20 Years of Pioneering Change

Industry-Academia cooperation in Poland. Challenges and ways to narrow the gap.

Report of the

American Chamber of Commerce in Poland

Warsaw, January 2010

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Section I

Introduction

The business future of our member companies is closely tied with the long term development of the Polish economy. Thus, our community is interested in taking an active role in supporting this development and the continuous improvement of Poland's international competitiveness.

Within the broader context of international competitiveness, one of the most critical factors is the innovative potential. We believe that the ability to innovate will ensure continuous growth. This ability is however shaped by complex relationships on micro and macro levels.

Studied experiences of AmCham members indicate that the innovative environment in Poland, despite significant improvement, still needs an upgrade. Poland needs to see its economy within the context of the world economy, through global manufacturing and trade relationships. It should be taken into account that Polish enterprises have to compete not only with regional but with global players as well.

One area where we see great opportunity and a driver of growth is the cooperation between industry and academia. Compared to other countries in the European Union, Asia or the United States, this cooperation is not effectively utilized in Poland. There are still barriers (including mental ones), which discourage market participants from effective collaboration.

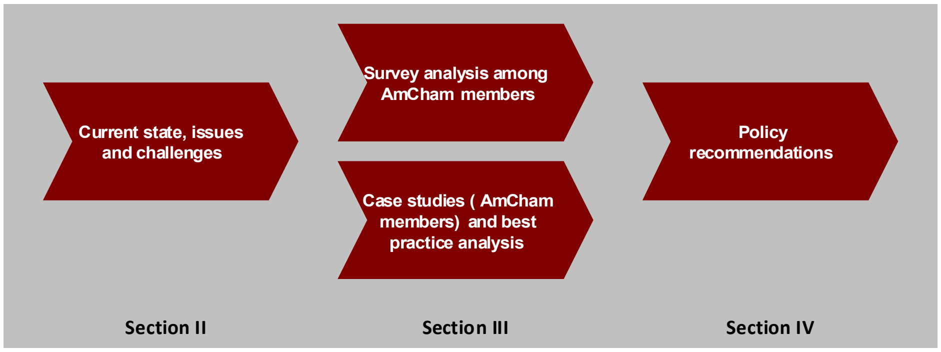
To better understand the obstacles related to industry-academia cooperation and finding some solutions to overcome them, AmCham decided to conduct comprehensive research among its members.

AmCham members are among the largest foreign investors in Poland, who have a well-established track record of cooperation with academia in the U.S. and in other international locations, including Poland.

In our opinion, sharing and popularizing these experiences could supplement ongoing initiatives undertaken by government, academia and industry.

The framework of the conducted analysis is shown below.

Our research framework



This report consists of three major sections: a high level discussion on the current state of cooperation and challenges; analysis of survey results conducted among AmCham members, analysis of selected case studies and best practices; and policy recommendations.

Section II

Is Polish academia meeting Poland's economic needs?

Poland's education boom

Poland's transformation has been characterized by phenomenal growth in the number of students and higher education institutions. During 1990-2008 the number of graduates has increased more than 7 times from 56,000 to 410,000. The gross scholarization ratio in the 19–24 age group increased from 13% to 51%. This growth was the result of both demand and supply factors. On the demand side, the key factor was the growing economy, driven by a quickly developing private sector demanding an educated workforce. An important stimulus was generated also by the inflow of foreign direct investments, which became an integral element of the Polish economy, generating almost half of the Polish foreign trade and 30% of GDP. The supply side was driven by the development of various new forms of education, including the creation of private sector education. During this period there have been more than 300 private higher education institutions created. This opened the doors to higher education for students from mid- and small-sized towns and those of employment age who wanted to upgrade their educational status.

The improvement and growth of educational opportunities has increased the attractiveness of Poland as a location for foreign investments. A well-educated and cost-competitive workforce is regarded as one of the strong points of the Polish economy.

Questionable quality of the boom

Despite the increased number of graduates, there are growing concerns about the quality of the education they receive. Growth in the number of students has not been accompanied by similar growth in research and lecturing potential. The ratio of the number of students to academic lecturers has been steadily increasing from 6 in the beginning of the 1990s to almost 20 nowadays (one of the highest in OECD). This shows that the inflow of new academic staff to the universities is limited while its load has increased, which has to have an impact on the quality of the educational process. The success of Polish students in international tournaments (e.g. IT coding) cannot hide the fact that Polish universities have not improved their position in international rankings.

Spending on education has increased significantly in recent years. Its structure can be, however, discouraging as only a relatively small fraction, compared to best performers in OECD, is being spent on education infrastructure.

Poland has not been able to turnaround a negative trend in R&D expenditures, which is a critical factor for building a competitive economy. The GERD to GDP ratio for Poland is below 0.6%, which is one of the lowest in the European Union.[1]

Industry and academia cooperation has not significantly improved

[1] GERD … Gross Expenditures on Research and Development

Strong and high quality education is the key to long term development. Many global surveys underline the role of education in building a highly competitive and innovative economy. The scale of the impact is to a large extent dependent on effective cooperation with industry and a mutual transfer of knowledge.

Has this partnership evolved successfully during Poland's transition? Data on the macro level indicate that the gap between industry and academia is rather increasing than decreasing. The exemplification could be again R&D. Poland is on the low end of the EU with regards to the private share in R&D financing. In 2008, the share of private financing was only 34%. It is worthwhile to note that the share of enterprises of foreign origin in total R&D expenditures amounts to almost 60%. The share of industry financing in universities' budgets is minor, not exceeding 7%. In 2007, GUS estimated that only 535 industrial enterprises had contracted relationships with higher education institutions (425 with JBR-research development units).

The weakness of industry-academia cooperation in Poland has been indicated also by research studies conducted on behalf of the Polish Ministry of Science and Higher Education and recent, country focused, innovation surveys conducted by OECD and the European Commission.

It is also worth mentioning that industry-academia cooperation is a priority interest of the European Commission. It is not only addressed by the Lisbon strategy or Bologna process but also has a dedicated platform in the University-Business Forum. We strongly believe, that thanks to its academic potential, Poland is well suited to take a more proactive role in this process.

Some high level impacts

Keeping in mind the entire education value chain, it can be stated that the level of industry-academia cooperation has a significant impact on a country's and firms' innovation potential. For example, in the survey published in 2006 by the U.S. National Academy of Sciences, conducted among 200 multinational firms on factors impacting R&D location decisions, five major factors were identified for investing in emerging economies:[2]

- the domestic market's growth potential;
- quality of R&D personnel;
- costs (net of tax breaks);
- the expertise of university faculty;
- ease of collaborating with universities.

It is worth noting that the cited study confirms the importance of soft factors impacting location decisions, such as the ease and willingness of cooperation.

The continued distance between academia and industry may have long term negative consequences for the Polish economy. Based on our observations we see at least these risks and costs for the Polish economy:

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[2] J. Thursby, M. Thursby, Here or There? A Survey of Factors in Multinational R&D Location -- Report to the Government-University-Industry Research, The National Academies Press, Washington, 2006 (http://www.nap.edu/catalog/11675.html).

- limited knowledge transfer from business to academia, which may lead to the “aging” of the knowledge of academic staff and generating graduates with limited knowledge of the most updated technologies;
- lack of emphasis on practical aspects of education and challenges faced by industry - decreasing graduates’ attractiveness for potential employers;
- skills shortages which may cause investors to invest outside of Poland;
- decreased FDI inflow concentrated on hi-tech skill input, instead attracting FDI concentrated on low skill and cheaper assembly type jobs;
- increased business costs to “retrain” newly hired graduates;
- inability of Polish science to cooperate with industry, which may negatively impact the presence of Polish academia in EU funded projects aimed at joint industry-science consortia;
- further decrease of private financing for Polish R&D; which will not only harm the R&D sector but also the enterprise sector, specifically small and medium sized enterprises, which do not have their own R&D potential.

Section III

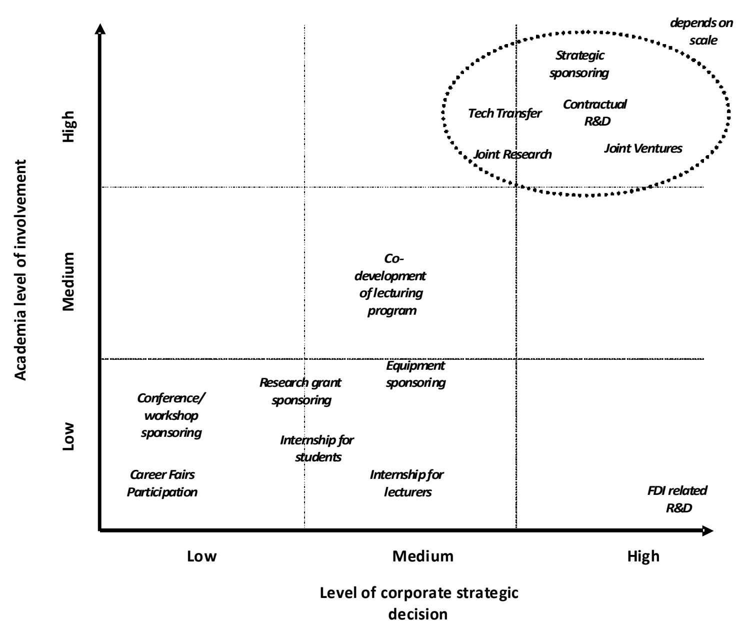
Survey outcomes. Industry and academia – symbiosis or different worlds?

