bologna three cycles.

The relationship between mobility and portability of student support is equally difficult to determine. Some countries have made their national grants and loans fully portable, others have introduced specific grants and loans for mobile students, and others still combine both elements. Yet as any individual’s students decision to study abroad will be complex and based on a wide range of factors, it is difficult to ascertain the impact of specific financial support measures. The issue of public financial support for mobility also has to be seen in the context of increasing societal demands on the public purse, including for example the demand to widen participation in higher education. At a time of financial uncertainty and growing demand, and with a tendency in many countries to shift a greater share of costs to individual learners, care will need to be taken to ensure that developing equitable opportunities for mobility in the European Higher Education Area remains a priority. (**Higher education in Europe 2009: Developments in the Bologna Process, pg. 11**)

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Although the first feature, the Bologna process, paves the way for a new and large international market for graduates — especially when combined with the free mobility of graduates, one of the four freedoms characterizing the European Union — which can be a serious contribution to peace, welfare and growth in the geographical area concerned, nothing has been provided regarding the financing of students’ mobility. Therefore, countries with the best schools will be more attractive for foreign students, but due to the mostly used financing mechanism of higher education, that quality will cost to the residents of the host country. In economic terms, countries with best higher education will provide the other countries with a positive externality. Conversely, countries might be tempted to free ride their better quality neighbors with the risk that such a process eventually downsizes the global quality of higher education in our part of the world.

The second feature is basically an empirical observation, not unrelated with the first one. Many students from France and possibly from The Netherlands are educated in Belgian higher education institutions at the expense of the Belgian taxpayer. In that sense France free rides Belgium, exporting students whose education is uncompleted and getting back enriched human capital four or five years later; roughly speaking those French students are mostly those who failed at the admittance competition for paramedical or veterinary medicine studies in France. That movement is stimulated by the good quality of higher education in Belgium, as well as by the proximity of language, the unrestricted access – at least initially - and the low level of tuition fees in Belgium. The same process appears between Germany and Austria, especially in medicine, and again the larger country free rides its smaller neighbor. That situation creates imbalances amounting to 4.7 per cent of the total number of higher education students in Belgium, and 4.4 per cent, similarly, in Austria — see below.

That situation also involves the appearance of protectionist behaviors from the local governments, like the introduction of quotas — price discrimination based on citizenship being prohibited with respect to students from the European Union. Imposing quotas is exactly the reverse of what the Bologna process aims to stimulate. (Financing Bologna, the international mobile students in European Higher Education Area, pg. 2)

Olson (2005) underlines the existence of competing visions in Europe, among the university as a service enterprise in competitive markets, the university as an instrument for national political agendas, and the university as a public service model based on the argument that higher education cannot be solely market-driven because the logic of the market does not apply easily to education. He regards the situation as unsettled, given the multitude of partly inconsistent criteria of success and competing understandings of what forms of organization and governance will contribute to good performance. Jacobs and Van der Ploeg (2006) also argue that higher education cannot be left to the market alone and that government interference may be necessary to correct for market failures. In their view, the challenge for reform of the European system is to achieve the diversity and quality for which the U.S. system is praised: choice, differentiation, and competition.

But Europe should not throw away the baby with the bathwater, i.e., it should not only invest in top academic universities but should also maintain and cherish the high average quality of its institutions. Van Vught (2006) is also concerned about the potential for simplistic market-type strategies in relation to the social dimension of higher education. The introduction through public policy of increased competition does not necessarily lead to more responsiveness of higher education institutions to the needs of the knowledge society. Rather than being driven by a competition for consumer needs, higher education institutions are driven by a competition for institutional reputation. In addition, the creation of more institutional autonomy in such a “reputation race” leads to cost explosions, related to hiring the best faculty and attracting the most talented students; institutional hierarchies; and social stratification of the student body. (European Responses to Global Competitiveness, pg. 19)

Challenges:

- Two European universities in the Shanghai top 20
Average spending on students: $10 191 (USA:$22 476)
1.3 % of GDP on HE (2.9 in USA)
Ever-declining share of Nobel prizes
Constrained institutional autonomy
24 % of working-age Europeans have a degree (39% USA) + Aging of the population but lifelong learning and access not always central in institutional strategies (European Higher Education: Key Trends and Challenges, pg. 34)

Magalhães (2001, 112) finds that autonomy does not have exactly the same meaning for the American system and the Western European systems. According to the author, autonomy to the American system “[…] is more than a claim, but a reality. On the contrary, the Western European systems – either continental or British, either Jacobian or Humboldtian […] have taken ‘autonomy’ to mean mainly academic freedom (freedom to teach, freedom to learn, freedom to search for the truth wherever it takes one) the state being not a menace to that exercise but its main guarantee”.

Another perspective is articulated by van Vught (1988), who describes authority in continental Europe as having strong bureaucracy at the top, guild-like authority at the bottom and minimal authority in the middle levels of the hierarchy. The problem in European systems surfaces when decisions are needed. Loosely coupled institutions with strong authority at the bottom find it difficult to reach decisions. Clark (1983, 134) suggests decisions in European HEIs are “produced more by senatorial courtesy than by rectorial muscle.” The vast majority of the European systems are public and therefore dependent on public financing from their governments. Thus, their autonomy can be compromised. Burton Clark (1995) called attention to the fact that autonomy can be exploited from the financial dimension. Some authors suggest that the sources of funding should be diversified in order to protect institutional autonomy (Goedegebuure et al., 1994b). It may, perhaps, be time to discuss the alternative of equipping the academic administrators, before they assume office, with the strategic planning support and leadership skills that will allow them to manage effectively. (The struggle for strategic planning in European higher education: the case of Portugal, pg. 5)

First, there were a number of process issues. It was remarked that some issues are not discussed properly in the decision-making fora in the Bologna Process, because people have different understandings of key terms, e.g. qualifications frameworks. Agenda setting was also criticised by some respondents, because they saw some countries representatives constantly trying to put new issues on the agenda, and in combination with the informality of the process this could lead to the political agenda being set by those who speak most. In the context of the process, some also deplored the loss of continuity that tended to occur because of the rotation of positions in the BFUG, its board and secretariat. Recently, there have been some voices to establish a permanent secretariat.

The second and largest group of comments concerned implementation issues. In particular, in a relatively large set of at least eight interviews the pace of implementation of the Bologna Process was perceived to be too slow in general, though with large diversity across countries. There were different levels of implementation in different countries and within different dimensions, sometimes called implementation à la carte (set of issues mentioned in eight). Implementation of national reforms was not always linked with the Bologna agenda, but with other (domestic) interests. A few interviewees in this context noted that as an international process the Bologna Process of course has no possibility to do more than put peer pressure on countries that do not implement action areas or do not participate fully. (The Bologna Process Independent Assessment, pg. 99)

A third set of perceived weaknesses had to do with the fact that Bologna action areas sometimes reached beyond the area of competence of ministers responsible for higher education, e.g. visas, work permits, pension rights etc., which however would be needed for goal achievement. A link that some would like to see was between the EHEA and the European Research Area (ERA). (Op.cit, pg. 100)

Now that most of the architecture of the EHEA is in place, the crucial step is to make this structure into a reality that is ‘lived and loved’ by teachers and learners, for this is the level where the EHEA is being
created. Regulations and policies can only create the conditions for the actual process of teaching and learning, and the current wave of resistance and protests (even if much of this is directed at issues that are not inherently part of the Bologna Process) shows that the EHEA is not yet sufficiently accepted by learners and teachers as a positive, interesting and challenging project. The strategic idea of creating compatibility of higher education outcomes across Europe appears to be experienced as rules that make higher education more hemmed in by regulations, ‘schoollike’ and with less room for short-term (credit) mobility.

The capstone of the architecture and the bridge to focusing on the compatibility of the outcomes of education should be the national qualifications frameworks (NQF). Their implementation in higher education institutions should make the common goals of the EHEA clearer to teachers and learners, showing a positive gain for teaching and learning. The NQFs are now on the ‘critical path’ of the implementation of the EHEA and their completion by 2012 is necessary to make the EHEA a positive reality by 2020. The 2012 deadline is important, because if it takes on average some three years (until 2015) to adapt curricula to an NQF—some programmes will be due for renewal earlier, others later—, then the first major cohort of learners of the renewed programmes will graduate from the first cycle after three years (2018) and from the second cycle one to two years later (2019–2020). 2020 will then be the year when the EHEA’s content as well as its architecture becomes a reality. (Op.cit, pg. 110)

2.) New Ideas and Recommendations

Government, employers and individuals should see training and upskilling as an investment in a sustainable future, rather than as a cost to be minimised. People’s skills are essential to social and economic success. Employers should encourage their staff to achieve the ‘one step up’. More and better jobs will only be possible if we also raise the demand for skills by raising employer ambition and create a ‘virtuous circle’ where more skills are both available and utilised in the workplace. Working environments need to encourage people to use their potential to the full to the benefit of their work and their own development. Leadership is crucial. (New Skills for New Jobs: Action Now, pg. 9)

Develop and implement cost-efficient approaches to identify and validate prior learning and practical experience, and make this an enforceable element of collective agreements and work contracts. Raise awareness about schemes for recognition and certification and guidance and counseling and assist jobseekers with analyzing their own skills better – including key competences. Improve the integration of existing tools, e.g. develop further Europass, by including enhanced self assessments tools, raising awareness and encouraging its broader use and acceptance across multiple sectors and at all levels of education and training to make qualifications, skills and competences visible. (New Skills for New Jobs: Action Now, pg. 20)

Make greater use and better evaluate the impact of learning accounts or learning vouchers, especially for low-skilled workers, based on the principle of ‘co-investment’ by government, individuals and employers, as appropriate. Use tax relief or lower interest rates on borrowing to provide investment by individuals/employers at preferential rates. Establish co-investment as part of collective agreements and work contracts for people in work, and via counseling/ PES for the unemployed. (Ibid.)

Prioritise guidance and counseling services and motivational support for individuals, improve the quality of these services and ensure that they tackle stereotypes. Publicise in a visible and comparable format on the web the opportunities and offers, as well as the prices and returns, of public and private education and training courses, so that individuals can make informed choices. Further develop in Public Employment Services profiling systems including internet and skill-based matching tools such as the EU tool ‘Match and Map’. (Ibid.)
Enhance skills development policies through public procurement, and promote tax incentives to stimulate targeted investment in low-skilled and older workers, avoiding redundant spending. (*Op.cit*, pg. 21)

Explore further the benefits of treating **capital investments** and **investments in training** on an **equal basis**. Consider knowledge and skills acquired by employees during the course of their duties as adding value to the company, so that part of the expenditure on training and salaries during the training period can be depreciable in tangible fixed assets and transferred accordingly on the balance sheet. (*Ibid.*)

Communicate the benefits of a skilled, adaptable workforce and on how to improve skills utilisation in the workplace, involving key intermediaries such as education and training providers, social partners or PES, and disseminate the results of successful skills investments by companies, for example through awards schemes or other recognition. (*Ibid.*)

Support the further development of **employer collaboration networks** to share information and good practices in skills development and skill use. (*Ibid.*)

Provide better support for SMEs:

a) in leadership/strategic planning and training for management including in **effective skill utilisation**, and b) in training for staff in **effective skill development**. Support SME by building up **regional qualification infrastructure** to enable them to pursue skill upgrading. (*Ibid.*)

Provide the right incentives to intensify **cooperation between the providers of education, training and businesses**. Increase the coherence between instruments and measures such as the definition of curricular standards, including the appropriate formulation of learning outcomes, the mechanisms of assessment, evaluation and managing quality, the training and continuous professional development of educators, and institutional leaders. (*Ibid.*)

Encourage greater **collaboration between education and training providers, employers and professional bodies**, including through partnerships between their national bodies and through national/regional tripartite and/or multi-stakeholder arrangements and bodies wherever they are available. (*Op.cit*, pg. 22)

Ensure the **responsiveness of education and training systems at all levels**, including through legal frameworks, institutional structures and financing mechanisms which facilitate openness, co-funding and stakeholders’ involvement. Encourage employers to co-invest and participate in the activities of education and training institutions in professional or governance and advisory board roles. Develop criteria to measure, monitor and evaluate progress. (*Ibid.*)

Develop **outcome-based qualifications** and a common language between education/training and the world of work, communicate the potential of **European Qualifications Framework** and **national qualification frameworks**, and ensure the involvement of all actors, including PES, employers and social partners. Encourage and facilitate the use of learning outcomes in planning and delivering educational and training programmes at all levels, including higher education institutions. (*Op.cit*, pg. 23)

Adapt pedagogy and training and assessment methods, to align them more clearly to learning outcomes. Make labour market needs analysis and the definition and implementation of appropriate learning outcomes a priority in institutional leadership and strategy, as well as in institutional level information and quality management. (*Ibid.*)

Break down barriers and **widen access to education** for a variety of audiences, including adults and vulnerable groups, through **accreditation of prior learning** and **flexible pathways**. (*Op.cit*, pg. 24)
Develop the integration of the key enabling competences such as creativity, innovation, entrepreneurship, and citizenship, in schools, in higher education and initial and continuous vocational education and training. Develop and provide tools for individual self-assessment.

Embed digital and media literacy at all levels in education and training, and map competences towards a goal of digital fluency for all citizens.

Develop Europe-wide indicators to measure levels of transversal key competences.

Set quantitative targets (e.g. access to entrepreneurship education; or digital literacy), and provide the metrics to monitor progress. *(Op.cit, pg. 25)*

Encourage public-private partnerships to map qualification and competence needs for a low-carbon economy and to design relevant qualification profiles and curricula. Reinforce in teachers’ education curricula ‘work-related’ issues: skills development, entrepreneurship and professional guidance. Ensure that newly qualified teachers come from initial teacher education with the appropriate skills and practical experience in fostering transversal competences; ensure they can engage with digital media across the curriculum and inside and outside of the classroom; re-skill as many existing teachers as possible.

Enhance the recognition of more practice-oriented teacher education programmes. Develop a European competence framework for teachers, monitor its implementation and strengthen the exchange of good practice on teachers’ professional development. Encourage teachers and institutional leaders to spend time in workplaces in industry or other services and apply the experiences made, as it is already the case in vocational education and training. *(Op.cit, pg. 27)*

Strengthen continuing training of teachers, in particular by facilitating placements outside the education and training sector, strengthening communication with enterprises and other users of qualifications. Make similar efforts to develop the skills of other key actors in the ‘learning sector’ such as specialists in pedagogical support, curriculum development, assessment, career guidance and providers of other education related services. *(Op.cit, pg. 28)*

Improve the capacity to anticipate future skill requirements, using a combination of different methods at European and national level in a coordinated way, combining skill supply and demand forecasts with qualitative information on actual skills needed (e.g. EU-wide employer surveys, sectoral studies and scenarios, advisory sectoral bodies and/or groups of experts analysing emerging, evolving and changing occupations and labour market conditions). Ensure good quality statistical data on jobs and skill/competence requirements, especially at EU level. *(Op.cit, pg. 30)*

Create EU sectoral councils, bringing together existing national networks at EU level for the analysis of the skills needs and the development of proposals for updated qualifications in each sector. Encourage the emergence of a new and specific body representing all key stakeholders of the learning sector at EU level. *(Op.cit, pg. 31)*

Share information on surplus and shortages of skills across EU countries, and take it into account in immigration policies, on the basis of the expanding legal framework on admission schemes both at EU and Member State level.

Set clear and transparent rules for the recognition of degrees and qualifications to better recognise migrants’ skills. *(Ibid.)*

We believe that mobility of students, early stage researchers and staff enhances the quality of programmes and excellence in research; it strengthens the academic and cultural internationalization of European higher education. Mobility is important for personal development and employability; it fosters
respect for diversity and a capacity to deal with other cultures. It encourages linguistic pluralism, thus underpinning the multilingual tradition of the European Higher Education Area and it increases cooperation and competition between higher education institutions. Therefore, mobility shall be the hallmark of the European Higher Education Area. We call upon each country to increase mobility, to ensure its high quality and to diversify its types and scope. In 2020, at least 20% of those graduating in the European Higher Education Area should have had a study or training period abroad. (The Bologna Process 2020 – The European Higher Education Area in the new decade, pg. 4)

The implementation of lifelong learning policies requires strong partnerships between public authorities, higher education institutions, students, employers and employees. The European Universities’ Charter on Lifelong Learning developed by the European University Association provides a useful input for defining such partnerships. Successful policies for lifelong learning will include basic principles and procedures for recognition of prior learning on the basis of learning outcomes regardless of whether the knowledge, skills and competences were acquired through formal, non-formal, or informal learning paths. (Op.cit, pg. 3)

Embedding concepts of widening access and lifelong learning in (organizations of tertiary education) institutional strategies. Universities will grasp the opportunity to address lifelong learning centrally in their mission and strategy as part of a wider definition of excellence. The complexity of lifelong learning concepts has to be acknowledged and explored as a key aspect of developing the contribution of universities to a culture of lifelong learning. (European Universities’ Charter on Lifelong Learning, pg. 5)

Providing education and learning to a diversified student population. European universities will respond positively to the increasingly diverse demand from a broad spectrum of students – including post secondary students, adult learners, professionals who seek to up-grade skills for the workplace, senior citizens taking advantage of their increasing longevity to pursue cultural interests, and others – for high quality and relevant higher education throughout their lifetime. European universities recognise the important contribution that a diversified student body will make to the development of a culture of success and innovation in the institution and wider society, and the need to think how far different types of learners can interact together in a supportive mutual learning environment. (Ibid.)

Adapting study programmes to ensure that they are designed to widen participation and attract returning adult learners. Flexible and transparent learning paths need to be in place for all learners to access and succeed in higher education in all its different forms. It is an essential responsibility of universities to ensure that this educational offer is always of high quality. European universities acknowledge the diversity of individual learner needs and therefore their responsibility to adapt programmes and ensure the development of appropriate learning outcomes in a learner-centred perspective. They also pledge to play their part in promoting widening participation and continuing education. (Ibid.)

Providing appropriate guidance and counseling services. Relevant academic and professional guidance, as well as other psychological counseling, should be available for all qualified potential students when needed. This support should be relevant to learners of all ages, and from all social and cultural backgrounds. (Ibid.)

Recognising prior learning. To ensure that all with the potential to benefit from higher education provision are enabled to do so, it is essential for universities to develop systems to assess and recognise all forms of prior learning. This is particularly important in the context of lifelong learning in a global era where knowledge is acquired in many different forms and places. (Op.cit, pg. 6)

Embracing lifelong learning in quality culture. Europe’s universities have taken important steps in developing internal quality culture, assuming prime responsibility for the quality of their provision. This work will adapt to an evolving framework for lifelong learning in order to ensure that an appropriate range of targeted learner support services are provided for increasing numbers of more diverse learners. (Ibid.)
Strengthening the relationship between research, teaching and innovation in a perspective of lifelong learning. Universities’ research and innovation missions can be strengthened through lifelong learning strategies, and universities’ specific contribution to lifelong learning should be underpinned by research. Researchers should also be recognised as a fine example of lifelong learners whose own educational needs are continually evolving, also taking account of the changing skills required by the labour market. Lifelong learning can also be a source of new research methodologies and topics. (Ibid.)

Consolidating reforms to promote a flexible and creative learning environment for all students. In creating the European higher education and research areas, Europe’s universities are engaged on a path of major reforms that places all learners at the centre. Universities now need to exploit the potential of these reform processes and their tools (ECTS, Diploma Supplement, European Standards and Guidelines for Quality Assurance, Qualifications Frameworks, etc) to enhance the development of a creative lifelong learning environment that is open to a more diverse population of learners, and thus responds to societal needs for the modernisation of higher education. Fully integrating lifelong learning to the mission of universities is essential to enhance the creativity and innovation profiles of institutions. (Ibid.)

Developing partnerships at local, regional, national and international level to provide attractive and relevant programmes. Providing relevant educational provision in a lifelong learning context cannot be done by institutions on their own. The need for structured partnerships – with a range of other educational institutions, employers, employees’ organizations (trade unions) as well as with other stakeholders – is essential if provision is to be responsive, flexible and innovative. (Op.cit, pg. 7)

Acting as role models of lifelong learning institutions. Universities are not only providers of higher education and research, but also major employers in their own right. They therefore have the potential to act as role models in society by offering lifelong learning opportunities for their own employees – whether academic, administrative or technical and auxiliary staff. They should also be key actors in lobbying for coherent policy development in national systems. (Ibid.)

Recognising the university contribution to lifelong learning as a major benefit to individuals and society. Governments have a responsibility to ensure that universities are valued for their contribution to lifelong learning, and that this is not perceived as a minor addition to the roles of universities. It is a major cultural shift to respond to the demands of a fast evolving lifelong learning society and of long-term labour market needs, and requires significant financial investment. (Op.cit, pg. 8)

Promoting social equity and an inclusive learning society. Governments should make efforts to ensure that lifelong learning achievements are valued by individuals, public and private employers and other actors, and that a culture of learning throughout life is shared as a common societal goal. Citizens need to be provided with information on accessing lifelong learning educational opportunities, while Europe’s universities need to be supported to ensure that such opportunities are open to all who have the potential to benefit from higher education at whatever time in their life is appropriate. (Ibid.)

Including lifelong learning objectives in the missions and work of national QA agencies and systems. Most countries have now developed quality assurance systems for higher education that have a major impact on the nature of programmes developed. Attention to issues of lifelong learning in quality assurance processes is therefore a necessity to ensure that lifelong learning is recognised as a national priority. (Ibid.)

Supporting the development of appropriate guidance and counseling services. Professional academic guidance, careers advice and welfare services are essential for all learners to find their way successfully through the more flexible provision that is being developed by universities, but particularly important to those individuals most at risk of failing to complete higher education programmes and who
have little support from family, friends and colleagues. Irrespective of whether services are delivered within or outside higher education institutions, **governments have a responsibility to ensure high professional standards**. Governments also need to **ensure that guidance, careers and counselling services are linked up in a lifelong learning perspective** to provide continuous support to citizens at all levels of education. This support should be relevant to students of all ages, and from all social and cultural backgrounds. *(Ibid.)*

**Recognising prior learning.** Governments have the responsibility to support and motivate institutions in the recognition of all forms of prior learning. This task can be facilitated through the provision of appropriate incentives to institutions, and by ensuring full integration of prior learning in qualification frameworks. *(Op.cit, pg. 9)*

**Removing specific legal obstacles that prevent many potential learners from returning to higher education.** Governments should address the systemic obstacles that discourage many potential learners from taking advantage of lifelong learning opportunities. This means taking action on matters such as social security rights, precariousness of employment rights, lack of financial support for lifelong learning, and loss of pension contributions during periods of study. *(Ibid.)*

**Ensuring autonomy and developing incentives for lifelong learning universities.** Governments have a responsibility to ensure that universities have sufficient autonomy to develop their own responses to lifelong learning challenges and to decide their own admission requirements, but also sufficient incentives to be rewarded for pursuing this key mission. Major progress in developing lifelong learning provision can only take place if such a framework of autonomy with incentives is achieved. *(Ibid.)*

**Encouraging partnerships at regional level with local authorities, employers and agencies.** The benefits of high quality lifelong learning provision will largely be realised in Europe’s regions, and regional development agencies, local employers, as well as employees’ organisations (unions) therefore have a high stake in this agenda. Regional partnerships with higher education institutions and social partners need to be strengthened as they are vital to the successful planning and delivery of lifelong learning educational services. *(Ibid.)*

**Acting as role models of lifelong learning institutions.** Like universities, governments can set standards in society by acting as role models for the policies that they advocate. Governments should ensure that **public sector employees therefore are encouraged to benefit from the range of lifelong learning opportunities** offered by the universities and other providers. *(Op.cit, pg. 10)*

Exactly the same master title can be obtained in one institution after a study programme of 60 ECTS credits, while in another institution, sometimes even in the same country, twice the study load is required, and in a third case the same title can be obtained by subscribing to an accredited distance learning programme without ever entering a higher education institution. Master thesis work is found to vary from active participation in scientific research to a simple literature study. While the Dublin descriptors stipulate that master qualifications imply the capacity to enter doctoral studies, in practice some master degrees are indeed considered a sufficient prerequisite for doctoral studies while others, with – on paper - virtually the same title and intended learning outcomes, are not. Among those one typically finds the professional master programmes that exist in some countries and short specialisation master programmes offered at different locations. Several higher education institutions apparently use the principle that every post-bachelor programme has to lead to a master degree.

This is certainly no plea to limit diversity and to standardise master curricula. Coimbra Group Universities are strong supporters of diversity in study programmes. There is a clear need, however, for **transparency in this diversity** and for quality assessment based on achieved learning outcomes rather than intended ones. In asking for this, the Coimbra Group Universities are not in favour of creating more bureaucratic evaluation processes, on the contrary. They suggest that:
- the forthcoming National Qualification Frameworks clearly differentiate standard three-cycle education from other learning provisions, which do not lead by themselves to one of the three-cycles’ degrees, but which – being “self-consistent educational segments” – may become an element of alternative learning paths according to precisely stipulated rules. These latter paths are clearly relevant in a lifelong learning perspective as well as in fostering the so-called “knowledge society”.

- the existing quality assessments focus on adequate in-depth level measurements rather than checking whether institutions provide the appropriate sentences on paper about the level of their study programmes. The quality assurance agencies have to focus on contents rather than procedures and have to be genuinely independent and not semi-independent from governments or universities as too often appears to be the case. The international character of evaluation panels should be the rule rather than the exception in assessments, to guarantee that the same level requirements are valid beyond national borders. On the other hand, external quality assurance agencies also ought to diversify their assessment procedures, so that, based on proven merit, particular institutions can be considered quasi self-accrediting institutions and serve as standards.

The inevitable outcome of more thorough master level assessments will probably be that some of the present master degrees have to be transformed into postgraduate certificates for bachelors. (The Coimbra Group and European Higher Education after Bologna 2010, pg. 3)

The Coimbra Group feels that the time is now ripe for major initiatives:

a) To promote a numerical increase in exchanges, adequately responding to the EC numerical targets and actions, which become more and more ambitious; as suggested in EU documents: “the long term target is for mobility to become the rule and no longer the exception”, e.g. by introducing a “window for mobility” in all study programmes. Attention should be given to developing the dormant mobility potentials at doctoral and master level. According to our Position Paper on doctoral programmes (Coimbra Group), mobility at doctoral level should become a compulsory ingredient in research training. Cooperation among departments on thesis work carried out by exchange master students may foster reciprocal exchanges of knowledge among research groups and open new co-operation paths. University networks such as the Coimbra Group can clearly be instrumental in promoting increased mobility;

b) To launch a benchmark initiative to set up quality guidelines in mobility programmes, on the basis of indicators of student performance, transparency of recognition procedures, level of language preparation, availability of sound information and orientation. Also here university networks such as the Coimbra Group, with its strong mobility tradition, may act as an important broker;

c) To contribute to concrete quality opportunities for vertical mobility, according to the motto “bachelor cycle at home, master abroad”. Again university networks can promote shared information and knowledge at faculty and degree course level among partner universities, recognise existing convergences at master and doctoral level and favour vertical mobility of students. Within this context benchmarking networks at discipline level can sow the seeds for future coordinated action in mobility. (Ibid.)

Apart from acquiring new knowledge and skills students have to be trained as responsible individuals and mature citizens. Only in this way will future graduates have the skills and the knowledge to contribute to the development of the societies they will enter – to create new enterprises, new jobs, alternative ways of solving problems, function in multi-cultural environments, etc. “Employability” is about the social role of future graduates, not the short-sighted fulfilment of today’s labour market needs. The present economic crisis only further underlines the need to have a clear focus on how diverse and multifaceted, creative and entrepreneurial the future graduates need to be. Universities train people to think, to synthesise, to combine, to analyse – they train tomorrow’s inventive, responsible entrepreneurs. Universities should not focus exclusively on delivering experts with immediately useful knowledge as there are far greater challenges for European universities than just
contributing to the knowledge society and the economy. Universities should remain safe and free havens for the development of visionaries and for research without any apparent and/or immediate economic benefit. *(Op. cit, pg. 7)*

Furthermore, ECA agrees that **studying the impact of quality assurance on higher education** and measuring its influence on learning and teaching is important. Such impact studies should assess the value of both external and internal quality assurance measures, since the final goal of all quality assurance is to further develop and enhance the quality of teaching and research. Consequently, no quality assurance procedure should be an end in itself.

ECA is completely in line with the principle of recognising diversity in the approaches to quality assurance as one of the main shared principles of the European Standards and Guidelines. After years of intense activity, however, ECA has ascertained that there are more similarities than differences in the practical work of quality assurance and accreditation agencies. ECA members have learned to build on these similarities to pursue common goals. The convergence of quality assurance methodologies based on common principles will also be the key for future constructive international cooperation and mutual recognition. *(ECA Position Paper on the BFUG "Bologna Beyond 2010" Report, pg. 2)*

A survey of national Rectors’ Conferences and university associations across Europe indicates that the following topics need particular attention:

- The proper implementation of ECTS & the introduction of modules;
- Consolidating the basic framework conditions for joint and double degrees;
- Improving recognition of prior learning, study periods and degrees;
- Ensuring that newly introduced bachelor and Master programme are sufficiently flexible to allow for student mobility as well as removing obstacles to mobility both of students and staff (e.g. portability of grants and pensions etc.);
- The introduction of national QFs and the tuning of QFs between systems and at different levels;
- Pursuing the discussion on employability – with special emphasis on the role of the bachelor on the labour market – while also balancing employability goals with the other purposes of HE. *(EUA policy position: The future of the Bologna Process post 2010, pg. 1)*

1. **Consolidating Europe’s broad base of research based higher education:** Reaffirming the essential link between higher education and research as a hallmark of European higher education and a determining factor of the competitiveness of Europe and European universities in the future. **This in turn requires connecting more closely the European Higher Education and Research Areas.** Success in bringing these two processes closer together will enhance the attractiveness of European higher education and strengthen considerably the European dimension. This requires:

   - encouraging universities to develop further their own specific and increasingly varied research and innovation profiles in line with their own (increasingly differentiated) missions;
   - maintaining the momentum in the ongoing reform of doctoral education
   - developing better career opportunities for young researchers
   - removing obstacles to mobility and overcoming national fragmentation so as to promote Europe wide opportunities for teachers and researchers at all stages in their careers (career structures, recruitment, pension rights, visa issues, link to charter & code etc…). *(Op. cit, pg. 2)*

2. **Providing more education to more people:** responsive and flexible universities: ensuring that at least 50% of each age cohort has access to high education. This requires:
• a new pact/consensus on lifelong learning based upon the commitments made in the Lifelong Learning Charter for Europe's universities – in order to address the needs of an ever more diverse student population (flexibility of learning paths, recognition of informal learning, customising the educational offer etc.
• increasing the permeability of systems by addressing related social questions (tuition fees, benefits, study grants/other financial aid)
• improving understanding and making better use of diversity (at institutional and programme level and in respect of the student body, while also taking account of the requirements of, and the demand for different disciplines, and the need to develop interdisciplinarity) *(Ibid.)*

3. Redefining public responsibility: the new challenges facing higher education, along with the increased autonomy that allows universities to respond better to societal demands, means that the role of the state and the relationship between public responsibility and institutional autonomy needs to be reconsidered in respect of:

• responsibility for quality,
• appropriate and sustainable funding,
• governance issues,
• the growth of private providers & the need for coherent systems of HE,
• the need to strive for parity of esteem by promoting excellence in relation to a variety of different institutional missions. *(Ibid.)*

4. Fit to face global challenges: The global engagement of the European Higher Education Area and the way in which European universities cooperate and compete on the global stage is a cross cutting priority that will be of major importance in the next decade. This requires:

• promoting 'European' internationalisation by considering incentives for enhancing the internationalisation of European universities based upon the Bologna tools and instruments developed over the last decade,
• strengthening degree mobility, in particular at master and doctoral level while maintaining existing levels of mobility within degree programmes;
• improving understanding of the relationship between the European and the global dimension by analysing:
  - where local, national, European and international agendas are becoming blurred (e.g. in research, with the global competition for researchers, which impacts on doctoral programmes, or in relation to transnational education, with Europe as both a provider and a consumer);
  - the extent to which the international dimension will grow in importance in the future, including: an analysis of the macroeconomic benefits of higher education, of the impact on national and institutional strategies, and of the need for more coherent policies and frameworks at European level. *(Op.cit, pg. 3)*

Funding higher education will become increasingly more challenging due to the relentless operation of Baumol's cost disease. If the EU has to make an effort to bridge its funding gap on higher education, be it public or private, this can only be realized if at the same time the governance of the higher education system is tackled. This is necessary to increase the efficiency of spending by these organizations, thereby delivering results. *To attract more funding, universities first need to convince stakeholders - governments, companies, tax payers and above all students – that existing resources are efficiently used and would produce added value for them. Higher funding cannot be justified without profound change. Providing for such change is the main justification and prime purpose*
for fresh investment. Given the prevalence of overlong study durations, high dropout rates and/or graduate unemployment in Europe, investing more in the current system could be perceived as unproductive or even counter-productive. Yet combined under-funding and system rigidities are so acute in some countries of the EU that they impede the reform process at universities, who are consequently trapped in a vicious circle. If Member States are to break this vicious circle, they need to combine more and better targeted funding simultaneously with reforms of the supply side, thus creating the necessary conditions to enable universities to improve their performance, to modernize themselves and become more competitive. This implies granting universities much more autonomy while at the same time demanding them to be more accountable for delivering results. (Higher Education Reform and the Renewed Lisbon Strategy: Role of Member States and the European Commission, pg. 14)

More competition among universities

In response to scarcer public budgets, a rationalization of the supply side of the higher education market has taken place. The resulting increase in the scale of universities has however generated the danger of creating (local) public monopolies. The enormous increases in scale and monopolistic practices have gone hand in hand with huge increases in overhead and capital expenditures leading to substantial falls in resources for teaching. Such monopolies reduce quality (‘grade inflation’), ignore demand of students and employers, and increase overhead costs. Monopolistic price setting drives up tuition fees and lowers quantity and quality of supply of education, especially if the price elasticity of demand is low.

