Academia-industry link progress in knowledge-driven economy

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Abstract—Science and technology will improve the quality of life of future generations. A knowledge-driven economy goes along with high-tech companies. University of Miskolc has information about industry products, marketing and development trends, feedback on graduates' competences, the quality of teaching, improves curriculum, teaching materials and methods, implements its research mission successfully by joint projects, provides graduates for the knowledge-driven economy, reduces the height of the wall between academia and industry. Industry employs graduates meeting up-to-date requirements, raises science and technology application in new products. It employs new PhD-degree holders, generates and mainly transfers, applies and disseminates new knowledge.

I. Introduction

In the early 2000s the European industry was not what it once was: although many industries were still to be found in Europe, but other economic blocs, such as Asia, were establishing themselves as the world's principal production sites, aided in part by a less costly workforce and the opening up of world markets.

European leaders therefore decided to stake the EU's future on something in which it had always excelled: science and technology. Knowledge would thus secure the future of the Old World, through the creation of a knowledge-based or knowledge-driven society rooted in higher education, innovation and research: these components so fundamentally inter-dependent that they came to be known as the *knowledge triangle*. "Knowledge Triangle" has three pillars: higher education, research and technological development (RTD) and innovation (i.e. the share of inventions that actually reach the market).

Universities' core mission will be therefore to educate graduates and to ensure they are equipped to engage in the process of new knowledge creation and the dissemination and application of knowledge. The speed of innovation will increase affecting social and economic processes; they have to be proactive to plan future scenarios. In future, Europe's added value would thus be based on the new knowledge created within the European Research Area (ERA), a source of jobs and profit.

In the year 2000 Europe produced a third of the world's scientific knowledge and occupied a leading role in many fields – aeronautics and telecommunications, for example – however its global research investments, both public and private, were far below those of its principal rivals, namely the USA, Japan and the "Asian tigers". This comparatively low level of investment was not uniform. In the new Member States, where resources are often fewer, the sector is sometimes precarious. Thus RTD systems in Europe are struggling to break free of the national framework [1].

The "fifth freedom" – the freedom of knowledge across borders within the EU – will become integrated into the existing rights of people, capital, services and goods to move freely. By 2030 an open, fair, genuine single market for innovation will pull new ideas, talent and investment from around the world [7].

For maximum economic and social impact, strategy for information society technologies concentrates on the future so-called convergence generation. This involves integrating network access and interfaces into the everyday environment by making available a multitude of services and applications through easy and "natural" interactions.

In March 2000, the Lisbon European Council adopted the development of the information society as a key priority in the strategy to make Europe "the most competitive knowledge-based society in the world".

This took practical shape in the e-Europe 2002 initiative, to promote "the information society for all": a cheaper, faster and more reliable Internet; stimulation of Internet use, and investment in people and skill.

The challenges facing the European economy have not changed: increasing productivity in response to the ageing population; confronting international competition; preparing for the increasing scarcity of natural resources, starting with fossil fuels.

The EU's sustained productivity growth depends largely on policies to stimulate science and technology and innovation systems. A high level of educational attainment is also positively correlated with a productive, skilled and adaptable workforce and is a precondition for lifelong learning as well as for higher labor-market participation rates.

University of Miskolc (UM) with its three Engineering Faculties, four Engineering PhD Schools, Engineering Departments and 400 academic staff members together with over 200 contracted industries/firms contribute to the knowledge-driven economy.

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II. Science and Technology – and What the Europeans Think About

A. Science and technology

Science and technology pose one of the greatest challenges facing the Union today. Advances in this field are crucial for its political and economic future if it is not to fall hopelessly far behind the USA and the "Asian tigers" in the relentless technological race of the modern world. To this end it must mobilize its true wealth: the creative spirit and energy of its people. This potential is the basis for its scientific strength and competitiveness, on which rests the high technical and scientific quality of its industry and agriculture.

The goal set in Lisbon thus remains "the appropriate framework for encouraging growth and jobs", especially at a time of crisis, as the European Council repeated on 20 March 2009. The EU is not alone in making this analysis. On 27 April 2009, *President Obama* declared that he had set the goal for the United States of investing more than 3% of GDP in research to prepare for the future. "The challenge, in short, is nothing less than our salvation", he concluded. That leaves the matter of the method to apply in implementing the Lisbon strategy. This is essentially threefold: • to increase the research effort to reach 3% (2% from private financing and 1% from public financing); • to facilitate exchanges between the private and public sector; • to encourage the creation of skilled jobs and high-tech companies. In 2007 just 1.85% of GDP was invested in research in the EU-27, precisely the same level as in 2000.