Industry-academia cooperation models

It should be taken into account that there is a variety of forms of industry-academia cooperation which can be impacted by very different factors and motivation. For example, there are forms of cooperation which do not need significant amounts of effort on either side, such as the organization/sponsorship of recruiting fairs or the organization of workshops. Most forms however need from mid to high levels of engagement. The most complex forms are those which are result-oriented and accompanied by significant investment. They include primarily R&D based cooperation and technology transfer agreements.

It is worth considering the different perspectives on cooperation. The picture below illustrates how cooperation models can be viewed from a firm's level of strategic decision-making (e.g. business importance, costs and benefits; addressing whether specific cooperation requires approval on corporation's international level) and the level of academia involvement (e.g. staff time, cost/CAPEX).

High-level perspective on industry-academia cooperation models



In the conducted survey we have not limited ourselves to any particular form of industry-academia cooperation. Our goal was to get a general understanding of the state of cooperation rather than to collect detailed insights for only some of them. This may be a shortcoming of the survey - as already mentioned the factors driving specific forms of cooperation differ very much. For example, the driving factor behind establishing cooperation when developing a new course could be skill shortages. On the other hand, R&D based cooperation could be driven by global R&D cost optimization.

Methodology

The conducted survey aimed to complement other research conducted in the area of industry-academia cooperation by showing the view of the foreign enterprise sector with a focus on Chamber members. We decided to survey cooperation with both universities and R&D institutions. In our opinion, the improvement of cooperation between industry and academia would benefit both sides and should bring an additional growth stimulus to the Polish economy.

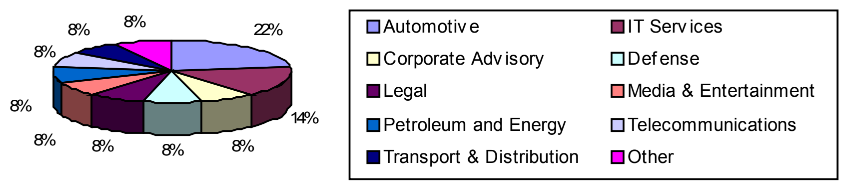
The survey was conducted in the form of a comprehensive online questionnaire, supported by follow-up interviews with selected respondents.

Survey Methodology

In total, 13 companies responded. The survey was conducted in April 2009 and included 34 detailed questions split into different categories. The analysis of the final results was supported by business cases and interviews with selected member companies.

The majority of respondents represented rather large companies with turnover exceeding 200 m PLN. Most respondents came from the automotive and IT industries.

Industry origin of the respondents



Key survey findings

The general results of the survey are not surprising. Enterprises do cooperate with academia; however, this cooperation has not met industry's expectations. There is still a cultural gap and lack of mutual understanding. Enterprises do not perceive academia as a proactive partner willing to cooperate with industry. It is usually industry that initiates the discussion on cooperation. In such situations, the ties with academia are not very deep. They are based on rather simple arrangements with little impact on ongoing operations.

Our analysis has identified several major findings, as shown below. Each of these findings is further analyzed in more detail.

1. *Industry observes skills shortages, primarily in the technical fields.*

2. *Education quality is deteriorating and does not match industry needs.*

3. *Industry-academia cooperation is not intensive, however, there is willingness to improve it.*

4. The general climate for industry-academia cooperation is worse than in other countries of respondents' operations.

5. Low quality of research and not understanding business needs are key barriers for establishing cooperation.

6. Industry lacks good information about the quality and potential of academia.

7. Government should engage more actively in direct and indirect support of industry-academia cooperation.

8. Bureaucracy and not understanding business needs are key barriers for establishing cooperation.

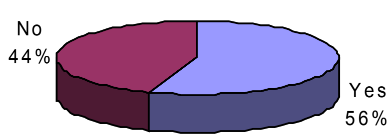
Finding 1. Industry observes skills shortages, primarily in the technical fields

Most respondents have been hiring in the last three years; out of them 25% hired more than 100 employees annually; 8% hired annually in the range of 51-100; the remaining 67% hired annually in the range of 1-50 employees.

Respondents see skilled labor as a very important factor influencing their future business development. Access to skilled labor received the highest ranking out of seven factors considered. Other important factors in descending importance included – labor costs, Polish market growth, infrastructure, level of IPR protection, regulatory framework, export market growth and supplier base.

The importance of labor issues was supported by a finding that the irrelevant skills of university graduates and high labor costs were mentioned as second and third factors having the most negative effects on current business opportunities (the first was tax complexity).

Have you experienced a skills shortage in the last 2 years?



Slightly more than half of respondents indicated they face skills shortages. The largest skills deficit was indicated in the area of IT, engineering and technical skills pools. Some small skill deficit was also indicated in finance and medical sciences.

Skills shortages were reflected in recruitment times. 44% of respondents indicated that average recruitment time (time needed to recruit an employee) in the last 2-3 years has increased slightly; 11% indicated it increased significantly. For 33% it decreased.

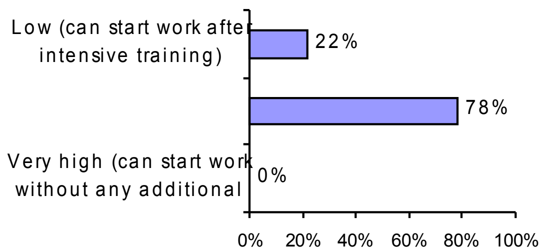
The above outcomes may be the result of major trends in Polish education and FDI. For several years technical studies have attracted fewer students, who prefer social sciences. At the same time, industry is one of the major drivers of export, GDP growth and FDI inflow (e.g. 2007: inward FDI stock -

manufacturing 33%, IT&telco 6%, energy 3%; GDP – share of industry 20%). The last three years were also years when emigration from Poland peaked, including highly skilled employees.

Finding 2. Education quality is deteriorating and does not match industry needs

Respondents rather negatively perceive the quality of the Polish education.

How do you evaluate the skills of new graduates?



None of the respondents evaluated the skills of new graduates highly. Most of them ranked the skills as medium and a significant share (22%) as low.

Respondents also evaluated moderately particular skills areas. With a rate of 5 assigned to extraordinary level, creativity received the highest average rank of just 3.0, team working 2.8, problem solving skills 2.7 and up-to-date technical knowledge 2.3. (One of the respondents added an additional skills area of basic engineering and rated it as 4.)

Insufficient skills force companies to increase spending on training. That is why “training packages” were usually rated high by investors evaluating investment incentives in emerging markets. In one of GUS surveys related to innovation, it was found that companies with foreign capital spend the vast majority (71%) of total industrial expenditure on staff training connected with innovation.

Finding 3. Industry-academia cooperation is not intensive, however, there is willingness to improve it

Many respondents cooperate on a regular basis with more than one academic institution. On average, each respondent indicated 2-3 cooperations with universities and 1-2 cooperations with R&D institutions. Usually the cooperation is formalized by different types of arrangements (e.g. formal contracts, letters of understanding, etc). The amount of formal arrangements was on average slightly smaller compared to the average amount of cooperations. The difference can be explained that there are some forms of cooperation which do not need formalization. This may include – providing some materials for lecturing, providing lecturers on an ad hoc basis, etc. Worth mentioning is that there were respondents who indicated that they have more than 7 formal arrangements with R&D institutions.

Existing cooperation with academia is, generally speaking, not intensive and not comprehensive. We have tested 17 different types of cooperation. The responses are summarized in the table below.

How intensely do you cooperate with the universities / R&D institutions taking into account various forms of this cooperation? (0-no cooperation, 5 – systematic cooperation)

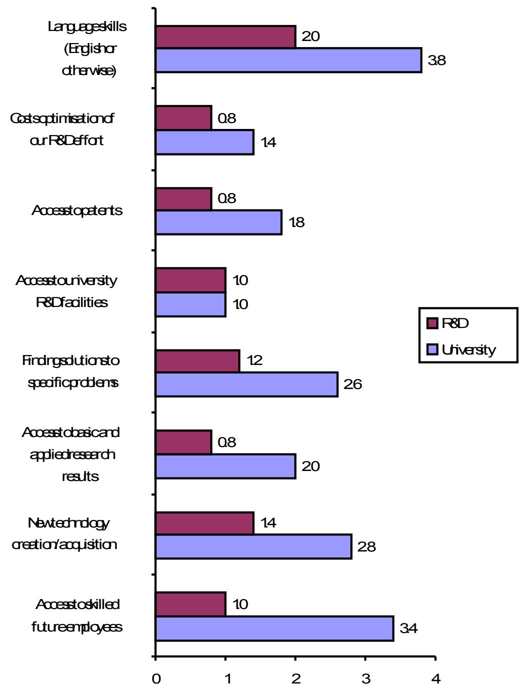
Cooperation form	University	R&D
1. Participation in recruitment fairs	1.4	1.3
2. Training and scholarship for students	1.0	0.5
3. Training and scholarships for lecturers/researchers	0.2	0.0
4. Co-development of lecturing programs	0.4	0.3
5. Masters/PhD thesis aimed at specific problem solving	0.6	0.3
6. Sponsoring research	0.6	0.5
7. Sponsoring equipment /technology transfer for lecturing and research purposes	0.2	0.0
8. Contracting research related to new technology creation/acquisition	0.4	0.5
9. Joint research funded from multiple sources	1.0	1.0
10. Delegating own employees to conduct lectures	0.8	0.5
11. Delegating own employees to conduct research	0.4	0.5
12. Sponsoring of visiting professors	0.8	0.8
13. Joint publications	1.0	0.8
14. Participation in university governance bodies	0.6	0.8
15. Joint Ventures, start-ups	0.4	0.5
16. Conference sponsoring	1.2	1.3
17. Joint application for EU funds for technology/ education initiatives	1.0	1.0

The results above do not clearly show, which forms of cooperation are used the most. On an aggregate level, it can be concluded that respondents relatively more often cooperate with universities in the area of recruitment fairs and conference sponsoring *than more complex forms of cooperation*. There is also some cooperation related to lecturing, including the provision of lecturers and lecturing materials, sponsoring visiting professors, course program co-development and supporting students in their masters' thesis. In regard to cooperation with the R&D sector, cooperation is concentrated on joint research areas – including joint projects and joint application for public R&D funding.