Barriers to enter the market for higher education should be lowered by abolishing historical funding and barring cross-subsidies that hinder fair competition. Both private and public universities are better able to compete if subsidies are allocated directly to students through vouchers/grants. Students can spend the vouchers on the institution and courses of their preference. A level playing field can open national markets to the international environment, especially if students can get student loans for study abroad and can spend their vouchers abroad.

To make the higher education market more transparent, it helps if an independent authority publishes yearly performance criteria of universities. These criteria should cover dropout rates, average enrolment durations, average exam marks, student evaluations, quality of scientific publications, evaluations of independent scientific committees, graduate performance in the job market, etc. (Op.cit, pg. 18)

Care must be taken not to base governance on the model used in commercial business enterprises. Governance should take account of the fact that universities consist of professionals. Too much external incentives can crowd out intrinsic motivation. Supervisory boards consisting of captains of industry have little affinity with university life and may well be counter-productive.

A pivotal area of university management is personnel management. Human resources are a core determinant of quality in higher education and research. Universities must therefore work to enhance their human potential, both qualitatively and quantitatively, by attracting, developing and keeping talent in the teaching/research career. Excellence can only emerge from a favourable professional environment based in particular on open, transparent and competitive procedures. Vacancies for professors and researchers should be advertised publicly, and internationally. Researchers should be treated as professionals from the early stages of their career. Mobility across national border and between university and industry should be nurtured. Compensation should reward quality and achievement in the performance of all tasks. (Op.cit, pg. 21)

The Commission should urge national decision makers in all ministries to acknowledge that closing the severe funding deficit in higher education is a core condition for achieving the Lisbon Strategy.
However, the mix of public and private funding and the mix of basic, competitive and output-related funding will remain different between countries to reflect the diversity of cultures, economies and university traditions within Europe.

The funding available directly at the EU level for education and research at universities is negligible compared to funding from Member States. Nevertheless, it can play a catalyzing role for enhancing the use of national resources and stimulating the quality of higher education in the EU. The mechanisms within the Financial Perspectives 2007-2013 include not only the Funds for “Competitiveness for Growth & Employment” programmes (the 7th EU Framework Programme for R&D, Lifelong Learning Programmes & Erasmus, Competitiveness and Innovation Programme), but also the Structural & Cohesion Funds. And also the EIB can provide an important financial impetus for higher education in Europe. (Op.cit, pg. 23)

It turns out that the cost of EU foreign students is supported by the host country. That cost will go up with the expected increasing mobility of students: countries made attractive by the high quality of their higher education will have to finance an increasing inflow of foreign students and thus to subsidize the enrichment of human capital of other countries. Such a situation, through the externalities generated, can involve inefficiencies, the adoption of restrictive behaviors by governments and an underprovision of publicly funded higher education — see the survey of the literature above. Indeed, countries which experiment imbalances — those who welcome a relatively larger number of students from abroad than the number of their nationals that they send abroad, like Austria and Belgium — tend to turn the prohibition of price discrimination through the adoption of quantitative quotas.

In line with the Bologna philosophy we propose to move from a system where the local public authorities are responsible for the financing of the studies supplied on their territory to a system where those authorities are responsible for the financing of the studies demanded by the students from their territory.

To fix the ideas we may consider as students from a territory those who have obtained their previous degree (high school, bachelor) on that territory after spending some years of studies in that territory.

**Financing the students can take the form of issuing two-part portable vouchers.**

*Financing Bologna, the international mobile students in European Higher Education Area, pg. 10*

The mechanism that we suggest and discuss consists for the origin country to provide his and her students with a two-part portable voucher. The first part of the voucher intends to cover the true cost of studies and might be regarded as a tuition fee voucher; it may be used in any higher education institution of a defined international area — say the EU or the Bologna area — provided it is used in the field of studies for which it is dedicated and in a school whose quality has been recognized by the country of origin, possibly through a network of certification. The second part of the voucher is dedicated to finance the cost of living at home or abroad, and can be called a student support voucher. That part might be modulated to take into account dissimilarities in costs of living, or to favour targeted groups of students or fields of studies, or still to compensate extra costs related to the family situation of the student. In short one can say that the second part of the voucher might be equity or fairness-oriented.

The combination of the two parts of the voucher makes it an interesting tool to monitor the choice of the studies, and thus of the careers, as well as to favour a more democratic access to higher education.

**Vouchers can either be provided for free, or they can take the form of a loan, or of a mix of a grant and a loan.** This is up to the origin government to take decision in that matter. However, as long as students going abroad come back home after the completion of their studies and then spend their career time in their country of origin, providing vouchers for free might be justified. In contrast, when the mobility of graduates increases, so that the market for graduates becomes Bologna-wide or EU-wide actually, completing the system of vouchers by turning them from grants to loans in proportion of the time spent...
working abroad or by introducing a system of Bhagwati tax to compensate the country of origin is more efficient. Its practicability will depend on the integration of the Bologna or otherwise defined area. (Op.cit, pg. 25)

The social dimension in the home country of the student

- Quality higher education should be equally accessible to all (Berlin and Bergen Communiqués)
- Students should have appropriate studying and living conditions, so that they can complete their studies within an appropriate period of time without obstacles related to their social and economic background (Berlin and Bergen Communiqués)
- Opportunities for all citizens, in accordance with their aspirations and abilities, to follow the lifelong learning paths into and within higher education should be improved (Sorbonne Declaration and Berlin Communiqué)
- Governments should take measures to provide students with guidance and counselling services with a view to widening access (Bergen Communiqué)
- Students are full partners in higher education governance and should participate in and influence the organisation and content of higher education (Prague and Berlin Communiqués)
- Governments should take measures to help students, especially from socially disadvantaged groups, in financial and economic aspects with a view to widening access (Bergen Communiqué)

The social dimension of mobility

- Ministers should take measures to facilitate the portability of national loans and grants (Berlin and Bergen Communiqués)
- Mobility should be promoted by overcoming obstacles to the effective exercise of free movement with particular attention to:
  - for students, access to study and training opportunities and to related services
  - for teachers, researchers and administrative staff, recognition and valorisation of periods spent in a European context researching, teaching and training, without prejudicing their statutory rights (Bologna Declaration) (Key issues for the European Higher Education Area – Social Dimension and Mobility, pg. 25)

One of the main aims of the Bologna Process is to promote citizens’ mobility. Within the Process the Ministers have agreed to implement a number of actions to facilitate mobility for example the creation of easily readable and comparable degrees through the full use of tools aimed at facilitating recognition, the development of national action plans to improve the quality of the recognition process, the adoption of a system based on three main cycles and an overarching framework for qualifications of the European Higher Education Area, the establishment of a system of credits (eg ECTS) for the transfer and accumulation of credits applied consistently throughout the EHEA, the portability of national loans and grants, the facilitation of the delivery of visa and work permits and the encouragement of increased participation in mobility programmes. Other commitments within the Process either relate to the promotion of mobility in a less visible way or are expressed in a more general manner such as “overcoming obstacles to the effective exercise of free movement” or the emphasis on the social dimension of mobility. Obstacles to mobility vary depending on who you are, what your family situation is, how and where you live, what the purpose of mobility is, different systems for higher education and incentives for promoting mobility periods etc.
III. Entrepreneurship Education

1.) Concepts, State of Play and Potential of Entrepreneurial Education

Entrepreneurship refers to an individual’s ability to turn ideas into action. It includes creativity, innovation and risk taking, as well as the ability to plan and manage projects in order to achieve objectives. This supports everyone in day-to-day life at home and in society, makes employees more aware of the context of their work and better able to seize opportunities, and it provides a foundation for entrepreneurs to establish a social or commercial activity. (“Effects and impact of entrepreneurship programmes in higher education”, pg. 7)

According to the Key Competence Framework put forth in 2006 by EU: The overall goal of entrepreneurship education is to give students the attitudes, knowledge and skills to act in an entrepreneurial way, for either a commercial or non-commercial objective. (Rethinking education: investing in skills for better socio-economic outcomes, pg. 39)

Entrepreneurship education should not be confused with general business or economic studies, as its goal is to promote creativity, innovation and self-employment. In this project, it was therefore agreed that existing activities and programmes qualify as education for entrepreneurship if they include at least two of the following elements:

a) Developing those personal attributes and generally applicable (horizontal) skills that form the basis of an entrepreneurial mindset and behaviour;

b) Raising students’ awareness of self-employment and entrepreneurship as possible career options;

c) Work on practical enterprise projects and activities, for instance students running minicompanies;

d) Providing specific business skills and knowledge of how to start and successfully run a company. (Entrepreneurship in Vocational Education and Training, pg. 10)

Entrepreneurship is the individual’s ability to translate ideas into action. It encompasses creativity, innovativeness and risk-taking, as well as ability to plan and direct action towards the achievement of goals. Entrepreneurship education mainly refers to wide-ranging work within the educational administration with a view to enhancing entrepreneurship. It is provided and supported by many educational institutions, labor market parties and organizations. Entrepreneurship education is rooted in lifelong learning and a networked mode of operation. (“Entrepreneurship education in the Nordic countries: Strategy implementation and good practices”, pg. 4)

Core to the development of indicators and benchmarks for entrepreneurship education remains the issue of definition. There has been an inherent lack of a common definition – with scholars using the terms, for example, entrepreneurship education, enterprise education and entrepreneurial education interchangeably within the academic literature – but recent years has seen the emergence of common understandings.

In a recent review of the literature on entrepreneurship education, Mwasalwiba (2010) found that scholars most commonly define entrepreneurship education as some kind of educational (or training process) that is aimed at influencing individuals’ attitudes, behaviour, values or intentions towards entrepreneurship, either as a possible career or to enhance among them an appreciation of its role in the community (i.e. creating an entrepreneurial society). Significantly, though he found relative agreement that the major rationale for entrepreneurship education is more economic than social (with entrepreneurship seen as a panacea to a range of economic problems, especially employment), there has been a partial convergence towards a behavioural view of an entrepreneur with entrepreneurship education seeking principally to influence attitudes, values and the general community culture. In this way, scholars are reluctant to
associate entrepreneurship education strictly with new venture creation as a sole educational objective.

This distinction between entrepreneurial attitudes, values and behaviour in contrast to skills is similarly reflected in the recent OECD review of entrepreneurship education which divided the multiplicity of entrepreneurship education activity into **three separate (but overlapping) categories** on the basis of overarching aims and objectives:

- **The acquisition of key (or core) skills**: these may relate to literacy, numeracy, communications, ICT and problem solving. They represent the fundamental requirements for operating effectively in a working environment, and for career planning and the process of identifying and accessing appropriate work opportunities;
- **The development of personal and social skills**: a whole raft of skill areas or personal attributes may be subsumed within this category, including: team working; self-confidence; self-awareness; risk taking; problem solving; creativity; and the desire to innovate; and,
- **Skills relating to business start-up or financial literacy**: such as drafting business plans, marketing, financial management, sales, and human resource management. Participants often undertake an exercise in setting up and running their own company. In some programmes, the inclusion of a financial element enables participants to develop the ability to plan personal and family budgets.

Most recently, High Level Reflection Panels convened by DG Enterprise and DG Education and Culture to inform the 2010 report ‘Towards Greater Cooperation and Coherence in Entrepreneurship Education’ have found a broad consensus between Member States on the aims and objectives of entrepreneurship education.

Stakeholders were clear that entrepreneurship education should develop both **general competences** (for example, self-confidence, adaptability, risk-assessment, creativity, etc.) and **specific business skills and knowledge** creation. Thus, entrepreneurship education is seen as comprising a dual approach:

- It can be **‘mainstreamed’ into the curriculum, at all levels**, where it tends to focus on general competences such as creativity, initiative and self-reliance; and,
- It can be taught as a **component of a separate subject, typically from the upper secondary level onwards**. It tends to have a stronger focus on learning the skills and know-how of setting up and running a business and to be an **elective rather than mandatory part** of the curriculum.

Stakeholders also recognised the substantial implications for how entrepreneurship education is currently delivered across Europe, including the need for a more structured and systematic approach to its delivery within and across national education systems. This implication contrasted with the very uneven landscape across countries, municipalities, schools, lecture theatres and classrooms noted by the Panel and, ultimately, a significant need for Member States to **embed and deepen implementation of entrepreneurship education**. *(Order 121 - Study on Support to Indicators on Entrepreneurship Education, pg. 10)*

Much debate surrounds the meaning of entrepreneurship education, and different definitions can apply in different countries and at different levels and phases of education. Recent thinking has shown that **narrow definitions** based around preparing learners for the world of business **may place limitations on both learners and the teaching community**. Instead a broader definition which sees entrepreneurship education as a process through which learners acquire a broad set of competencies can bring greater individual, social and economic benefits since the competences acquired lend themselves to application in every aspect of people’s lives. Entrepreneurship in this sense refers to an individual’s ability to turn ideas into action. It includes creativity, innovation, showing initiative and risk-taking, as well as the ability to plan and manage projects in order to achieve objectives. This supports everyone in day-to-day life at home and in society, makes employees more aware of the context of their work and better able to seize opportunities, and provides a foundation for entrepreneurs establishing a social or commercial activity.
Entrepreneurship education is thus about life-wide as well as lifelong competence development. As well as contributing to European competitiveness, entrepreneurship education also helps to ensure a number of positive social benefits. The entrepreneurship key competence plays a vital role in Europe 2020 as a consequence. (Entrepreneurship Education: Enabling Teachers as a Critical Success Factor, pg. 2)

Equally it was evident from the discussions at the Symposium that alongside the entrepreneurial teacher it is also important to see the development of the entrepreneurial school. Indeed, the entrepreneurial teacher and the entrepreneurial school are in practice inseparable if we wish to see entrepreneurship education available for every student in every school. As was noted in the 2010 European Commission report, Towards Greater Cooperation and Coherence in entrepreneurship education, progress in the field has thus far tended to depend too much on the individual entrepreneurial teacher. Without entrepreneurial schools we shall never establish an institutional framework through which entrepreneurship education can be fully implemented and sustained. In the following sections we therefore look at two key objectives: the qualities of the entrepreneurial teacher and of the entrepreneurial school. (Entrepreneurship Education: Enabling Teachers as a Critical Success Factor, pg. 7)

The fourth long term objective of ET 2020 is to enhance creativity and innovation, including entrepreneurship, at all levels of education and training. The importance of entrepreneurship education is also visible in the Europe 2020 Strategy where the need to embed creativity, innovation and entrepreneurship into the education systems is highlighted in three flagships: Youth on the Move, An Agenda for New Skills and Jobs, and Innovation Union. Results from a 2011 survey on entrepreneurship education show that 23 EU Member States have current strategies or on-going initiatives addressing the implementation of entrepreneurship education into general education at primary and/or secondary level. Specific strategies/action plans focused exclusively on the integration of entrepreneurship education are found in Sweden, Denmark, the Netherlands, the UK (Wales), Estonia and Lithuania. The survey also looks at whether entrepreneurship education is explicitly recognised in central level educational steering documents. Such recognition is found in two thirds of the EU27 countries at primary level and at upper secondary level all Member States integrate entrepreneurship into the curriculum in some form.

At secondary level most countries have defined learning outcomes for entrepreneurship education, in many countries covering all three dimensions: attitudes, knowledge and skills. No country has learning outcomes linked only to entrepreneurial skills. There is currently a lack of international data providing comparable measurements of entrepreneurship as a key competence. Most available data apply to a narrower understanding of entrepreneurship, i.e. linked to business start-ups, and do not allow conclusions on the role of entrepreneurship education for such start-ups. (Rethinking education: investing in skills for better socio-economic outcomes, pg. 39)

The demand for entrepreneurial learning has been and is still steadily increasing. However, there are a number of obstacles hindering the implementation of entrepreneurship education. For one, there is a shortage of human resources and funding for this type of education; therefore it is not possible to meet this demand fully. Action-oriented teaching is labour-intensive and costly, and requires specific training. Also due to the historic development, where entrepreneurship education often started as a course on small business management and it evolved from the business school setting; there has been a tendency in academic/teaching communities to perceive entrepreneurship education exclusively with learning how to start and run a business. Some academics find this entrepreneurship endeavor to be at odds with the general objectives of higher education institutions and therefore they are reluctant to engage in entrepreneurship education. More insight into the impact of entrepreneurship education can contribute to overcome these obstacles. (“Effects and impact of entrepreneurship programmes in higher education”, pg. 23)

The elements in entrepreneurship education
Primary education determines to a large extent the entrepreneurial mindset of people, whereas at a higher educational level one of the main purposes of entrepreneurship education is to develop entrepreneurial skills.

Entrepreneurship education will include at least one or more of the following elements:

1. Foster those personal attitudes and skills that form the basis of an entrepreneurial mindset and behaviour (creativity, risk propensity, self-confidence, independence, etc.);
2. Raise awareness of students about self-employment and entrepreneurship as possible career options;
3. Use practice-based methods, where students are involved in project work and/or in activities outside the classroom (linking them with the business world or with the local community);
4. Provide basic business skills for self-employment or self-management, and knowledge of how to start and develop a commercial or social venture successfully.

Entrepreneurship education should not be confused with general business and economic studies, as its goal is to promote creativity, innovation and self-employment. Entrepreneurial programmes offer students the tools to think creatively, to be an effective problem solver, and to communicate, to network and to lead. Entrepreneurship is not necessarily a topic - it is also a different way of teaching and of helping young people to fully develop their potential. ("Effects and impact of entrepreneurship programmes in higher education", pg. 44)

To establish entrepreneurship education as a clear and defined entitlement for all pupils, a range of strategies and procedures can be used, e.g. an agreed list of annual activities, specific timetabling, use of a pupil diary, a school schedule, etc. Reference to entrepreneurship education should appear through explicit references in a number of curriculum policies.
The entrepreneurial school would also be clear as to how entrepreneurship should be introduced to pupils, discussing it with them well before activities take place. It is part of the ethos of entrepreneurship education that pupils are made aware of why they are involved in entrepreneurship activities, and of the intended learning outcomes and longer term benefits of developing entrepreneurship capabilities. All entrepreneurship education activities should be preceded by a structured briefing in which the purposes of the activity are explained and the intended learning outcomes are defined, emphasising the applicability of entrepreneurial skills throughout life, not just at work, and also the ethical aspects.

The entrepreneurial school would explicitly identify time for entrepreneurship education in the school timetable. This would include time identified within the 'normal' curriculum across a broad range of subject areas, and also opportunities created through collapsing the timetable, operating 'themed' sessions and, in addition, extra-curricular activities.

Entrepreneurship education activities in the school would aim to develop the full range of entrepreneurship capabilities and pupils would be increasingly encouraged to take on responsibility for their own learning. Entrepreneurship education activities would require pupils to apply decision-making and problem-solving skills, to work as part of a team and to get involved in 'supported' risk-taking and learning activities that incorporate the possibility of failure. Entrepreneurship education activities would be adequately varied to allow for the preferred learning styles of different pupils/students.

An entrepreneurial school would also make sure that it uses student assessment methods that are appropriate to assessing transversal skills and attitudes like those involved in entrepreneurship. Such methods can differ markedly from those that are often used which are designed mainly to assess knowledge acquisition. They are critical to ensuring teachers have the incentive to engage in entrepreneurship education. ("Entrepreneurship Education: Enabling Teachers as a Critical Success Factor", pg. 44)

The Commission, within the Small Business Act, will:

• By the end of 2010, launch a proposal to extend and transform the Preparatory Action Erasmus for Young Entrepreneurs (EYE) into a permanent programme.

• Support specific teacher-training programmes as well as the exchange of best practice to develop teachers' training in entrepreneurship, and launch a policy handbook on entrepreneurship education in order to enhance the spread, impact and quality of entrepreneurship education in Europe. ("An Agenda for new skills and jobs: A European contribution towards full employment", pg. 19)

The model sets out four sequential stages from 'pre-strategy' through to 'mainstreaming' and specifies in detail the required steps to be taken for: national strategy and frameworks; schools; teachers; regional and local authorities; and businesses private associations and organisations.

The model foresees:

• a conceptual shift from entrepreneurship education as 'how to run a business' to how to develop a general set of competences applicable in all walks of life, and experience their application at school; and from being a curriculum 'add on' mainly available at upper secondary level to being an integral part of the curriculum at all stages;

• the development of a vision shared at national level by all the key stakeholders, with learning outcomes, and objectives, targets and indicators, with enhanced mechanisms for interministerial cooperation and social partner involvement; and

• the key role for developing more systematic and sustainable approaches being taken by teachers, schools, and businesses at local level supported by private associations and

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organisations and by local, regional and national support infrastructures involving teacher training, teaching resources and tools, mechanisms to share good practice, clusters and partnerships. (“Towards Greater Cooperation and Coherence in Entrepreneurship Education”, pg. iii)

Since the 2006 Communication "Fostering entrepreneurial mindsets through education and learning", the Commission in cooperation with Member States had identified the need for strong and well organised cooperation between relevant ministries in order to develop and implement effective entrepreneurship education. In particular, it had shown that progress starts from co-operation between different ministries, especially those responsible for enterprise and for education, while also involving relevant stakeholders from the business world, and should ultimately lead to a coherent and comprehensive approach to entrepreneurship education at all levels. However, despite the 2006 Communication, little progress had been made in this area. In 2008 the Small Business Act for Europe (SBA) increased the momentum for development and intensification of entrepreneurship education, stating:

'The education system, and in particular the school curricula, do not focus enough on entrepreneurship and do not provide the skills which entrepreneurs need. Children can learn to appreciate entrepreneurship from the beginning of their education.'

In Principle I, the SBA identified the need to 'foster entrepreneurial interest and talent', and in particular invited Member States to:

- stimulate innovative and entrepreneurial mindsets among young people by introducing entrepreneurship as a key competence in school curricula, particularly in general secondary education, and ensure that it is correctly reflected in teaching material;
- ensure that the importance of entrepreneurship is correctly reflected in teacher training; and
- step up cooperation with the business community in order to develop systematic strategies for entrepreneurship education at all levels. (“Towards Greater Cooperation and Coherence in Entrepreneurship Education”, pg. 3)

The Decision of the European Parliament and of the Council concerning the European Year of Creativity and Innovation (2008) again highlighted the role of entrepreneurship for personal development, as well as for economic growth and employment, and emphasised the need to foster entrepreneurial mindsets, particularly among young people.

In essence, then, two key goals resulted from the European Commission's work on entrepreneurship education:

- to develop greater co-operation between ministries responsible for entrepreneurship education, and between ministries and other relevant stakeholders; and
- to develop more systematic approaches to the development and delivery of policy and practice in entrepreneurship education. (“Towards Greater Cooperation and Coherence in Entrepreneurship Education”, pg. 4)

Entrepreneurship is included in the national curricula for vocational education in a majority of European countries, at least to some extent. Moreover, some countries report that between 90% and 100% of vocational education students participate in entrepreneurship programmes at some point during their vocational education path. However programmes and activities included in those figures may differ greatly in intensity and effectiveness. In any case, there is in general a perception that there is still a gap to be filled.

Some major reasons for the gap identified are the following:

- entrepreneurship is not included in all parts of the VET system;
- student participation is limited;
teaching methods are ineffective;  
the practical element of entrepreneurship is missing;  
teachers are not fully competent;  
entrepreneurship is not linked to specific training subjects or professions;  
business people are not sufficiently involved.

Therefore, despite some encouraging data, it appears that the uptake and the effectiveness of entrepreneurship education in European vocational schools are still far from being fully satisfactory. A partial lack of competence of teachers is in many cases perceived as a problem, at least as regards their practical experience of entrepreneurship. Improvement is greatly needed in this area. Most countries report that some training courses on entrepreneurship are offered to teachers, but few offer a systematic approach. ("Entrepreneurship in Vocational Education and Training", pg. 7)

Summary of some key findings

- In general, there is in Europe a shortage of entrepreneurship studies within nonbusiness institutions and disciplines: entrepreneurship is not yet sufficiently integrated into different subjects of the curriculum.
- Available data from some European countries show that the majority of entrepreneurship courses are offered in business and economics studies.
- Coverage of entrepreneurship in non-business studies is particularly weak in some of the Member States from central and Eastern Europe that joined the EU in and after 2004.
- While the demand for learning about entrepreneurship is increasing, there is a shortage of human resources and funding for this type of education, making it impossible to meet this demand fully.
- There are currently too few professors of entrepreneurship. There is a need to graduate enough PhD students in entrepreneurship who can become teachers.
- There is very little in terms of incentives to motivate and reward teachers for getting involved in entrepreneurial teaching and activities with students. It is currently difficult to build a career in entrepreneurship, as research remains the main criterion for promotion.
- Increased funding from the government can enforce changes within universities. Policy level changes to funding would have an immediate effect on institutional behaviour and the internal allocation of resources.
- The development and delivery of entrepreneurship is significantly affected by the internal organisational structure of the institution. However, in general terms even current structures can accommodate entrepreneurship education. The main problem is a lack of commitment on the part of decision makers within the institutions.
- Faculties and departments are working quite separately, with too many obstacles for students who want to move and for teachers interested in establishing cross-disciplinary courses. A rigid curriculum structure is often an impediment to an inter-disciplinary approach.
- Although a wide range of methodologies exist — supplementing lectures as the most basic tool of teaching — there seems to be a gap between the methods applied and those that are seen as the most effective and appropriate.
- The use of experience-based teaching methods is crucial to developing entrepreneurial skills and abilities. Traditional educational methods (lectures) do not correlate well with instilling entrepreneurial traits and attributes.
- Methods seen as the most effective are based on “group and team techniques for creating new business ideas”, the use of “case studies” and “business planning workshops”.
- Crossing boundaries between disciplines, and multi-disciplinary collaboration, are essential elements in building entrepreneurial abilities.
- There is a need for greater flexibility in course design. Work placements, alternation between full- and part-time study, the organisation of intensive courses and the accreditation of informal and non-formal learning all have a role to play.
• A challenge lies in **integrating start-up activities into degree studies, as they are currently mostly outside the curriculum and sporadic in nature.** Business incubators exist in many cases outside university, for all starters. It is advisable but not essential for them to be embedded within universities: what is important is that students are linked and directed to them.

• If the business idea and/or innovation is developed inside the university, there will be basic problems as to intellectual property rights and to teachers’ role as civil servants (in some countries the law prevents teachers and researchers from working as entrepreneurs and exploiting innovations developed in the course of their work).

• The degree of **mobility of teachers and researchers** between higher education institutions and business is in **general very low**, and **this practice is not encouraged**. There are in many cases few or no incentives, or even disincentives. For instance, lecturers may be banned from taking part in external commercial activities.

• Although entrepreneurs and business practitioners are in general involved in the teaching, there are few examples of entrepreneurial practitioners engaged in the full curricula experience. Most frequently, they are only engaged in short presentations to students (e.g. as testimonials or guest lecturer) or as judges in competitions.

• European higher education institutions are not sufficiently involved and effective in working with alumni, who can bring back knowledge and also funds.

(“Entrepreneurship in higher education, especially within non-business studies”, pg. 65)

Through years of developing entrepreneurship education, all the Nordic countries have adopted certain common features which distinguish them from other countries. For example, in Asia, the strategy for entrepreneurship education is generally formulated only by the Education Authority, and entrepreneurship education is mainly offered by higher education. There are no non-profit organizations which would play a key role in enhancing and promoting entrepreneurship education.

The ‘Nordic Model in entrepreneurship education’ could be seen as a starting point when discussing possible Nordic collaboration in this area.

The combined features of the 'Nordic Model in entrepreneurship education'

(“Entrepreneurship education in the Nordic countries: Strategy implementation and good practices”, pg. 43)
Entrepreneurship support in universities, in particular entrepreneurship education, is demanding reinforcement and development of existing human resources and employing new staff. Working with entrepreneurs, chief executives, bankers, venture capitalists and business angels is important too. It provides access to the “world of business, and can help to overcome staff bottlenecks, as we will see further down. The first entrepreneurship course was introduced in the Harvard Business School in the 1940s by Professor Myles Mace. Yet, it took until the 1970s before entrepreneurship education found its way into other universities. Still today, there is debate as to whether entrepreneurship should (and can) be taught at universities. We start from the assumption that “everyone who can face up to decision making can learn to be an entrepreneur and to behave entrepreneurially” and that entrepreneurship is “behaviour rather than personality trait” (Drucker, 1993: 26; 34). Entrepreneurship can therefore be promoted by appropriate teaching. To complement entrepreneurship education, certain targeted start-up and early growth support needs to be provided, such as finance and training. ("Partnering for Success in Fostering Graduate Entrepreneurship", pg. 10)

On the differences between Europe and the USA:

Many of the interviewed experts felt that entrepreneurship education in their country was lagging behind the US. Looking at this from the debate in the literature, it seems that whilst the US may benefit from a more mature state and increased legitimacy of entrepreneurship education, the impacts at classroom level have not yet been fully explored. It is questionable whether (i) the course contents and delivery is significantly different to that in Europe, given the differences in the latter, and (ii) whether the US curriculum development is applicable to other socio-economic contexts.

From what is known at present, it appears that US universities are stronger in multidisciplinary entrepreneurship education. In Europe, building inter-disciplinary approaches, making entrepreneurship education accessible to all students, mixing students from economic and business studies with students from other faculties and with different backgrounds, and creating start-up teams remain key challenges. Crossing boundaries between disciplines, and multidisciplinary collaboration, are, however, essential elements in building enterprising abilities. ("Partnering for Success in Fostering Graduate Entrepreneurship", pg. 12)

While entrepreneurship education policy is often coordinated by education ministries, it can be covered by one or more ministries – including ministries of education, culture, industry/enterprise, research, and science and technology. For example, the Danish Government has developed a Strategy for Education and Training in Entrepreneurship, with specific goals set for 2015. All of this work comes under a new Foundation for Entrepreneurship, which plays a key role in teacher training, curriculum reform, and the assessment of entrepreneurship education. A partnership initiative between the public and private sectors is also a key pillar of the entrepreneurship education strategy in Singapore (see http://www.ace.sg). A growing number of countries have developed national entrepreneurship education strategies to provide a roadmap to ensure that the necessary players are engaged and that appropriate budgeting and financing is made available to implement those policies. ("Entrepreneurship education, innovation and capacity-building in developing countries”, pg. 7)

In designing policy approaches to entrepreneurship education, it is also important to recognize the type of entrepreneurship and to make a distinction between “opportunity” and “necessity” entrepreneurship. The Global Entrepreneurship Monitor (GEM) measures levels of entrepreneurial activity, and shows that overall activity is higher in developing countries than in developed, and opportunity (and high-growth entrepreneurship) is more prevalent in developed countries. Given the high rates of necessity entrepreneurship in developing countries (informal and micro-entrepreneurial activity), it is important to establish policies which can not only help transition successful necessity entrepreneurs (often with low levels of formal education) into opportunity entrepreneurs (with social and basic business skills necessary to run their own small business), but also encourage more high-growth-oriented entrepreneurs. This often means that coordination on entrepreneurship education policy between
ministries within a country is critical. *(Entrepreneurship education, innovation and capacity-building in developing countries, pg.4)*

In developing countries, it is important to integrate entrepreneurship education into the overall poverty reduction strategy. Malaysia has for many years included the development of entrepreneurship skills in its economic plans, with the goal of contributing to the eradication of poverty in the country, and entrepreneurship education continues to be on the national agenda. Its recent poverty eradication plans, and the New Economic Agenda (2010), include entrepreneurship skill development programmes as a means to combat poverty in disadvantaged communities, particularly targeting ethnic minorities.