The reason the ratio has stagnated overall in recent years is that economic growth was strong prior to 2008 and investment in research grew less quickly than the wealth produced. The fall in Europe's GDP since 2008 has the automatic effect of producing a relative increase in the research effort, while Member States maintained their scientific budgets and companies their RTD budgets. 23 of the 27 EU countries, representing more than 98% of the EU's public investment in research, are following the Commission's recommendations to respond to the crisis by investing in research. Just two Member States facing a very difficult financial situation were unable to do this [11].

The *private sector* should seize the new opportunities to work with the public sector and to develop innovative products. This is the ultimate test of the success – or failure – of the Lisbon strategy. One figure sums up the situation: 49% of European researchers are employed in the private sector compared with 80% in the United States and 68% in Japan. Private sector research must be strengthened and its results converted into added value if the EU is to create a genuine knowledge-driven economy, and it is on achieving this that the post-2010 effort and reorientation must focus.

Economists stress that one of the obvious reasons for Europe's difficulties in converting its scientific excellence into economic growth lies in the nature of its system for protecting intellectual property. Registering a patent remains much more expensive in Europe than in the rest of the world. To protect an invention, an industrialist spends up to 10 times as much in the EU as in the United States, and 13 times as much as in Japan. The costs of maintaining a patent are even higher, often acting as a deterrent for small businesses that are forced to cede their innovative technologies. This cumbersome system for obtaining intellectual protection is not new, however, and in recent years European leaders have taken a number of steps to correct it [8].

B. Popularity ratings of Europeans on science and research improvement

The Eurobarometer gradually measures and analyzes EU-27 people ratings on various impacts. 69% of Europeans (EU-27) believe that the applications of science and new technologies will make work more interesting. This statement met with very broad acceptance in all the countries.

TABLE I.
Popularity Ratings on Quality of Life in Percentage

Quality of Life Indicators	Agree	Disagree	Do not Know
For most people today, their quality of life is better than it was for their parents' generation	85	14	1
The next generation will enjoy a better quality of life than we do now	58	34	8
Developments in science and technology have improved the quality of life for your generation	87	10	3
Science and technology will improve the quality of life of future generations	78	15	7

Source: Eurobarometer (2005-08), structured by the authors

Science and technology will improve the quality of life of future generations; approval rates of Estonia is 92%, Slovakia 83%, Hungary 82%, EU-27 average is 78%.

TABLE II.
Optimism of Europeans regarded expected technological progress

Technological progress areas	Contributions to technological progress to quality of life in percentage			
	Improvement support (optimism)	No effect (scepticism)	Will deteriorate (pessimism)	Do not know (uncertain)
Computers and information technology	79	11	6	4
Solar energy	77	14	3	6
Wind energy	74	16	3	7
Mobile phones	58	23	15	4
Biotechnology/ Genetic engineering	53	13	12	22
Space exploration	44	35	9	12
Nanotech	40	13	5	42
Nuclear energy	32	18	37	13

Source: Eurobarometer (2005-08), structured by the authors

Nobody denies that science opens the door to knowledge. But what is the limit to the world's intelligence? Will it one day be able to explain "everything"? The statement made is the following: "one day science will be able to give a complete picture of how nature and the universe work". One in two Europeans believes that will be the case. The most optimistic are citizens in Southern Europe – the Maltese (73%) and the Greeks (70%) – while the people of Northern Europe are the most sceptical: the Finnish (58%), the Swedes and the Dutch (54%).

While the IT revolution and the prospects of renewable energy sources (solar and wind power) draw *strong support*, those optimistic about the biotech sector and genetic engineering enjoy only a slim majority. With regard to the biotech sector in particular, European citizens are divided in their reaction, between *scepticism* (13%), pessimism (12%) and "don't know" (22%). In contrast, a large proportion (35%) of those surveyed, remain sceptical of the benefits of space exploration although it is indispensable for emerging technologies like mobile phone, computing science and internet. The response to nanotechnologies was the most uncertain (42%), while nuclear power had the largest group of opponents (37%) probably due to Chernobyl and other crises.