The relatively low intensity of cooperation is also the result of the firms' models of operation. In some cases, firms hire graduates, accepting their weaknesses (indicated in our findings), and then apply intense training and coaching to quickly improve their skills. In terms of R&D, some firms have their own R&D facilities (in our survey 56% respondents indicated that they have their own R&D facility in Poland), which are closely tied to their global R&D operations, and only cooperate with external R&D institutions to a limited extent. Another important area which was not studied in our survey, which impacts the need for cooperation, is the type of the value added. For example in manufacturing, this may range from very complex engineering work requiring highly skilled labor to pure assembly where the process and cost efficiency is most important with a much smaller emphasis on high technical skills. In such cases, firms may not be highly motivated to establish cooperation with academia.

The existing forms of cooperation result from a number of factors, including different motives and expectations of parties and the operational environment affecting the willingness and success of cooperation on both sides.

What are your key driving factors for establishing cooperation with universities / R&D institutions? (0 - not relevant, 5 - critical importance)?

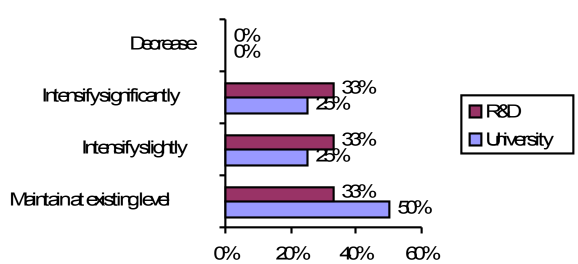


To make a proper interpretation of the results, it should be mentioned that in our approach we decided to value both cooperation with universities and R&D institutions. There are respondents who cooperated in both fields and there are also respondents who cooperate in only one of these fields. We have not limited respondents in responding to any of the fields. Thus those not cooperating could indicate 0, which naturally decreased the average rating.

Having the above limitation in mind, it can be stated that the main motivation to cooperate with universities is the access to future skilled employees. There is also quite a large number of respondents being motivated by the ability to access R&D results and joint technology development. These are also the main motivation factors behind the initiation of cooperation with R&D institutions.

An important finding is that respondents perceive the need to intensify cooperation. This can be concluded based on two questions that we asked – (1) Do you plan to intensify your cooperation with university / R&D institutions in the future? And (2) How important for your business is cooperation with universities / R&D institutions in the following activities?

Do you plan to intensify your cooperation with university / R&D institutions in the future?



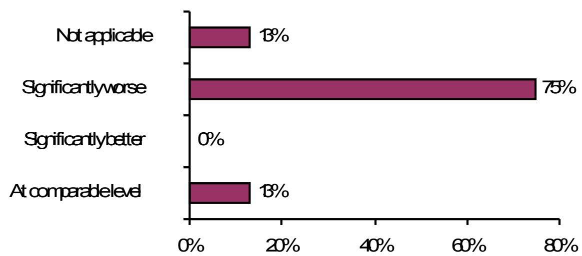
For question (1), no respondent was willing to decrease the current intensity of cooperation in the future. In the area of cooperating with universities, half of the respondents stated a willingness to intensify it, the R&D share of such responses is even greater, at 66%.

Regarding question (2), respondents were asked to rate (already shown earlier) 17 different types of cooperation forms. It is interesting that on average, respondents assigned higher rankings (0 -no importance, 5 - critical importance) compared to their evaluation of the intensity of current cooperation. This difference may indicate that there is a need for more intense cooperation.

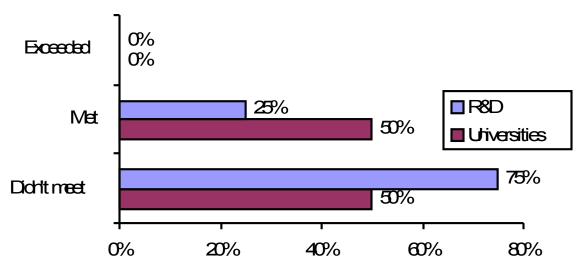
Finding 4. The general climate for industry-academia cooperation is worse than in other countries of respondents' operations

In general, the respondents have negatively assessed the environment of industry-academia cooperation in Poland. Two thirds of them indicated that encouraging industry and academia cooperation in Poland is significantly worse compared to other countries.

Generally speaking, how good is Poland compared to other countries of your operations with encouraging industry/academia collaboration?



In general, has your cooperation with universities / R&D institutions met your needs?



Despite a rather negative perception of encouraging industry and academia cooperation in Poland, the individual assessments of existing cooperation differ. 50% of respondents were satisfied with their cooperation with universities. Regarding cooperation with R&D institutions, two thirds of respondents were dissatisfied with the results. The results indicate that the level of cooperation could be much better as none of the respondents has evaluated its cooperation as exceeding his expectations.

Finding 5. Low quality of research and not understanding business needs are key barriers for establishing cooperation

The survey identified a number of factors hampering cooperation between industry and academia. They were addressed through two direct questions – one assessing barriers, on the cooperation partner side and the second viewing barriers arising from specific constraints internal to the firms (see next finding).

What are the main barriers of cooperation with universities / R&D institutions? Our firms' perception of academia. (0 - none, 5 - very large)

Barrier	University	R&D
Bureaucracy	3.3	1.0
Lack of understanding of the business needs	4.7	2.3
Low emphasis on practical knowledge	4.3	2.0
Low quality of research	4.7	2.5
Appropriateness of the research	4.7	2.5
Rights to patents and licenses	2.7	1.0
Conflicts of interest	1.7	1.3
Conflicts of commitment	1.3	1.0
Lack of experience with forms and benefits of the cooperation	2.7	1.3
Lack of project management experience	3.0	1.3
Weak technology facilities	2.7	1.8
Differences in culture	2.0	1.3
Lack of interest on academia side	2.7	1.3

Based on the results above, the main barriers to establishing cooperation could be defined as follows:

with universities:

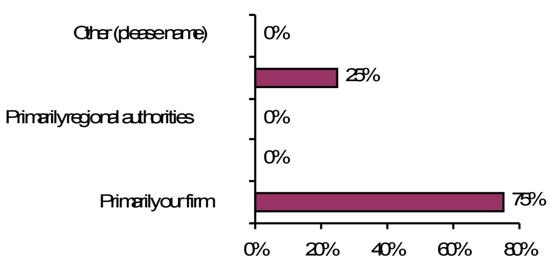
- primarily in the R&D area, it is the low quality research offer not adapted to market needs;
- not understanding industry needs or specifics and benefits of the cooperation;
- inefficient administration driven by high bureaucracy;

with R&D institutions:

- similarly to universities, low quality research offer not adapted to market needs.

It is worth noting an important barrier is the lack of interest of academia to cooperate with industry.

Which side usually initiates the cooperation?



This indication may be the result of the industry's perception that it is the industry, not academia, which usually initiates the cooperation. In our survey, this was the case with 75% of respondents. Again, this raises issues of perceiving the benefits of cooperation. In joint R&D it is relatively clear. But in the education field? Our firms' experiences show that it is quite usual for the academic world to state its knowledge self-sufficiency and aversion to external "interference" in their course programs.

Finding 6. Industry lacks good information about the quality and potential of academia

Despite some experiences in cooperation, industry is still lacking information on the quality and potential of Polish academia. Rankings published by the press are very generic and their assessments differ from firms' experiences at the operational level.

It is also clear that firms assess cooperating with academia in terms of costs and benefits. For example, co-organizing a course on the costs' side means time for education market screening, time for course material preparation and validation, staff's time delegated to lead such cooperation or act as lecturers, time to gather "the fruits" e.g. identification of potential candidates for hire. In this case, however, the risks and costs are much smaller compared to risks associated with joint R&D, where the expectation is to deliver concrete results.

Some respondents indicated as an important barrier the lack of financial incentives offered by central or regional governments.

What are the main barriers of cooperation with universities / R&D institutions? Our firms' internal constraints. (0 - none, 5 - very large)

Barrier	University	R&D
Lack of incentives (e.g. fiscal, financial - research grants)	2.5	0.5
Substituting R&D	2.5	1.3
Lack of knowledge on quality and capabilities of academic institutions	3.0	0.8
High protection of technology, facilities, ...	2.8	1.0
Financial resources	3.8	1.8
Limited staff availability	3.0	1.5

It is obvious that business makes decisions based on the quality of information. This is also true for selecting an academic cooperating partner. The insufficient information about academia was stressed by responses. Almost 60% of respondents assessed the availability of information needed to evaluate potential future academic partner as non-existing (20% insufficient and only 20% as sufficient).

Taking the above into account, it is not surprising that the most important sources of information about academia are: own employees' experience, personal contacts, observation of competition and experience of industry partners. The central or regional authorities as sources of valid information were ranked very low.

Finding 7. Government should engage more actively in direct and indirect support of industry-academia cooperation

Respondents have indicated a range of potential initiatives, which could potentially stimulate cooperation. In general, they can be divided into actions, which can be initiated on the government's side and actions more dependent on the proactive approach of both industry and academia.