Unfortunately, many of the least developed countries (LDCs) do not mainstream entrepreneurship education into their poverty reduction strategies. However, there are some notable exceptions. Rwanda has made efforts to target entrepreneurship education to women and rural populations, as part of its economic development and poverty reduction strategy. Other countries, such as Mozambique, have begun to address entrepreneurship education as a poverty alleviation strategy through technical cooperation projects involving the United Nations and donors. *(Entrepreneurship education, innovation and capacity-building in developing countries, pg.6)*

So far only a few higher education institutions have explicitly directed their training towards high-growth enterprises. At most universities and colleges that are either international or national leaders in entrepreneurship, one or more growth modules have been integrated into the teaching, or activities are organized which are oriented towards spinning off enterprises from the university. In Europe, these institutions are frequently sponsored by the government on a project funding basis; this is in contrast to the US, where most entrepreneurship centres are privately funded. However, “research shows that until today, even in the United States commercialization of university research remains differentially successful and is concentrated in just a handful of universities”. (“Educating the Next Wave of Entrepreneurs: Unlocking entrepreneurial capabilities to meet the global challenges of the 21st Century”, pg. 76)

Better knowledge about the impact of entrepreneurship education is one of the things that Member States are constantly looking for. However, so far there are only a limited number of studies on the effects of entrepreneurship education and many are often from the US and/or project-based. Despite the lack of evidence on the effects of entrepreneurship education, the key role of entrepreneurship education must not be disregarded. In addition to equipping young people with the skills needed for the 21st century, entrepreneurship education is a means to increase social inclusion; it can increase the number of entrepreneurs – social and commercial, and it can be a gateway for a greater integration of the framework for key competences for lifelong learning. (“Effects and impact of entrepreneurship programmes in higher education”, pg. 7)

Development of the entrepreneurial competence is expected to lead to more innovative behaviour by individuals and consequently this would mean that the enterprises that these alumni are leading are more innovative than other enterprises. This expectation seems to be the case, as relatively more alumni of the entrepreneurship group assess their enterprise as innovative in terms of introducing new or improved processes, introducing new or improved goods/services and/or introducing new and improved forms of organisation, business structures and practices. (“Effects and impact of entrepreneurship programmes in higher education”, pg. 17)

Common objectives appealing to and aiming at all students are, for instance:

- exploiting opportunities;
- developing an idea further into a product or service;
- daring to deal with problems and to solve them;
- creating networks with other students and adults;
- accepting the implications of their own choices;
- seeing self-employment as a valuable choice of career;
- managing resources and money in a responsible way;
- understanding how organisations operate in society.

For students who will start an own activity at some point after their studies, more specific skills will be necessary, such as:

- being able to draft a business plan;
- knowing the administrative procedures for starting a company;
- understanding the principles of accounting, commercial law and tax law;
- being conscious of business ethics and social responsibility;
- having a clear understanding of market mechanisms;
- being acquainted with selling techniques.

Regardless of the vocational training area, the most effective way to achieve these objectives is to have students participate in practical projects and activities, in which learning by doing is emphasised and real experience with entrepreneurship is gained. Problem-driven and experience-oriented education is essential to fostering entrepreneurial mindsets and abilities. Especially good results can be achieved by working in small groups. (“Entrepreneurship in Vocational Education and Training”, pg. 22)

Through appropriate methods of delivery, programmes and courses should be geared to the acquisition of generic and horizontal skills, aiming to make students:

- more creative/innovative; highly motivated; pro-active; self-aware; self-confident; willing to challenge;
- better communicators; decision-makers; leaders; negotiators; networkers; problem solvers; team players; systematic thinkers;
- less dependent; less risk averse; able to live with uncertainty; capable of recognising opportunities.

In terms of specific content, programmes and courses should be adapted to different target groups (by level: undergraduate, graduate, post-graduate, PhD; by field of study: economics/business, scientific/technical studies, humanities, arts & design, etc). The higher the level of studies, the more complex and close to real business life is the content of teaching (up to start-up financing competitions, etc).

Teaching should use an inter-disciplinary approach, the ultimate objective being that to combine students from different faculties and different fields of study, who will cooperate in developing joint activities and projects. (“Entrepreneurship in Vocational Education and Training”, pg. 26)

Developing generic attributes and skills that are the foundations of entrepreneurship is complemented by imparting more specific knowledge about business according to the level of education. Emphasising the notion of “responsible entrepreneurship” will help to make an entrepreneurial career a more attractive proposition.

While not all youngsters who develop entrepreneurial competence will become entrepreneurs, some evidence shows that around 20% of participants in mini-company activities in secondary school go on to create their own company after their studies.

Education in entrepreneurship increases the chances of start-ups and self-employment and enhances individuals’ economic reward and satisfaction. Moreover, any dynamic SME that wants to grow will benefit from young people with entrepreneurial mindsets and skills.

However, the benefits of entrepreneurship education are not limited to more start-ups, innovative ventures and new jobs created. Entrepreneurship is a key competence for all, helping young people to be more creative and self-confident in whatever they undertake and to act in a socially responsible way.
The Education & Training 2010 Work Programme included entrepreneurship in a reference framework of eight key competences for lifelong learning, necessary for personal fulfillment, social inclusion, active citizenship and employability. This forms the basis for a recent Commission proposal for a Recommendation of the European Parliament and the Council.

Traditionally, formal education in Europe has not been conducive to entrepreneurship and self-employment. However, as attitudes and cultural references take shape at an early age, the education systems can greatly contribute to successfully addressing the entrepreneurial challenge within the EU. ("Implementing the Community Lisbon Programme: Fostering entrepreneurial mindsets through education and learning", pg. 4)

Entrepreneurship is a great enabler, which can help level the playing field between developed and developing countries and regions. Embedding entrepreneurship in education and providing greater access are important steps for building an innovative culture and creating entrepreneurial individuals and organizations which, in turn, can create economic growth and jobs, and can help to improve quality of life around the world. Despite the tremendous growth in entrepreneurship education, many challenges remain. One of the predominant challenges is to change the culture and mindset in countries and regions in which business and entrepreneurship are either not viewed favourably and/or are not understood. (Entrepreneurship education, innovation and capacity-building in developing countries, pg. 19)

Entrepreneurship education can be a societal change agent, a great enabler in all sectors. Not everyone needs to become an entrepreneur to benefit from entrepreneurship education, but all members of society need to be more entrepreneurial. The public sector, private sector, academia and non-profit sectors all have roles to play in facilitating the development of effective ecosystems that encourage and support the creation of innovative new ventures. We need to create the types of environments that are conducive to encouraging entrepreneurial ways of thinking and behaving.

Much has been written about the impact of entrepreneurship on economic growth. If we are to attain the Millennium Development Goals of reducing poverty, we must develop human capital in all countries and societies, in remote regions as well as major cites, and in all sectors, to address both the opportunities and major challenges we face in the world. While the contexts around the world vary dramatically, entrepreneurship education, in its various forms, can equip people to proactively pursue those opportunities available to them based on their local environments and cultures. We have seen a number of "waves" in entrepreneurship education, starting a century ago, developing in phases and now expanding exponentially. By making entrepreneurship education available to young people and adults alike, we are preparing the next wave of entrepreneurs to enable them to lead and shape our institutions, businesses and local communities. ("Educating the Next Wave of Entrepreneurs: Unlocking entrepreneurial capabilities to meet the global challenges of the 21st Century", pg. 12)

National and supranational policy-makers have focused in the past decade on youth entrepreneurship as an important tool to combat persistent youth unemployment, criminality, and so on. In addition, evidence is mounting that girls and young women may benefit disproportionately from entrepreneurship education, in part because they are often denied full access to, or advancement within, existing (male-dominated) organizations and hence seek tools to create their own businesses. ("Educating the Next Wave of Entrepreneurs: Unlocking entrepreneurial capabilities to meet the global challenges of the 21st Century", pg. 25)

For entrepreneurship education, focusing on institutions of higher education offers the chance to develop knowledge intensive high-growth enterprises from all academic disciplines, not just technical ones. Higher education institutions should create an environment that fosters entrepreneurial mind-sets, skills and behaviours across their organizations. Universities can teach students how to start and grow enterprises in ways that benefit society. Technical universities in particular provide potential breeding grounds for high technology and high-growth companies or "gazelles". ("Educating the Next
Wave of Entrepreneurs: Unlocking entrepreneurial capabilities to meet the global challenges of the 21st Century”, pg. 44)

Opportunity-based entrepreneurship, access to information and a broad market orientation in the start-up phase distinguish entrepreneurs of future high-growth firms from low-growth firms. All over the world, numerous innovative new enterprises have recognized the entrepreneurial opportunity and achieved a profitable high growth. The economic and social benefits of young growing enterprises have been repeatedly demonstrated by research, especially with regard to employment, stimulation of innovations, industrial dynamics and regional development. (“Educating the Next Wave of Entrepreneurs: Unlocking entrepreneurial capabilities to meet the global challenges of the 21st Century”, pg. 44)

An increasing number of university officials also have recognized the economic significance of entrepreneurial education and, in particular, of spin-offs for universities and colleges. This has been true for some time in countries where universities and colleges primarily finance themselves privately and are therefore in a position to make investments in enterprises (for example in the United States, Canada, Australia). However, as countries where state universities and colleges predominate are increasingly forced to retrench their expenses, and universities and colleges subjected to budget constraints have to look out for new ways of financing, entrepreneurial and commercial university initiatives will also gain in importance. At the same time, the benefits with regard to finances and reputation for the university and the faculty from which new business have evolved, and finally for the national economy as a whole can be considerable. (“Educating the Next Wave of Entrepreneurs: Unlocking entrepreneurial capabilities to meet the global challenges of the 21st Century”, pg. 50)

These two facets of entrepreneurial activity in the self-employment and business administration contexts can be addressed in university education with mutual benefit as shown, for example, at the University of St Gallen, Switzerland, which caters to both future managers and entrepreneurs. Overall, developing entrepreneurial mindsets via entrepreneurship education at universities and colleges can improve the image and the standing of entrepreneurs and intrapreneurs in society, an improvement needed in many countries of the world. (“Educating the Next Wave of Entrepreneurs: Unlocking entrepreneurial capabilities to meet the global challenges of the 21st Century”, pg. 52)

Interesting aspects of this study are networks, in which universities have made a special contribution to the generation of new ventures, particularly to those with a high growth potential. Typical benefits of continuous relationships of spin-off ventures with their university are assistance in the protection of intellectual property rights, reputation signalling by the university and a brokerage role of the university to external stakeholders, in particular potential investors and technology partners.

Networks are intended to promote knowledge and technology transfer and can generate business opportunities in the first place. A specific form of networks, which is of particular interest for new high-growth enterprises, is the formation of clusters. In a modern knowledge economy, growth will depend to a large extent on existing or emerging networks. They provide a favourable environment, which encourages innovations based on the entrepreneurial culture of the region and the skills, attitudes and motivation of its workforce. (“Educating the Next Wave of Entrepreneurs: Unlocking entrepreneurial capabilities to meet the global challenges of the 21st Century”, pg. 59)

A large number of private enterprises and entrepreneurs finance entrepreneurship chairs, institutes and centres. As regards private financing of higher education institutions, the United States leads the way, where an almost unique culture of pay-back is highly developed among prominent personalities. In Europe and Asia, higher education institutions are mostly financed by the state, although in recent years many of these universities and colleges have increasingly made efforts to raise funds from private enterprises and entrepreneurs. In terms of synergies the potential for collaboration between established companies and universities and their spin-offs should be nurtured further because of the benefits evolving from such cooperation. (“Educating the Next Wave of Entrepreneurs: Unlocking entrepreneurial capabilities to meet the global challenges of the 21st Century”, pg. 78)
2.) Challenges

Better **knowledge about the impact of entrepreneurship education** is one of the things that Member States are constantly looking for. However, so far there are only a **limited number of studies** on the effects of entrepreneurship education that are often from the US and/or project-based. Despite the lack of evidence on the effects of entrepreneurship education, the **key role of entrepreneurship education must not be disregarded**. In addition to equipping young people with the skills needed for the 21st century, entrepreneurship education is a means to increased social inclusion, it can increase the number of entrepreneurs – social and commercial, and it can be a gateway for a greater integration of the framework for key competences for lifelong learning.

Meanwhile, an increasing number of Member States are implementing national strategies on entrepreneurship education, which creates a platform that provides an opportunity where the impact can be measured in a European context and at a policy-level instead of at a project-level. Currently, the Member States are contemplating how they can measure the impact of their policies and here the European dimension can really provide added value. It is important to ensure that **Member States are not producing their own individual national measures**, but instead that they will join forces to find ways to measure the broad impact of entrepreneurship education. ("**Effects and impact of entrepreneurship programmes in higher education**", pg. 23)

To move entrepreneurship education from being an **extra-curricular 'add-on'** to an **integral part of the curriculum involves**:

- **changes in teaching methods**: greater use of experiential learning and a new coach/moderator role for teachers which helps students to become more independent and to take the initiative in their education;
- **changes in the education context**, which takes students out of the classroom into the local community and real businesses, and which establishes less hierarchical relationships within schools; and;
- **a key role for governments**: only they can bring about the required step change in the spread and quality of entrepreneurship education.

("**Towards Greater Cooperation and Coherence in Entrepreneurship Education**", pg. ii)

**First**, within a system strongly characterised by voluntarism, **teachers have often played the key role, taking the first steps in the teaching of entrepreneurship education** and in shaping current practice. This is the case even in countries where entrepreneurship education might be said to be most widely available and well developed, such as the **UK** before the recent development stimulated by central government.

**Secondly**, entrepreneurship education has tended **not to be treated systematically in the curriculum**. Instead, it is **typically an extra-curricular activity**, added at the margins of mainstream education, reliant on the enthusiasm of individual teachers and schools. This has meant:

(i) the focus has tended to be on **topics** more directly related to **how businesses function** or on giving students a **general appreciation of the world of work** rather than more general competences related to entrepreneurship per se;

(ii) it tends to consist of providing **opportunities to interact with businesses** rather than on developing competences like creativity and risk-taking; and

(iii) it tends **not to be assessed as part of the mainstream curriculum**: teachers and schools instead rely on in-house prizes and awards, or take part in competitions run by well-known organisations such as Junior Achievement-Young Enterprise (JA-YE), outside of mainstream qualifications.
Thirdly, the lack of systematic treatment of entrepreneurship education means that teachers have drawn on a variety of resources to support their teaching, very often developed and provided by private business and/or non-profit organisations (see below). The range of approaches, methods and tools includes using virtual simulations of business situations, practical, hands-on experience of businesses, and ‘Enterprise Days/Weeks’ where students develop ideas, carry out activities such as market research and design and turn their ideas into mock products or services. In all these cases, entrepreneurship education offers alternative methods to mainstream teaching practice. (‘Towards Greater Cooperation and Coherence in Entrepreneurship Education’, pg. 15)

Fifthly, whilst many programmes and simulations can be run by teachers within schools, only businesses can provide real, practical, hands-on experience of entrepreneurship in action for students. Unfortunately the availability of businesses that are willing and able to support entrepreneurship education is highly variable across – and even within - countries, Schools and teachers often have to depend on serendipity when it comes to making connections with local businesses; individual parents often provide the links. However, in some areas the interaction between businesses and schools has become well structured and formalised, with schools forming education-business partnerships, perhaps under the leadership of municipalities, and involving local business organisations (e.g. chambers of commerce). For businesses, involvement represents a significant commitment, and the motivation often comes through a sense of corporate social responsibility. In many countries many small businesses would be willing to assist but lack the time to make a long-term commitment.

Sixthly, in the absence of national policy, regional and local authorities can play an important role as promoter and facilitator: promoting entrepreneurship education to schools, and facilitating links between education and business, as just noted, where municipalities can provide brokerage services, act as resource centres etc. (‘Towards Greater Cooperation and Coherence in Entrepreneurship Education’, pg. 16)

A partial lack of competence of teachers is in many cases perceived as a problem, at least as regards their practical experience of entrepreneurship. Improvement is greatly needed in this area. Most countries report that some training courses on entrepreneurship are offered to teachers, but few offer a systematic approach. (‘Entrepreneurship in Vocational Education and Training’, pg. 7)

However, it is interesting to note that even in those countries where entrepreneurship is included in national curricula, there is in most cases a perception that the situation is not yet satisfactory, and that there is still a gap to be filled. This may be related to the extent of participation of schools and students, or to the effectiveness of methods applied.

Some major reasons for the gap identified are:

- teaching methods are ineffective;
- entrepreneurship is not included in all parts of the VET system;
- student participation is limited;
- teachers are not fully competent;
- business people are not involved;
- the practical element is missing;
- entrepreneurship is not linked to specific training subjects or professions.

(‘Entrepreneurship in Vocational Education and Training’, pg. 14)

One of the main difficulties reported by experts is involving small and micro-enterprises in school activities. Small companies do not have sufficient time to dedicate to work placements of students in the company, or do not see any benefit in cooperating with schools. Therefore, despite the interest and goodwill of many teachers and entrepreneurs in engaging in cooperation activities, there are still a number of obstacles to be overcome, such as:
the large number of different tasks to be performed by staff of very small companies, leaving little
time for involvement with schools;
the lack of mutual knowledge and understanding of each other's priorities and what each party is
involved in on a day-to-day basis;
a possible lack of trust as a result of the above;
the differences in working times / hours of working;
the absence of a main point of contact in the school.

In some cases another obstacle is that teachers are not allowed to work in other domains outside school.
Teachers should be allowed flexible periods of training in companies. ("Entrepreneurship in Vocational
Education and Training", pg. 26)

Support for schools:

- Coordination is lacking, because there is no single support structure and financial resources are
  fragmented.
- Funds and resources either are lacking or lack continuity.
- Information is poorly disseminated to schools.
- Institutional cooperation between the formal education system and the labour market is weak.
  ("Entrepreneurship in Vocational Education and Training", pg. 30)

Obstacles and risks to schools and educators:

- Support from the school management and local community is lacking.
- Teachers and the school management are reluctant to introduce entrepreneurship programmes.
- Entrepreneurship programmes are confused with management programmes.
- The teacher does not succeed in making entrepreneurship education relevant to the students.
- Teachers lack competence and knowledge. Some teachers' knowledge is only theoretical.
- As a result, the programme is too theoretical (academic). Theoretical knowledge is stressed
  rather than developing entrepreneurial skills.
- Teachers are not trained in entrepreneurship education.
- Career guidance and counselling is weak.
- The learning environment is not entrepreneurial.
- It is difficult to measure the outcome of entrepreneurship education, and experience in measuring
  and assessing results is lacking.
- The school environment is isolated and lacks links to local entrepreneurs.
- Entrepreneurship is a separate field or course, and is not otherwise linked to or interwoven in
  vocational education and training.
- Entrepreneurship is seen merely as a course that ends with a grade rather than a permanent way
  of thinking or attitude.
- Time (and staff) commitment is lacking and there is increasing competition with other activities.
- Business people are not available as volunteers: it requires a lot of resources to recruit, train and
  support a large number of volunteers; furthermore, in today's environment, corporate volunteering
  may become less prevalent. ("Entrepreneurship in Vocational Education and Training", pg. 32)

Recent data from certain European countries show that the majority of entrepreneurship courses are
offered in business and economic studies (for instance in Spain and in the UK, see Tables 1 and 2 in the
previous Section). However, it is questionable whether business schools are the most appropriate place
to teach entrepreneurship: innovative and viable business ideas may be more likely to originate from
technical, scientific and creative studies. In Germany, most spin-offs are from universities of applied
sciences and technical universities. Therefore, the real challenge is to build inter-disciplinary approaches,
making entrepreneurship education accessible to all students, and where appropriate creating teams for

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the development and exploitation of business ideas, mixing students from economic and business studies with students from other faculties and with different backgrounds. “Entrepreneurship in higher education, especially within non-business studies”, pg. 23)

<table>
<thead>
<tr>
<th>Table 1: Entrepreneurship in Higher Education in the UK</th>
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<td>Curricular provision of entrepreneurship teaching in the UK, by field of study (in %)</td>
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<tr>
<th>Business</th>
<th>Engineering</th>
<th>Art / Design</th>
<th>Main / Computing</th>
<th>Natural / Pure Science</th>
<th>Medicine / Health</th>
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<tr>
<td>70%</td>
<td>10%</td>
<td>5%</td>
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<th>Table 2: Entrepreneurship in Higher Education in Spain</th>
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<td>Curricular provision of entrepreneurship teaching in Spain, by field of study (in %)</td>
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<tr>
<th>Economics / Business Sciences</th>
<th>Technology</th>
<th>Social Sciences</th>
<th>Health Sciences</th>
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<tr>
<td>60%</td>
<td>10%</td>
<td>20%</td>
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(“Entrepreneurship in higher education, especially within non-business studies”, pg. 22)

An indicative list of main risks and obstacles identified by the Experts is set out below:

- lack of support from decision-makers;
- changing political environment, with changing priorities and orientations;
- a bureaucratic culture inside institutions, and organisational inertia; inappropriate institutional policies, practices, cultures and structures;
- conflicting academic philosophies of the role of entrepreneurship in higher education;
• opposition to, or little acceptance of, entrepreneurship due to existing prejudices, such as the
  perception that entrepreneurship means business invading universities or that everyone has to
  become a businessman; lack of support for entrepreneurship professors within the institutions;
• lack of cooperation among different departments/faculties;
• a negative image of entrepreneurs, and a lack of positive role models for young people;
• only a minority of professors and professionals are really committed;
• some professors are still of the opinion that technical students should learn only technical know-
  how;
• lack of desire to change the way in which teaching has always been delivered;
• courses are taught just as academic courses by educators who have no link with business life;
• entrepreneurship may not be correctly understood, with a risk that this “heading” is used to
  “cover” any business course (e.g. finance, marketing, accounting);
• failure to get students enthusiastic for this type of course;
• no understanding of the need for tailored programmes; 39
• poor use of a broad base of pedagogical tools;
• lack of rewards, incentives, recognition for faculty and educators;
• no established systems for evaluating programme results;
• lack of alignment between practices, outcome and impact;
• the business world tends to underestimate the universities’ role as a driver of economic
development;
• sustainability issue: the fragility of funding and resources.

(“Entrepreneurship in higher education, especially within non-business studies”, pg. 38)

No project alone is capable to constitute a good practice

A project or practice is not capable to establish itself as a good practice without external assistance and
promotion. Not only financial support is a key issue, but also the leverage by cooperating and networking
with other organizations and institutions, and by receiving help from the local and regional government.
The cooperation enhances knowledge transfer and cost-saving, thus providing the involved parties
opportunity to focus more on their special area. For example 'Measurement Tool for Entrepreneurship
Education' (MTEE) has YES as its marketing arm and YVI as its contents support. Therefore, educational
institutions or entrepreneurship service organizations should be motivated to work with each others both
at the national and the Nordic level.

Good practices require effective communication and promotion strategy

It appears that there is a lack of systematic knowledge transfer in promoting good practices. Even if we
did find websites that provide good practices, the academics or school administrators may not actively
carry out this type of search, or might be reluctant to change. In such cases the good practices will not be
shared. In order to stimulate learning, remove inertia and increase media exposure, more proactive
measures may be needed, such as periodically conducting Nordic or international seminars where
organizations or institutions are invited to present their innovative projects, curriculum, teaching methods
and research.

Business collaboration demands careful planning

Typical for many good practices is to engage the business sector. In order to enhance the cooperation
and improve the process; the local community, universities and entrepreneurial centers play an important
role, for instance, in matching schools and companies. The increasing concern for corporate social
responsibility also results in higher number of companies willing to fulfill their social obligations while
pursuing their economic interests.
Collaboration with business sector is a two-way process. It is equally important that entrepreneurs have a role in schools, and teachers and students ‘shadow’ entrepreneurs in companies. Various activities can be carried out, such as lectures of entrepreneurs, mentoring, company panels, internships, placements and secondments, company visits, joint projects and so on. However, simply having exchange programmes is not sufficient enough to promote entrepreneurship. It is crucial to deliberately match and select partners, followed by evaluation of the performance, in order to see whether mutual goals are fulfilled.

**Funding issues**

Lack of funding is a common problem to practitioners and more funding would be needed to improve the content or take the good practices of entrepreneurship education to the next level. *(Entrepreneurship education in the Nordic countries: Strategy implementation and good practice, pg. 65)*

As Europe needs the young generation to create new ventures and provide innovation and entrepreneurial thinking in the existing business, EIs need to overpass the barriers they face in providing education and coaching for the young entrepreneurs in a way that the new and innovative ideas do not get lost. The main barriers stated by the survey participants are the lack of funding to support the entrepreneurial activities; the entrepreneurship education depends on the efforts of individuals/few people and the lack of expertise from the academic staff.

On the overall analysis very few EIs mentioned as a barrier the “no support from the top management” (6 per cent). The lack of quality materials is also a barrier that only 9% of the EIs are facing. When taking SPACE network apart, “no support from top management” has been mentioned by 7% of the EIs. The lack of quality materials in entrepreneurship is also a barrier that only 7% of the SPACE members are facing. This could mean that entrepreneurship is heading to a mature stage, where the collaboration between top management and lecturers should be the focus point and actions towards strengthening the collaboration have to be taken. *(Survey of Entrepreneurship in Education in Europe, pg. 42)*

Entrepreneurs fuel innovation by developing new or by improving existing products, services or processes. Entrepreneurship education develops skills in creativity, opportunity identification, problem-solving, self-efficacy and leadership. In addition, science, technology, engineering and maths (STEM) are critical for developing the innovative breakthroughs of the future, but are losing popularity with young people. More must be done to ensure that both entrepreneurial and technology-based skills training is provided to students at all levels of the education process.

Entrepreneurship education will also need to introduce a diversity of management skills related to innovation. These issues may include skills related to product development, employee management and training, marketing, and public relations. Much of the knowledge presented would fall under the category of soft or process technologies and innovation. Entrepreneurs need to stay on top of developments in process innovation that affect their firms, and correctly judge when, how and at what cost to invoke process change in order to improve their competitiveness. *(Entrepreneurship education, innovation and capacity-building in developing countries, pg. 16)*

**3.) Good Practice**

The University of Wolverhampton (UK) is coordinating the SPEED project (Student Placements for Entrepreneurs in Education), a network of 13 institutions to help students develop self-employment opportunities as an alternative to traditional work placements. Students present their business ideas to a panel. If accepted, they are offered a placement of 9 to 12 months. Each student is helped to develop a personal and business development plan, and is given access to one or more mentors selected for their experience in a related area. The placement may be full time, as part of a sandwich degree course, or
part time alongside their academic studies. Each student is supported by a mixture of bursary payments, finance for business related activities and professional services. The institution provides additional resources in the form of incubation facilities and skills training. Where possible a SPEED placement will be credit bearing for the student. ("Entrepreneurship in higher education, especially within non-business studies", pg. 29)

Entrepreneurship education is delivered at Manchester Academy through a variety of formal and nonformal settings, associating all teaching staff on a whole-school approach. The key principles of this approach are the following:

- Self-respect and self-esteem: lead students to respect themselves and to believe in their capacities. At the core of this principle is the belief that all students have talents, some of which they may even be unaware of, especially in the case of low academic achievers.
- Collide with opportunities: provide students with as many opportunities as possible, in and outside the school, to experiment new things and ideas. The involvement of the outside community is key to this principle. Partners outside the school include the local business world, schools from other countries as well as higher education providers.
- Identity is not destiny: raise students’ aspirations by leading them to realise that they can open all doors, and equip them with the life skills they need to do so. This is particularly relevant given that many students at Manchester Academy come from disadvantaged backgrounds. As a result, they may conclude that some jobs / universities etc. are out of their reach or they may lack the social and transversal skills required to access these positions.

The approach followed by the Manchester Academy has improved academic results dramatically: in the ten years before it was established, the former school had never reached 15% of pupils receiving A* to C grades in five or more GCSE (General Certificate of Secondary Education) subjects. Since becoming the Manchester Academy, this score has gone from 8% in 2004 to 81% in 2010 and 84% in 2011. ("Entrepreneurship Education: Enabling Teachers as a Critical Success Factor", pg. 10)

Certificate in Entrepreneurship for Initial Teacher Education – St. Mary’s University College Belfast, UK

St Mary's College, a provider of initial teacher training at the Queen’s University in Belfast, started offering the Certificate in Entrepreneurship to its students in 2005. All students at St. Mary's University College Belfast are afforded the opportunity to develop and challenge entrepreneurial ideas through an intensive and inter-active programme of workshops, seminars and lectures. The course challenges the students to consider the practical/entrepreneurial dimensions to be encountered in their main degree programme. It employs a range of experiential methods of teaching which have been developed including the use of drama, business games and live case studies.

As the entrepreneurship education training programme is offered on a voluntary basis, rewarding students’ effort with an accredited award (in this case a Certificate in Entrepreneurship offered in addition to their teaching degree) is reported to have made the course more appealing to student teachers and helped to secure their buy-in the optional entrepreneurship course.

Building on the experiences acquired, St Mary’s has also introduced a new course at Masters degree level for school teachers, from both primary and post-primary sectors, as part of its contribution to continuing teacher education. As part of its recently completed review of its teacher education degree programmes, St Mary’s is now proposing to enhance Entrepreneurship Education through establishing more formal cross-disciplinary linkages within its programmes, and between the degree programmes and the Certificate in Entrepreneurship. ("Entrepreneurship Education: Enabling Teachers as a Critical Success Factor", pg. 25)

Fourthly, a significant role is played by private associations and organisations. Most prominent amongst these are the following organisations with international profiles:
- JA-YE, which uses hands-on experiences to help young people understand the economics of life with enterprise and economic education programmes designed for young people ages 6-25 and implemented through a partnership between local businesses and schools.
- EUROHEN, the practice firms network, which supports, co-ordinates and develops services which promote and enhance the concept of learning in and from a simulated business environment. EUROHEN's objectives are to facilitate exchange of information, provide innovative training tools to its members, promote the practice firm concept and to represent its members at different government levels and private institutions.
- JADE (in Higher Education), which fosters the development of Europe's Junior Enterprises by implementing European projects and providing the framework for crossborder co-operation on multinational studies. It organises international congresses and meetings that facilitate exchange of knowledge and experience, intercultural understanding and promote the European idea. The JADE network presently has 20,000 members in 11 EU countries and includes 150 junior enterprises. ("Towards Greater Cooperation and Coherence in Entrepreneurship Education", pg. 15)

### Strategy for Entrepreneurship in the Field of Education – The 2009 Sweden National Strategy

In the Budget Bill for 2009, the Swedish Government announced its ambition for the teaching of entrepreneurship to be an integrated theme throughout the education system. Extensive reforms of the education system are now being carried out. The Government has already taken decisions on several initiatives that support the development of entrepreneurship programmes in schools and higher education institutions. The Government will make decisions on other initiatives as the reform process continues. All these initiatives are now brought together in a strategy for entrepreneurship, published in May 2009.

The strategy consists of 11 key points, detailing action by government and stakeholders, ranging from providing greater opportunities for more in-depth studies of entrepreneurship in upper secondary school, through to mapping activity across all sectors and the development of cutting edge programmes in the fields of entrepreneurship and innovation. ("Towards Greater Cooperation and Coherence in Entrepreneurship Education", pg. 39)

### A Mature Context Approach: The Netherlands

The emphasis in the Netherlands is on providing policy direction, support and encouragement (through a programme approach) rather than making entrepreneurship education a compulsory part of curricula in all educational institutions. Subsidies are provided (through the National Education and Entrepreneurship Programme managed by the public agency SenterNovem) to implement entrepreneurship education across the educational phases, based on a commitment contained in the national Strategic Agenda for Higher Education, Research and Science Policy; although entrepreneurship education is not explicitly part of the curriculum. The focus is on deficits identified in the current educational system which concern the early-stage in particular, while the approach to implementing the programme is deliberately demand-led, i.e. focusing on institutions that expressed a specific interest in starting to teach entrepreneurship education. Some schools are now offering projects for pre-school children, one example being 'My Restaurant' where classes are set up as restaurants with children making menus etc, coupled to a visit to a real restaurant in the locality. Primary schools typically start entrepreneurship education at the age of eight.