III. European Research Area as a Solid Pillar of Knowledge-Driven Economy

A. State-of-the art of the European Research Area

The objective is to find ways of overcoming the continuing fragmentation of European public research. The European Research Area (ERA) concept encompasses three interlinked areas:

- Progress towards a new "*internal market*" for research, in which scientists, technologies and knowledge can move freely;
- Real coordination of national and regional research programs, at the European level, on the basis of common priorities;
- The launch of infrastructural initiatives introduced and financed simultaneously at European, inter-governmental and inter-regional level.

The fragmentation of public research makes Europe unattractive to businesses wanting to invest in RTD. These companies often find it difficult to cooperate or form partnerships with research institutes, in particular from one country to the next. European companies are investing more in RTD in the USA than US companies are in the EU, and *the transatlantic balance of investment deficit is widening*.

B. Knowledge-driven economy and framework programs

European research is torn between two poles. On the one hand there is the desire to 'see big' and encourage partnerships between the continent's largest and most imposing names in science and technology, in order to *achieve a 'critical mass'* and/or structure the European Research Area. But on the other hand there is a concern not to overlook smaller players and the vital innovative potential to be found in SMEs. For this first pole, FP6 was given new financial instruments with which to support not only traditional targeted research programs, but also so-called *'integrated' projects* and *'networks of excellence'*. The aim of the *networks of excellence* was to constitute a framework of high level scientific and technological networks, and put an end to the fragmentation of human and material capacities which curtails the European Research Area.

A knowledge-driven economy goes along with high-tech companies. It is high-tech that generates most of the private investment in with the ERA is so sorely lacking. However, the structure of the European economy is changing, with a relative deindustrialization and a switch to the services sector. This is not yet generating much research, less than aeronautics, the motor industry or energy – sectors in which the EU retains a leading place – and above all the biotechnologies and information and communication technologies. It is in these last three fields that the EU is being left behind, particularly by the United States, where a lot of biotechnology start-ups grow into major pharmaceutical companies with huge RTD budgets. In Europe they remain small businesses. The same is true in the Internet sector. The EU is still waiting for its Genentech or its Google.

Recent years have seen increased research in the manufacturing industry and services in Europe. But the decisive battle is being played out in the high-tech industries.

Around 50 000 or *two thirds of the players* involved in the European programs *come from the public networks* – universities, higher education institutions and research. Of the 435 000 researchers working in the 4 000 higher education institutes known to the EU authorities, an estimated 1 in 10 benefits to one degree or another from European financing.

This predominance of the public and academic sector should not, however, be allowed to mask a profound change that is taking place as European research policy opens up towards the private sector. As integrated projects grow in size, some of Europe's leading industrial players are increasingly involved in strategic sectors like ICT, nanotechnologies, aviation and space.

IV. Higher Engineering Education Serves Knowledge Creation and Transfer

"Engineering is directed to developing, providing and maintaining infrastructures, goods and services for industry and the community" (SARTOR). The ideal of the university is the open, digitally networked, knowledge institution working in co-operation with industry and society. Some further clustering of universities is expected to gain leadership in one or more emerging fields. A new EU reform will start with this "open knowledge institution": open to industry, politics and society at large. University career structures would change, so that excellence, not time served, is the criterion for advancement in teaching and research. Striving for excellence is the only choice Europe has. The ideal mechanism is when the EU institutions will become the "gold standard" to which all may aspire, but only the best succeed.

The EU's higher education performance indicators in terms of research (university ranking) or in terms of educational achievement are at 70% or less than in the United States [10]. University ranking system is to be somewhat mono-dimensional (focused primarily on research) on the other hand, and do not fully cover dimensions such as teaching and learning quality of knowledge transfer. Such mono-dimensional systems use indicators that discriminate only among the most research-intensive institutions and hence do not always provide useful feedback on ways forward for the majority of European universities. The ability of Europe to attract foreign brains is also less effective than in the US.

The untapped reservoir of talented young people, especially in the newer Member States, is probably the EU's greatest underexploited asset. A young graduate will be able to earn a degree in one country and easily move to another to work and teach; indeed, a growing population of researchers will earn PhDs with a truly European dimension, obtained by working in more than one Member State (Euro-PhDs).

Higher education and research systems cannot be changed within short term and it is sometimes several years before the results of reforms are evident. Most Member States have introduced legislation to make universities more autonomous and thus able to enter into cooperation with the private sector. Work is currently in progress to develop a European system for the international comparison of universities with a wider range of criteria than the famous Shanghai classification. This should make it possible to make a better appraisal of the international performance of European universities [2].