What could stimulate your cooperation with universities / R&D institutions? (0 - not relevant, 5 - potentially highest impact)

Initiatives	University	R&D
1. Fiscal incentives (e.g. joint research costs, research sponsoring/funding)	4.0	3.0
2. Reorientation of teaching programs towards more practical needs	4.0	3.0
3. Increased government funding of joint industry-academia R&D	4.0	2.3
4. Competitive collaborative research grants	4.0	1.0
5. Involvement of regional authorities to initiate and institutionalize cooperation	2.0	1.0
6. Increased government funding of science parks and development clusters	3.0	1.3
7. Teaching the university decision makers on options of university / R&D institutions cooperation	3.0	1.3
8. Ensuring systematic communication between industry/academia/government authorities on regional and central level	3.3	1.7
9. Including business representatives in opinion bodies on research grants	3.7	2.7
10. Streamlining patent regulations	3.0	1.7
11. Increased government funding for university spin offs/start ups	3.7	2.0
12. Increased support for R&D clusters	3.3	1.7
13. Enabled academic faculty to work in industry as well	3.3	1.7

14. Establishment of joint research centers	3.7	2.0
15. Joint industry/academia supervisors of masters/PhD thesis	3.3	2.0
16. Spin-Offs/Start-Ups	3.0	2.0

Based on the above results it can be concluded, that industry sees government's role in:

- creating a favorable institutional framework; giving incentives for industry and academia cooperation;
- rearranging university financing to tie closer university and industry;
- increasing government funding for science in Poland.

Government could also focus more on promoting industry and academia cooperation by establishing a neutral platform for discussion between academia and industry on the benefits of cooperation.

Section III

Selected examples and forms of industry-academia collaboration and institutional framework

Industry-academia cooperation, AmCham members' experiences

This section supplements the previous ones by showing specific examples of the forms of cooperation with academia applied by AmCham members. The objective is to present and analyze examples, which could be propagated by academia and the business community.

Each case study was structured to address specific issues of cooperation.

Case Study 1. CISCO

Company	**CISCO** – one of world's largest telecommunications equipment manufacturers. Polish operations established in 1990.

Example no. 1

Program/Project	
- name	Cisco Network Academy Program (location: Poland)
- objectives	complement university education by transferring industry specific knowledge
- partners	multiple universities
- form of cooperation	Instructor led and e-learning courses
- duration	launched in 2000
- scale	in the 8-year history of the Net Academy in Poland the academies educated more than 11 000 students ready to take the certification exams and has had over 47,000 students
- major input of industry partner	• providing course materials, • supervision of the certification process • funding the platform
- major input of academia partner(s)	• providing lecturing facilities • ensuring teaching staff • ensuring student participation
Description	Cisco Networking Academy is a well-functioning partnership between Cisco, educational institutions, government and community organizations around the world, aimed at nurturing IT professionals. The program employs an e-learning model, using a combination of Web-based and instructor-led training along with a hands-on lab environment to teach students how to design, build and maintain computer networks. The network's institutional framework proved to be successful, institutions either of higher education or vocational schools found their education interest in joining the Cisco Networking community. The program fosters local economic growth by developing and supporting technical education. The demand for a highly trained, technically perceptive workforce continues to grow with the increasing reliance on the networks in everyday life, as well as the need for larger and more highly integrated network designs and implementations. IT education is perceived as highly valuable since potential employers look for talents with the highest technical skills. Much of the available technology training often trails behind the demand for the latest technical skills, or is unavailable to students. Teachers are often under-trained or insufficiently qualified, lacking the professional support and continuing education needed to keep pace with technological advancements. Without an educational framework that can train a qualified and experienced workforce, communities cannot benefit from IT industry opportunities—outdated courses and obsolete equipment cannot provide students with skills that attract high-technology employers locally.
Benefits for academia / industry	Benefits for academia: • Cutting Edge Industry specific education, updated as technology evolves. • Professional, industry recognized certifications

	Benefits for industry partner: • gaining access to qualified engineers; • sharing technology knowledge within the Polish industry.
Key conclusions	The most important issue in dealing with Universities in Cisco's experience is identifying the right person to work with at the University, regardless of the type of cooperation. Other major challenges include finding English speaking contacts, university's reference materials in English to share with Corporate, an understanding of professional project Management and fundamentally, an interest in working with business. Lastly, there is a general complete lack of enthusiasm for working with business, which results in lack of follow-up and as a multi-national corporation that cooperates with universities across the globe, it is difficult to make the case to work with universities in a country that appears unresponsive, don't understand what we consider Advanced Technologies, and are not effectively able to communicate and present themselves to senior executives.
Other	--

Example no. 2

Program/Project	
- name	Cisco Entrepreneur Institute (location: Poland)
- objectives	Acceleration of the Entrepreneur environment in Poland
- partners	Universities, Government Agencies
- form of cooperation	Instructor led and e-learning courses
- duration	Ongoing, Varies with type of courses offered
- scale	Nationwide
- major input of industry partner	• providing course materials, • supervision of the certification process • funding the platform
- major input of academia partner(s)	• Facilities • Professors • Students
Description	The Cisco Entrepreneur Institute in Poland is a new initiative that is focused on fostering entrepreneurship. Small to medium sized businesses represent the largest employment sector in Poland and is also where much of the greatest innovation occurs. Working with local public and private sector organizations, Cisco's mission is to help communities and nations harness the power of entrepreneurship for economic and social prosperity. Cisco believes this initiative will create significant long-term benefits for the citizens of Poland and have a positive social impact on a national scale. Entrepreneurs have the potential to be the greatest source of innovation and growth in an economy. Involvement of high level government officials and local authorities has been a key element of Cisco Entrepreneur Institute's strategy in Poland and we have the Polish Minister's of the Economy official patronage as part of a nation-wide governmental strategy to support small to medium sized businesses. Cisco is currently looking forward to opening a training center at the Jagiellonian University as well as opening an institute at the University of Economics in Krakow. Other cities where we are opening the Institute include Rzeszow, Poznan and Warsaw. Cisco is actively recruiting additional Non-Governmental Organizations, like Business Centre Club and Leviatan, to cooperate in accelerating the success of small to medium sized businesses in Poland
Benefits for academia / industry	Benefits for academia: • Relevant Entrepreneur Education from the world's leading universities, companies and entrepreneurs. • Access to a global network of entrepreneurs via a dedicated social networking site for graduates. • Tailored curricula specific to each stage of the entrepreneur development lifecycle. Benefits for industry partner: • gaining access to qualified engineers; • access to technical knowledge for the Polish industry.
Key conclusions	
Other	--

Case Study 2. TELCORDIA TECHNOLOGIES

Company	**Applied Research Laboratory of TELCORDIA TECHNOLOGIES** – originally a part of Bell Labs, the company is a leading global provider of fixed, mobile, and broadband communications software and services. In 2008, the company opened the Technology Research Center in Poznań.

Example no. 1

Program/Project	
- name	applied research cooperation
- objectives	encourage academia to partner in EU funded research programs
- partners	multiple universities
- form of cooperation	various
- duration	launched in 2008
- scale	several projects won and completed jointly with Polish partners within EU Seventh Framework Program(FP7)
- major input of the industry partner	• own R&D base • knowledge of worldwide technology development • access to own R&D experts from its international locations • experience in managing multipartner R&D projects • financial potential • access to other industrial partners
- major input of academia partner(s)	• own R&D staff and facilities • networking base within EU research community
Description	Being a traditional research organization, Telcordia's Applied Research Group has identified EU Seventh Framework Programme as a potential opportunity to leverage its research excellence and experience. To be an eligible beneficiary of the FP7 it decided to open the Technology Research Centre in Poznań. It was decided that Poznań would be the best location due to its significant R&D facilities and university network. The main driving idea behind establishing the centre was to act as a partnership catalyst between joint industry-academia within the FP7. It was assumed that Telcordia's value added in the partnership with Polish academia would be to bring world-class research experiences. In addition, close ties with many industry partners enable further commercialization of the developed technologies, which is a European Commission priority.
Benefits for academia / industry	Benefits for academia: • the easiness in establishing cooperation with an industrial R&D partner, thanks to proximity and Polish speaking staff • engagement in multi-national R&D teams • gaining management experience enabling potential leadership in future EU funded R&D programs (currently Polish universities rarely act as leaders of research consortia) Benefits for industry partner: • access to well established research partners • increasing chances in winning the R&D contracts
Issues and challenges	• complicated procedures when awarding contracts • lack of project management skills on the academic side • Unlike the academic partners, Telcordia is usually the one to initiate a joint approach to tenders.
Key conclusions	It can be stated that within the Polish academia there is strong scientific knowledge.
Other	--

Example no. 2

Program/Project	
- name	Interdisciplinary masters program on Technological Internet Applications (location: Poland)
- objectives	To train specialists in future internet applications
- partners	Uniwersytet Ekonomiczny in Poznań, Politechnika Poznańska and Uniwersytet im. Adama Mickiewicza in