There is involvement of players at all governance levels. Along with the frameworks provided by the national government, at regional level chambers of commerce are involved in: supporting startups; putting entrepreneurship education on the regional agenda via sector skills organisations; and simulating projects between schools and companies. At local level, local authorities can stimulate projects at local schools and with local companies and organisations. The Netherlands is also starting to address the issue of assessment and is putting in place a National Entrepreneurship Certificate. This will apply at middle vocational training level up to and including university level and will build on certificates currently being
offered by a number of HEIs (for example the Utrecht Academy of Entrepreneurship). In terms of
measurement and monitoring the impact of the Netherlands Education and Entrepreneurship Programme
is measured on a two year cycle. ("Towards Greater Cooperation and Coherence in Entrepreneurship Education", pg. 43)

A Newly Developing Context Approach: Portugal

In Portugal the Education Ministry is implementing a National Education Project for Entrepreneurship
Education (Projecto Nacional de Educação para o Empreendedorismo or PNEE) which aims to establish
entrepreneurship education as a cross-curricular subject within the curriculum. Within the framework of
the PNEE, elementary, secondary and vocational / professional schools have been invited on a voluntary
basis to develop a set of initiatives leading to the creation of entrepreneurship competencies and
attitudes. In doing so, the PNEE also seeks to contribute to a continuous programme of qualifications and
of learning, both for education professionals and learners.

In 2007/2008, 99 schools participated, involving 4153 pupils in both general and vocational tracks in more
than 357 projects, and covering both technical and social dimensions entrepreneurship. Some of the
projects are likely to be “upgraded” into real enterprises in the future. In the final trimester of 2008, a
national training for trainers action was launched involving around 300 professionals from schools
participating in the PNEE. A national strategy is now being considered based on the PNEE. ("Towards
Greater Cooperation and Coherence in Entrepreneurship Education", pg. 44)

Teacher Training in Austria

In Austria the Initiative for Teaching Entrepreneurship (IFTE) has been created to develop and provide
teacher training and each year it runs a Summer School for Entrepreneurship in Kitzbühel. The course
runs for one week in July and is intended for teachers from both vocational schools and colleges, and
general secondary education tracks. The programme is broad, and topics include entrepreneurship in the
context of educational philosophy, business ethics, and ideas creation, along with practical work on
implementation, and how to use change management processes to create innovative educational
organisations. There is a strong emphasis on experiential learning. The course team is drawn from across
business, universities and schools, reflecting the fact that the IFTE is backed by a range of sponsors from
the public and private sectors. ("Towards Greater Cooperation and Coherence in Entrepreneurship
Education", pg. 50)

Identifying Entrepreneurship Talents Online in Baden-Württemberg, Germany

"Talentschmiede Baden-Württemberg" is a pilot project run by the NaturTalent Stiftung (Natural Talent
Foundation) and is for students between 15 and 20 years old enrolled in schools providing a general
education. The aim is to raise awareness among pupils of their natural talents and to provide guidelines
for potential career paths. The rationale is that if people can apply their talents in their jobs, then they are
likely to be much more effective and innovative. The first stage of the process involves pupils taking
different on-line tests (those must be taken at home) which altogether take about five hours and consist
of: a competence check, a check to find a potential profession, a "strength finder" to assess personal
traits and talents and finally an entrepreneur talent check.

Participants also complete two written tests at home: a self-evaluation test and an assessment of their
strengths completed by asking friends, parents etc. The online-tests are sent to a "talent coach" and are
followed up by a one-day seminar (with maximum 12 pupils) where the participants work with the "talent
coach": discussing the results of the tests and developing their own ‘talent sheet’. Also, at the end of the
seminar the students go home with five concrete proposals for future vocational training, profession or
studies. In the first 18 months of the project more than 4,500 students from 170 schools have
participated. Financed by the Ministry of Economy of Baden Württemberg (as a result of its interest in
entrepreneurship) and by the Federal Employment Office Baden-Württemberg (as a result of its interest in
Ensuring the Direct Involvement of Entrepreneurs in the Teaching of Entrepreneurship Education: the University of Valencia, Spain

At the University of Valencia in Spain business owners finance and manage a Chair on entrepreneurship education. Teachers/lecturers on the accompanying course are drawn exclusively from the local business community. This means they not only act as role models but are involved directly in the teaching of entrepreneurship education. Over the ten years that the programme has been running, 250 business projects have been developed. A key output of the venture has been the acquisition of entrepreneurial skills and attitudes amongst students. (“Towards Greater Cooperation and Coherence in Entrepreneurship Education”, pg. 57)

A concrete example of a close partnership can be seen at Køge Business College (Denmark). In this college students conclude their education by carrying out a practical project in enterprise on which the enterprise and the school cooperate. Taking a real problem as the point of departure, the student can demonstrate his/her entrepreneurial skills and creative thinking by coming up with a solution or a product that meets the enterprise's needs.

Before starting, the student drafts a project description which must be approved jointly by the enterprise and the school. This case-based final exam can be taken individually or in groups. In the city of Cagliari (Italy), La Città dell'Impresa (City of Enterprise) is a meeting place aiming to stimulate creativity and to spread an entrepreneurial culture. It has three sections: the Exhibition, the Factory and the Academy. The Exhibition is an interactive multimedia path where young people can learn about emerging local markets, test their entrepreneurial skills and receive practical advice. After the virtual part there is the real area, the Factory, where experts in the field give consultancy and practical advice, help examine the feasibility of ideas put forward by potential entrepreneurs and suggest the best ways of realising them. (“Entrepreneurship in Vocational Education and Training”, pg. 27)

Good Practice indicators for entrepreneurship education in vocational schools

1) The programme or activity has well-defined objectives and appropriate measures of success. It is regularly evaluated, and receives positive feedback from students. Evaluation results are continuously fed into the development process.

2) There is a good balance between theory and practice: the programme or activity is action-oriented, based on experience and project work. It aims to improve the students’ abilities to work in a team, develop and use networks, solve problems, and spot opportunities.

Students are actively involved in the learning process, and responsible for their own education.

3) The programme or activity is adapted to the students’ learning environment and to their specific fields of study.

4) The institution has external links with enterprises, experienced business people and young entrepreneurs, and with the local community. Entrepreneurs are involved in the learning process.

5) Students are exposed to real-life work situations and encouraged to take part in extracurricular activities. External events, activities and contests are organised.

6) Teachers have an appropriate qualification in entrepreneurship (through experience in business and/or participation in training). They use up-to-date study materials and up-to-date knowledge.
7) The programme or activity stimulates the students and teachers to look beyond the borders of their school environment (e.g. by exchanging experience or ideas with other schools, with students from other countries or with other technical backgrounds).

8) The programme or activity is part of a wider scheme: students are followed after participation in the programme, and are referred to the right support mechanisms if they want to start up a business. ("Entrepreneurship in Vocational Education and Training", pg. 30)

The Knowledge Centre ‘Competento’ (Belgium)

This broad initiative, developed in Flanders, include two main action lines: A Virtual Knowledge Centre with a large database on materials (documents on policy and research reports; models, methods and course materials; and screening instruments for entrepreneurial competences), initiatives, information, events and contests.

The Virtual Knowledge Centre is a unique platform for spreading all kinds of material on entrepreneurship education to teachers. It forms an exchange platform between pedagogical supervisors, teachers and educators, coaches in specific courses and business representatives, who are indeed ideal intermediaries.

The ‘Entrepreneurial Class’ Week aims to highlight actions on entrepreneurship in schools and training centres over one week. There is a leaflet to inspire participants. The theme for 2009 is Creativity and Innovation.

All creative and innovative ideas and initiatives get an equal chance to be known by the target public. All education and training partners are contacted so there is ample support for the transfer of new information and exchange of knowledge and experiences regarding entrepreneurial competences and entrepreneurship.

Before the Competento website was set up, the wide range of methods and initiatives was fragmented and confusing for the user. The Competento database provides an overview of options for promoting the entrepreneurial spirit and competences in Flanders, and many international initiatives. Good practices are disseminated via the Competento website. Anyone looking for examples finds them all in one place. Teachers, trainers and others in education can subscribe to the newsletter to be informed of new activities. ("Entrepreneurship in Vocational Education and Training", pg. 33)

In terms of entrepreneurship promotion there appears to be a significant amount of activity in Denmark. For example, the education system promotes and supports entrepreneurial activities at all levels. There is an established network of business support organisations providing a wide variety of business support services and initiatives. Relevant initiatives are listed below.

North Jutland Entrepreneurs Network is a regional Entrepreneurs programme which has been coordinated by North Jutland Growth House (Væksthus) since 2001. It is a network of business development agencies providing wide variety of consultations for participants in the programme. Participants of the programme receive 16 hours of free consultations in the form of vouchers from local business service, business plan evaluation, accountants, solicitors, marketing etc. Some 80% of all new business registrations in the North Jutland region had participated in the programme which accounts for 1,200-1,300 entrepreneurs per year. The evaluation of the programme highlighted that 98% of all registered entrepreneurs are still active (to some extent) after three years.

Further development of the programme is foreseen by providing further support for the top 10% of entrepreneurs. They would benefit from an additional 100 hours of consultations. The tools foreseen for this are: growth guides, networks, mentors, springboard, training/certificates.

Øresund Entrepreneurship Academy unites and develops strong competences and experiences with entrepreneurship education at the universities in the Øresund region. Currently, cooperation involves 12
In France, the mobility of teachers and researchers between higher education and business is encouraged at the state level. Since 1999, a law has allowed researchers to quit universities and labs to create a new venture based on their work. A network of academic incubators has been set up to support them. They are allowed to go back to university if desired. Between 2000 and 2005, 844 enterprises have been created by researchers in France, through academic incubators. Recently a new type of company, called “Young Academic Enterprise”, allows significant advantages to encourage business creation by researchers and students.

In Germany, some universities give their professors the opportunity to get practical business experience. For example, the Gelsenkirchen University of Applied Science can give professors one semester off for testing and using scientific expertise and methods as well as to get practical experience in firms (after a period of at least eight semesters).

In Spain a new Act for Universities was published in 2007, reforming the Statute of University Professors and enabling them to participate in business projects. (“Entrepreneurship in higher education, especially within non-business studies”, pg. 32)

Good practice criteria in delivering entrepreneurship education

1) The purpose of the course/programme is precisely defined, being linked to the delivery of the expected outcome (definition of objectives, and capacity to measure outcomes related to those objectives).

2) There is a balance between the theoretical and practical aspects. Teaching makes use of interactive and pragmatic methods; active self-learning; action-oriented pedagogy; group work; learning through projects; student-centred methods; learning by direct experience; methods for self-development and self-assessment. Delivery is through mechanisms that maintain the motivation of students at a high level.

3) Activities and events are organised to improve students’ ability to work in a group and build a team spirit, and to develop networks and spot opportunities.

4) Different guest lecturers are involved (e.g. experts on patent law, company financing, etc). A close relationship is in place with the local entrepreneurial environment, and educators are part of relevant networks (formal and informal). There is a collaborative approach with real business practice and industry.

5) Young entrepreneurs (for instance, alumni who have started a company) and experienced business people are involved in courses and activities, and contribute to their design. Practical experience, by means of students cooperating with enterprises and working on concrete enterprise projects, is embedded in the programme.

6) Courses and activities are part of a wider entrepreneurial programme, with support mechanisms for students’ start-ups in place and actively utilised.

7) Exchanges of ideas and experience between teachers and students from different countries are sought and promoted, to encourage mutual learning and to give an international perspective to programmes, courses and activities. (“Entrepreneurship in higher education, especially within non-business studies”, pg. 35)

Junior Achievement - Young Enterprise as a part of the curriculum

Except in Iceland, Junior Achievement – Young Enterprise (JA-YE) has made a significant contribution to entrepreneurship education in the Nordic countries, and is therefore more than just a good practice. Most of the programmes are integrated as a part of the curriculum in educational institutions. Not only they
integrate the national strategy in entrepreneurship education but, for instance, JA-YE Finland is also a part of the national working group to develop the national strategy (Finland 2009). In Denmark, the objectives for the Danish Foundation for Entrepreneurship - Young Enterprise (FFEYE) are to ensure the integration of entrepreneurship in every educational level of the Danish education system.

JA-YE has already become a significant feature of entrepreneurship education in the Nordic region. In the figure below, the aim is to identify similarities and differences in implementation between JA-Yes.

**Similarities and differences in implementation of JA-YE in the Nordic countries**

<table>
<thead>
<tr>
<th>JA-YE region</th>
<th>Covered region</th>
<th>Programme category</th>
<th>External funding rec'd 2011</th>
<th>Teacher training</th>
<th>Teaching materials</th>
<th>Awards</th>
<th>Nordic collaborated projects</th>
<th>Measuring performance</th>
<th>Research in EE</th>
<th>Alumni</th>
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<tbody>
<tr>
<td>Finland</td>
<td>19</td>
<td>Pre-school &amp; grade 1-6</td>
<td>€115,000</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Coming</td>
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<tr>
<td></td>
<td></td>
<td>Grade 7-9</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td>Sec school</td>
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<td>Higher edu</td>
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<td>17</td>
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<td>Yes</td>
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<td>Yes</td>
<td>Yes</td>
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<td>6</td>
<td>6</td>
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<tr>
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<td>Grade 2-5</td>
<td>SEK 77m</td>
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<td>Few</td>
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<td></td>
<td></td>
<td>Grade 6-9</td>
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<td>1</td>
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<td></td>
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<tr>
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<td>Mostly in secondary level</td>
<td>DKK 32m</td>
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<td>Yes</td>
<td>Some</td>
<td>Yes</td>
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<tr>
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<td>Aged 16-22</td>
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<td>At request</td>
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</tbody>
</table>

(“Entrepreneurship education in the Nordic countries: Strategy implementation and good practices”, pg. 44)

**Entrepreneurship education focused on higher level – Aalto University, Finland**

Aalto University (AU) was designed to be the world’s first ‘innovation university’ for the cross-discipline collaboration of faculties, researchers, and students of Finland’s leading universities of technology, art & design, and economics. Established in 2010, AU is a newly created university merging three Finnish universities: Helsinki School of Economics, University of Art and Design in Helsinki, and Helsinki University of Technology. The combination of three universities opens up new possibilities for strong multi-disciplinary education and research. Since the establishment, there is a determined effort to focus on innovation-based entrepreneurship. As AU moves forward, it will be better positioned to transform research ideas into competitive commercial technologies and innovative startups and growth companies.

**The main entrepreneurial organizations within Aalto**
According to the interviewee, AU integrates to a much closer extent technology transfer, startup acceleration, and entrepreneurship teaching and research compared to most other universities. These are embedded primarily in the Aalto Center for Entrepreneurship, Aalto Venture Garag9, Aalto Ventures Program, and Aalto Entrepreneurship Society.

AU also provides platform where teachers, students and business sectors could meet and share information, in particular, at Aalto Venture Garage and Aalto Design Factory. Since establishment of Aalto in 2010, Growth Entrepreneurship has become one of the main priorities of the newly formed university. See figure above for the main entrepreneurial organizations within Aalto – Aalto University Growth Entrepreneurship.

In terms of corporate collaboration to stimulate growth entrepreneurship, Nokia and Microsoft have chosen AU to co-develop the world’s leading mobile application development ecosystem. This so-called ‘Appcampus’ is a pilot program for creating application development hubs.

One interesting event is the ‘Fail Day’ celebrated by Aalto Entrepreneurship Society on October 13 every year. The initiative grew out of the risk aversion in the Finnish mentality that prevents many startups from being born. The aim of the event is to send out the message that there are many lessons to be learned from a failure on the road to success. ("Entrepreneurship education in the Nordic countries: Strategy implementation and good practices", pg. 61)

**Cambridge Centre for Entrepreneurial Learning: a people approach instead of a ‘how-to-approach’**

The focus of the Cambridge Centre for Entrepreneurial Learning (CfEL) is on planning and implementing entrepreneurship courses, within the whole University, using a specific philosophy and a well-thought learning approach. 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.). CfEL was established in 2003 from the division of two units formerly belonging to the University of Cambridge Enterprise 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. CfEL has nine full-time staff to plan and organise entrepreneurship courses, including a director, programme managers, a centre manager and administrative staff. All activities aim at developing self-confidence and self-efficacy amongst students.
Entrepreneurship is understood as a set of skills, attitudes and behaviours rather than just venture creation. Teaching methods range from lecturing, video and online assignments, to problem-based learning, project work on real technologies, entrepreneurs in the classroom. 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 main strength of CIEL is its clear focus on the development of entrepreneurial skills, attitudes and behaviours through an entrepreneurial pedagogy. This means focusing 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) instead of to a „how to approach” that emphasises business administration skills and tools to develop a (successful) business plan. („Partnering for Success in Fostering Graduate Entrepreneurship”, pg. 16)

In primary education, the adoption of school books, interactive games and online tools has proved to be particularly useful. For example, the award-winning Disney Kauffman online game teaches young people (aged 9–14) about the excitement and opportunity of entrepreneurship. The Junior Achievement programme, present in 19 African countries, includes six sequential themes for pupils from kindergarten level up to fifth grade, plus one capstone experience. Students learn the basic concepts of business and economics, and how education is relevant to the workplace. External evaluators have found that elementary school students who participate in the Junior Achievement programme demonstrate significantly higher critical thinking and problem-solving skills than their counterparts. („Entrepreneurship education, innovation and capacity-building in developing countries”, pg. 8)

UNCTAD’s Empretec methodology Empretec is an integrated capacity-building programme of UNCTAD which is currently operating in 32 entrepreneurship centres across the developing world. Empretec distinguishes itself from other trainings by offering a behavioural approach to entrepreneurship. Research undertaken has demonstrated that there is a series of 10 key personal entrepreneurial competencies represented by 30 behaviours associated with successful entrepreneurs. The Empretec programme reinforces and strengthens these competencies through an Entrepreneurship Training Workshop (ETW) which involves self-assessment, individual transformation and business stimulation activities. The ETW encourages individuals to focus on their role as entrepreneurs, and challenges them to critically examine their personal strengths and weaknesses. The training method is highly interactive and experiential, and is combined with other services. („Entrepreneurship education, innovation and capacity-building in developing countries”, pg. 11)

4.) Initiatives, Proposals & Recommendations

Entrepreneurship education should be prioritised. Most Member States have strategies or on-going initiatives addressing the implementation of entrepreneurship education into general education at primary and/or secondary level, yet only in a quarter of member states did a majority of adults believe they had the right skills and knowledge to start a business. Consequently, entrepreneurship needs to be introduced early, and included at all levels and in all disciplines of education and training. (Rethinking education: investing in skills for better socio-economic outcomes, pg. 4)

Attention should be particularly focused on the development of entrepreneurial skills because they not only contribute to new business creation but also to the employability of young people. However, at the national level only six Member States have a specific strategy for entrepreneurship education. To address this, in 2013 the Commission will publish policy guidance to support improvements in the quality and prevalence of entrepreneurship education across the EU. Member States should foster entrepreneurial skills through new and creative ways of teaching and learning from primary school onwards, alongside a focus from secondary to higher education on the opportunity of business creation as a career destination. Rethinking Education: Investing in skills for better socio-economic outcomes, pg. 4)
Real world experience, through problem-based learning and enterprise links, should be embedded across all disciplines and tailored to all levels of education. All young people should benefit from at least one practical entrepreneurial experience before leaving compulsory education. Measuring the impact of this work is important, and to support Member States the Commission will identify tools to assess progress and demonstrate the acquisition of entrepreneurial skills. At the level of individual institutions progress will be boosted by a self-assessment framework, carried out jointly with the OECD, to guide and advance the development of entrepreneurial education institutions at all levels including schools and vocational education and training (VET). (*Rethinking Education: Investing in skills for better socio-economic outcomes*, pg. 4)

**Entrepreneurship education actions to include**: publishing policy guidance on entrepreneurship education in 2013; establishing, jointly with the OECD, a guidance framework for entrepreneurial education institutions; and the development of tools to monitor progress and the acquisition of entrepreneurial competences. (*Rethinking Education: Investing in skills for better socio-economic outcomes*, pg. 17)

**Partnerships between education, business and research** such as the Knowledge Alliances, the Sector Skills Alliances and the partnership actions within the Marie Skłodowska-Curie programme will be promoted through the proposed Erasmus for All programme 2014-2020 and Horizon 2020 in order to adapt education and training systems closer to the needs of companies, especially SMEs. (*Rethinking Education: Investing in skills for better socio-economic outcomes*, pg. 17)

The following objectives are to be reached through entrepreneurship education:

- Improvement of the entrepreneurship mindset of young people to enable them to be more creative and self-confident in whatever they undertake and to improve their attractiveness for employers.
- Encourage innovative business start-ups;
- Improvement of their role in society and the economy.

("Effects and impact of entrepreneurship programmes in higher education", pg. 7)

**The policy should support entrepreneurship programmes**

It can be concluded in general that providing entrepreneurship education at higher educational institutions has a positive effect on entrepreneurship. The results underline the importance of the policy on the development of entrepreneurial skills through education in all EU Member States as it is presented in the Programme for the Competitiveness of Enterprises and small and medium-sized enterprises (COSME) and in the Europe 2020 strategy Agenda concerning new skills and jobs. Member States should stimulate and give full support to higher education institutions to develop entrepreneurship programmes.

**Providing entrepreneurship education should become obligatory and should be extended to all disciplines**

The enterprises created by entrepreneurship alumni can be characterised as being innovative, having high growth and ambitious, whereas the enterprises established by the control group can be characterised as being traditional, stable and less risky.

Apart from that, entrepreneurship programmes also have an impact on entrepreneurship in a broader sense, by stimulating entrepreneurial and innovative capabilities of individuals in paid employment. The survey results show that the employability, the entrepreneurial attitude and innovative and creative capacities of individuals have been positively impacted by the offering of entrepreneurship programmes. This made these individuals more attractive to employers.

These results show that there is an argument to make entrepreneurship education obligatory and to broaden the inclusion of entrepreneurship programmes into other disciplines in which individuals are
trained for paid employment such as engineering sciences and agriculture sciences, forestry and nutrition sciences or social sciences. In recent years an extension of entrepreneurship education into other disciplines is already taking place in some countries. This extension is also visible in the institutions which participate in this study. This extension should continue in all Member States.

**Learning by doing should be an important part of training**

JADE is the European Confederation of Junior Enterprises. A Junior Enterprise is a student association in which students have the opportunity to add practical experience to their theoretical skills, as well as to develop entrepreneurship at an early stage by running professional studies for companies and managing the organisation itself. In these SMEs, students from different fields of studies (from business and economics, to engineering, IT and communication) can develop some technical and soft skills essential for their future careers, and also to get an early contact with the business world.

JADE alumni score better in many aspects than the other group of entrepreneurship alumni and the control group alumni. These results support the importance of including practical training in the education programmes.

**Value the impact on society**

Improving the entrepreneurial key competence is also expected to have an impact on the social and personal life of individuals and consequently on society. Attending entrepreneurship education does not impact the extent to which individuals participate in voluntary work according to the survey, although the participation in non-commercial projects seems to be affected in a positive manner.

This can be explained by the fact that the entrepreneurship programmes focus on the use of entrepreneurial competences in working life. Governments can stimulate education institutions to broaden this focus to personal and social life. (*Effects and impact of entrepreneurship programmes in higher education*, pg. 85)

**Specific attention to female students**

The entrepreneurship and JADE female alumni outperform female alumni in the control group on almost all aspects. However, the survey shows that female alumni value their entrepreneurial characteristics, skills and knowledge less than the male alumni. In addition, female alumni are less inclined to become an entrepreneur. These gender differences are found in the entrepreneurship group, the JADE group and the control group. These results are important in the context of the objectives which the Commission has set in COSME to stimulate female entrepreneurship. Specific attention to this group of students is needed.

**Measure impact in more than one period**

In this study the impact of entrepreneurship education was measured only on one single moment. Most of the entrepreneurship programmes on the higher education institutions are less than ten years old. We also know that many graduates first want to gain some work experience before they even consider starting a business. For example it is likely that in ten years time more alumni will be involved somehow in entrepreneurship than there are at this time. Longitudinal information should be collected in order to measure the impact of entrepreneurship education. (*Effects and impact of entrepreneurship programmes in higher education*, pg. 86)

It is proposed that the European Commission:

I. acts as a key 'catalyst', stimulating and accelerating developments by supporting the establishment of an observatory of policy and practice, and a research hub to collect and disseminate good practices, commission new research and develop frameworks, e.g. for monitoring and evaluation;
II. builds ‘platform’ mechanisms through which stakeholders – especially teachers and businesses - can come together at EU level to discuss and debate common issues. Such platforms can be both virtual (web-based), and/or based on real-life contacts (e.g. seminars, training, panels on specific themes, etc.). This involves both deepening the HLRP process, which provided a new and innovative arena to consider how to develop and implement strategies, as well as mobilising critical groups of stakeholders including teachers and businesses;

III. develops an ‘enabler’ role. This function involves mobilising the resources available through EU programmes to support activity, both at EU level and within Member States;

IV. establishes a European Centre for Entrepreneurship Education as the main vehicle to implement the above activities, by leading developments at EU level as well as linking into national activities, observatories and hubs as they develop;

V. leads these actions through the Directorates General “Enterprise and Industry” and “Education and Culture” and develops better coordination across the Commission, including with those other DGs with an important role, such as the DG “Regional Policy” and the DG “Employment, Social Affairs and Equal Opportunities”. (“Effects and impact of entrepreneurship programmes in higher education”, pg. v)

The EU as Enabler: Key Activities

- Funding the establishment of a European Centre for Entrepreneurship Education to act as an observatory of good policy and practice, a research and development hub, and a platform for stakeholder engagement.
- Funding new research and development (e.g. into an EU-wide common monitoring and evaluation framework) and the collection and dissemination of good practice.
- Support the development and dissemination of teaching materials and methodologies, and teacher training, e.g. through seminars and workshops.
- Funding awareness-raising initiatives to spark new activity, for example through utilisation of the European Enterprise Awards to recognise good practice in entrepreneurship education, and by extending into entrepreneurship education the 'ambassadors' concept (as in the recently launched European Network of Female Entrepreneurship Ambassadors) to develop a network of European Ambassadors for Entrepreneurship Education which would draw upon individuals in the teaching and business worlds.
- Ensuring that identified EU priorities (e.g. on key competences) are integrated into existing programmes (e.g. Youth in Action, the Lifelong Learning Programme) through calls for proposals, new initiatives, tenders
- Incorporating entrepreneurship education fully into forthcoming programmes (post-2013) through the impact assessment/ex-ante evaluation procedures and then in the design of the programmes themselves (not as a later addition).
- Funding interventions in MS/regions to encourage cohesion and new economic growth and prosperity through National Reform Programmes (NRPs) and Operational Programmes (OPs) by promoting and developing opportunities through ESF/ERDF to ministries/programme monitoring committees and regional authorities. Entrepreneurship education activities can be supported through these funds. Business-development measures are commonplace within NRPs and OPs and can be supported and enhanced through the development of coherent packages of support for entrepreneurship education. (“Towards Greater Cooperation and Coherence in Entrepreneurship Education”, pg. 77)

Teacher training needs to develop the specific skills required to teach entrepreneurship, such as:

a) Project management skills

The heart of entrepreneurship education is students setting up and running a project. Teachers require the skills to support students throughout this process, which includes: planning and preparing the project
(setting objectives and identifying what exactly is required and how it can be carried out, etc.); anticipating students’ needs at each stage of the project; setting personal targets and goals throughout the project; and doing the final evaluation.

b) Pedagogical skills

The emphasis is on pedagogies that encourage learning: by doing; by exchange; by experiment; by risk taking and ‘positive’ mistake making; by creative problem solving; by feedback through social interaction; by dramatising and acting the part; by exploring role models; and by interacting with the outside/adult world.

This involves the teacher in suggesting and guiding rather than giving instruction, asking ‘open’ questions that do not necessarily lead to one correct answer, learning alongside the students, helping to resolve conflicts and difficulties that may arise and persuading students to face up to things they may initially resist or avoid.

c) Personal skills

Much of the success of the facilitation process depends upon a range of communication skills, including that of active listening, the ability to negotiate and work in teams with other colleagues and the ability to create a learning environment in which students can be open and frank, and feel confident and secure. The most effective way to ensure that teacher competence in this field is adequate and up-to-date would be to make entrepreneurship a mandatory part of teacher education. It is also important to offer further education to those teachers who have already completed their initial education. (Entrepreneurship in Vocational Education and Training, pg. 25)

Public authorities:

1) Set up a national steering committee for entrepreneurship education, including representatives from different ministries and relevant stakeholders (including delivery partners and NGOs), with the objective of launching and developing a national strategy.

2) Create a legal framework that enables entrepreneurship education, and make the necessary funds available (e.g. for teaching the trainers, support tools, teaching material).

3) Introduce entrepreneurship as an explicit goal within the curriculum, and formally recognise entrepreneurship education activities. Develop steering documents (e.g. curricula and syllabi) and guidelines, and measure both the scope and effect of entrepreneurship education in schools.

4) Make career exploration mandatory, and include entrepreneurship in vocational guidance: the opportunity of learning about entrepreneurship should be offered to all students.

5) Raise awareness and improve knowledge about entrepreneurship education among school management, for instance by holding dedicated seminars.

6) Provide counselling for schools and teachers in designing VET curricula, and disseminate successful experiences and practices between VET schools. Create contact points to support teachers and schools wanting to engage in entrepreneurship education.

7) Help teachers to become better qualified in entrepreneurship: require entrepreneurship education when teachers are in university studies, and endorse the on-site training that teachers receive from recognised providers.

8) Support those non-profit organisations and NGOs whose mission is promoting and delivering entrepreneurship education and acting as intermediaries between vocational schools and businesses.
9) Grant ‘micro-scholarships’ to innovative and brilliant students in VET schools who want to start an independent activity and have a good business idea.

**Vocational Schools:**

10) Within the school, establish the role of an enterprise champion who is specifically responsible for school-enterprise partnerships, or encourage one or two teachers to take the lead.

11) Extend entrepreneurship to all fields of study in vocational education. Link practical training in specific fields of study with the objective of entrepreneurship, and provide support for students interested in starting up a business.

12) Present entrepreneurship in a practical way. Promote the use of methods based on real experience (project work with real enterprises or with the local community, student mini-companies, etc.).

13) Involve businesses in the entrepreneurship education process. Ensure access to experts (from businesses, business associations, and NGOs) who can provide training and ongoing support.

14) Organise talks and seminars by entrepreneurs to encourage students, and to make them aware of the potential and implications of becoming self-employed.

15) Encourage and motivate teachers, by ensuring access to appropriate training, information and guidance. Allow internships in enterprises in the country and abroad.

**Business organisations, and other intermediary organisations:**

16) Promote partnerships between VET schools and enterprises, and act as an intermediary in finding work placements for both students and teachers.

17) Provide expert help with preparing programmes and cooperate with schools on implementing entrepreneurship education activities, particularly through project work.

18) Encourage both young and experienced entrepreneurs to get involved in entrepreneurship education as role models.

19) Raise awareness among businesses, particularly at local level: start corporate social responsibility (CSR) initiatives that would motivate more business people to get involved in entrepreneurship education.

**Coordination and support at European level:**

20) Establish a European platform for entrepreneurship education, providing all the information, good practices, exchanges, finding partners, promotion material, etc.

21) Make funds available through existing EU programmes for students, teachers, entrepreneurship education organisations and VET providers. In particular, support trans-national projects with a European dimension.

22) Promote the exchange of good practices in teaching entrepreneurship; publish and disseminate case studies and good practices.

23) Make expertise available to all countries, for example by supporting visits by experts to deliver presentations. Support ‘peer learning’ and organise study visits to locations selected as good examples. Organise exchange meetings for entrepreneurship educators followed by the dissemination of results.

24) Promote campaigns to raise awareness among the general public about the importance of entrepreneurship, and in particular competitions and European awards for entrepreneurship programmes, courses and activities in vocational education. Set up or support European awards (best school, best
teacher, best student, best company), and/or introduce an Education category in the European Enterprise Awards. Encourage the involvement of private sponsors.

25) Monitor and benchmark the process in Member States, and disseminate information about the results. (**Entrepreneurship in Vocational Education and Training**, pg. 43)

The lack of relevant skills and experience to teach entrepreneurship is especially acute in the post-transition countries of central and eastern Europe. This can be overcome, or at least alleviated, by:

a) establishing professional networks for the regular sharing of teaching practices and methodologies;

b) short-term exchanges of entrepreneurship teachers between the institutions of higher education in order to disseminate best practice and teaching methods;

c) short-term internships of teachers in businesses.