	Poznań
- form of cooperation	joint masters program
- duration	launched in September 2009
- scale	120 participants / year (there were about 600 candidates)
- major input of industry partner	• Defining the capabilities of the future engineer • co-development of the curriculum • providing course materials for students and teachers • co-providing lectures by Telcordia engineers/scientists • offering R&D facilities for students working on masters thesis • co-funding internships for best graduates
- major input of academia partner(s)	• arranging administrative issues with the Ministry of Science and Higher Education • providing lecturers and lecturing facilities • supervising the quality of the program
Description	From the very beginning, partnering with academia was perceived as necessary for the success of the recently opened Technology Research Center. The masters program is the effect of Telcordia Technologies' partnership with Poznań universities established in 2008, by creating the Consortium for Advanced Applications of Information and Communication Technology. Creating the consortium should result in R&D and education cooperation. Multiple universities and an industry partner cooperating to develop and deliver the masters program is a unique phenomenon in Poland. It is expected that the program will train future experts in internet technologies with both university and up-to-date industry knowledge. During courses students will be able to meet with experienced practitioners and will have the possibility to see practical deployment of knowledge they've gained.
Benefits for academia / industry	Benefits for academia: • extending the current education offer • getting familiar with the newest technology development Benefits for the industry partner: • create a local talent pool of highly qualified people with employment opportunities in Telcordia Technologies • new sources of technology development.
Issues and challenges	• long lasting administrative procedures (the time needed to launch the program was 2.5 years) • nontransparent regulatory environment
Key conclusions	Cooperation in the area of education is relatively standard. Participating in the program allows the partners to share experiences and mutual capabilities and sets a solid foundation for more complex projects in the future, such as R&D. Key success factors: • buy-in from key universities' department heads who will be involved on the operational level and will be able to transform high level partnership terms into concrete actions • complimentary offers (industry is extending university offers rather than substituting) • mutual understanding of needs, responsibilities, costs and benefits • well defined roles of each partner • long-term commitment
Other	The company has recently launched a series of seminars at partnering universities on critical technologies. The lecturers are senior engineers from Telcordia Technologies. Participants of the seminars include students and university staff. The aim of the seminars is to share and discuss progress on key technologies.

Case Study 3. BMW

Company	**Company: BMW - leading global car manufacturer with well established presence in Poland**
Program/Project	
- name	ongoing cooperation
- objectives	provide students and university staff access to car technologies
- partners	Politechnika Warszawska, Politechnika Lubelska
- form of cooperation	In kind; free of charge contribution; use of engines and a test car
- duration	launched in 2006
- scale	--
- major input of industry partner	• in kind contribution of engines and complete car • sharing technology knowledge
- major input of academia partner(s)	• course development taking into account the contributed equipment • providing laboratory facilities
Description	The cooperation with Politechnika Warszawska started in 2006 and afterwards some cooperation with Politechnika Lubelska was established. Both programs are evolving and are not regulated by any formal arrangements. BMW, being one of the major car players on the Polish market was in a natural way interested in increasing technical and practical knowledge of graduating students with automotive-related majors. Increasing the quality of technical education, the company extended its existing corporate initiative by contributing key car elements to partnering academic partners. It was assumed that handing over a complete car or car elements should allow students and academic staff to gain more practical experience with car technologies.
Benefits for academia / industry	Benefits for academia: • extending the lecturing program by allowing students to conduct experiments on the handed-over equipment • expanding existing laboratory assets; free of charge • access to technologies Benefits for industry partner: • creation of knowledgeable staff, who potentially may find employment in the BMW dealer network • brand awareness
Issues and challenges	• it is usually the industry partner who is proactive and willing to establish the cooperation • academia is not aware of possible forms of cooperation with industry • the existing model of engineering programs does not fully match the specifics of the automotive market development in Poland
Key conclusions	The described cooperation form can be widely adapted. It gives academia access to technology without significant spending. It is also a transparent transaction from the tax perspective. It should be however taken into account that this is a capex expenditure on the industry partner's side. Unfortunately, there is no special tax incentive encouraging this type of transactions.
Other	To encourage students to undertake demanding topics in their master thesis, BMW has granted at The Faculty of Automotive and Construction Machinery Engineering of Politechnika Warszawska a year long scholarship for the best master thesis. BMW is considering further expansion of its cooperation with academia. The company plans to launch a joint car diagnostics related course. There are also plans related to creating internship programs and additional technology transfer to academia.

Case Study 4. GLAXOSMITHKLINE

Company	**GlaxoSmithKline** – one of world's largest pharmaceutical companies. A leader in the Polish pharmaceutical sector. The operations in Poland were established in 1998 by joining former polish company PZF Polfa and international company GlaxoWellcome. Then the merger between GlaxoWellcome and SmithKlineBeacham created GlaxoSmithKline (GSK). Current employment in Poland amounts to over 1600 employees. The company has a manufacturing facility in Poznań and commercial forces in field managed from Warsaw. GSK created many shared services for international service markets for other GSK companies in the world.
Program/Project	
- name	Internship and scholarship program
- objectives	To allow students to gain practical experiences
- partners	The program is focused on the Poznań region. Main partners include - Uniwersytet Medyczny, Uniwersytet Przyrodniczy, Uniwersytet Ekonomiczny, Politechnika Poznańska and Uniwersytet im. A. Mickiewicza
- form of cooperation	Internships and scholarships for students
- duration	Started in 1997 (internships), extended as a project (scholarships) in 2005
- scale	Yearly approx. 100 students participate in the program (including approx.: 90 interns and 10 scholars) selected out of over 200 applicants
- major input of industry partner	• Co-development of the internship model • Financing the program and technology platform • Creating working projects for interns • Practical verification of interns' knowledge as future candidates for employees
- major input of academia partner(s)	• Co-development of the internship model • Conducting the initial candidate selection • Assisting students in gaining practical experiences supplementing the theoretical knowledge
Description	Having manufacturing and R&D facilities located in Poznań, GSK has decided to sign cooperation agreements with major universities in the region. The main objective was to establish a long-term cooperation in the areas of education and R&D. In the education area the emphasis was put on creating an attractive and repeatable internship and scholarship program. The program consists of several layers. Students may apply for training, internships and scholarships. The program has a multidisciplinary character as it attracts students from different disciplines such as quality assurance and quality control (scholarships); internships: quality assurance and quality control, manufacturing processes, administration, logistics. Scholarship: Major academic partners - Uniwersytet Medyczny, Uniwersytet Przyrodniczy, Uniwersytet im. Adama Mickiewicza. The scholarship usually lasts 2-3 years. GSK is responsible primarily for organizing the scholars' work, including participation in projects, mentoring and scholarship financing. Internships: Multiple universities involved. Form – university relegation. In general with no remuneration; however 3-month paid traineeships are also available. The program usually starts in July and ends in September. At the very beginning GSK and academic partners agree on the scale of internship actions and objectives. The next step is to launch the recruiting process and selecting the interns. Candidates submit applications through a dedicated online platform or through career centers at the universities. The initial selection of candidates is conducted by GSK HR. Candidates receive a final approval by GSK managers who take care of interns/scholars. Best participants can be offered employment contracts. GSK selects candidates taking into account the university's recommendation. The program is supported by organizational units within the GSK HR department and career centers at universities. Each intern/scholar has assigned roles and tasks to perform under the GSK manager's supervision. Facing some obstacles in establishing the internship program, GSK developed streamlined models of cooperation with universities. These obstacles were related to issuing and interpreting internship relegations. It should be mentioned that university relegations are required for the company to grant internships. Otherwise, it may violate the Labor Code. The key challenge was to establish a unified approach to the internship program among various academia partners. Two approaches proved to be successful. First – it is based on the idea of centralizing cooperation in a specific unit within the university, such as the career center. In this model, the head of the career center secures the internship from the university administration perspective. This approach works well when heads of career centers are well positioned within the university hierarchy and may pursue important decisions. The second approach is based on formalizing the cooperation through a contract signed (FC) between GSK and the university. The FC outlines the scope, responsibilities and procedures. It is the basis for action for faculty, which then may issue the relegations for interns without any additional concerns.
Issues and challenges	Issues: • Every university has a different approach to supporting internships. There are some, which are

	actively screening the market to find opportunities for their students, but there is also a substantial number of those, which are very passive and generally not interested; • large and ineffective bureaucracy; difficulties with obtaining relegations from the university for the traineeship. Very often it is caused a by lack of will and incompetent practices pertaining to issuing even standard forms of relegation; • there is no university wide integrated approach. Each faculty can have its own approach, some are reluctant to making decisions requiring multiple approval collection; • universities themselves can create additional barriers for internships. An example could be internship duration. Some universities strictly require a certain amount of weeks in an internship, but this maybe an unrealistic assumption as industry acts within a volatile business environment and may not fulfill such requirements. The result can be the industry partner's drop of interest. The key success factors of a well functioning internship program are: • mutual understanding of needs and benefits, • major rules driving the cooperation defined by all parties involved, • finding relevant individuals who run and support the initiative.
Benefits for academia / industry	Benefits for academia: • Students gain practical experiences and implement the knowledge gained during studies in real life environment; • Feedback from GSK on the internship program development helps university partners improve their education programs Benefits for industry partner: • Access to skilled future employees; • Benefiting from fresh ideas and exchanging experiences • Brand development
Key conclusions	The applied approach is relatively easy to implement. It requires however the will to cooperate and flexibility on both sides, industry and academia
Other	--

Case Study 5. IBM

Company	**IBM** – one of world's largest IT companies. Poland's operations were established in 1991. **Major divisions include -** IBM Global Business Services (consulting), IBM Global Technology Services (IT infrastructure), IBM Software Group (software), Systems and Technology Group (hardware). The company has also established development centers in Poland - IBM Innovation Center and IBM Software Laboratory. IBM c**urrently employs in Poland approx. 2600 employees.**
Program/Project	
- name	IBM Academic Initiative
- objectives	Develop and equip students with technical skills needed in the 21st century
- partners	multiple universities, primarily technical
- form of cooperation	develop competence centers by transferring know-how and technology
- duration	The program has been implemented for 2 years
- scale	Universities – 17 (general), 5 (UCC), approx. 50 students interning yearly, around 100 in 2010
- major input of industry partner	• developing skills among university professors, • providing software and class materials, • running and financing student internships, • mentoring on specific technologies, • providing free professional certification exams, • co-creating projects conducted by interns, • financial support for top research programs.
- major input of academia partner(s)	• dedicated lecturing staff, • providing lecturing facilities, • technology adoption, • graduation projects run together with IBM. • Involving top students in joint projects
Description	The described program is a part of a globally implemented IBM initiative. For years, IBM has built traditionally strong relations with academia both in education and R&D areas. The IBM Academic Initiative is a skills development program based on IBM and academic institution collaboration. The skills development is conducted through traditional teaching and laboratory work. The specific courses or themes are built in the overall masters/bachelors programs depending on priorities of partnering universities. The key value added brought by IBM is providing– course materials (+textbooks, articles, tutorials), access to IBM online knowledge libraries (+ webcasts, forums), access to IBM experts (who may provide explanations to the materials or in some cases act as guest speakers), training for lecturing staff (to transfer the knowledge) and software/hardware tools. The technology knowledge transferred are e.g. industry wide standards, open source applications and technologies developed specifically by IBM. The university staff may use IBM materials to develop their courses. Some materials can be freely modified to match the teacher's needs. The knowledge gained during the courses can be further applied in the laboratory environment leveraging access to software/hardware tools provided by IBM free of charge. IBM provides specific technology projects, which can be solved by students.
Issues and challenges	The key success factor to establishing cooperation is to gain mutual understanding of the goals, roles, expectations and benefits of all participating partners. Identifying proper academic staff supported by faculty management who can implement and drive the idea is important. Our experience shows that the failure of the initiative is caused by lack of attention. By its nature, the program is aiming to supplement and upgrade existing tech skills. It is very important to understand this as many universities are very conservative in accepting any interference in their programs. The issue is however, that some programs are not addressing challenges that industry is facing and are not innovative enough to meet the expectations of future employees. Taking into account the above, the knowledge offered has to be of high quality to be accepted by academia. Poorly prepared course material is simply not attractive for academic staff, which is also looking for an opportunity to enhance its knowledge. One of the most important bottlenecks, which were identified, was the low level of proactive approach to

	upgrade university learning portfolio, which requires academic staff involvement. Also level of language knowledge is still a frequent communication barrier as materials provided by IBM are in English.
Benefits for academia / industry	Benefits for academia: • free access to software technologies, • access to new skills, • access to training, • access to course material, • students may gain professional certificates, which are widely accepted by industry (IT and non-IT) Benefits for the industry partner: • technology adoption, • joint projects help solving particular technology challenges, • access to future employees
Key conclusions	The experience gained so far shows that cooperation works best in building skills and curriculum development. Still some improvement is needed in joint projects cooperation regarding effort and direct industry-academia interaction.
Other	Students may also participate in worldwide contests organized by IBM.

Case Study 6. Hewlett Packard Labs

Company	**HP** is a technology company that operates in more than 170 countries around the world. HP creates new possibilities for technology to have a meaningful impact on people, businesses and society. The world's largest technology company, HP brings together a portfolio that spans printing, personal computing, software, services and IT infrastructure to solve customer problems. HP's revenue in fiscal year 2008 totaled over US $118.4 billion. HP invested over $3.5 Billion in R&D activities in fiscal year 2008. The described program is managed by HP Labs, HP's central research organization. More information about HP (NYSE: HPQ) is available at http://www.hp.com
Program/Project	
- name	HP Labs Innovation Research Program
- objectives	The program is designed to create opportunities - at colleges, universities and research institutes around the world, for breakthrough collaborative research with HP. Program's objectives include: • Encourage the development of well-educated students • Create new knowledge • Encourage a flow of ideas • Interact in a network of leading innovators • Participate in an innovation ecosystem
- partners	multiple universities, colleges, research institutions worldwide
- form of cooperation	cash support for the project allocated in a competitive call for proposals
- duration	The program has started in 2008, continued in 2009 and 2010
- scale	The program has a worldwide scale. In 2008, 450 proposals were received from 200 universities in 28 countries HP Labs selected 45 projects at 35 institutions to receive the awards. In 2009, 61 projects from 47 universities in 12 countries received awards, including 31 projects that will receive a second year of funding. Since its launch, the program has been available for Polish academia. While some applications from Poland were received, no awards have been made in Poland to date.
- major input of industry partner	• define R&D project areas • provide funding for the selected project • provide access to leading scientists and researchers at HP Labs willing to collaborate with academic partners • provide internship opportunities at HP Labs for student researchers • provide reasonable IP and collaborative terms that allow both parties to benefit from collaboration
- major input of academia partner(s)	• provide/or obtain resources (faculty and student researchers) as specified in the project proposal • collaboratively conduct research according to the project proposal • disclose to the university and HP all project results • prepare project results for publication and dissemination, with HP Labs collaborators as co-authors, where applicable
Description	The program is conducted through an annual, open Call for Proposals. Received proposals are in sync with current research topics, which represent the portfolio of high-impact research currently underway at HP Labs. Proposals are reviewed by HP Labs scientists for alignment with the selected research topic and impact of the proposed research. Proposals can be submitted by academic institutions only – colleges, universities and research institutions. The program is designed to support graduate students and their professor, who acts as the principal investigator. For example, in 2009 there were 8 research topics defined grouping 15 subtopics. In its proposal the applicant precisely defines the proposed scope of research targeting one of the proposed research topics. The evaluation criteria include – (1) the innovativeness, ambition and the scientific and societal impact; (2) how the proposed topic addresses the relevant research topic; (3) the amount of university/third party resources to be dedicated to the project; (4) the research record and standing of the principal investigator in the relevant fields; (5) the strength of the research plan. The matching funds criterion - (3), was added in 2009, to extend the impact of the funded projects and dissemination of produced knowledge. However, this criterion is not a strict requirement for submitting a proposal, but contributes to a proposal's overall competitiveness versus other projects. Project awards range from US $50,000 to $100,000 per year and may be renewed for up to three years

	depending on the project's duration. The quality of the results of funded projects is measured by key scientific indicators – e.g. number of publications and invention disclosures, among others, such as continued alignment with HP Labs' research agenda.
Benefits for academia / industry	Benefits for academia: • funding for the research • possibility to work on real-life technology challenges • graduates have the possibility to gain industrial experience • availability and encouragement for publications • receiving HP funding may attract funding from other third-parties Benefits for industry partner: • creation of new knowledge and creative approaches to ongoing technology challenges • access to specialized facilities and expertise not available at industry host • access to high profile scientists and potential future employees
Key conclusions	The key success factors of the program include: • definition of transparent project award rules • sharing the risk – both partners should be aware of making a joint investment into the project • mutual understanding of needs, objectives • complementary expertise/experience • transparent IP policy • mutual freedom of operations – for universities: freedom to do future research and freely publish the results of the funded research; for HP - freedom to do future research and commercialize the results from funded projects
Other	The 2010 HP Labs Innovation Research Program will be launched in December 2009. More details are available at: www.hpl.hp.com/open_innovation/irp/

Institutional solutions - examples from U.S. government best practice

In our opinion it is worth presenting some successful institutional solutions encouraging industry-academia cooperation. We decided to share some U.S. experiences as the U.S. has been for years at the forefront of stimulating industry-academia cooperation. It is also known for many successful tech transfers from academia to industry. Based on OECD data, in 2008 the share of industry in total R&D expenditures amounted to 66%. The U.S. is also a major player in globalizing R&D and technology knowledge. In 2004, affiliates of foreign companies spent $30 billion USD on R&D expenditures (including European ones – $23 billion USD). At the same time, affiliates of U.S. parent companies spent on R&D abroad $28 billion USD (including $18 billion USD in Europe).

There is a variety of instruments which address different elements of cooperation. In general, we can distinguish direct and indirect instruments. The direct instruments are usually those which involve central or regional state budget funding and provision of services. On the other hand, the indirect ones are those which create incentives to undertake cooperation (e.g. legal, tax). The U.S. government applies both types of instruments.

In this section, we have presented some direct instruments successfully applied by the U.S. government. We concentrated on programs involving small and medium sized enterprises as very important innovation carriers and more reflective of Polish enterprise organization.

We believe that some specifics of the programs could be implemented into existing instruments applied by the Polish government and its agendas.

Example 1.