A main prerequisite for achieving a good level of entrepreneurship teaching is ensuring that educators are close to the problems and issues of the real business world. (**Entrepreneurship in higher education, especially within non-business studies**, pg. 38)

**Public authorities (framework conditions)**

1) Establish a task force or steering group (including the Ministry of Education and other departments: Economy; Employment; Science and Research) to determine how entrepreneurship can be integrated into the education system across primary, secondary, and higher education. The task force would also get the viewpoints from representatives of other relevant organisations. This should lead Member States to develop a coherent national strategy for entrepreneurship education, clearly linked to an agreed framework of desired outcomes.

2) Adopt legislation supporting relations between private business and universities, including allowing professors to work part-time with business. A joint inter-ministerial programme with a financial budget should accompany the above legislation and support institutions in developing action learning programmes that also result in new venture creation.

3) Help develop an accreditation system to validate informal learning and practical activities that favour entrepreneurship development: students should receive credits for their regular and successful work.

4) Establish awards for entrepreneurial universities, teachers and students. Promote positive examples of academic spin-offs.

5) Create Regional Centres responsible for coordinating, organising and promoting entrepreneurship action (e.g. “Entrepreneurship Houses” in France). These centres could build up a critical mass of activities at a local level, encourage the sharing of best practice and tools, provide support for networking among educators, entrepreneurs and students. Action would include training teachers, and mobilising entrepreneurs to operate in the classroom.

**Activities at the level of institutions**

6) Institutions should have a strategy and action plan for teaching and research in entrepreneurship — embedding practice-based activities — and for new venture creation and spin-offs.

7) Institutions should embed entrepreneurship in all faculties. One effective way of doing so will be to establish an entrepreneurship education department responsible for disseminating entrepreneurship throughout the institution. This role should be played by the Business School, where there is one. Non-business higher education establishments should create a specialised administrative unit for dealing with all activities related to entrepreneurship (Centre for Entrepreneurship). Centres for Entrepreneurship
should be entrepreneurial hubs within the institution, whose function is to spread the teaching of entrepreneurship across all other departments.

8) An introduction to entrepreneurship and self-employment should be offered — as part of career guidance — to all undergraduate students during their 1st year. In addition, all students should be given the opportunity to attend seminars and lectures in the subject. Therefore, as a minimum requirement, all higher education institutions should provide at least one entrepreneurship course, and enforce structures that allow students to choose.

9) Institutions should have incentive systems for motivating and rewarding faculty staff in supporting students interested in entrepreneurship and new business start-ups, and should acknowledge the academic value of research and activities in the entrepreneurial field.

10) Develop clear institutional rules about intellectual property. Provide templates for use as a reference, and give examples. Comparative information on IPR rules applied by different institutions should be available for teachers, researchers and students. Good practice should be disseminated.

11) Encourage the spontaneous initiative of students. Existing students’ organisations aimed at developing entrepreneurial projects and activities, and of building contacts with the business world, should be given the best conditions to operate and should be supported. Where relevant, Enterprise Clubs — supported by the faculty but operated by the students themselves — could be set up. Create frameworks and support for students to organise their own activities.

12) Award academic credits for activities within student associations, and more generally for practical work on enterprise projects outside the established courses, including the development of business plans.

Other relevant players and the business world

13) Business associations should encourage the involvement of their members in teaching entrepreneurship within educational establishments, as well as in taking an active role in organising business plan competitions and in providing support for getting the winning ideas off the ground. Industry should provide sponsorship and funding for start-ups created by students, within incubators or as a result of business plan competitions.

Coordination and support at European level

14) The Commission should support programmes for training entrepreneurship teachers within a European dimension, and should back the creation of networks and crossborder exchange programmes for educators. This would include encouraging the mobility of teachers across Europe for short periods of placement within institutions in different countries, and supporting the organisation of summer schools for a one-week exchange of experience among entrepreneurship professors and sharing of case studies and methods.

15) The Commission should conduct a regular and comprehensive benchmarking of public policies in this area. Member States should define an action plan, with results measured each year by way of reports that Member States would submit to the Commission. (Entrepreneurship in higher education, especially within non-business studies, pg. 67)

A Framework for policy development

A1 Ensure political support for entrepreneurship education at the highest level. Real progress will be possible only with a strong commitment from national and regional governments and from the relevant Ministers, in the context of the implementation of the Lisbon strategy.
A2 Better integrate Entrepreneurship Education into the Lisbon monitoring process (Integrated Guidelines for Growth and Jobs), and make the assessment of Member States' progress in this field more effective by means of applying specific indicators.

A3 Set up a European-wide framework of what is to be achieved, followed by proper evaluation of the impact of measures taken. Coordination needs to be ensured at the EU level, with the definition of broad objectives and of desired outcomes for entrepreneurship education. The above framework could be supported by the establishment of a European Observatory for Entrepreneurship Education, with national antennae.

A4 Launch national strategies for entrepreneurship education, with clear objectives covering all stages of education. Such strategies should call for the active involvement of all relevant actors (public and private), and establish a general framework while defining concrete actions. These will range from the inclusion of entrepreneurship into the national curricula to providing support to schools and teachers. The overall goal will be to ensure that young people can progress coherently in acquiring entrepreneurial competences across all stages of the education system.

A5 Create Steering Groups, both at European and at national level, where all the different stakeholders involved in entrepreneurship education can be represented (public administrations, businesses, educational establishments, students, etc.). These Groups would have among their objectives that of setting targets for entrepreneurship education, taking into account its various elements, and that of reporting on progress achieved.

A6 Promote entrepreneurship education at regional level, with a coherent programme bringing together local stakeholders and addressing the various levels of education through a range of different instruments.

A7 Facilitate the development of entrepreneurship education within the Bologna process by: encouraging the mobility of teachers (across countries and across different institutions, including in the private sector); recognising the role of educators other than teachers (practitioners, entrepreneurs, students themselves); recognising entrepreneurial career paths in undergraduate education at university.

A8 Increase coherency between European funding programmes that can be used to support entrepreneurship education projects and activities (in particular the Lifelong Learning Programme, the ESF, the ERDF). These programmes can be valuable in supporting actions taken at national and local level.

A9 Ensure coordination at European level in the evaluation of programmes and activities, in order to allow the comparability of results. The EU could bring together a group of researchers in entrepreneurship education, to help define indicators and specify typical educational processes. (The Oslo Agenda for Entrepreneurship Education in Europe, pg. 1)

B Support to Educational Establishments

B1 Better integrate entrepreneurship programmes and activities in the established curriculum for schools at all levels (primary, secondary, vocational), as a horizontal element in all fields of study (entrepreneurial mindset) and as a subject in its own right (entrepreneurial skills).

B2 In its broader definition (fostering attributes like creativity, autonomy, initiative, team spirit, etc.) entrepreneurship should be also included in the curriculum for primary schools. Especially at this level of education it is important to convince schools, teachers and parents that entrepreneurship is a key competence for all, and it does not aim to turn all pupils into businessmen.

B3 The European Commission should support curricular reforms to be undertaken at national level and facilitate comparative analysis, through a range of instruments going from the coordination of the implementation of the Lisbon strategy to facilitating the exchange of good practice.
B4 Support the use of practice-based pedagogical tools whereby students are involved in a concrete enterprise project (for instance in running a mini-company). Embed these activities as a recognised option in official school programmes, particularly at secondary level.

B5 Stimulate - through targeted public funding - the implementation of pilot projects in schools, in order to test different ways of delivering entrepreneurship education. The final goal will be to disseminate resulting good practices widely, and to encourage take up of tested methods by the largest number of schools.

B6 Ensure sustained funding/support for entrepreneurship education activities, and for the implementation of concrete enterprise projects in school. The termination of short-term project funding or the changing of funding mechanisms creates fragility to sustainable provision, unless this can become embedded within a coherent strategy.

B7 Grant public funding for the establishment of Entrepreneurship Centres at universities and the creation of a network between them. These Centres would have the missions - among others - of: spreading entrepreneurship across different fields of studies within the institution; fostering the commercialisation of research and the exploitation of new business ideas; building links with businesses; etc.

B8 Build common European and national platforms of existing programmes, projects and teaching material, in order to help sharing and dissemination. Such platforms will greatly support practitioners in improving the offer of entrepreneurship education.

B9 Develop research to assess the impact of entrepreneurship education on individuals, communities, society and the economy. The possibility of tracking alumni will be an essential success factor. (The Oslo Agenda for Entrepreneurship Education in Europe, pg. 2)

C Support to Teachers and Educators

C1 Providing specific training to teachers in entrepreneurship is a policy issue, and should be attached to the national curriculum reforms. The educational authorities should talk to teachers in their own language, explaining why entrepreneurship is a key competence for all and how related methods and activities can bring more dynamism and innovation into different courses.

C2 Adopt innovative methods to train teachers in entrepreneurship. These would include case studies and other inter-active methods, such as involving teachers in real work on enterprise projects or even in running themselves a mini-company. By acquiring direct experience, teachers will be more effective when using these methods with the students.

C3 Set-up incentives at school level to enable teachers to teach entrepreneurship, for instance by means of setting up staff development funds, and by recognising and rewarding the involvement of teachers in activities that require an innovative pedagogy and very often also an extraordinary effort from them.

C4 Launch innovative actions for training teachers on entrepreneurship, with a European dimension, to be supported under the Community Lifelong Learning Programme.

C5 Support the mobility of educators across Europe, particularly in higher education, through the Community Lifelong Learning Programme and/or other instruments specifically designed for that purpose. Greater mobility and exchange of experience is needed in Europe, not only between universities but also between academia and the business world. Programmes need to be developed that allow educators to spend time at other institutions and/or in the private sector to truly engage, learn and develop. Europe needs greater sharing of knowledge and good practice across sectors and national borders. (The Oslo Agenda for Entrepreneurship Education in Europe, pg. 2)

D Entrepreneurship activities in Schools and in Higher Education
D1 Embed elements of entrepreneurial behaviour (curiosity, creativity, autonomy, initiative, team spirit) already in primary school education. To this end, use games, cartoons and other tools appropriate to the age of pupils.

D2 Starting from primary school, raise awareness in young children of the role of enterprises and entrepreneurs in society. Emphasising the notion of "responsible entrepreneurship" will help to make an entrepreneurial career a more attractive proposition.

D3 Disseminate within schools a book with success stories of young entrepreneurs, in order to improve the image of entrepreneurs as role models for young people.

D4 Introduce innovative pedagogies into all courses, as a necessary basis for building an entrepreneurial spirit. Extend the range of pedagogies in use through innovative curricula development. School education should build upon the curiosity and the natural entrepreneurial ability of children.

D5 As part of the final evaluation of a programme or course in entrepreneurship, test the entrepreneurial competences of students and offer them a certificate ("entrepreneurial driving licence") acknowledging the acquisition of those skills.

D6 Associate students to real companies and to business people, in order to ensure a close relation with real business experience. Students should not be kept in isolation and far from the world outside the school, for instance when running a virtual firm or simulating a business plan.

D7 Allow and support the spontaneous initiative of student associations pursuing objectives such as creating links with businesses, and involving students in work on enterprise projects. Recognise and reward the time that students dedicate to these activities by means of educational credits.

D8 Engage alumni in the activities of the school/university and in the classroom (for instance, alumni who started a company).

D9 Offer entrepreneurship education to disadvantaged groups. In particular, young people at risk of social exclusion (low-income youth, school dropouts, adolescents in danger of long-term unemployment, refugees, etc.) may greatly benefit from this type of training. It can raise the motivation of those who learn best by doing, and who have difficulties in more traditional subjects. Some programmes addressing these target groups proved very successful both in terms of startups and of social integration.

D10 Higher education establishments should integrate entrepreneurship across different subjects of their study programmes, as it may add value to all degree courses (e.g. technical and scientific studies, but also humanities and creative studies). All faculties/disciplines should develop opportunities for students at every level to experience entrepreneurship.

D11 In higher education, bring entrepreneurs into the classroom and involve students directly in enterprise projects. Using active learning methods is more complex than traditional teaching methods. It requires engaging students’ feelings and emotions in the learning process. Educators/facilitators therefore must be able to create an open environment in which students develop the necessary confidence to take risks.

D12 Increase the production of European case studies to be used in the classroom in higher education. Group work on concrete cases is an effective method, as it improves the understanding of real issues related to entrepreneurship and engages students in finding solutions to real problems. To be most effective, case studies used should have a European and local dimension, rather than being imported from the US.

D13 Give entrepreneurship more academic esteem: establish good research programmes and PhD programmes on entrepreneurship, in order to create a "critical mass" of future teachers with this specific competence;
D14 Encourage students, graduates and researchers with commercially viable business ideas to develop them into companies, by providing a range of support services within the institution (incubators, financing, mentorship, etc.).

D15 Embed evaluation systematically into all programmes. The most effective evaluation is independent and comparative (i.e. it should be run before the beginning of the programme and after its conclusion). *(The Oslo Agenda for Entrepreneurship Education in Europe, pg. 3)*

E Building links and opening education to the outside world

E1 Encourage the creation of learning communities with the mission of fostering entrepreneurial mindsets, by building links between the public and the private sector, involving schools, academia and businesses, as well as relevant intermediary organisations. In particular, the role of those intermediary organisations dedicated to the dissemination of entrepreneurship activities within schools and universities, and to building links between education and the business world, should be better recognised.

E2 Encourage the involvement of private partners in education for entrepreneurship, through funding or contributions in kind. This involvement should be seen by firms as a long-term investment, and as an aspect of their corporate social responsibility.

E3 Businesses should consider donating at least a tiny part of the working time of staff to participation in activities within schools and universities. In fact, mentoring and coaching from people with business experience are a basic element in all entrepreneurship training.

E4 Develop or support research on how employers can be better engaged in school/university education. The business community needs incentives to more fully engage with educational institutions. Opportunities for mutual benefit can work, but are often not recognised as verifiable and appropriate staff activities.

E5 Help develop the pedagogical abilities of entrepreneurs and business people, in order to make their participation to activities in the classroom more effective. This task could be usefully performed by those non-profit organisations dedicated to linking schools and businesses, and by business organisations.

E6 Conceive, develop and promote a label for “entrepreneurial schools” and “entrepreneurial universities”, to be used by educational institutions on a voluntary basis. Broad criteria could be defined at European and/or national level, which should be in any case adapted to the local environments and education systems. This initiative could be implemented at national level by intermediary organisations with in-depth experience in entrepreneurship education, through cooperation with educational authorities and with schools/universities.

E7 Give young people the opportunity to develop their enterprising skills by helping them to create their own "summer job", and earn money by using their own ideas and initiatives. These activities can be promoted through cooperation between schools, non-profit organisations, businesses, local authorities.

E8 Build Entrepreneurship Centres at a local level, with the missions of assisting schools and teachers, developing links between educational establishments and enterprises, facilitating the participation of entrepreneurs and business people in programmes at school and university, promoting raising awareness initiatives in the local community. *(The Oslo Agenda for Entrepreneurship Education in Europe, pg. 4)*

F Communication activities

F1 Launch awareness campaigns at European and national level, ensuring that entrepreneurship is understood in its broader sense (not just about running a business). Broad initiatives could bring together
and coordinate different actions to take place at national and local level (e.g., entrepreneurship days, or a European Year of Entrepreneurship).

**F2** Celebrate entrepreneurship education activities and programmes that work well, by organising awards and competitions.

**F3** Establish awards, at European and/or at national level, to acknowledge enterprises that distinguish themselves more in dedicating funds and working time of their staff to teaching, mentoring and more generally to participation in activities within schools and higher education. *(The Oslo Agenda for Entrepreneurship Education in Europe, pg. 4)*

1. **Tackling Campus-Level Obstacles to Innovation**

   **a.** Faculty should not be viewed as enemies of reform, but as enablers of innovation. One strategy for making this happen is for campuses to create research funds targeted at innovative teaching models, then ask faculty to compete for research grants. Teamteaching should also be encouraged to avoid the “siloing” of faculty. In addition, certain faculty roles, such as developing curriculum and developing testing instruments, should be unbundled to reduce redundancy and allow more effective specialization.

   **b.** To allow for innovation to be accepted more readily, changes in curriculum and program should become a routine part of campus culture. At the same time, campus-level change will be easier if institutions work in coalitions rather than in isolation.

   **c.** State policymakers could give colleges incentives to innovate by, for example, offering higher levels of funding to institutions with better student outcomes (and, presumably, more effective curriculum and teaching). This, in turn, will require better measures of what happens to students after graduation.

2. **Rethinking Accreditation**

   **a.** There was no consensus on the elimination of accreditation called for by some participants. However, there was general agreement that accreditation should focus much less on inputs, such as the requirement that professors in many courses hold PhDs, and more on outcome measures such as student performance and loan default rates. This would foster innovation: for example, new entrants could post a surety bond until they graduated their first cohort of students, after which they could receive accreditation and federal funds based on outcomes.

   **b.** Accreditation should follow the “do no harm” principle, with the fewest possible restrictions on new and existing providers. Accreditation could take place at the course level, or accreditors could require that course delivery and student assessment be separated entirely. Seat time should no longer be required for a program of study to be considered legitimate by accreditors. Indeed, online learning should be largely deregulated so long as minimum course level outcomes are specified. Accreditors should require that completed course credits be transferable to other postsecondary institutions.

   **c.** All six regional accreditors should have the same rules and procedures. At the same time, some independently administered oversight bodies may emerge to award certificates for certain programs, sidestepping the existing accreditation system entirely.

   **d.** Federal aid and loans should be unbundled from the regional accreditation system.

3. **Streamlining State and Federal Regulations**

   **a.** State and federal regulations should be focused above all on helping students, not protecting the interests of existing institutions.

   **b.** States should relax existing rules to make it easier to start charter colleges, including community colleges. Like charter schools in the K-12 sector, charter colleges would be given great flexibility in exchange for improving student outcomes.
c. Rules governing federal loans and grants can be used much more effectively to influence policy outcomes. Pell grants for low-income students should be staggered, providing fewer dollars up front and more as students advance toward degree completion. Colleges’ and universities’ eligibility for enrolling students who receive federal loans should be tied to bringing down costs. The government also should leverage its role as a lender to inform students about the seriousness of taking on loan obligations.

4. Improving Incentives to Boost Academic Productivity

a. Research universities should revisit the common breakdown of faculty time, rethinking the research/teaching/service balance on a case-by-case basis. Professors whose time would be more productively spent in the classroom than conducting research could be given financial incentives to teach extra courses.

b. More efforts should be made to share journals and other library resources across institutions. This will require an acceleration of the initiatives that already have been launched by university libraries and others to create consortia that share research resources and to bring all academic journals online.

c. Universities should continue to explore new pedagogies driven by technology. In some cases, these permit teaching and learning to take place at a scale where low marginal costs could dramatically drive down tuition. In others, innovative instructional models should be pursued simply because of the promise they hold to improve how, and how much, students learn.

5. Filling Information Gaps about Student-Learning and JobMarket Outcomes

a. Better metrics to measure the effectiveness of colleges and universities are vital. Prospective students need to know more about which institutions do a better job teaching their students and preparing them for the job market. Policymakers don’t know very much about which colleges and universities offer the best value to the taxpayers who typically support most of their operations. All states should immediately provide information on labor-market outcomes by creating “unit record” data that links information on individual students’ college experience to how they fare in the job market.

b. Before starting college, students should be required to sign a “truth in enrollment” form, akin to the truth-in-lending statements required for home purchases, stipulating that they have received information about the institution’s costs, completion rates, graduates’ employment rates, and graduates’ salary information by major.

c. While precise measures of student learning outcomes remain a work in progress, all states should require colleges and universities to assess student learning and release the information publicly. In time, this will give institutions an incentive to develop more effective learning measures, which in turn will provide the information needed to gauge the relatively pedagogical success of different colleges and universities.

6. Overcoming Barriers to Taking Innovative Models to Scale

a. The transparency measures called for in previous sections will be essential for spreading the most promising new ventures and practices. Clear and easily accessible information about prices and student outcomes, both in the classroom and in the labor market, will introduce greater competition in the higher education sector. More competition, in turn, should create more opportunities for new entrants to introduce new models and take the most successful ones to scale.

b. With more such measures available, public dollars at the state and federal levels should be allocated on the basis of outcomes rather than through the use of formulas that rely heavily on input measures such as classroom enrollment.

c. The U.S. Department of Education should create a new “innovation demonstration program” that allows a designated group of new postsecondary providers to award certificates and degrees even if those
institutions are not already accredited. (College 2.0: An Entrepreneurial Approach to Reforming Higher Education: Overcoming Barriers and Fostering Innovation, pg. 4)

This report provides a set of recommendations that Education Institutions could take into account in order to improve and develop the provision of entrepreneurship education and training.

- Creating a policy on entrepreneurship education is a must when Education Institutions want to shift to entrepreneurial institutions.
- Every EIs which focus on being entrepreneurial should find the resources to create an entrepreneurship department and appoint change agents that can act as spokesmen/advocates at the management level.
- Encourage staff members to get involved in the entrepreneurial activities by offering incentives and create value for students through the activities provided.
- For a better quality of the entrepreneurship provision, the academic staff should have more possibilities to improve their skills and competence in the field of entrepreneurship education and training.
- Lecturers/academic staff should be offered incentives for their accomplishments in the field of entrepreneurship since there is a huge need that people get involved and stay motivated.
- EIs should focus on exchange programmes for entrepreneurship lecturers across Europe, so they can develop their competences and acquire best practices.
- Entrepreneurship degree constitutes an important tool for entrepreneurial institutions. Where the degree is not offered it should be taken into account and act towards offering one.
- Increasing the number of entrepreneurship courses in the curriculum should be taken in consideration.
- Entrepreneurship courses credited to students’ degrees should increase so the recognition becomes much easier.
- Explore the possibilities of offering more degree programmes in entrepreneurship in a way that students are offered continuity.
- Every EIs should focus on embedding the entrepreneurship education across all study discipline.
- In order to increase the number of start-ups, students should have access to more incubator facilities and guidance from mentors so that they can start an entrepreneurial career.
- The creation of a real connection between the courses/activities to the business environment
- The real effect of the entrepreneurship education will be perceived when the creation of new business will increase or the existing business will grow through the use of newly trained entrepreneurs.

(Survey of Entrepreneurship in Education in Europe, pg. 42)

**Recommendation 1**: The need for continuation of support to the development of information and data on entrepreneurship education given even greater international and EU policy emphasis on entrepreneurship as a driver of economic growth and social cohesion;

**Recommendation 2**: The need for coordination to identify a common cross-national monitoring framework for entrepreneurship education given that substantial gaps in both information and data remain at EU level – and despite a surge in entrepreneurial education activity amongst Member States;

**Recommendation 3**: That DG Education and Culture and DG Enterprise and Industry continue their fruitful joint activity on entrepreneurship education by seeking to establish an EU platform for Member States and experts in the field to take forward the development of a common cross-national monitoring framework on entrepreneurship education;

**Recommendation 4**: That work to develop a common monitoring framework should take note of:
• The need for a distinct EU approach to indicator and framework definition (notwithstanding any international developments) given the EU position that understands entrepreneurship as a key competence for everyone (whether that be in their lives at home, in the workplace or in society);
• That whilst no comprehensive monitoring framework is evident within EU, that a skeleton framework may be discerned through a common set of indicators utilised by Member States and as set out initially in this Report;
• That systematic data collection in Member States is very limited on indicators of inputs and operations / activities of entrepreneurship education;
• That monitoring of entrepreneurship as a key competence will require both ‘hard’ and ‘soft’ outcomes to be measured;
• That international surveys already in situ – namely Global Entrepreneurship Monitor (GEM) and EU Flash Barometer – and national labour force statistics provide a strong basis as robust, comprehensive data sources for a number of the highest level and most credible common outcome and impact indicators; and,
• That thought be given to the potential to incorporate a longitudinal dimension within any developments of a cross-national monitoring framework as the basis for developing greater understanding of the individual and societal outcomes and impacts of entrepreneurship education.

(Order 121 - Study on Support to Indicators on Entrepreneurship Education, pg. 52)

Embedding entrepreneurship into the formal educational system at all levels requires a strong commitment from the government in terms of policy and resources, since most schools, universities and training programmes are overseen by the government. It is never too early to start exposing students to business and entrepreneurship. Perceptions and attitudes about entrepreneurship start at a young age. By the time students reach secondary and higher education it can be “too late”, particularly if they do not pursue further education or if they have developed some negative perceptions about entrepreneurship. Entrepreneurial learning should be integrated into the curriculum, rather than only being offered as standalone courses, in order to change the mindset among students. For example, in 2007, Nigeria included entrepreneurial skills in the new basic education curriculum for its primary and secondary schools. (Entrepreneurship education, innovation and capacity-building in developing countries, pg. 8)

More effective measurement and evaluation of the long-term impact of entrepreneurship education programmes on economic growth and job creation is needed. These should be based on a broadly defined set of outcomes, not only on narrow measures such as the number of start-ups created. For comparable data across countries, there needs to be agreement on the definition of entrepreneurial education and on the scope of what should be measured, and agreement on the process of data collection and on coordinating mechanisms.

Reinforcing the role of STI in entrepreneurship education is only part of the task. Assessing students’ learning habits and using real-world case references that are relevant to their immediate environment could help to improve the understanding and application of any acquired knowledge. Academic learning may be complemented by practical training outside schools. Productive cooperation between schools and firms and their business associations, with the positive policy support of government, greatly enhances the potential for success in reinforcing STI in primary and secondary education curriculums.

STI human capacity development policy needs to fully embrace a lifelong learning philosophy. This is an imperative in today’s fast-paced economy, which is subject to a swift rate of technological change and requires continuous foresight and enhancement of human capital. However, in order to develop a lifelong learning ability, investment is needed in the development of skills such as learning to learn, advanced literacy, mathematics and ICTs. This would not only require adapting curriculums, but also evolving teaching and learning skills so that they become self-sustaining even after formal education and training.
Enabling legislation, and in particular incentives and other instruments that promote greater interaction and mobility between public and private academic and R&D institutions, and between those and the productive sectors, can help increase coherence between the activities of the education and research base and national development needs. Demand driven education models can develop strategic collaboration between educators and employers to produce human capital that is relevant to growing sectors and trade opportunities. Private sector involvement should extend to funding joint/partnership activities promoting scientific and technology curriculums in education and training.

Government should play a leading role in developing reforms in STI education that need to feed back into curriculum development, including through the better use of information technologies. Educational institutions that adopt a systems approach to reforming their STI faculties should have priority in STI funding.

As scientific and R&D institutions in developing countries are facing growing competition from developed countries, policies aimed at improving linkages, both locally and globally, are needed to improve human capital retention. Interactions between universities, research centres and private sector firms can be supported by increasing the mobility of researchers and academics between universities and firms, and encouraging greater involvement by firms in the development of STI education strategies and planning for STI human capacity development.

Developing-country firms and entrepreneurs need to be aware that the ability to absorb technologies, and use to these to their competitive advantage, will determine their commercial success and mark their contribution to national economic development. Therefore, STI policy needs to review the effectiveness of incentives for acquiring scientific and technological knowledge. Access to technology and knowledge in the public domain or under public licence needs to be addressed as a singular issue. (Entrepreneurship education, innovation and capacity-building in developing countries, pg. 20)

IV. Business – Academia Partnerships

1. Role, Benefits and Impact of Business – Academia Collaboration

European universities and other research institutions are realizing their changing role in the globalized economy and have undertaken interesting initiatives. They realize that they are no longer simply providing the local area with graduates but that they find themselves competing on a global scale for students, researchers and industrial partners. In turn, they will need to open up to business and international collaboration, which may also help leverage new funds Sharing knowledge in particular through R&D collaborations with business – while a potential source of income for research institutions – may well give an important boost to both quantity and quality of the research undertaken. (Improve knowledge transfer between research institutions and industry across Europe, pg. 7)

External factors influence the results of the co-operation process. The prevalent innovation policies in a given Region, the commitment of the financial system and the culture of entrepreneurship will all exert an influence on the success of the partnership. Shared programmes involving Industry and financial organisations allow greater control over these external factors and can therefore improve the results obtained. In concrete terms, co-operation enables highly skilled business people to pass on experience and skills to entrepreneurs, can spread the risk of investment and connect individuals with complementary interests. (R&D-Industry Co-operation to Foster Innovative Firm Creation, pg. 134)

It is particularly interesting to note the range of benefits which can be obtained by pooling patents between research institutions. A patent pool can help create a critical mass of intellectual property
which is necessary for an innovative idea to be attractive to the private sector. If marketed properly, every relevant industry player could be made aware of the research centres that generated the IP and this would help catalyse links with industry. Furthermore, building a patent pool can lead to **stronger relationships between knowledge transfer offices** and provide a basis for further inter-institutional endeavours. Such pooling of resources appears to be particularly appropriate for those research institutions that do not have the scope and volume of exploitable research results to justify the establishment of a knowledge transfer office. (Improve knowledge transfer between research institutions and industry across Europe, pg. 9)

In addition to the knowledge transfer activities themselves, there are also **indirect benefits** and should be considered in the longer term:

- The development of **mutual trust** between the research institution and industry, beneficial to the establishment of long-term strategic partnerships (as opposed to one-off contracts).
- The **enhancement of research institutions research activities** (access to state of the art industrial equipment, improving research institution project management skills, complementing the research institution competence base by new skills and techniques developed in industry, improved understanding of market needs and of industry problems).
- **Gaining status and prestige** (resulting from successful partnerships and products).
- The **enhancement of research institutions teaching activities** (involvement of industry-based lecturers, enrichment of teaching contents and materials with practical examples, learning to apply skills and knowledge to solve real business problems, etc).
- The **identification of potential new clients or partners** for further research.
- Attracting, retaining and **motivating good scientists interested in entrepreneurial aspects** or in new professional career opportunities.
- Contributing to public authorities better recognising the **socio-economic relevance** of publicly-funded research, potentially leading to **increased funding** thereof.
- **Facilitating exchanges of staff** between the research institution and industry, or hiring new graduates from the research institution by industry. (Improving knowledge transfer between research institutions and industry across Europe, pg. 20)

**Closer co-operation** between the R&D system and industry aids the spinning-off process. New innovative firms that meet market needs and obtain profitable returns from the economic and human resources would be difficult to crate by a sole organisation. The process becomes much more fluid and fruitful when undertaken in the context of collaboration between public and private institutions. (R&D-Industry Co-operation to Foster Innovative Firm Creation, pg. 134)

**Networking between different agents** opens up greater opportunities for innovation than the traditional approach based on a one-way transmission between ‘knowledge-generators’ (universities and R&D labs) and ‘knowledge-users’. In practice, knowledge is generated and used everywhere and the continuous flow of information through well engineered networks ensure that the right information reaches the right people at the right time. (R&D-Industry Co-operation to Foster Innovative Firm Creation, pg. 135)

There was a general feeling that **technology transfer often lacked professionalism**. Much of the blame for this was placed with the **universities which are frequently ‘still run by professors’**. It was stated that, whilst universities have successfully collaborated with industry with the support of policy frameworks, the necessary management skills are not ingrained in many universities themselves. Therefore, when they come to do it alone, there is a skills gap. However, it was not felt that ‘retraining professors’ was the answer. Rather **universities need to train dedicated technology transfer people and recruit experts**. (Effective Collaborative R&D and Knowledge Transfer, pg. 26)

One of the key problems within the university was that the **technology transfer office is often not involved in the university’s strategy development**, and universities often don’t have ‘innovation
Consultancy is one of the simplest ways for business to interact with universities and draw on their research. SMEs can become involved for relatively low fees, and the terms are simple to arrange. For larger companies, consultancy offers the chance to get to know a researcher before deciding whether to set up larger research contracts. In particular, increasing consultancy may be one way to bring more companies into contact with universities. It may increase the volume of research collaboration, with many contracts originating from consulting relationships. It may also improve the effectiveness of technology transfer, as more than 50 per cent of licences go to companies known by the academic, and consultancy increases the pool of companies an academic is exposed to. (Lambert Review of Business-University Collaboration, pg. 35)

Partly in recognition of the number and complexity of these relationships, many universities have developed corporate or business liaison offices, with a specific remit to act as the interface with business. These offices have taken on an increasing number of tasks as universities’ engagement with their wider community has developed. These include developing networks of businesses; marketing the research strengths of the university; advising on consultancy agreements and contract research; arranging complex collaborative research agreements or major joint ventures. (Lambert Review of Business-University Collaboration, pg. 42)

There is no single model for a university business or corporate liaison office. Some take in knowledge transfer and technology transfer activities, while others keep the two activities separate and have established specialised companies to manage technology transfer. The appropriate approach will vary depending on the needs of local business, the mission of the university, and the focus of the local economy. . (Lambert Review of Business-University Collaboration, pg. 42)

Why should universities engage in knowledge transfer?