Institution responsible	**National Science Foundation**
Program	
- name	**Industry & University Cooperative Research Program**
- objectives	Encourage academia-industry cooperation
- form of funding	continuing awards granted based on a competitive scheme
Description	The program, established in 1973, develops long-term partnerships among industry, academia, and government. The centers are catalyzed by a small investment from the NSF and are primarily supported by industry center members, with NSF taking a supporting role in the development and evolution of the center. Each center is established to conduct research that is of interest to both the industry members and the center faculty. Objectives of the center include – finding solutions for specific technology challenges, technological breakthroughs and technology transfer, developing graduate students' skills and getting them familiar with industrial practice, catalyst for start ups. The I/UCRC program initially offers five-year (Phase I) continuing awards. This five-year period of support allows developing of a strong partnership between the academic researchers and their industrial and government members. After five years, centers that continue to meet the I/UCRC program requirements may request support for a second five-year (Phase II) period. These awards allow centers to continue growth and diversify their non-NSF memberships during their Phase II period. After ten years, a Phase III award provides a third five-year award for centers that demonstrate their viability, sustainability, and which have had a significant impact on industry research as measured through annual reports, site visits, and adherence to I/UCRC requirements. Centers are expected to be fully supported by industrial, other Federal agencies, and state and local government partners after fifteen-years as an I/UCRC. Creation of the program should be attractive for industry as it is assumed that industry partners provide the primary financial resources for the center. The budget for the center is created from membership fees – where members include primarily academic institutions and industry. The NSF grant supplements the membership budget. For example, in Multi-institutional research sites with annual industry membership participation budgets in the interval $150,000 to $300,000, grants can amount to $55,000 annually. The membership fee from individual industry partners may vary, with the minimum fee of approx. 10,000-15,000 $ annually. The funded center has to meet a variety of formal criteria, including its organization formula such as creating the Industrial Advisory Board that reviews and recommends on all research activities.
Key conclusions	Thanks to its structure, the success of the specific center is highly dependent on the proactive role of academia and identifying from the early beginning the right objectives, scope of activities and how they may benefit industry. This may convince industry partners to become members of the program. The multi-partner structure of the centers implies cost sharing, which may lead to some R&D cost avoidance on the industrial partner's side. This is one additional stimulus for industry to join the program.
Source	http://www.nsf.gov/eng/iip/iucrc/

Example 2.

Institution responsible	**National Science Foundation (NSF)**
Program	
- name	**Grant Opportunities for Academic Liaison with Industry (GOALI)**
- objectives	• Catalyze industry-university partnerships • Encourage an innovative application of academia's intellectual capabilities • Bring industry's perspective and integrative skills to academia • Promote high quality research and broaden educational experiences in industrial settings

- form of funding	grants
Description	Program promotes university-industry partnerships by making project funds and fellowships/traineeships available to support an eclectic mix of industry-university linkages. Special interest is focused on affording the opportunity for: (1) Faculty, postdoctoral fellows, and students to conduct research and gain experience in an industrial setting; (2) Industrial scientists and engineers to bring industry's perspective and integrative skills to academia; and (3) Interdisciplinary university-industry teams to conduct research projects. NSF provides grants to a university to support its participation. Required matching funds from industry.
Key conclusions	The program is not very large – approx. 10 m $ of yearly budget for approx. 60-80 awards. It is however uniquely structured to support the exchange of scientists and engineers between academia and industry.
Source	http://www.nsf.gov/pubs/2009/nsf09516/nsf09516.htm

Example 3.

Institution responsible	**National Institute of Standards and Technology**
Program	
- name	**Technology Innovation Program (TIP)**
- objectives	• Stimulate technological innovation • Use small business to meet federal R&D needs • Foster and encourage participation of minorities and disadvantaged persons in technological innovation • Increase private-sector commercialization of innovations derived from federal R&D
- form of funding	Grants
Description	TIP addresses societal challenges not being addressed in areas of critical national need with benefits that extend significantly beyond the proposers. TIP concentrates on those challenges that justify government attention. It supports innovative high-risk, high-reward research. Focuses on ideas with a strong potential for advancing the state-of-the-art and contributing to the U.S. science and technology knowledge base. Thus two major evaluation criteria: scientific and technical merit (50%) and potential for S&T and National Impacts (50%). The program funds small and medium sized businesses, institutions of higher education, national labs, nonprofit research institutions and other organizations. The program may fund: (1) single company projects led by a small or medium-sized U.S. company or (2) Joint venture projects of either: 1) at least two for-profit U.S. companies with the project being lead by a small or medium-sized company, or 2) at least one small or medium-sized company and one institute of higher education or other eligible organization lead by either organization. Large companies (e.g. Fortune 1000 companies), may participate as consortium members through funding their participation. They are not eligible for direct funding from this program. Funding: TIP may fund single company projects up to $3M during a maximum of three years or Joint Venture projects up to $9M during a maximum of five years. TIP awardees share at least 50% of the yearly total project costs – direct plus indirect. It funds direct project costs only.
Key conclusions	The program encourages industry-academia consortia. It is highly concentrated on finding a solution to specific needs of national importance thus the commercialization and technology transfer based on project results is one of top priorities. The limitation of the program is its overall budget as less than a dozen of new projects are funded every year.
Source	http://www.nist.gov/tip/

Example 4.

Institution responsible	**U.S. Small Business Administration**
Program	
- name	**Small Business Technology Transfer Program (STTR)**
- objectives	Stimulate technology transfer through a cooperative effort
- form of funding	Grants
Description	Established in 1982, the objective of the program is expanding the public/private sector partnerships to include the joint venture opportunities for small business and the nation's premier nonprofit research institutions. Every year there are approx. 600 project awards for Phase I and II. The program promotes a cooperative business-academia R&D effort (min 40% small business; min 30% U.S. research institution).

	STTR combines the strengths of both entities by introducing entrepreneurial skills to high-tech research efforts. The technologies and products are transferred from the laboratory to the marketplace. The small business profits primarily from commercializing the project's results. Awards are made to partnering small businesses and nonprofit research institutions; based on small business/nonprofit research institution qualification, degree of innovation, and future market potential. Small businesses that receive awards then begin a three-phase program: Phase I is the startup phase - awards of up to $100,000 for approximately one year fund the exploration of the scientific, technical, and commercial feasibility of an idea or technology; Phase II awards of up to $750,000, for as long as two years, expand Phase I results. During this period, the R&D work is performed and the developer begins to consider commercial potential. Only Phase I award winners are considered for Phase II; Phase III is the period during which Phase II innovation moves from the laboratory into the marketplace. No STTR funds support this phase. The small business must find funding in the private sector or other non-STTR federal agency funding.
Key conclusions	Program encourages small business to engage in R&D cooperation. Funding helps developing the technology up to the stage when innovation is created. Accent on commercialization and thus achieving positive ROI.
Source	http://www.sba.gov/aboutsba/sbaprograms/sbir/sbirstir/index.html http://www.sbir.gov/

Example 5.

Institution responsible	**U.S. Small Business Administration**
Program	
- name	**Small Business Innovation Research Program (SBIR)**
- objectives	• Stimulate technological innovation • Use small business to meet federal R&D needs • Foster and encourage participation by minorities and disadvantaged persons in technological innovation • Increase private-sector commercialization of innovations derived from federal R&D
- form of financing	Grants
Description	Established in 1982, SBIR is a highly competitive program that encourages small businesses to explore their technological potential and provides the incentive to profit from its commercialization. Over 1,500 firms receive over 5,000 awards each year. SBIR targets primarily these small businesses, which have some of their own R&D facilities. The program allows for some subcontracting of the R&D efforts to external R&D research institutions; approx. up to 33% in Phase I and approx. up to 50% in Phase II. Phases and levels of financing in the program are the same as in STTR.
Key conclusions	The program supplements existing R&D efforts of small businesses. Usually existing funds are insufficient to cover the technology development cycle. Accent on commercialization and thus achieving positive ROI.
Source	http://www.sba.gov/aboutsba/sbaprograms/sbir/sbirstir/index.html http://www.sbir.gov/

The R&D tax environment

Although it was not the focus of our study, we would like to indicate the importance of tax instruments in strengthening industry-academia cooperation.

Many countries, including the U.S. or EU countries, use tax policy instruments within their broader technology development based industrial policies. The major objectives of tax policy in this area are:

- to create incentives for firms to engage in R&D and educational activities;
- to increase country competitiveness and attractiveness for FDI involving R&D;
- to encourage domestic firms to develop R&D skills;

- to encourage academia-industry technology transfer.

In general there is a variety of tax instruments and they may be differentiated by:

- form – tax credit, deductions, etc.;
- targeted firms' size – all enterprises; small and medium enterprises; large enterprises (each may have different incentive schemes);
- targeted stage in innovation value chain – e.g. basic research, experimental research, applied research;
- mode of targeted tech transfer – e.g. in-house development, tech transfer from external partners;
- dynamics – e.g. incentives may be significantly higher if a firm exceeds a certain level of R&D spending.

Poland has applied some incentives for R&D and tech transfer to its law on corporate income tax. It consists of two key elements: (1) cost of experimental development can be recognized as a tax deductible cost in one amount or through depreciation (depreciated may be only the successfully completed experimental development work); (2) possible expenditure relief of 50% from the tax base for acquisition of new technologies (a new technology is defined as technology knowledge which has been in worldwide use for less than 5 years).

Understanding that the effects of the implemented solutions may be known in the short- to mid-term perspective, we would like to point out some weaknesses which could be the basis for further improvement:

- lack of precise definitions – the Law on CIT does not define "experimental development" (*prace rozwojowe*), what may create difficulties in proper transaction interpretation and accounting;
- too narrow focus – primarily on experimental work;
- no incentives for very early stages of the R&D process;
- too narrow classification of deductible costs - only experimental development is indicated as a tax deductible cost;
- highly complex (and probably costly) ability to be granted tax relief – an opinion is required that the acquired technology is in worldwide use for less than 5 years by an eligible scientific institution;

- tax relief does not promote in-house R&D as it promotes the acquisition of new technology from external sources;
- lack of promotional and self-explanatory materials how firms may benefit from the R&D tax incentives. International experience shows that firms that conduct R&D, but are not aware of tax incentives do not apply for tax credits.

The current scale of tax incentives is behind those granted by other EU/OECD countries. Based on OECD B index measuring the rate of R&D subsidies, in 2007 (current legislation has not been introduced at that time) Poland's rate was below 0.05, while the leading countries ranged between 0.2-0.4; e.g. Spain, Mexico, China, Portugal, Czech Rep., India.