This fundamental question has been addressed in the past by the Commission, which has said that "many European universities still underestimate the potential benefits of sharing knowledge with the economy and society ". The benefits of knowledge transfer – in other words, the exploitation of research - go beyond simple financial return. In fact, even in the US, where knowledge transfer is more developed, only a fraction of such activities generate net profit. The benefit also lies in a number of other, less tangible benefits for research institutions, for industry and for the society as a whole, such as helping research institutions focus their research on the wider needs of society and industry.

Benefits for industry

More effective and systematic knowledge transfer in Europe would improve the ability of industry to tap into the knowledge developed by the public science base. Such links can for example be developed through collaborative and contract research. The development of long-term partnerships between industry and research institutions, with priorities jointly agreed and implemented will build trust, improve the contribution of the research organisation and result in a better alignment of interests and benefits.

Benefits for society

There are also benefits for public authorities who increasingly need to ensure that their investments in research have an optimal socio-economic impact, e.g. new products on the market (pharmaceuticals, etc.), new jobs and new companies. Moreover, knowledge transfer at the national or regional level potentially has a strong impact on local development.

Knowledge transfer between research institutions and industry – Frequently asked questions, pg. 2)
Rationale

The qualifications, values and methods of operation, and the skills and routines required for a successful spin-off creating, and licensing organisation, often differ from those normally found within universities. Universities tend to be conservative in terms of their management, and to focus on process rather than ends, to focus more on inputs and less on final results. Moreover, there are cultural differences between universities and for-profit organizations that must be resolved. A unit or an office internal to the university can be handicapped by these aspects and as a result would likely function less efficiently than an organisation that is both separate from the university, and is profit oriented. The cultural problems are summarised below:

<table>
<thead>
<tr>
<th>University</th>
<th>Corporate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Social responsibilities</td>
<td>Organisation responsibilities</td>
</tr>
<tr>
<td>Basic research</td>
<td>Applied research</td>
</tr>
<tr>
<td>Create new knowledge</td>
<td>Develop new products</td>
</tr>
<tr>
<td>Pure scientific driven research</td>
<td>Specific objectives: products</td>
</tr>
<tr>
<td>Publications and collaborations</td>
<td>Ownership and secrecy</td>
</tr>
<tr>
<td>Sharing of information</td>
<td>Control of information</td>
</tr>
</tbody>
</table>

(The reform of public research centres and universities, pg. 24)

However, a profit oriented organisation, owned and controlled by the university, when operating vis-à-vis industry or financial institutions has the advantages that:

- It can enjoy its similarity to industry and financial institutions while maintaining total access to and cooperation with the university. It will become a bridge between the university and the economic world.
- It can hire people from industry on industry terms and conditions which will help them in their day to day negotiations.
- It can enter into fund raising activities and build up experience in financial and economic venture management.
- It can operate on an economic basis and legally own property such as firm shares, or other financial assets.

This type of organisation is likely to be efficient when dealing with the economic world on behalf of the university. The top university management must be involved (Deputy Director, Rector for instance, chairing its board) to ensure that the university retains the control over its operations, and adheres to academic principles. (The reform of public research centres and universities, pg. 25)

Process

The establishment of a unit / office within a university to serve as a Knowledge Transfer Unit (KTU), is allowed in all European countries. However, in several countries the ownership by universities of profit oriented organisations is prohibited by law. Therefore, the first step is for the governments to pass legislation allowing the universities to own and operate these types of organisations. The second step is to obtain financial support, and make a training and marketing effort – information days, workshops demonstrating the advantages and operation methods for such organizations to persuade the high levels of university management. This would also involve the publication of the best practices and success stories of similar organisations in order to encourage all universities to adopt the pattern. It
should be pointed out that in assessing the performance of a university for the purpose, say, of national funding, the performance of an outside unit would be taken into account. (The reform of public research centres and universities, pg. 25)

While the recommendation above referred to the ability of the KTUs to create spin-offs, it is important to remember that the most important factor in knowledge creation, and therefore its transfer, is the researchers. In addition to having academic freedom and ability to publish, the creators of the knowledge, who have a decisive role also in its protection and transfer, should have a basic understanding of spin-off and licensing activities. It is not suggested that they must become experts in these activities, but they should be familiar with the terms and processes, and understand the stages involved in protecting their IP and making its spin-off or licensing more worthwhile. (The reform of public research centres and universities, pg. 25)

**Rationale**

In most cases the researchers form the "front line" in identifying the commercialisation potential of their work. It may be necessary for them to provide technological support for any spin-off and they should be made aware of what might be involved. Generally, universities have not seen these types of capabilities as needing to be included in a researcher’s repertoire. If spin-off activity is to really accelerate this will require the re-training of the research community and their adaptation to new demands on their time. This retraining and informing effort should be encouraged and coordinated centrally; each university should adapt this training to its particular system and circumstances. (The reform of public research centres and universities, pg. 26)

**Process**

The researchers should be encouraged, as part of their on-going training and promotion cycle, to participate in basic training in spin-off and licensing activity. This training should be supported by government, and regulated as part of the national requirements for the academic training and capabilities of a university researcher. All universities should be encouraged to develop a training programme designed for all researchers, both existing staff and new members.

The training could be nationally coordinated and financially supported to ensure conformity and relevance across all universities, and augmented by tailored sections to suit the requirements of individual institutes and universities, to be delivered by the university KTU. The KTUs would be able to design specific training to build on the basics; this might include details of specific by-laws and methodologies in a particular university. The KTU should provide advice about marketing giving examples, of success stories and presentations from invited entrepreneurs. This training is not to turn the researchers into KTU staff, but to furnish them with some know how about spinoffs including basic legal knowledge about establishing and operating a firm (legal function, authorities etc.), business financing models (angels, seed funds, first round, IPO, etc.) and basic training in patenting (submission, approval, PCT, EU patents, etc.), and similar information about licensing. Researchers should be familiar with what is involved and the terminology, but not the fine detail, which should be the responsibility of the KTU personnel. (The reform of public research centres and universities, pg. 26)

The experience of US universities demonstrates that technology transfer is not usually a large revenue generator. A number of US universities started with that aim, but found it impossible to make significant amounts of money and so changed their objectives. MIT, Stanford and Yale all now state that their main reason for engaging in technology transfer is to improve the public good – that is, to create the greatest possible economic and social benefits from their research, whether they accrue to the university or not. (Lambert Review of Business-University Collaboration, pg. 49)

Fostering an entrepreneurial mindset as well as the relevant skills among researchers can greatly contribute to the reduction of the cultural divide which exists between research institutions and industry. In order to foster interactions between them, researchers need to be provided with basic knowledge
transfer and business skills. Entrepreneurship education should be offered to provide training on how to manage intellectual property, interact with industry, start and run a business. Although tertiary education is normally highly decentralised, there are examples of national strategies for promoting entrepreneurship in higher education (e.g. the Science Enterprise Challenge in the UK). To help address the question of content of such courses, the Commission is currently funding a project to create a core set of training materials to raise awareness of the importance of IP management issues amongst a variety of actors. (Improving knowledge transfer between research institutions and industry across Europe, pg. 10)

Many European universities still underestimate the potential benefits of sharing knowledge with the economy and society, while industry has not developed sufficient absorption capacity to harness the potential of university-based research.

Consequently, the cross-fertilisation with the business community and with wider society remains difficult. This lack of openness to the business community is also seen in the career choices of doctorate holders, who tend to pursue their whole careers in either academic circles or industry, and not as entrepreneurs. ("Delivering on the Modernisation Agenda for Universities: Education, Research and Innovation", pg. 4)

Universities should be funded more for what they do than for what they are, by focusing funding on relevant outputs rather than on inputs, and by adapting funding to the diversity of institutional profiles. Universities should take greater responsibility for their own longterm financial sustainability, particularly for research: this implies pro-active diversification of their research funding portfolios through collaboration with enterprises (including in the form of cross-border consortia), foundations and other private sources.

Each country should therefore strike the right balance between core, competitive and outcome-based funding (underpinned by robust quality assurance) for higher education and university-based research. Competitive funding should be based on institutional evaluation systems and on diversified performance indicators with clearly defined targets and indicators supported by international benchmarking for both inputs and economic and societal outputs. ("Delivering on the Modernisation Agenda for Universities: Education, Research and Innovation", pg. 8)

Programmes to support transnational collaboration between research centres, universities and companies have an observable impact on:

- The quality of research in Europe, which they are helping to improve, whilst increasing its visibility, in key areas for growth;
- The dissemination of knowledge and results within the Union, and the ability of researchers to become involved in high-level projects. (Science and technology, the key to Europe's future - Guidelines for future European Union policy to support research, pg. 5)

University administrators, and their political masters, should set only one goal for the TTO: make money – as much as possible, as quickly as possible, for the sole benefit of the university. Let the head of the TTO choose the means. And then fire that person if the promised results aren't delivered, and provide bonuses if they succeed (civil servants don't belong in tech transfer offices). Social goals are right for the rest of the university. A simple financial goal is for the TTO. (The Innovation Manifesto, 9 Ideas to bridge the gap between industry and academia – and make Europe more competitive in global technology, pg. 6)

Sub-optimal research collaboration and knowledge transfer between Public Research Organisations (PROs), particularly universities, and industry are one of the weaknesses of the European research and innovation system. While a number of Member States have done valuable work in this area, they have often only considered the national perspective. As a result, current rules and practices in the EU are fragmented, especially those regarding ownership of publicly-funded research results and contractual arrangements between PROs and industry. More consistent rules and practices across the EU would foster PRO-industry links and maximise their impact. This will help create a level playing field for cross-
border university industry research partnerships, and thus contribute to the European research and innovation area. (More Research and Innovation – Investing for Growth and Employment: A Common Approach pg. 15)

The proposed IP Charter should concentrate on highlighting out the issues that need to be addressed in a collaboration agreement and what the possible approaches and solutions exist ...

The online consultation also finds that:

- Research institutions should have IPR management systems + policies in place (95% agreement);
- Royalties should be shared with researchers (89% agreement);
- Public authorities should have a non-exclusive licence to use the results (60% agreement);
- Industry should refund the public contribution if they manufacture products outside of Europe (60% agreement);
- All income should be used for research and education (79% agreement);
- EU industry should be given preference when selling the results (60% agreement).

That said, the responses also make it clear that publicly funded results should not necessarily be owned by the research institution, that research institutions should be free to sell their results to industry and finally that SMEs should not be given preference when selling the results. (The European Research Area: Green Paper Consultation, pg. 16)

A stronger outward orientation of TTIs should facilitate closer collaboration between research and enterprises. Thus, the expert group encourages PROs and TTIs to pro-actively seek and foster contacts with enterprises. As good practice examples show, institutionalising such contacts is helpful and can be instrumental in stimulating regional clusters. ("Improving institutions for the transfer of technology from science to enterprises – Conclusions and Recommendations", 6 – 7 pp.)

Establishment of Technology Licensing Offices (TLOs)

Over the past two decades, many universities and research institutes have developed institutional structures that are specifically in charge of handling every aspect of technology transfer activities. The specific institutional arrangement has varied greatly ranging from off-campus private sector technology brokers and technology incubators for university spin-offs, to university-managed units integrated to the overall university administration. The Technology Licensing Office (or TLO) in its broadest sense4, has emerged as an important player within universities and generally plays a crucial role in identifying technologies with a commercial potential, assisting researchers to patent their inventions, packaging the technology appropriately so as to attract industry, developing a strategy to market such technologies, and leading the licensing negotiations with potential licensees.

It is important within this process that structures are in place to facilitate as much as possible the procedures so that researchers are not discouraged. The establishment of a structure with responsibility over technology licensing greatly simplifies the process of commercialization enabling the inventor/researcher to focus on the research side of the project and less on the related legal/business aspects for which they may not have the appropriate expertise.

Research is indicative of the positive impact and the spillover effects of industry – academia linkages through pronounced flow of knowledge and information between the two partners. This is believed to lead to considerable diffusion of scientific and technical knowledge, which in turn impacts economic
development. According to a study sponsored by Alfred P Sloan Foundation and the National Academy of Engineering, academic research in a single discipline often contributes to more than one industry and conversely, a single industrial innovation is usually a result of complementary advances in many fields of research. A major challenge for the universities is keeping pace with the rapidly changing research and human resource needs of the industry. (Industry-Academia Convergence: Bridging the Skill Gap, pg. 6)

Ensure curriculum adaptations moves as fast as the pace of Industry change;
- Build up relationship with industry and career advisors;
- Tailor make education for the unemployed in shortage areas, for Small and Medium size Enterprises (SMEs);
- Collaborate to develop “Learning Models”;
- Develop joint Academic – Industry Degree Models;
- Development of research based teaching material;
- Alumni networking and developing broad based relationships, not one of associations;
- Mutually enabling processes for capacity building of the faculty, students and the companies; and
- Explore possibilities of endowed Chairs in specific areas of management.

(Industry-Academia Convergence: Bridging the Skill Gap, pg. 8)

**Industry – Institute interface** is a critical dimension for any management institute as this interface decides the extent to which the institute becomes an acceptable brand. Industry – Institute interaction has to be sustained and is beneficial for both. Industry can benefit from the knowledge base available with the management institutes and the management institutes can benefit from the field experience and the industry exposure through projects, guest lectures and update seminars.

It is necessary to have a realistic understanding about the expectations of the industry from management institutes to impart industry relevant management education in order to groom fresh graduates as managers.

The industry interface can also be through faculty exchange programmes – industry experts taking time off from the industry to serve a term in the management institute and / or the faculty member joining the industry to prepare case studies and conduct training programmes. Industry can also participate by sponsoring courses in the institute and participating in the research activities of the management institute.

(Industry-Academia Convergence: Bridging the Skill Gap, pg. 15)

2. **Constraints and Limitations of B-A Collaboration**

Training is often not adequate for working in industry. Future researchers are generally trained for a career in academia and do not always possess the necessary skills to find a job in the other sector. Researchers in academia also need skills to work efficiently with industry. (Mobility of Researchers between Academia and Industry, pg. 10)

Personnel working on knowledge transfer must possess a wide range of skills in order to carry out their tasks effectively. However, relatively inexperienced staff is often appointed to many of the recently established knowledge transfer offices. Continuous professional development exists in a limited number of countries but is often inadequate in terms of cost and/or delivery. (Improving knowledge transfer between research institutions and industry across Europe, pg. 8)

Unilateral supervision from academic supervisors may lead to one-side view of research. Supervisors should also be trained to be more effective. (Mobility of Researchers between Academia and Industry, pg. 12)
Temporary mobility between sectors is often difficult or not possible: either the available positions are not largely publicised, or it is simply difficult to find the expertise needed. (Mobility of Researchers between Academia and Industry, pg. 12)

Often specialised skills are missing in a sector, while they exist in the other sector. (Mobility of Researchers between Academia and Industry, pg. 15)

Inter-sectoral mobility is frequently not taken into account during appraisal, and can in circumstances even have an unfavourable impact. A transparent and fair career appraisal with appropriate feedback should lead to personal and professional development (lifelong training), and facilitate mobility between sectors throughout the career. To this end, large companies an provide many good practices. (Mobility of Researchers between Academia and Industry, pg. 14)

Administrative barriers hamper academia from undertaking the above mentioned actions, especially with regard to recruitments. (Mobility of Researchers between Academia and Industry, pg. 17)

Academia-industry partnership can only materialize when interests are aligned between the two. (Mobility of Researchers between Academia and Industry, pg. 18)

Informal networks between SMEs and academia are difficult to create because SMEs have scarce financial and human resources to find research contact in academia. However, their development is essential for innovation in Europe. (Mobility of Researchers between Academia and Industry, pg. 20)

Academic staff is often trained for a career in academia and do not always possess the necessary skills to find a job in either the one or the other sector. They also need lifelong training to cope with their new environment (e.g. career appraisal) and changing functions (e.g. from professor to chancellor…). Researchers in academia also need skills to work efficiently with industry. (Mobility of Researchers between Academia and Industry, pg. 20)

Many EU relevant instruments ease obstacles to inter-sectoral mobility. These instruments are often not fully exploited. (Mobility of Researchers between Academia and Industry, pg. 21)

Rules relating to internships and labour-market regulation, in particular those dealing with social security and pension arrangements, can impede staff exchanges. Furthermore, in some countries, public – sector researchers are not allowed to work for industry on a part-time, consultancy or other basis. (Improving knowledge transfer between research institutions and industry across Europe, pg. 9)

Most interactions between research institutions and companies involve large firms. This is due to the fact that such collaborations are considered to be more durable and regular than with SMEs. (Improving knowledge transfer between research institutions and industry across Europe, pg. 13)

Monitoring knowledge transfer activities has several purposes including helping research institutions promote what has been achieved for the public good. While several university rankings exist, they mostly rely on academic indicators such as publications and numbers of PhDs, and do not consider performance in the exploitation of R&D results. There is evidence that the benchmarking of “innovation-related activities”, especially if conducted on the basis of comparable metrics across the EU, would allow research institutions to compare their own achievements at European as well as at national level. (Improving knowledge transfer between research institutions and industry across Europe, pg. 13)

Collaboration between university and industry is necessary for more reasons than one. One of them being the scarce human resources. Collaborating should be realistic, it is not usual that senior academics (professors) commit themselves, meaning their research group, to a project and face the fact that they cannot find the necessary personnel (e.g. Ph.D. students) for the work. This is not solely the case for a university; also industry is faced with this problem, even in collaborating with a university. (Effective Collaborative R&D and Knowledge Transfer, pg. 21)
The weakness of demand from industry is a crucial matter, and is mainly (but not entirely) an SME issue. These smaller enterprises have significant impact on economy but tend to focus on short term solutions rather than longer term strategy/innovation. (Effective Collaborative R&D and Knowledge Transfer, pg. 24)

Perhaps the most universally supported issue was the need for alignment. The key barrier is different starting posts of university and industry. It was suggested (by the industrial delegates) that universities have an unrealistic view of what they can in with their IP. In turn, it implied (by university delegates) that industry often views university partners as a sources of cheap labor easily exploited. (Effective Collaborative R&D and Knowledge Transfer, pg. 25)

The mismatch between industry and university timescales. There is also a general feeling that university and industry people ‘think differently’ and that this can often lead to a lack of trust. (Effective Collaborative R&D and Knowledge Transfer, pg. 25)

Consequently, through lack of communication and misunderstanding, it was felt that parties to collaborative projects often do not recognize their strategic differences and differing objectives. (Effective Collaborative R&D and Knowledge Transfer, pg. 25)

Industry representatives stressed that it is important for universities to deal with patents professionally and to understand the need for ownership in industry. Many felt that universities were too demanding about confidentiality agreements etc.; as one industry representative stated ‘it’s a nightmare working with universities’. The consequence of a lack of understanding in this area was illustrated with the Framework Programme, where networks of excellence are increasingly losing industrial partners because of IP issues. It was suggested that universities should consider mechanisms other than patents and licensing. (Effective Collaborative R&D and Knowledge Transfer, pg. 27)

Universities were also criticised for holding on to patents for too long and for patenting unnecessarily. Their professionalism in dealing with patents was also questioned. In particular, industry representatives often thought university patents to be often weak due to a high likelihood of academic publication at some point in the process (even if accidental). In addition to this, students and postgraduates were often thought to be unaware of the conditions surrounding industrial collaboration and IP. (Effective Collaborative R&D and Knowledge Transfer, pg. 27)

The main barriers to greater consultancy in the UK seem to be the time limits set by individual institutions, the lack of reward structures for academics who bring in extra research income as a result of consultancy, and a general academic culture that does not recognise the value of this kind of work. (Lambert Review of Business-University Collaboration, pg. 36)

Increasing academic consulting activities will improve the links between academics and business, but the appropriate amount will vary according to the mission and strengths of the university. A single policy on academic consulting activities for all universities would not work. (Lambert Review of Business-University Collaboration, pg. 36)

When establishing collaborative research partnerships it is important to determine at the outset the ownership and exploitation rights for any intellectual property (IP) that may be generated. Business and universities both report that negotiations on the terms and conditions of IP ownership and exploitation can be extremely lengthy and costly. Small companies may be deterred from establish research partnerships because of the legal costs and time involved. (Lambert Review of Business-University Collaboration, pg. 40)

Universities are complicated institutions, and businesses can find it very difficult to find their way around. SMEs in particular can be put off if there is no obvious point of entry to the university’s resources. (Lambert Review of Business-University Collaboration, pg. 42)
From the consultation, it is also clear that the regulatory differences between Member States can prove to be a disincentive for transnational collaboration. In particular, an element of harmonization of rules regarding Intellectual Property Rights ownership by PROs and joint ownership regimes of should be considered. (“Public consultation on transnational research cooperation and knowledge transfer between public research organisations and industry”, pg. 20)

**Comprehensive education programs** should be **modular-based** and must provide and/or improve the core-skills identified below:

- Business development
- Negotiating (internally & externally)
- Networking & interpersonal skills (communications & relationships)
- Marketing & selling
- Personal organisation (multiple projects & skills integration)
- Coaching / leadership
- Project management / finance
- IP management / legal
- Contacting (Work stream 2, pg. 84)

According to the OECD, the European Union has about six full-time researchers per thousand people employed, compared with nearly 10 in the US and a bit more than 10 in Japan. Those researchers it has are sedentary: they don’t move as often as Americans from region to region, and if they have a post at a university they’re unlikely to risk it for a job at a corporate lab. (The Innovation Manifesto, 9 Ideas to bridge the gap between industry and academia – and make Europe more competitive in global technology, pg. 17)

In order to maintain its position and strengthen its role internationally, the Union needs a pool of top-level researchers/teachers, engineers and technicians. The **university remains the focal point for training people.** In terms of quantity, the Union is in the paradoxical situation of producing slightly more scientific and technical graduates than the USA, while having fewer researchers than the other major technological powers. The explanation for this apparent paradox lies in the smaller number of research posts open to scientific graduates in Europe, particularly in the private sector: 50% only of European researchers work in the business sector, compared with 83% of American researchers and 66% of Japanese researchers.

The situation in Europe could well get worse in the years ahead. The absence of career prospects will alienate young people from scientific and technical studies, while science graduates will look to other more lucrative careers. Furthermore, around one third of the current European researchers will retire over the next 10 years. As the situation is similar in the United States, the competition between universities internationally is set to become even keener. (The role of universities in the Europe of knowledge, pg. 19)

Universities in the US, Canada and many European countries have adopted a **wide range of different policies on patent ownership and royalty-sharing formulas** between researchers, the researcher’s department, the technology licensing office and the university itself. Anecdotal evidence from a number of countries shows that lack of a clear policy on royalty-sharing and the exclusion of any benefit to the inventor/researcher or his/her department have resulted in a lack of incentive to patent and exploit inventions as well as, on occasions, university researchers patenting under their own name. (“Research and Innovation Issues in University – Industry Relations”, pg. 5)

**Lack of expertise** is often perceived as one of the most limiting factors in managing the commercialization of IP by universities. Bernhard Hertel, managing director of Garching Innovation points out that “the right mixture of scientists, lawyers and businessmen and a well-organized back-office is the basis for success in technology transfer.” This contrasts with many **Technology Licensing Offices (TLOs)** where emphasis was devoted to technical expertise at the expense of legal and business
expertise. Limitations in terms of expertise and human resources often leads to the outsourcing of part of the work to patent agents, technology brokers, business consultants, etc. Studies in the US6 note that the vast majority of university TLOs outsource the preparation of patent applications to external patent agents in order to make sure that people with the appropriate technical expertise are selected to draft each patent application. ("Research and Innovation Issues in University – Industry Relations", pg. 6)

Conflict of Interests

The concern remains for many that a greater emphasis on technology transfer by universities will result in a deference of universities to the needs of the corporate world or in a move away from research projects that will not result in commercially viable technologies (e.g. basic research). According to Tsekouras et al., “the basic source of tension is the conflict between the public interest which is supposed to be behind the funding of public research and the commercial interest which needs to be taken into account if IP rights become a widely used strategy for PSR [public sector research institutes]”. These are issues that need to be addressed in order to ensure the autonomy of the university and that efforts to facilitate technology transfer from universities to industry do not result in neglect for some of the basic functions of universities. In addition, it is generally necessary to address issues concerning the differences that are likely to arise between university departments with the ability to develop commercially viable technologies and, therefore, benefit from external financing and royalty incomes, as compared to other departments where research is of a more academic nature (e.g. the humanities). ("Research and Innovation Issues in University – Industry Relations, pg. 7)

Financial Resources

One of the problems faced by TLOs relates to the resources required for their functioning, particularly during the start-up phase. The expectation in most universities is that the TLO will ultimately be self-sufficient and would indeed provide substantial financial resources to the university once royalty streams from patent licensing begin to flow in. According to Lita Nelsen, director of the Massachusetts Institute of Technology’s TLO, the reality is somewhat different: “the direct economic impact of technology licensing on the universities themselves has been relatively small (…) most university licensing offices barely break even.” What this points to is perhaps not so much that TLOs are not economically viable, but that the initial optimism concerning the transfer of technology from university to industry is increasingly replaced by a more realistic approach. According to Bernhard Hertel “TT [technology transfer] is a longterm process. A TT office should have a basis to survive at least for ten years. It is difficult to predict when you will get your big project. But when it comes you must havethe skills to manage it and the resources to defend it if necessary.” In this light, private sector technology brokers have often come to be perceived as a possible alternative wherever the market for technology brokering is sufficiently developed. ("Research and Innovation Issues in University – Industry Relations, pg. 7)

One of the greatest limitations that has been noted in many countries or institutions following the establishment of TLOs is that inventions have been transferred from laboratory shelves to the TLO shelves without subsequent commercialization. The marketing of patented inventions is one of the most essential functions of a TLO but one that has often not received sufficient attention, as personnel has generally been recruited on the basis of their technical expertise rather than their business or marketing expertise.

Web sites of TLOs advertising their licensable technologies may be successful where they belong to institutions with very high visibility and reputation but may not be the case for smaller TLOs. It is thus crucial for TLOs to have a clear marketing strategy and to establish fluid contacts with industrial partners. ("Research and Innovation Issues in University – Industry Relations, pg. 8)

Licensing or Spin-off Route

The commercialization of university research results follows two main routes (each one implemented in a variety of different ways): (1) the licensing of the invention to one or more existing companies for the
purpose of its commercialization (2) the creation of a spin-off company that will commercialize the invention. Different institutions have favoured different routes and generally decisions are taken on a case-by-case basis, including considerations on whether the university researchers themselves are willing to become involved in commercializing the technology through the creation of a spin-off company. The spread of incubators within university structures has been one way of facilitating the creation of spin-offs and in assisting the development of companies through its start-up phase. However, even when based within universities, incubators are generally not exclusively aimed at the commercialization of university research results but also accept extra-university start-ups. The existence of a well-developed venture capital market is also important for the establishment of university spin-offs. The Silicon Valley represents an example where the conjunction of universities with a high degree of technical expertise, technology incubators and ventural capitalists has facilitated the development of a large number of university spin-offs. (*Research and Innovation Issues in University – Industry Relations, pg. 8)

A piece done by The New York Times indicates that only one in four engineering graduate in India is employable, based on technical skills, English fluency, and teamwork and presentation skills. It is estimated that India will face a shortage of 500,000 knowledge workers by 2010, the BPO services sector alone will need about 350,000 workers by 2010. (Industry-Academia Convergence: Bridging the Skill Gap, pg. 6)

- **Lack of Industry orientation** – the essence of the system still follows examination based evaluation processes and not project based assessments;
- **Rigidity** – Since all educational institutions are under the ambit of UGC regulations the process of re-evaluation of course content becomes non-flexible;
- **Lack of industry experience of the teachers** themselves;
- **Lack of attention towards pure sciences** – Even countries like China and Vietnam have been concentrating on the same, rightly understanding the importance of the ITES in a post-industrial economy.

Besides these obvious technical preconditions necessary in a professional, there are various grooming and personality based qualities, which our education system does not address adequately. These include **language skills like diction and fluency; analytical abilities and basic logic;** as well as cross – **cultural sensitivity and customer service orientation and behavioral attributes.** (Industry-Academia Convergence: Bridging the Skill Gap, pg. 16)

It is also important to note that not all academia is interested in working together with industry, and vice versa. In fact, only a minority of academics actually take special interest in working with industry on R&D. Most are focused on the core business of academia, which is research (without the development or commercial aspect), teaching, and university administration. As a result, most academics tend to have a ‘hermit’ mentality and do not subject themselves to much team work. For this reason, Project Managers must take great care to nurture existing relationships or to create new linkages with academia, i.e. industry-academia R&D is no easy simple task, and takes plenty of persistence, convincing, and time to get things moving. (Two cultures – Joint success, pg. 3)

Despite the **plethora of collaboration models,** many of the most successful models do not provide open access to data or resource sharing. This protective approach to data management limits innovation. Although sharing data is part of the mission and culture of universities, it does not fit within the traditional competitive business models practiced by most companies. However, there are emerging examples of **new open business models** that support **open innovation.** The continued development of such open business models will be as crucial, if not more crucial, than technology development to sustain highly innovative collaborative structures between industry and academia. It is the hope that such open research collaborations will lead to the development of new paradigms to approach disease treatment, yielding high-value therapies and testing technologies that better define those patients who will benefit from a given therapy and therefore provide true value based on healthcare outcomes. (Open innovation networks between academia and industry: an imperative for breakthrough therapies, pg. 2)
3. General Regulatory Framework and Financial support for Business – Academia Collaboration (tax treatment of R&D Expenditures, IPR protection and use, other)

Cohesion policy’s main instrument, the European Regional Development Fund (ERDF), is used to support incubators and science parks (infrastructures and accompanying services) which are an effective means to spin-out knowledge into the market place and can help create better SMEs – university links. Well-run incubators and clusters have significant advantages which make them outstanding instruments of knowledge transfer, most notably for high technology. A distinctive feature is that services are available which increase the likelihood of knowledge transfer occurring successfully. However, as well as support for infrastructure, the ERDF provided co-financing of around €4 bn in the period 2000-2006 for innovation and technology transfer and for establishing networks and partnerships between business and research institutions. The ERDF therefore played a significant role in facilitating interaction between public research organisations and industry, both in terms of regional and trans-regional interaction. (Improving knowledge transfer between research institutions and industry across Europe, pg. 14)

The European Social Fund (ESF) provides financial support through the assistance to persons (training, guidance, etc.), and for the development and modernisation of educational structures and systems. In the new programming period (2007-13), there is an increased emphasis on strengthening research and innovation, particularly through knowledge transfer. (Improving knowledge transfer between research institutions and industry across Europe, pg. 15)

Transnational knowledge transfer has always been at the heart of the Research & Technological Development Framework Programme (FP). Indeed, most FP projects involve a mix of participants from the public and private sectors, from several countries. Certain thematic areas, such as the ICT sector, have been particularly successful in this respect: more than 90% of projects involve research institutions - industry collaboration. This clearly facilitates the development of technologies ready for commercial exploitation. As well as R&D projects, the FP also funds the intersectoral mobility of research staff, including university-industry exchanges. (Improving knowledge transfer between research institutions and industry across Europe, pg. 15)

The new Competitiveness and Innovation Programme (CIP) supports all forms of innovation, public-private partnerships and measures to improve access to finance including loans, venture capital, and "business angel" finance. It also funds novel ways to facilitate knowledge sharing between research institutions and companies, in particular for SMEs, as well as new trans-national clustering initiatives. In the area of eco-innovation, it in particular supports the market up-take of innovative technologies and practices through pilot and market replication projects. (Improving knowledge transfer between research institutions and industry across Europe, pg. 15)

Some favour co-location of researchers from academia and industry where mobility will naturally occur due to proximity and alignment of interests. (Mobility of Researchers between Academia and Industry, pg. 18)

Joint funding: favour collaboration by providing jointly funded research grants and fellowships. Joint funding will foster collaboration. Experience shows that companies (both large and SMEs), which contribute financially to training fellowships, tend to become more committed in the training of researchers, incorporating them in core projects of the company. (Mobility of Researchers between Academia and Industry, pg. 18)
Awards and individual funding: provide extra funding through awards for exceptional collaboration between the private and public sectors, e.g. rewarding “entrepreneurial academics”. Develop new initiatives, e.g. funding actions for retired people from industry, who could bring their expertise to academia. *(Mobility of Researchers between Academia and Industry, pg. 18)*

Performance indicators: parts of the national public funding for academia should be linked to performance indicators based on allocating public funding in relation to, among others, the number and size of industry collaborations. *(Mobility of Researchers between Academia and Industry, pg. 18)*

Continuity of funding schemes: a certain degree of continuity of funding schemes and programmes is needed to allow recognition by both sectors. Renaming and multiplying funding instruments should be avoided in order not to confuse the potential applicants. *(Mobility of Researchers between Academia and Industry, pg. 18)*

Knowledge transfer support: support the establishment of interface offices between academia and industry that can take the form of knowledge transfer activities or others. The interface offices will increase awareness about the importance of cooperation with industry. In order to ease the process, governments should provide guidelines and codes that set the relationship between academia and industry for commercialisation of research results and to address ethical aspects of research. *(Mobility of Researchers between Academia and Industry, pg. 19)*

An example of existing good practice is the Netherlands’ innovation vouchers scheme whose main objective is to enable SMEs to buy knowledge and strategic consultancy from research institutions through innovation vouchers (worth €7500) and thus to stimulate interaction and exchange between the knowledge suppliers and SMEs. The knowledge supplier can then hand in the voucher to the Innovation Agency SenterNovem and receive payment. State aid rules allow supporting such consultancy with public funds. *(Improving knowledge transfer between research institutions and industry across Europe, pg. 13)*

Whilst some countries may opt to increase core public funding to encourage SME interaction, this may not have the desired effect. There is considerable potential for the current conditions of core public funding, and legal frameworks, to be modified to promote interaction with SMEs, or large industry partners.

To reward and encourage success, any income from patents, IPR or spin off activities of Public Research Centres should be ploughed back into the PRCs’ R&D activities. The legal framework of the PRC organisation should favour a market orientation, to include their being forced to close down or, as is the case in the UK, Denmark and Sweden, having the right to declare themselves bankrupt if they are not able to generate sufficient income. *(The reform of public research centres and universities, pg. 18)*

Each research institution should develop and implement policies regarding at least the management of intellectual property, staff incentives and conflicts of interest. Thus regarding Intellectual Property (IP) Policy, the research institution should define and communicate a long-term strategy in relation to the management of IP and Knowledge Transfer (or more broadly innovation), including a strategy as to how these activities should be pursued. A written policy explaining how IP management relates to and supports the overall mission of the research institution should be developed, published and implemented. This policy should include guiding principles relating to the emphasis the research institution places on the financial and non-financial benefits of the effective management of IP exploitation of Knowledge Transfer. *(Improving knowledge transfer between research institutions and industry across Europe, pg. 6)*

It is considered a good practice that an adequate research institution Intellectual Property policy will:

- Ensure that inventions can be identified easily and, where appropriate, protected;
- Make the research institution a more attractive partner by providing evidence relating to the research institution’s expertise in IP management;
- **Make inventions more visible** to external stakeholders, in order to promote their exploitation (through licensing, etc.);
- **Promote the use of publicly-funded research results**, including the spinning out of new companies;
- Provide a formal **incentive mechanism for staff** who participate actively to knowledge transfer. *(Improving knowledge transfer between research institutions and industry across Europe, pg. 6)*

Although they vary from one research institution to the other, typical IP policies often covers the following issues:

- Ownership of research results and associated IP rights;
- Rules applicable to “non-employees” of the research institution such as a students;
- Management, protection, and promotion of the exploitation of IP rights;
- Negotiation of IP issues raised during interaction with industry (ownership of IP, confidentiality, etc.);
- Incentives for researchers who participate actively to knowledge transfer;
- Management of conflicts of interest;
- Monitoring and reporting of Knowledge Transfer activities. *(Improving knowledge transfer between research institutions and industry across Europe, pg. 6)*

Intellectual property rights (IPR) constitute an **important framework condition** for knowledge transfer. Commercialisation of research results through patents and licensing is important, although sometimes overemphasised. Proper treatment of IPR is a prerequisite of collaborative research although their economic relevance differs greatly between different fields of technology. The legal framework at HEIs differ also. Specialised supportive infrastructure is a prerequisite for the successful use of IPR. *(Good practice in industry-science relations, pg. 35)*

**Governmental action should be subsidiary, integrating, catalysing** and always form part of a **greater strategy**. The actions that particularly pertain to the governmental arena require, in the main, a sustained, long-term effort. They range from actions that can form part of a specific policy to identify concrete needs to those that are more general in nature and that seeks to act upon the fabric of culture and society:

- Improving ICT networks across the region.
- Fostering seeds funds of a mixed public-private nature.
- Driving internationalisation.
- Facilitating contact between the offer and demand of technological, commercial and financial services.
- Simplifying administrative burdens.
- Promoting networking.
- Disseminating good practice in the promotion of new firm creation.
- Driving forward education and training. *(R&D-Industry Co-operation to Foster Innovative Firm Creation, pg. 139)*

It is the **regions** however that have the **greatest opportunity to turn strategic policy into practical results** in the short and medium term. The concept of regional or local environment is important in the innovation process because it is geographically proximity, the nearness of the people that work in the firms, research centres and universities, sharing a common culture and a lifestyle that facilitates patterns of cooperation and interaction between firms, institutions and public administrators. *(R&D-Industry Co-operation to Foster Innovative Firm Creation, pg. 141)*

Several reasons why universities patent IP:
- Universities are not organisations to keep trade secrets.
- In order to protect its knowledge, universities should patent.
- At least in some sectors, the existence of a patent eases the negotiation process with industry.
- Universities patent inventions to increase the potential use.
- Universities patent for profit.
- Universities patent in order to facilitate the subsequent processes of spin out and value creation through acquisition.
- Universities should not patent their IP, but instead should establish the partnerships with firms that can manage the process professionally.

(Effective Collaborative R&D and Knowledge Transfer, pg. 12)

**Lack of clarity over IP ownership** increases the time and cost involved in negotiating research collaborations and prevents some deals being completed. Many universities and businesses say that disagreement over IP ownership is a major barrier to research collaborations. The costs of protracted negotiations in some cases can be high, both financially and in tying up staff. This in itself deters some organisations, especially SMEs, from trying to collaborate with universities in research. But more important, several businesses and universities have failed to reach agreement and walked away from collaborations because they found it too difficult to reach agreement on IP ownership. *(Lambert Review of Business-University Collaboration, pg.50)*

A number of businesses also comment that some universities overvalue their IP. This has stopped several businesses agreeing deals with universities. Increases to third stream funding announced by the Government will reduce the financial pressure on universities to make their knowledge transfer operations self-sustaining. But it is important that universities do not overvalue their IP and as a result prevent deals from being completed. *(Lambert Review of Business-University Collaboration, pg.50)*

Maximum creative use of IP allows the full economic potential of a research collaboration to be unlocked. The business sponsor needs to have the rights that are required to bring the technology to the market. But universities also have important interests. Publication of their research results is of benefit to the wider scientific community. Continuing research in the same field may lead to new scientific developments. Universities may also want to explore other applications and uses of the IP in different scientific fields. Recent reports from the CBI, the Royal Society and the Patent Office confirm that these freedoms are important.12 If business negotiates full ownership of IP with strong restrictions on university use, this may reduce the total economic impact of the IP in the future. *(Lambert Review of Business-University Collaboration, pg.51)*

The Review has identified a number of objectives for improving the management of IP in research collaborations:

- It would be useful to establish a simple set of ground rules for IP ownership, which would be the default position on which to build most negotiations.
- There should be maximum flexibility in the use of IP, to stop it being locked up in a way that limits its exploitation across as wide a range of areas as possible.
- At the same time, the Funding Councils and Research Councils should make it clear to universities that public funding is intended to promote the public good rather than to raise revenues.
- Academics should continue to receive incentives from universities to produce commercial IP.
- Companies should have secure rights to the IP they want to commercialise.
- Ownership should be proportionate: the party which makes the biggest contribution (intellectual as well as financial) should have first rights on the IP ownership.
The Review believes that the best way to meet these objectives is to introduce an IP protocol. This would provide simple ground rules for negotiations and encourage the flexible use of IP by both universities and business. In most cases universities make a significant contribution to collaborations, so the default position should be that they own the IP. But companies could own the IP whenever their contribution is significant.

It is unlikely that the protocol would affect negotiations for strategic relationships between large companies and universities. These are usually designed to benefit both parties, and involve significant contributions from each. The likely impact would be highest on SMEs and those larger businesses that have fewer relationships with universities, and on universities that have less developed industry research links. (Lambert Review of Business-University Collaboration, pg. 51)

Institutions should track their doctoral graduates to become significant drivers at institutional, national and international level and to inform doctoral candidates of their potential employment options. Support of governments as facilitators for university-business cooperation processes and growing awareness of IPR are important structural factors. (European University / Business Forum, slide 12)

If you are an inventor at, say, the University of Cambridge or Stockholm’s Karolinska Institutet, first you have to figure out who has the right to file for the patent: you, your university, the company that co-funded your research or some combination of the above. Then you have to figure out where to file: in your national patent office for something cheap but local; at the European Patent Office for something expensive but European (though not, despite the name, European Union); in Geneva under the World Intellectual Property Organization’s rules (which, again, despite the name isn’t really global); or country by country. Then the questions really start. How many languages must you file in? What if you disagree with the patent examiner? What court do you go to if someone steals your idea? (The Innovation Manifesto, 9 Ideas to bridge the gap between industry and academia – and make Europe more competitive in global technology, pg. 13)

The European countries that have not done so already should consider enacting regulations on the use of the results of publicly funded research. The principle of assigning to PROs ownership of results and first right to inventions should be recognised as good practice. ("Management of intellectual property in publicly-funded research organisations: Towards European Guidelines", pg.2)

**Importance of intellectual property regulations** for the technology transfer from PROs to enterprises, the expert group underlines the need for a community patent.

The expert group urges the Commission and the Member States to proceed with the establishment and implementation of the Community patent and to explore the possibilities to achieve better reciprocity between the European, US, Japanese, and other patent systems. ("Improving institutions for the transfer of technology from science to enterprises – Conclusions and Recommendations", 6 – 7 pp.)

Recognizing that reporting obligations of PROs on their transfer activities would raise PRO’s awareness of the importance of this function and that reporting, thus, could be an appropriate lever for the installation of appropriate transfer mechanisms, the expert group recommends the Commission together with the Member States to explore the possibilities for a general reporting system building on the experience of the presently employed reporting systems.

While such a system should be adjusted to national needs, a number of common indicators should be applied in all countries in order to facilitate benchmarking processes between Member States. These indicators should include performance indicators such as revenues from contract research, patents filed and granted, licences and revenues from licensing, number of active contracts, number of client enterprises (including SMEs) and number (and development) of spin-offs, but also more qualitative information such as transfer strategies and kind of institutions employed for this purpose. ("Improving institutions for the transfer of technology from science to enterprises – Conclusions and Recommendations", 6 – 7 pp.)
The expert group concludes that as far as end-users are concerned, successful knowledge and technology transfer depends less on the particular type of TTI than on the ease of access, visibility and efficiency of the system used and, thus, recommends Member States and PROs to stimulate, implement and organise technology transfer in a way which corresponds best to the needs of the respective enterprises. (“Improving institutions for the transfer of technology from science to enterprises – Conclusions and Recommendations”, 6 – 7 pp.)

**National Policy Framework**

The existence of a national policy framework is generally the crucial first step. The impact of the Bayh-Dole Act in the US in providing a national framework with a clear set of rules concerning the ownership of IP rights by universities as well as other non-profit organizations. A national (or regional) strategy is required that clarifies issues of ownership under different scenarios in particular whenever research is publicly funded. Conditions and criteria on exclusive licensing of such technologies also need to be considered as well as broader issues concerning the role of universities in science and technology policy, on the one hand, and educational and cultural policies on the other. The necessity to view the issue from a broader perspective is also driven by the need to address potential conflicts of interests that may exist between universities’ efforts to facilitate the exploitation of their research results with their other educational and research objectives. (“Research and Innovation Issues in University – Industry Relations”, pg. 4)

Institutional policy on IP for universities should also consider issues relating to IP ownership within collaborative research programs and/or other contractual agreements with various partners (including other universities, sponsors, companies, public sector bodies, etc.). “Research and Innovation Issues in University – Industry Relations, pg.5”

In many institutions, TLOs also play an active role in sensitizing researchers and students on the existence of the office, on the benefits of considering exploitation of their research results and on the appropriate procedures for disclosing inventions, patenting and licensing. Training and awareness raising therefore constitutes an important added function of the TLO. “Research and Innovation Issues in University – Industry Relations”, pg.6)

In all Member States there are schemes to promote intersectoral mobility and training in industry; however, a few good practice examples as regards public to private sector mobility can be identify. In Italy, for instance, academic researchers can be seconded to industry at low costs to the industry and with financial support from the ministry to replace such researchers. The French law on innovation and research of 1999 provides some measures to facilitate mobility from academia to industry, including the possibility to create or to be associated with the creation of a spin-off company exploiting the research, without losing the status of civil servant for up to six years and taxation relief for companies employing young PhDs. Austria is moving towards a system where researchers in the public sector are no longer civil servants and therefore not part of the specific civil service pension system. Some countries have developed significant opportunities for start-ups and spin-offs. For example, in the Netherlands, a large programme has been created in the area of life sciences. In any case, efforts to increase networking between industry and academic institutions should continue. (“Raising EU R&D Intensity, Direct Measures”, pg. 68)

In the area of “Incubator”, “Bridge” or “Conversion Gap”, lessons from past experience and emerging good practice suggest that policy makers need to:

- **Recognise an important gap** in the technology transfer process, not restricted to specific regions or countries, between the completion of a grant-funded research project in a university or research institute, and the development of a high-growth business start-up proposal, based on this innovation, that should be capable of attracting outside risk capital investment on reasonable terms.
• Establish programmes that have secure financing and realistic expectations of costs and revenues, including adequate public or educational sector sponsorship. Their continuation should not depend on generating investment returns or private-sector fundraising that can distort project selection and divert management time.

• Utilise private sector commercial management to select much less narrowly than would an early-stage investor from individual research projects with some definite commercial potential. ("Raising EU R&D Intensity, Risk Capital Measures", pg. 22)

Supporting RTD are:

• Direct Measures, i.e. measures involving the direct transfer of financial support from the public to the private sector via grants, loans etc.;

• Fiscal Measures, i.e. measures whereby the public sector foregoes tax income from the private sector in exchange for approved R&D investment behaviour;

• Risk Capital Measures, i.e. public measures affecting the flow and use of risk capital for innovation-related activities likely to increase R&D investment levels;

• Loan and Equity Guarantee Measures, i.e. measures whereby the public sector tries to encourage additional investment in R&D by offering to share part of the risk involved in the provision of support for innovation-related activities. ("Raising EU R&D Intensity, Fiscal Measures", pg. 1)

Proprietary information could, in turn, be divided into two separate subgroups—information that should be safeguarded and information that can be disclosed without damage—using the sort of valuation processes that companies already use to determine the value of patented discoveries and inventions. Information that is not central to a company's business, such as data derived from toxicity assays, could then be sold to other companies or academic research institutions at market value. Any company that fears giving its competitors an advantage could delay selling the data until it is entirely safe to do so, although it should bear in mind that the value of its research could depreciate over time. (Open innovation networks between academia and industry: An imperative for breakthrough therapies, pg. 5)

4. Specific B-A Collaboration Support Instruments:

For Public Research Organisations (PROs)

Without abandoning the Open Science Model, PROs should seriously consider taking a pro-active role in the innovation process by managing IPR arising from research results. This is an important strategic decision, which requires establishing a clear mission, realistic objectives, appropriate resources and a dedicated professional transfer office.

Industry and PRO associations should develop and implement by mutual agreement voluntary codes of conduct and guidelines to optimise the opportunities for a range of strategic relationships that can be entered into. Both of these key stakeholders should recognise the mutual benefits that such interactions can yield.

("Management of intellectual property in publicly-funded research organisations: Towards European Guidelines", pg.1)

Provide incentives for inter-sector mobility through internal academic appraisal systems, or better working and salary conditions. However, inter-sectoral mobility shouldn't be enforced. Criteria for appraising inter-sectoral mobility should be linked to the benefit for the host institution, the researchers’ group, or the individual researcher. Example of criteria: co-publications with the industry partner (publications are important for industry reputation), list of contacts, launching of cooperation projects, commercialisation, IPR knowledge or IPR co-ownership, start-up or spin-off experience even for
failures. A **sabbatical** can be appraised through a report written by the researcher that lists the added value of the mobility (this is common practice in many countries). A researcher pursuing a career in the other sector may need tailored criteria in order to benefit from the principle of equal opportunities. *(Mobility of Researchers between Academia and Industry, pg. 14)*

Develop fair and transparent **career evaluation processes** as recommended by the **European Charter for Researcher** and the **Code of Conduct for the Recruitment of Researchers**. The career evaluation process should cover all stages of the research career, providing checks and balances, feedback, counselling and appeal process. The objectives as well as the list of criteria and their respective weightings should be defined and be well-known in advance, and should be gender and family neutral. *(Mobility of Researchers between Academia and Industry, pg. 15)*

**Regular career orientation** should occur (e.g. every 5 years). *(Mobility of Researchers between Academia and Industry, pg. 15)*

Provide **training and standardised procedures to evaluators**. Review effectiveness of the evaluation as a form of training. Develop transparency of the evaluation mechanism in a manner that evaluations are comparable and well-motivated. *(Mobility of Researchers between Academia and Industry, pg. 15)*

Include **various evaluator profiles**, gender balance, and external evaluators, including international experts, in the evaluation committees. The committees should also take part in the definition of criteria. *(Mobility of Researchers between Academia and Industry, pg. 15)*

As part of the package earmarked for research, provide **funding for setting up training programmes** in order to ensure adequate training for employability in both sectors and at all levels of responsibility. *(Mobility of Researchers between Academia and Industry, pg. 20)*

Introduce substitution to legal barriers such as **insurance** negotiated with private companies that can follow the researcher when moving (including pensions) or “**intermediary bodies**” (public or private) that can take financial, legal and operational responsibility for the mission of researchers outside their host institution. *(Mobility of Researchers between Academia and Industry, pg. 21)*

Raise **awareness** in the widest sense (e.g. information, training, etc.) among public and private research bodies and researchers, in particular in the New Member States, about the existence and impact of **EU relevant instruments** on inter-sector mobility (Directive on Fixed-term Contracts, Recommendation by the Commission on the **European Charter for Researcher** and the **Code of Conduct for the Recruitment of Researchers**, Entry conditions for third country researchers, social security rules, RTD funding schemes, etc.). *(Mobility of Researchers between Academia and Industry, pg. 21)*

Raise **awareness** on compatibility of **complementary pension schemes** between academia and industry in light of relevant existing and future EU legal instruments for the acquisition (“waiting and vesting” periods), preservation and transferability of such rights. Take into account inter-sector mobility in other EU instruments such as the current review of the Community Framework for State Aid for R&D or the forthcoming communication defining guidance to bring about a more effective, stable and concerted use of R&D tax incentives across Europe. *(Mobility of Researchers between Academia and Industry, pg. 21)*

**Public Research Centres (PRCs)** can be a critical “**link in the chain**” between knowledge and society, but the nature of this linkage needs to be established so that both internal and external parties understand the contribution of PRCs. As noted above, it may not be appropriate for all PRCs in a national system to work with industry in general and SMEs in particular. *(The reform of public research centres and universities, pg. 18)*

The Nordic experience points toward a completely new approach to the needs of SMEs, whilst the more traditional model of the large sized PRC needs to evolve dynamically in order to match the needs of the modern society. The two approaches are not contradictory.
As far as larger PRCs are concerned, there is the need to re-define the operational model, and to integrate demand driven approaches in planning research activities. This can be done by taking account of the industrial structure, the ratio of SMEs to large enterprises and the dimensions and peculiarities of individual countries. At the same time, re-shaping of large PRCs should include the possibility of creating "ad hoc" participated enterprises with the mission of selecting and transferring appropriated technologies to industrial bodies (especially SMEs) or of allowing internal research laboratories to fulfil this function. Such an approach would integrate the Nordic model and the large PRC model, resolving any seeming contradiction between the two models. *(The reform of public research centres and universities, pg. 18)*

The government should set clear, long-term goals specifically related to Public Research Centres' knowledge transfer activities. These goals should include the number and type of enterprises engaged in this activity, targets for SME turnover and other knowledge transfer activities. Achievements should be measured and improvements rewarded. If a PRC does not achieve its goals, its current working practices should be reviewed and changes implemented. Funding could be reduced or discontinued depending on the strategy adopted and the market demand for the services of the PRC. Consideration might be given to providing part of the budget based on a performance contract, and part in open competition involving other PRCs and universities, with awards being made based on the most deserving projects. *(The reform of public research centres and universities, pg. 19)*

**Contacts, and competition with the best players in the world** in particular scientific fields will yield cutting edge knowledge, which can be utilised when PRCs engage in research projects with domestic large enterprises and SMEs. *(The reform of public research centres and universities, pg. 19)*

The PRCs should have in place systems for rewarding activities in relation to knowledge transfer contracts and spin offs. The award of this internal funding should be based on qualitative and quantitative success. The PRCs should have sufficient administrative flexibility to operate in a business environment. *(The reform of public research centres and universities, pg. 19)*

Funding programmes supporting knowledge transfer should ideally be operated by dedicated foundations, awarding finance directly to the unit involved in the knowledge transfer and sometimes to the recipients of that knowledge. Close links between such foundation and the PRCs should increase the chances of successful investments.

The promotion and reward of PRC staff should be reviewed. If they are being asked to undertake additional duties to what might be expected from their university researcher counterparts i.e. more knowledge transfer, less basic research, then these staff should be reviewed not based on academic criteria, but in criteria that take account of their interaction skills, as well as their research skills. *(The reform of public research centres and universities, pg. 19)*

**Knowledge transfer units (KTUs)** are important for effective cooperation between universities and industry, for the transfer of knowledge generally, and particularly for spin-off activities. It must be understood that effective knowledge transfer activities require the involvement of professionals, combining expertise and experience. Regional or national government must be responsible for supporting KTUs while their establishment must be in line with the fit of the university with the demands of the industrial environment. The size of the KTU should be determined based on the scope and size of activities envisaged (for example, one KTU might serve several universities). *(The reform of public research centres and universities, pg. 21)*

Occasional spin-offs can occur in the absence of a KTU, but the existence of a professional, well connected and networked unit is necessary to support large scale spin-off activity. Success and experience promote increased activity, leading to greater experience and improved efficiency, which should characterise effective KTUs. However, the commercial concepts of knowledge transfer and spin off are as yet not very familiar within the academic organisational culture; therefore the establishment of KTUs will require support, and guidance will be needed in the initial phases of their
operation. As the UK example (4) shows, some countries have these systems in place and results are encouraging. *(The reform of public research centres and universities, pg. 21)*

**KTUs are centres of specialisation.** The commercial effects of collaboration with the industry are limited compared to those of a network of KTUs. The expertise and experience stemming from a KTU active in knowledge transfer can be augmented by the network. There are established networks that collect and disseminate the joint experience of several KTUs, allowing each to benefit from a wide base of experience, and speeding up the learning process. Networks enable the creation of specialized centres for specific activities and referrals among KTUs, thereby reducing costs and inefficiencies (a KTU specialised in spin-off could assist another specialised in knowledge transfer.

This joint experience could result in reduced training or other fixed expenses (joint spin-off website, collaboration in technology fairs and workshops, shared platforms and personnel, etc.) and would exploit size advantages. Individual KTUs could thus be of small size, and need not have the capabilities to cover the full range of expertise of knowledge transfer activities, including spin-offs and licensing. The network should be nationally supported with this support decreasing over time counterbalanced by the increased support of the KTUs within it.

It is recommended that national/regional networks relate to other networks within the ERA, to maximise learning effects, and work towards a unified work methodology. *(The reform of public research centres and universities, pg. 22)*

When a technology sector critical mass exists in a specific region, and if the economic activity in the area and the supporting knowledge transfer infrastructure are considered underdeveloped, it is beneficial to form regional organisations, external to the universities (the universities could and should of course be partners) to deal with spin-offs and licensing in the region. Such organisations, with partners such as stakeholders, banks, local authorities, NGOs and others, can assist not only in the creation and organisation of spin-offs, but in the processes and support required for knowledge transfer. When spin-offs require the formation of a local venture capital company (VCC), or the assistance from local banks for special debt programmes, this is better managed on a regional basis; it is very difficult for a university on its own to achieve such a shift. This can also be applied to licensing which is such a complex area that mediating entities to provide links with industry and increase the legitimacy of the relations with the industry should be encouraged. *(The reform of public research centres and universities, pg. 22)*

When the KTU requires an efficient and active presence in the industry to find the best licensee helps if there is a body already involved in the industry on a regular basis. Thus the regional critical mass can be the motivation for the creation of a supporting environment for spin-offs. A regional organisation also has more influence when legislative changes or regional support from central government are being sought. Such regional organisations might be part owned by and could support KTUs, but would also act for the general public, and support non-university originated economic development. *(The reform of public research centres and universities, pg. 23)*

While KTUs have the capabilities and tools necessary for many of their activities (e.g. licensing, contract research), in order to encourage and support spin-off activity they must specialise. This includes hiring a spin-off expert, setting up a database linking technologies and potential investors, and creating the necessary network for investment funding (VCs, local institutes and private investors, investors clubs, etc.). *(The reform of public research centres and universities, pg. 23)*

**Rationale**

To support spin-off activity the KTU needs a specialist infrastructure, including expert personnel, an evaluation system, supporting network. Since the KTU generally will opt for the most efficient way of transferring knowledge, it may favour licensing over spin-off activity. However, the authorities (government, local or regional) should encourage KTUs to develop spin off expertise. Support in the form of both funding and training should be provided. Spin-off activities are complex and intensive. For
example, an entrepreneur (and sometimes a whole team) is needed to lead the project, something that is not required for licensing. It requires contacts in the VC and financing community, the building of a reputation and good screening and business planning capabilities. Such a major investment necessarily requires long term commitment to spin off activity. (The reform of public research centres and universities, pg. 23)

**Process**

Government support should be given to enable the KTU to hire a professional with a strong technology background, experience in industry, and experience of forming at least one start-up company. To be effective the person holding this position must quickly familiarise him/herself with the regional/national facilities and establish a nucleus for spin-off activities within the KTU. The KTU should be encouraged (by the supporting authority) to modify its evaluation process to identify spin-off candidates among the technologies reported for commercialisation. (The reform of public research centres and universities, pg. 23)

KTUs can exist in different organisational forms. The above examples show that it is beneficial for KTUs to be companies, or profit oriented organisations. However, another organisational form is for the KTU to be a unit within the university structure, for example a TTO. Each of these organisations has advantages which are discussed below. However, it would seem from the examples of good practice identified above, that the profit oriented organisation, institutionally separated from the university, produces the best results in terms of spin-off and licensing activities. The university must decide whether the entire KTU should be a separate company, or just the part managing its spin-off and licensing activities. This separate unit would still be owned by the university. (The reform of public research centres and universities, pg. 24)

**Alignment of interests;**

- **Strategic collaboration** is a deal as any other and both sides must strive to achieve a ‘win-win’ situation. Each party must clearly state their objectives, their understanding of the collaboration strategy, and their own position in it. If the goals are clear, then at least the partners can attempt to find a solution. Unless both parties are happy with the terms of the collaboration – each should be willing to say ‘no’ to the project. (Effective Collaborative R&D and Knowledge Transfer, pg. 25)

  - The details of the deal (including technical annexes, research strategy, re-negotiation clauses etc.) must be explicitly stated and set out with the help of experts.
  - To enhance understanding of the ‘different starting posts’ of university and industry it was proposed that there should be increased interaction between university and industry in the form of forums for discussion and conferences.
  - Universities should strive to better understand industry by installing industrial representatives on the board of the university.
  - At grass roots level, links between industry and graduates / postgraduates should be encouraged (student sponsoring, sandwich courses with a year in industry, etc). these can be good breeding grounds for long term relationships. (Effective Collaborative R&D and Knowledge Transfer, pg. 25)

The expert group encourages PROs to establish recognizable portals on the Internet and in their physical organisation. This portal should facilitate easy access by enterprises of all sizes, but also reach out to the PRO’s own personnel, and efficiently direct them to the appropriate transfer services, which provide the various services such as patenting, licensing or contract research in the science areas the PRO covers. ("Improving institutions for the transfer of technology from science to enterprises – Conclusions and Recommendations", 6 – 7 pp.)

The measures referred to would include the following:
• Introduce sweeping changes to current regulations and bylaws, to reduce red tape that impedes the process. To be effective, these changes have to be recommended by the University administration, mandated by the Government, and overseen by joint committees.

• **Encourage faculty members (expats and nationals alike) to reach out to the industrial sector** to cultivate meaningful contacts, develop (one on one) connection with their counterparts, and search and find potential areas for collaboration, within their field of specialization. This would invariably result in faculty members gaining relevant experience that would eventually be passed on to students.

• Institute a **Faculty Fellowship Program**, where tenured or tenure-track engineering faculty could spend 10 weeks, a semester, or an academic year, gaining valuable industrial experience (on site) in their field of technology, or in an allied area, compatible with the interests of the Industry and the College.

• Set up advisory boards to: facilitate collaborative efforts, provide logistical support and resources to collaborators, and monitor progress of joint activities. (*On Industry-Academia Relations in the Arab Gulf States: Steps toward Building Strategic Partnership*, pg. 5)

### 4.1 Collaborative Research

Use funding **schemes to develop informal networks** and activities **between SMEs and academia**. Create informal networks with a view to respond to local needs. Informal networks will enhance inter-sector mobility by creating contacts through meetings, events, conferences, job fairs, etc. SMEs will be easier to involve through national industry federations, or other representative organisations, such as clusters of SMEs or forums. (*Mobility of Researchers between Academia and Industry*, pg. 20)

Adequate mechanisms and professional **resources** must be in place if Knowledge Transfer activities are to take place effectively – preferably through the creation of a **Knowledge Transfer Office (KTO)**, either for individual institutions or clusters thereof. Although many variations may be encountered, a typical KTO:

- Is staffed by professional knowledge transfer experts, including – or with access to – legal, financial and intellectual property (IP) advisors.
- Develops and executes the research institution’s strategy in respect of working with industry and users of research results, and the exploitation of intellectual property.
- Helps identify, evaluate and – where appropriate – protect intellectual property.
- Advises on commercial and IP issues, in particular in the negotiation of research contracts.
- Promotes the use of inventions and other R&D results, in particular by negotiating technology transfer agreements or facilitating the creation of spin-offs.
- Disseminates information – in particular to potential users – regarding what intellectual property the research institution owns and what is available for licensing.
- Administers license agreements and equity participations, collects and distributes the revenues.