Keeping in mind more developed R&D infrastructure in these countries, the current legislation may not attract R&D related FDI and encourage domestic industry to significantly increase its spending on R&D. It also may not sufficiently support academia-industry tech transfers, as most research conducted by academia is early stage R&D, which is not promoted by current legislation.

Section IV

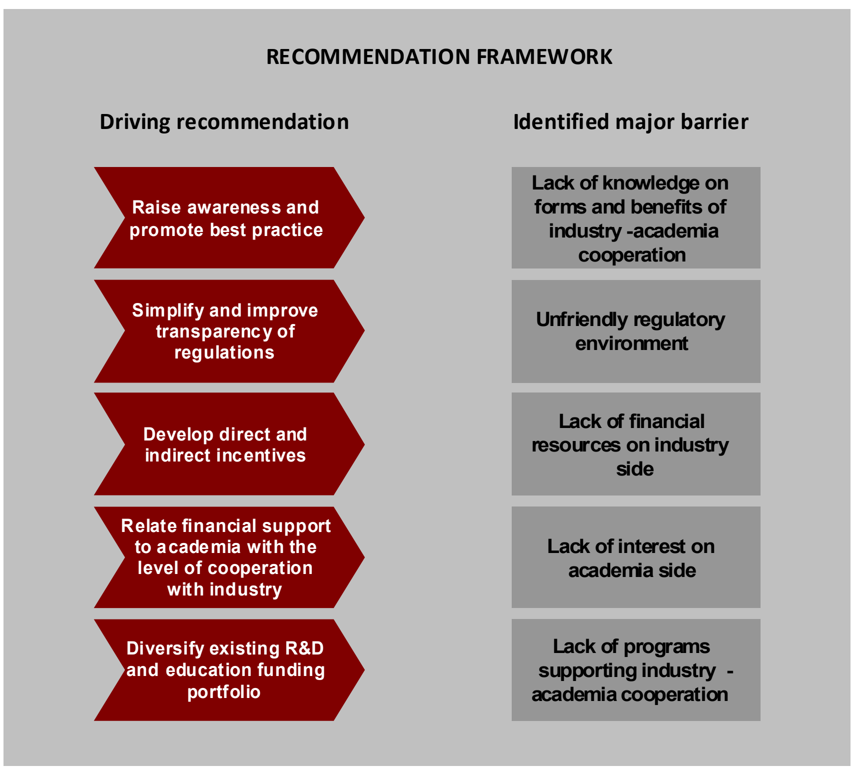
Policy recommendations

We have formulated our recommendations keeping in mind the Polish science and higher education system transformation efforts initiated by the Ministry of Science and Higher Education. In our opinion the proposed changes, if implemented, should improve Poland's education and raise the competitiveness of Polish science.

However, keeping in mind the current status of industry-academia cooperation and the international experiences of AmCham member companies operating in Poland, the above efforts should be significantly strengthened and accelerated. Poland should be aware of global developments and global competition in this area. Many countries are continuously improving their scientific and educational potential, perceiving it as a major factor of economic development. This is taken into account by international corporations in making decisions when locating their R&D and educational ventures.

Our recommendations aim primarily to raise awareness and create incentives for future industry-academia cooperation. We looked for pragmatic, small step improvements, based on our knowledge and past experiences gained up to now. The driving idea is that industry and academia should live in closer symbiosis and should be complementary to each other.

The recommendation framework is illustrated below.



The proposed detailed recommendations are listed below.

	Proposed recommendation	Proposed responsible stakeholder
1	**Promote and raise awareness of industry-academia cooperation** a. establish a database of university-industry cooperation, b. develop best practice guidelines for each major form of cooperation (both in education and R&D fields), c. on a regular basis, identify and share with larger audiences university and industry cooperation best practices and case studies, d. assign a yearly prize for the best cooperation model; e. launch university-industry cooperation awareness campaign supported by tangible best practices; utilize support from industry associations, including AmCham f. create a simple, one-page university-industry cooperation report card, published semi-annually on a website, mandatory for public universities and voluntary for private ones.	**Ministry of Science and Higher Education** **Ministry of Economy**
2	**Measure the output of the state/EU funding targeted at R&D and industry-academia cooperation.** Modernizing R&D infrastructure and funded projects should take into account how and whether they lead to tech transfer, applied research phases and commercialization. There is a need for broader measurement of this process. Better knowledge of the results may lead to better policy design. a. build a publicly accessible detailed database on granted state/EU funding; e.g. type and scale of funding / projects, funded institutions and its scale (firms in general are not aware if they have any chance to get funding from NCRD); b. define measures and regularly prepare public reports on the results of provided funding (currently it is very difficult to learn how funded programs stimulate Poland's innovation capability); c. based on the above improve existing programs; d. promote projects where both academia and industry are involved.	**Ministry of Science and Higher Education** **The National Centre for Research and Development (Narodowe Centrum Badań i Rozwoju)** **Ministry of Economy / PARP**
3	**Continuously improve and promote R&D tax incentives** a. Review current legislation in relation to international best practices to design more competitive legislation; b. Extend incentives into whole R&D related activities; c. Consider increased level of tax relief; d. Promote R&D incentives among the business community; prepare understandable tutorials (specifically important for small and medium enterprises); e. Consider introducing incentives targeted at non-R&D related knowledge transfer within education type; f. Consider introduction of incentives stimulating industry to cash/in-kind donations on behalf of academia (e.g. new and used tech equipment).	**Ministry of Finance** **Ministry of Science and Higher Education** **Ministry of Economy**
4	**Launch an industry wide survey on skills assessment** – the aim would be to gather	**Ministry of Science**

	Poland's industry responses to the status of current skills– in which areas they face the largest skills shortages? what are the factors impacting skills shortages? how many vacancies remain unfilled due to skill shortages? which industries and regions face the largest skills shortage? what are the costs of skills shortages to the economy? are the skills of new graduates matching business needs? a. Results of the survey could help policymakers shape better education policy towards e.g. supporting higher education institutions in developing relevant education programs, education institutions create program offers better matching market needs; b. Survey could be conducted on an annual basis by GUS; c. Survey could be modeled leveraging UK experiences of The Learning and Skills Council survey "The National Employers Skill Survey" (see: http://readingroom.lsc.gov.uk/lsc/2006/research/commissioned/nat-nationalemployersskillssurvey2005mainreport-re-june2006.pdf) or based on related surveys conducted by Labor Offices / PARP	**and Higher Education** **Ministry of Economy** **Ministry of Labor**
5	**Launch a government-wide committee on decreasing administrative barriers hampering industry-academia cooperation in education and R&D:** a. The ultimate goal of this committee should be to find pragmatic solutions to ease and stimulate industry and academia cooperation; b. The committee should be able to provide recommendations: to existing or new legislation; to existing financing schemes (budget funding, EU funding); c. Committee should consist of representatives: prime minister, key ministries, education and R&D spheres and business	**Prime Minister office** **Ministry of Science and Higher Education** **Ministry of Economy**
6	**(1) Encourage business representatives to get involved in the decision-making bodies of universities –** e.g. as an opinion/consultative representative; **(2) Launch a working platform aimed at filling the knowledge gaps.** The sense of this initiative works under the following assumptions – (1) there are educators who feel they have limited possibilities to gain knowledge about specific industry issues. This does not allow them to show practical examples (e.g. welding technologies) to students; (2) there are employers who are ready to share their knowledge with educators (e.g. discuss technology issues with teachers, show machinery and processes, enable on-site courses for students, request students to prepare master theses to solve practical problems). The initiative could be refined to a problem solving marketplace: solution seekers will meet solution solvers. a. initiative could be implemented as a web portal developed as a voluntary partnership of universities and industry players; b. initiative should support „operational" level of cooperation – the need for knowledge should be submitted by university units (e.g. specific departments) rather than universities as such; c. initiative could be financed from EU innovation support schemes. Financing should go into site maintenance (this would enable proactive maintenance of the platform), small budget covering cost of travel, preparation of materials, etc. d. the initiative could help get access to industry from smaller academic institutions not located close to industrial centers. **(3) Develop, in cooperation with business associations, the best formula for a "Business to University Ombudsman" position.** This position located in a university would be	**Universities' Rectors' Confederations (e.g. Konfederacja Rektorów Akademickich Szkół Polskich, Konfederacja Rektorów Polskich Uczelni Technicznych**

	responsible for business and university relations. The person's role would be to identify and attract industry partners to cooperate with universities (R&D, education). Leveraging its members network, AmCham could support this initiative through: a. co-developing an optimal formula e.g. defining the role and responsibilities, location in the university organization structure, budget structuring; b. organizing a workshop with member firms' representatives to enable future Ombudsmen to better understand the business approach to cooperation, industry expectations, limitations, etc. **(4) develop formulas to share experiences and knowledge between various firms and industries** a. leverage regional cluster network; b. take proactive role in cooperation with regional and national industry associations e.g. AmCham; c. this initiative could be supported by workshops during which industry could share their experiences with academic partners. **(5) Encourage academia to open its doors towards industry e.g. through easing barriers for:** a. joint masters/PhD thesis supervision; b. conducting (or co-conduct) lectures by outside industry experts who do not possess relevant academic degrees (PhD); c. stimulate teachers to work with students on real life problems; d. in cooperation with industry, extend lecturing programs to enable granting some industry-recognized professional certificates; e. encourage and support academic staff in conducting training / research in business facilities **(6) incorporate in relevant courses knowledge related to industry-academia partnerships** **(7) create financial incentives for individuals successfully attracting industry funds to universities.**	

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