If an institution creates a **new KTO**, it is recommended that it be empowered **first as a service organization** and only if required and presumed it is capable, **as a strategic exploitation office**. Once it has necessary experience and capacity to fulfil its function, it could be authorised to generate, protect, and enforce IPR. (*Improving knowledge transfer between research institutions and industry across Europe*, pg. 26)

To perform knowledge transfer activities effectively, **research institutions need to have sufficient autonomy to recruit experienced knowledge transfer staff on a competitive basis**. Increased mobility between the public and private sectors will help research institutions’ researchers and managers identify shared needs industry. (*Improving knowledge transfer between research institutions and industry across Europe*, pg. 9)
There is also a need for existing resources to be made more accessible. This can be partially achieved through co-ordination. At present, certain research institutions have **staff who actively pursue links with industry, but who do not interact amongst themselves.** By pooling their knowledge transfer competencies, they can ensure that such skills are made more widely available throughout the research institutions. Furthermore, significant benefits may arise by outsourcing certain specialised functions or by pooling resources or R&D results (and associated IP rights) between several research institutions. Examples of pooling resources between several knowledge transfer offices include the patent marketing and knowledge transfer agencies established in Germany, the *North of England Science Initiative* or the Belgian VIB. Alternatively, such pooling can address a single industry sector (for example the *White Rose Consortium*) or a single knowledge transfer activity. *(Improving knowledge transfer between research institutions and industry across Europe, pg. 9)*

**Resources are scarce** and, as such, the decision on which **research area** they should be focused in order to obtain the best results for society is **one of the most difficult and important** for policy makers at all levels. One of the best ways to optimise public investment is to identify areas in which there will be the greatest number of beneficiaries – it frequently takes the form of a **Cluster.** *(R&D-Industry Co-operation to Foster Innovative Firm Creation, pg. 136)*

**Setting-up research-based spin-offs within such an area** has a series of positive effects that include the continued revitalisation of both cluster and the university/R&D centre from which the spin-off emanates. The firms can benefit from the ready-made network of potential clients and mentors, the university can benefit from the practical data obtained from placing the research on the market and new jobs are created that keep knowledge workers in the region. *(R&D-Industry Co-operation to Foster Innovative Firm Creation, pg. 136)*

This feedback process also generates new services offered by the university itself that strengthen its work and can lead to the birth of a particular technology cluster that could elevate the research institution to international levels more rapidly. And, indirectly, the process enhances the professional opportunities available to students through the growth of the regional economy as a whole. At a regional level, the ability to identify emerging sectors can help to direct resources to support the creation of high-growth enterprises that have the greatest impact on the socio-economic well-being of the region. *(R&D-Industry Co-operation to Foster Innovative Firm Creation, pg. 137)*

The new applied research groups should ideally be located on or close to existing HEI campuses. It is crucial that they have distinct governance that ensures their autonomy and protects their distinct mandate and **culture of applied research.** The relationship with the HEI can be defined by a Memorandum of Understanding (MoU) or legal agreement which would among other things spell out arrangements for both sides to have access to each other's facilities. They will need **strong professional management with a commercial background as well as operational independence from the HEI** but the potential for recruiting researchers with the right profile and the ability to link with academic researchers. *(Promoting Enterprise-Higher Education Relationships, pg. 25)*

Large companies are **consolidating their relationships with university research departments.** Whereas in the past they may have had scores of short-term research contracts with different departments across the country, today many prefer a small number of substantial longterm collaborative research partnerships. *(Lambert Review of Business-University Collaboration, pg. 38)*

Collaborative research often involves academic researchers working alongside company employees on **shared projects.** The contributions of each side to the partnership will vary, but the company may provide long-term secure funding along with company data, staff and equipment. In return the university department will offer access to skilled researchers and an international network of academics. A pioneering example of this type of relationship is the **Rolls-Royce network of University Technology Centres (UTCs).** Many other multinationals, for example British Nuclear Fuels, BAE SYSTEMS, and
GlaxoSmithKline have also developed this type of longer-term strategic relationship. *(Lambert Review of Business-University Collaboration, pg. 38)*

Awareness in the academia (PROs) as well as in industry must be created regarding the meaning and importance of “academic freedom” and working together. Too quick and too easy a decision is made, that in a partnership the concept of academic freedom is violated. This hampers two ways an intended partnership. *(Effective Collaborative R&D and Knowledge Transfer, pg. 20)*

The expert group recommends **PROs and TTI managers to establish appropriate communication** between technology transfer functions and researchers to increase internal visibility.

PROs should in addition implement and improve incentives for researchers to engage and cooperate in technology transfer: These incentives should include a fair share of the financial rewards, but also extend to other aspects, such as professional career and advancement. (“*Improving institutions for the transfer of technology from science to enterprises – Conclusions and Recommendations*”, 6 – 7 pp.)

Conduct evaluation of teams/groups and institutions with a view to give **credit to academia-industry collaborations.** As science is more and more team-based, evaluation of groups, research teams or institutions provides incentives for joint experiences. Evaluate positively academia that includes industry representatives in its organisation structures and decision making-bodies, for example by participating in the management board, advisory committees, or in the design of programmes, etc. *(Mobility of Researchers between Academia and Industry, pg. 19)*

### 4.2 Consultancy Work

Develop the concept of **consultancy by academic staff** as one of the simplest ways for academia to interact with industry and exchange research expertise. The legal arrangement terms of short employment contracts are relatively simple in comparison to other short term mobility. For large companies, consultancy offers a chance to get to know academic researchers, while SMEs can benefit from consultancy for a relatively low cost. **Consultancy** is often seen as a **first step towards other collaboration.** Much collaborative research in academia originates from consultancy relationships. *(Mobility of Researchers between Academia and Industry, pg. 13)*

A company can enter into an **agreement with a researcher** that he supplies certain services on a consulting basis. This counts as a bilateral contractual relationship between the company and the scientist. **Sideline activities should not limit the scientist’s capacity to work for the university,** and use of university infrastructure, materials or equipment should not be part of the agreement, but should be agreed directly with the university as revenue-funded activities. *(Contacts, contracts and codices, pg. 32)*

As the company finances the assignment, the normal procedure would be that the company has the full right of disposal over the results of the project. But the consulting assignment is only a sideline for the scientist. His main activity is at the university, and he is therefore comprised by the Inventions Act and the university’s guidelines for researchers’ sideline activities. Accordingly, the **university should approve any agreements on rights** emanating from inventions made during the consulting assignment. *(Contacts, contracts and codices, pg. 33)*

A discussion may arise as to whether the scientist only makes personal knowledge available that has nothing to do with his main activity, or whether this is knowledge that the scientist, the institute and the university have developed through research. The importance of this definition becomes particularly relevant if patentable inventions result from the consultancy. *(Contacts, contracts and codices, pg. 33)*

Bilateral consulting services have only limited relevance when the service lies within the main research area of the scientist. The **university ought to be involved,** and it will most often be an advantage to see
the project as commissioned or co-financed research. The researcher should inform his superiors about private consultancy contracts. A similar duty to inform ought to apply in connection with scientists’ participation on boards, on advisory boards or in managements of private companies. An information principle further serves the purpose that potential conflicts of interest can be dealt with beforehand. 

((Contacts, contracts and codices, pg. 34)

The Danish Rectors’ Conference and DI recommend that all universities formulate a **policy for sideline activities of their scientists**. Such policy should include guidelines regarding:

- Duty of notification and scope. When should a scientist inform his superiors of duties he assumes outside his main activities. How much sideline activity can he have beside his research job.
- Handling of IPR. Under which circumstances can the university claim rights that result from researchers’ consulting services. 

((Contacts, contracts and codices, pg. 34)

When academic consultancy or contract research is carried out on behalf of industry, universities must adopt clear policies to avoid conflicts of interest. **Publicly-funded research must not be compromised in a bid to secure a consultancy agreement** or contract research. 

((Lambert Review of Business-University Collaboration, pg. 37)

Behind the formal procedures such as joint supervision or placements in business, successful long-term university-business cooperation processes are holistic, – i.e. the soft part of the relationship is very important and continuous face-to-face experience is mandatory to build trust and durable partnerships. 

((European University / Business Forum, slide 12)

### 4.3 Tax Incentives for Corporate R&D Expenditure

Fiscal R&D incentives allow companies to reduce their tax payments as a reward for carrying out innovative activities. Most EU-15 countries operate some form of tax measure to stimulate business enterprise R&D, as do Australia, Canada, Japan, the US and China. The use of fiscal incentives for R&D has increased in recent years. Some examples of the types of schemes employed are given in the following table.

<table>
<thead>
<tr>
<th>Corporation Tax Schemes</th>
<th>Italy: (only for firms in Objective 1,2 and 5b areas) United Kingdom: (separate schemes for SMEs and large firms) Canada (federal and state level schemes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corporation Tax Schemes</td>
<td>Belgium (per additional member R&amp;D staff) France, United States, Japan, Korea</td>
</tr>
<tr>
<td>Incremental</td>
<td></td>
</tr>
<tr>
<td>Corporation Tax Schemes</td>
<td>Austria (three parallel schemes), Portugal, Spain (national level and some regional fiscal schemes), Australia</td>
</tr>
<tr>
<td>Mixed systems</td>
<td></td>
</tr>
<tr>
<td>Schemes based on employers’ share of wage tax and social contributions</td>
<td>Netherlands</td>
</tr>
<tr>
<td>Fiscal schemes to attract foreign “key personnel” * through personal income tax</td>
<td>Finland, Sweden, Denmark, Netherlands (all have favourable income tax rates)</td>
</tr>
</tbody>
</table>

* These schemes are not exclusively for R&D staff but for all “key personnel” which could also include other staff e.g. management, engineers.
Clarifying the legal conditions for Member State R&D tax incentives arising from EU law notably relevant European Court of Justice (ECJ) jurisprudence on the EU Treaty freedom and State aid rules;

Highlighting general design features for R&D tax treatment and incentives based on expert analysis of good practices ("Towards a more effective use of tax incentives in favour of R&D", pg. 3)

When assessing an R&D tax incentive that constitutes State aid in accordance with Article 87 (1) of the EC Treaty, the Commission will look particularly at the following elements:

- The R&D tax incentive applies to one or more R&D categories defined in the Framework (i.e. fundamental research, industrial research and experimental development);
- The R&D tax incentive relates solely to certain eligible R&D costs listed in the Framework; and
- The aid intensity of the R&D tax incentive can be established and does not exceed the maximum threshold established in the Framework.
- The R&D&I-framework furthermore states that when doing so, the Commission will assume that on the basis of evaluation studies presented by Member States, R&D tax incentives have an incentive effect by stimulating higher R&D spending by enterprises.

("Towards a more effective use of tax incentives in favour of R&D", pg. 7)

To enhance the effective use of R&D tax incentives and improve R&D tax treatment in the EU, there are a number of other specific tax issues that need to be addressed in a consistent way, on top of the basic design principles outlined above (i.e. compliance with EU law and learning from Member State good practices). Some of these issues are research-related aspects of the general taxation system while others concern R&D issues of common interest.

Member States are invited to discuss the initiatives proposed in this section at EU level and consider them when reviewing their tax policy. ("Towards a more effective use of tax incentives in favour of R&D", pg. 9)

Tax incentives targeting Young Innovative Enterprises as introduced by some Member States can have a positive effect on R&D activities and said companies’ growth. They can take the form of a corporate tax exemption or a time-limited exemption on social security payments associated with the employment of highly qualified personnel (e.g. researchers and experts), thereby lowering the costs for young R&D–based businesses. Member States are invited to consider offering specific tax incentives for this strategically important category of enterprises.

A further way of promoting European R&D investment could be to improve the tax treatment of philanthropic entities funding research, e.g. foundations and charities (research foundations). Research foundations are private entities with the aim of enhancing scientific knowledge by funding R&D activities in public-benefit organisations, typically universities and public research centres. However, although some large research foundations exist, this source of funding is under-exploited in Europe when compared to the US, and certain formal and informal obstacles appear to inhibit both donations by individuals and corporations on the one hand and the flow of funds to research on the other.
There is therefore a need to improve the tax conditions for cross-border donations and foundation activities to create a level playing field in the EU. Agreeing upon a common definition of public-benefit purposes, or a move towards the mutual recognition of public benefit organisations entitled to tax relief, would be an important step to facilitate cross-border funding. Such an approach can be found in the European Foundation Centre’s proposal for a European Foundation Statute, which also advocates a non-discriminatory approach to the tax treatment of such foundations and their donors and beneficiaries.

Member States are invited to support a common approach regarding i) the tax treatment of the foundations themselves, irrespective of where they are established in the EU, and ii) the definition of public-benefit organisations. (“Towards a more effective use of tax incentives in favour of R&D”, pg. 10)

Some Member States (e.g. France, Spain) allow firms to request a certificate recognising their capacity to perform R&D. Such certificates facilitate the application of R&D tax incentives and are valid for several years. They are used by tax authorities to streamline the processing of tax relief claims. To avoid territorial discrimination in cases of cross-border outsourcing of R&D, Member States implementing such processes are invited to extend them to R&D performing firms established in other Member States. (“Towards a more effective use of tax incentives in favour of R&D”, pg. 11)

VAT on R&D costs incurred by taxable persons is deductible where the goods and services in question are used for VAT-taxable transactions. The current rules of the 6th VAT Directive concerning exemptions, public authorities and subsidies may affect this deductibility and hence place an unnecessary burden on certain research activities. The Commission has committed itself to reviewing these three issues, which need to be modernised. When reviewing the legislation, the Commission will critically examine the restrictions on the recovery of VAT on R&D expenditure. It will also consider to what extent the current rules on public authorities and subsidies hamper the creation of public-private partnerships and cost-sharing arrangements, including in the research field where such structures are increasingly being used to conduct R&D efforts requiring the pooling of resources from public and private entities or the outsourcing of research by private entities to public ones (contract research). (“Towards a more effective use of tax incentives in favour of R&D”, pg. 11)

In the longer term, it is desirable to seek an EU-wide tax definition of R&D and innovation and to give such expenditure favourable tax treatment in the common consolidated corporate tax base (CCCTB). The Commission will include this in the relevant working group discussions with Member States, with a view to defining a coherent and well-balanced solution in line with other possible incentives within the CCCTB. (“Towards a more effective use of tax incentives in favour of R&D”, pg. 12)

There is a need for complementary actions to make firms ware of the opportunities and threats, but also the necessity, of innovation and going ‘international’ and of measures to encourage their entrance to new, more innovation-demanding markets. Without these, direct R&D-supporting measures to encourage them to be involved in R&D and innovation, collaborate with research organisations, and the like, or indirect measures such as tax incentives, may still have limited results in terms of increasing the private investments in R&D. (“Raising EU R&D Intensity, Direct Measures”, pg. xiv)

Generalisations concerning the efficacy of different types of R&D tax incentive schemes are difficult to make in the absence of extensive evaluation studies of fiscal schemes and the methodological difficulties associated with many of the econometric studies undertaken in this area. Nevertheless, the following tentative conclusions can still be drawn:

- **If well designed, fiscal incentives can stimulate business R&D.** It has proven difficult, however, to evaluate the amount of additional R&D generated per unit of tax income forsaken by the public sector. The few tentative evaluations that exist show positive but moderate levels of leverage and
additionality, and the possibility of externalities (R&D spillovers) strengthens the likelihood of fiscal incentives having positive impacts;

- **There is a clear need for more formal evaluations** to establish the effectiveness and impact of fiscal incentives, and for greater efforts to improve the methodological tools needed to conduct them;
- **Better micro-level data sets are needed** to understand the long-term impact of fiscal incentives on business R&D;
- Existing evaluations of fiscal R&D incentive schemes in different countries cannot be compared due to the use of different methodologies, incommensurable data sets and dissimilar time periods. **Coordinated, cross-country comparisons of the efficacy of different types of scheme using similar methodological approaches are needed.** ("Raising EU R&D Intensity, Fiscal Measures", pg. x)

There are a number of clear design principles that Member States should use to review their current fiscal mechanisms and design new ones:

- **Simplicity.** Schemes should be transparent and easily accessible to a broad spectrum of firms;
- **Low administrative and compliance costs.** For firms, it should not be complex and time consuming to apply for and receive a tax credit/allowance. For administrations, the auditing systems needed to check on the eligibility and validity of claims should be effective without being onerous for all concerned;
- **Reliability.** Firms should be able include fiscal allowances or credits in their forward plans with a fair degree of certainty. Receipt or non-receipt of tax incentives at any point in the future should not dependent on concurrent levels of profitability;
- **Stability.** The rules of the game should not be changed too often, since this reduces the ability of companies to budget for future tax benefits when making R&D investment decisions. Greater certainty in the long term allows firm to forecast the cost of their R&D projects more accurately. ("Raising EU R&D Intensity, Fiscal Measures", pg. xi)

Assure **re-fundability** (cash refund) of tax credits or tax allowances in cases where companies make losses (and, therefore, would not be able to benefit from a reduction of corporate income tax liabilities). For large firms this could be dealt with by using carry-forward / carry backward arrangements. For small firms a cash refund is preferable since it will have an immediate effect on their cash flow. ("Raising EU R&D Intensity, Fiscal Measures", pg. 34)

**A clear definition of R&D** is essential for deciding in a cost-effective manner what are the eligible R&D costs and which activities count as R&D. We recommend that the definition used in Member Countries should be based on the international standard defined in the Frascati Manual of the OECD. ("Raising EU R&D Intensity, Fiscal Measures", pg. 35)

There is a need for an **optimal policy mix** regarding business R&D. Tax incentives should be used when governments want to reach a broad range of firms involved in R&D activities. Direct government funding of business R&D should be targeted towards the fields of research were the gap between private and social rates of return is large. ("Raising EU R&D Intensity, Fiscal Measures", pg. 36)

Policy makers need to ensure that fiscal measures and direct government funding of business R&D complement each other. This would be achieved only through an **effective co-ordination mechanism** between the public institutions (ministries and agencies) involved in the stimulation of business R&D. ("Raising EU R&D Intensity, Fiscal Measures", pg. 36)

Fiscal incentives using **personal income tax breaks**, if appropriately formulated, could effectively attract researchers from abroad. The expert panel finds that there is insufficient information to assess the consequences and effectiveness of these schemes at this stage. It is recognised that personal income tax break may induce potential distortions within the EU labour market. ("Raising EU R&D Intensity, Fiscal Measures", pg. 37)
4.4 Staff Exchange Programmes and Industry Placements

The Commission has been an active proponent of through the "Marie Curie Industry-Academia Strategic Partnership" scheme which supports the development of such long-lasting collaborations via the exchange of researchers. The new research, development and innovation State aid framework has also introduced a measure on aid for the loan of highly qualified personnel from research institutions (or large companies) to SMEs. (Improving knowledge transfer between research institutions and industry across Europe, pg. 10)

In order to better answer to future employers' needs, graduates and early stage researchers should be trained adequately, providing them the appropriate skills for their future profession of researcher in both sectors, in particular the private business sector. (Mobility of Researchers between Academia and Industry, pg. 10)

Develop graduate and doctoral programmes in partnerships with the business community, including with SMEs, as programmes jointly developed will better suit future employers’ needs. Industry involvement in defining and reviewing academic training programmes will also help adapting them to constantly changing market needs. (Mobility of Researchers between Academia and Industry, pg. 10)

Provide entrepreneurship training to nurture a new category of researcher: the “entrepreneurial academic”. Entrepreneurial skills allow researchers to exploit their knowledge and develop the commercial of their work. Senior researchers should also be trained or retrained in this sense. Set up technology, innovation and research management training programmes in order to equip experienced research with strategic and organisational skills. (Mobility of Researchers between Academia and Industry, pg. 11)

Recognise merits of early stage and experienced researchers in both sectors with for example a “skills portfolio”. The portfolio should record courses taken and experience acquired by the researcher, including in industry. For early stage researchers, such a portfolio approach could be considered as a valuable addition to the diploma. (Mobility of Researchers between Academia and Industry, pg. 11)

Provide doctoral candidates with two supervisors, one from each sector or alternatively a supervisor from academia and a supporting mentor from industry and set up an agreement between the supervisors on their respective responsibilities towards the doctorate. (Mobility of Researchers between Academia and Industry, pg. 12)

Prepare supervisors for their supervision responsibilities with ad-hoc training by professionals including receiving an accreditation. (Mobility of Researchers between Academia and Industry, pg. 12)

Develop inter-sectoral mobility opportunities via staff exchanges, part-time positions, sabbaticals, honorary positions, or financial or statutory incentives, offered to both early stage and established researchers. (Mobility of Researchers between Academia and Industry, pg. 12)

Ensure transparency in recruitment procedures in both sectors by advertising positions through well-known channels such as the Researcher’s Mobility Portal ERACAREERS (http://ec.europa.eu/eracareers). Organise placements and internships in industry, especially in SMEs. Such schemes already exist, however the aim should be to include placements/internship in researchers’ curricula as it is the case with most engineer and business schools in Europe. A minimum period of six months should be ensured. Early stage researchers should be trained for being effective in their search of internship. Academia alumni could provide assistance for finding suitable internship positions. (Mobility of Researchers between Academia and Industry, pg. 13)
Increase inter-sector mobility by providing researchers industry relevant expertise online in an easy accessible format, to allow industry to find appropriate contacts in academia, i.e. individual technical expertise or expertise of a group. This could help SMEs to connect with the academic world by finding the expertise needed, especially at the regional level. Alumni networks should be developed in order to tap researchers working in industry. (Mobility of Researchers between Academia and Industry, pg. 14)

Academia should recruit professional managers and experienced staff from industry. Provide leadership at top managerial levels in order to foster efficiently the cultural change, and link it to an institutional strategy. Different profiles should be included in the management committee, including industry representatives. (Mobility of Researchers between Academia and Industry, pg. 15)

Employ staff specialised in industrial relations. Partnership between academia and industry can only flourish with staff specially designed to take care of the relations with industry, while working in academic premises. This can take many forms such as Technology Transfer Offices (TTO), or development or liaison offices. This is especially important for establishing cooperation with SMEs, which have not often established direct contacts with academia. For further information go to http://www.eif.int/tech_transfer/ (Mobility of Researchers between Academia and Industry, pg. 16)

Provide the necessary autonomy to institutions so that they are able to combine staff with experience in both sectors and to recruit on a competitive basis. Offer the possibility to recruit managers or researchers with experience in industry. (Mobility of Researchers between Academia and Industry, pg. 17)

Legally endorse the possibility of part-time professorships in academia for researchers working in industry. National legislation should allow researchers in academia to work for industry on a part-time, consultancy, or other basis. Legal status should permit and encourage "posting" researchers from academia to industry and vice versa for a limited period of time. Researchers from public institutions should also be able to benefit from leave of absence such as a sabbatical leave to start-up a company. (Mobility of Researchers between Academia and Industry, pg. 17)

Joint research programmes, which promote direct collaboration between industry and science, are a well-established policy intervention mechanism, which has a significant effect upon the level of industry science relations (ISR). In this area, good practice particularly refers to thematically focused programmes which apply a bottom-up approach of defining joint research themes, have a long-term perspective of cooperation and rely, at least partially, on an ‘infrastructure’ approach, i.e. the establishment of institutions and/or facilities that are operated both by enterprises and science institutes and maintain cooperation after funding has ended. With respect to such programmes, a competition-based approach of allocating funding has proved to be effective. Such an approach stimulates the involvement of a large number of applicants but restricts funding to promising ‘best practice’ cases, which may serve as orientation points for other actors. (Good practice in industry-science relations, pg. 13)

Fostering the direct commercialisation of research results in public science is an important policy issue especially in fields such as biotechnology, genetic engineering, new materials, and new information and communication technologies. Good practice in commercialisation covers, amongst others: the provision of a supportive infrastructure that reduces transaction costs and information asymmetries in using IPRs (patent licensing offices); advisory support and pre-seed capital for start-ups; and several awareness measures that raise the perception of researchers in the commercial potential of the research results they have achieved. (Good practice in industry-science relations, pg. 20)

The reform of institution settings in public science are particularly successful when the following issues are considered: implementing ISR as part of the institutions’ mission; considering ISR activities in evaluations; providing both individual and organisational incentives; and linking industry and science through advisory boards. A special approach is to introduce new, flexible organisational units that particularly focus on industry-related research and education, including a strong involvement of industry both in financing and strategy development. (Good practice in industry-science relations, pg. 25)
In many countries, a successful way of strengthening ISR is to establish **transfer-specialised institutes** either in universities or within public research laboratories. Key success factors in these institutions include: keeping together basic and applied research within a research team; regular auditing of the research strategy in order to cope with changes in the economy and society; direct transfer between researchers and industry (i.e. avoiding intermediaries); and individual remuneration of successful transfer activities. (*Good practice in industry-science relations*, pg. 29)

The need for greater professionalism in managing and handling collaborative R&D and knowledge transfer **requires** that **universities train people accordingly**. Both students and academics need this training. Basic IP course (single modules or greater depth) should there be offered as a standard part of degree programmes and as on-the-job training. (*Effective Collaborative R&D and Knowledge Transfer*, pg. 17)

Collaborative projects should be **managed professionally from both sides, respecting each other’s skills and expertises**. Although a split in responsibilities between the scientific and project management is recommendable, it is also recommendable that the scientific project leader has a basic understanding of managing a project. A (short) training course to this end should be developed focussing at researchers (both in academia and industry). (*Effective Collaborative R&D and Knowledge Transfer*, pg. 21)

**Consultants** can be **key knowledge transfer parties** for technical knowledge and management process skills. They are also active with Business Schools and some technical groups, but their role can be a blind spot to universities and governments, for example as formative training ground for new graduates. (*Effective Collaborative R&D and Knowledge Transfer*, pg.24)

There may be a **conflict between the company’s need for confidentiality and the Ph.D. student’s need** to show as many aspects of his work as possible to his tutor and the examiner in order to support his conclusions. In addition, doctoral dissertations must be defended at a public, oral presentation.

Company, tutor and Ph.D. student should discuss which information that can/should be included in the dissertation and defence and, if need be, how confidential information can be coded. The student’s tutor should be made aware of his duty of confidentiality regarding company-specific information that will come to his knowledge during the project. Some let individual researchers enter into individual confidentiality agreements, while others enter into confidentiality agreements between the company and the university. The examiner is obliged to keep the information that he receives through his examination activities confidential. (*Contacts, contracts and codices, pg. 37*)

Doctoral programmes and knowledge transfer are intrinsically linked. **Schemes with business participation** are a **strong vehicle** to enhance **university-business mobility** and the necessary evolution in “mindset change” in all stakeholders. (*European University / Business Forum, slide 12*)

**Geographical and inter-sectoral mobility needs to increase substantially.** The proportion of graduates who have spent at least one term or semester abroad or with experience in industry should at least double. This is even more true for researchers.

All forms of **mobility** should be explicitly valued as **a factor enriching studies** at all levels (including research training at doctoral level), but also improving the career progression of university researchers and staff.

**National grants/loans should be fully portable within the EU.** Full portability of pension rights coupled with the removal of other obstacles to professional, international or inter-sectoral mobility is needed to foster staff and researcher mobility and hence innovation. ("Delivering on the Modernisation Agenda for Universities: Education, Research and Innovation", pg. 5)
4.5 Funding for Commissioned Research

Promoting innovation and disseminating new knowledge can be successful as long as intellectual property issues are understood and managed professionally. Interaction on these points can be facilitated by tools such as the CREST decision tree, model contracts such as the UK’s Lambert agreements, or guidance such as the Danish document on Contacts, contracts and codices, as well as through awareness initiatives by the European and national patent offices. The Responsible Partnering initiative, developed by 4 major European university and industry associations (EIRMA, EUA, PROTON, EARTO), presents key insights into how effective research collaboration can be created. Member States have a role in the development and delivery of such initiatives and should support them actively. (Improving knowledge transfer between research institutions and industry across Europe, pg. 10)

Although in certain cases formal protection (e.g. design rights, patents or material transfer agreements) may be necessary if a product is to be brought to market successfully. It is therefore important to ensure that researchers are aware of the benefits of both approaches and that decisions are made on the basis of socio-economic impact. Given that the rules governing the ownership of publicly-funded R&D results still vary across Europe, it may be appropriate to revisit in the near future the question of a single European ownership model for publicly funded research. (Improving knowledge transfer between research institutions and industry across Europe, pg. 10)

In many countries, research institutions have created reward systems whereby the inventor receives a share of any profits made when licensing or spinning off inventions. An illustrative model is one where profits are split evenly between the researcher, the research institution and the business partner. However, although some financial incentives may apply, many staff remain reluctant to take part in such activities, especially as they are not taken into account for career progression. It is therefore important that the appraisal criteria also take into account other activities such as patenting, licensing, mobility and collaboration with industry. (Improving knowledge transfer between research institutions and industry across Europe, pg. 11)

Member States should make full use of the available funding sources, and encourage research institutions to do so. Cohesion policy funding (the European Regional Development Fund and the European Social Fund), national funding in line with the new Community framework for State aid for research and development and innovation (RDI), and the European Framework Programmes should all be used to leverage more links between industry and research institutions. (Improving knowledge transfer between research institutions and industry across Europe, pg. 11)

Continuity is critical for the accumulation of skills and the achievement of the necessary competence. It can only come from having core group on long-term career contracts rather than being assembled only for a project term. An important part of continuity is technical sustainability. The Applied Research Groups should therefore have some links with academic research to avoid senescence. (Promoting Enterprise-Higher Education Relationships, pg. 25)

From the university’s perspective, contract research can lead to longer-term collaborative research projects. It also helps university researchers to keep up-to-date with the latest developments in professional practice and to gain external research income. From the business perspective, many large companies have cut back their corporate R&D laboratories and smaller businesses often have limited financial resources to conduct their own R&D. Contract research in universities can be a flexible and cost-
effective way for companies to undertake research. *(Lambert Review of Business-University Collaboration, pg. 36)*

The main question about contract research concerns **the price that universities should charge business** for such work. This issue was thoroughly examined by the Transparency Review which established a methodology to determine the full costs of research and other publicly funded activities in higher education. This Review supports its recommendation that universities should implement robust costing mechanisms. This will enable them to identify and charge at least the full economic costs for the contract research that they undertake for business. *(Lambert Review of Business-University Collaboration, pg. 37)*

### 5. Other Recommendations

Key **employment skills** should include **industrial needs and experience**, complementary to **tradition of academic training**. This includes:

- Research skills and techniques
- Communication skills: including reporting and writing techniques, oral presentation skills, and effective support to teaching researchers (teaching, mentoring, or demonstrating activities)
- Interpersonal skills: e.g. accepting responsibilities, working in teams, networking etc.
- Awareness on Intellectual Property Rights (IPR): i.e. patents, copyrights, designs and trademarks
- View on private sector constraints: e.g. time constraints and engagements, mainly for delivering
- Career management: e.g. writing a CV, applying for jobs, submitting funding applications, planning a career, etc.
- Broaden scientific expertise with experience in other research domains, in particular for researchers who are likely to work in multidisciplinary teams. *(Mobility of Researchers between Academia and Industry, pg. 11)*

Policy makers are well advised to improve industry-science relations **by taking up good practice examples**, **putting them into the context of their respective national innovation systems** and **integrating ISR into the broader policy context** with the objective of improving the overall system. *(Good practice in industry-science relations, pg. 39)*

**Rolls Royce’s University Technology Centres** illustrate how having Centres of Excellence in specific technology fields, concentration of activity into fewer and larger centres, based around groups with proven track records (can work successfully). With 5 year rolling contract covering business and technical goals, high quality staff, formal IPR agreement, formal performance review every 2 years, close working enables effective technology transfer, staff exchanges and secondments. *(Effective Collaborative R&D and Knowledge Transfer, pg. 10)*

Funding of new initiatives, whether applied research groups or new centres, should be based on **award through open competition** among the full range of providers – universities, institutes of technology, national and international research providers. The Groups should be well resourced with facilities and equipment of a high standard, awarded following a competitive process open to organisations nationally and internationally. The Strategy for Science, Technology and Innovation 2006-2013 allocates close to €400 million over the eight year period to support for enterprise collaboration with Higher Education. The development of applied research groups should be funded from this source. *(Promoting Enterprise-Higher Education Relationships, pg. 25)*

**Insularity:** European higher education remains fragmented - between and even within countries – into medium or small clusters with different regulations and, naturally, different languages. It needs to become “readable” in the world if it wants to regain its position as the leading destination of mobile students - a
privilege lost to the US in the 1990s. It also remains largely insulated from industry, with limited knowledge-sharing and mobility. As a result, too many graduates – even at the highest level - lack the kind of entrepreneurship and skills sought on the labour market. Most universities are strongly dependent on the state and ill prepared for worldwide competition over talent, prestige and resources. ("Mobilising the brainpower of Europe: enabling universities to make their full contribution to the Lisbon Strategy", pg. 4)

**Human resources** are a core determinant of quality in higher education and research.

Universities must therefore work to enhance their human potential, both qualitatively and quantitatively, by attracting, developing and keeping talent in the teaching/research career.

Excellence can only emerge from a favourable professional environment based in particular on open, transparent and competitive procedures. Vacancies, at least for rectors, deans, professors and researchers should be advertised publicly, and where possible internationally.

Researchers should **be treated as professionals from the early stages of their career**. Physical and virtual mobility (whether across boundaries or between university and industry) and innovation leading e.g. to university spin-offs should be encouraged and rewarded.

Compensation should reward quality and achievement in the performance of all tasks, including a share of income from research contracts, consultancies, patents, etc. These measures would over time reinforce world-class excellence at European universities, thus reducing the attractiveness gap with other world regions and benefiting all of Europe - through highly qualified graduates moving or returning to more regional universities, whether immediately or later in their careers. ("Mobilising the brainpower of Europe: enabling universities to make their full contribution to the Lisbon Strategy", pg. 6)

European universities also need to become more attractive partners for industry. Lasting partnerships are a condition for structured staff exchanges and for curricular development responding to industry’s need for well trained graduates and researchers. But the development of commercially relevant training/retraining, research and consultancy services demands investment over some years before these activities start paying for themselves – all the more so if public subsidies are correspondingly reduced. This means that the development of sustainable partnerships with industry may well hinge (initially, at least) on the availability of tax incentives. ("Mobilising the brainpower of Europe: enabling universities to make their full contribution to the Lisbon Strategy", pg. 9)

The Commission should use its resources to call for and fund proposals for new trans-European, co-ordinated incubator/pre-seed fund activity. Criteria for proposals should include a need for experienced, properly-remunerated private management who understand both technology transfer and investment processes. Proposals should be consistent with activity already existing at national and transnational levels and should be of sufficient scale to ensure cost-effectiveness (i.e. regional or more concentrated level). Proposals could be geographically or technology-sector based. ("Raising EU R&D Intensity, Risk Capital Measures", pg. 23)