V. ACADEMIA-INDUSTRY LINK PROGRESS

A. Challenges

The walls between industry and academia are still too high; mobility of staff between them is low. Europe's past failures at innovation are true, thus a robust whole-business model for researchers and industrialists and an integrated innovation system in order to strengthen the "put-through" capacities are needed [8]. When large international companies look for a site a research facility, they look not only for major markets, but also for a strong research and competence base. Yet to date, the fact was ignored that proximity of competences matters.

The average rate of *industry participation* within the 7th Framework Program (FP7) is around 30%. The participation of industry is a question of the challenges faced by different sectors. When objectives of research are very important for European industrial competitiveness, they should be industry-driven. Often projects do not respect that priority. They are coordinated by universities or other research organizations which are collecting support from industrial corporations. The opposite situation was more frequent in the first Framework Programs. Throughout Europe industrial participants say that they are not in the driving seat anymore. The prime question is the role industry can play in the implementation of the European Framework Programs.

The root of the university-industry relationship in Europe is that the EU does not have many strong centers of excellence, like Massachusetts Institute of Technology (MIT), Berkeley, Stanford, and Columbia in the USA, which are leading academic research institutions. Industry cannot find these kinds of partners, but the EU will establish a separate European MIT, the new European Institute of Technology (EIT) in Hungary [9] and will reconcile the partners with the different approach and attitudes to public-private partnerships in each Member State. The EU simply must be able to use the best universities in Europe, to start strengthening them and creating an incentive structure where they would have a genuine interest in collaborating with industry. This is the culture that Europe is lacking.

In the training and careers hierarchy at the starting blocks, girls do well. In 2005 they made up more than half the university population. 59% of European female students EU-27 – all disciplines together – went on to complete their basic courses (bachelor, masters, etc.) as against 41% of male students. But at the top level (grade A which stands for the highest grade/post at which research is normally conducted) in universities and research institutions, women have just one representative (15%) against six male colleagues (85%).

The European academic world has around 15% of women professors. Women were best represented at this level in Romania (29%) and Latvia (26.5%) and were least present, at around 9%, in Germany, the Netherlands, Austria, and Belgium. The percentage of 'Grade A' (EU-25) also varies according to area of specialization, with feminization strongest in human sciences (23.9%), social sciences (16.6%) and medicine (15.6%).

According to an OECD report, employment of human resources in science and technology (HRST) "continues in all countries to progress much faster than overall employment, at an average rate of 2.5% a year in the USA, and 3.3% in the EU. This acceleration is due mainly to the increase in female employment and the expansion of the services sector".

According to Eurostat, *'qualified female knowledge workers' are to be found principally in the high knowledge intensity services* – which welcome the majority of higher science and technology (S&T) graduates, 44% of women and 56% of men. On the other hand, in the high tech sector with a more specifically industrial vocation, which at European level employs over 8.7 million scientists and engineers, only 29% of 'graduate' jobs are held by women. At this level, their presence tends to stagnate, while the proportion of men is growing by 2% a year.

In 2005, 43% of the 88 000 doctorates acquired in European universities were awarded to women – an increasingly large number, and quite impressive compared with the figure of just 25% in Japan. Since 1999, the growth in female doctorates (7%) has been well above that of the men, estimated at 2%. The countries posting the highest proportions of women reaching PhD level are, in particular, those of Central and Eastern Europe, with their strong traditions of scientific gender mix.

In terms of specializations, life sciences come well in front, and *engineering trails the pack*. The weakness of this latter figure is not, however, comparable everywhere: 33% of Hungarian women PhDs, and almost 25% of Finnish and French ones, are to be found in the *'engineering'* segment, as against just 7% in Germany.

Around 30% of all *active researchers* in Europe are women. They account for more than a third of the grey matter resources of universities and other higher education institutions and of the research carried out in countless public laboratories. On the other hand, they are still largely 'left on the shelf' by private labs, where one finds only one woman for five men. Differences from one country to the next can, as is often the case, be quite large.

The former communist countries are where the greatest proportion of women are employed in scientific structures, filling between 30% and 50% of jobs in the RTD sector compared with between 20% and 35% in the EU-15. In terms of research budgets, the picture is the reverse. The greater presence of women in the new Member States is often accompanied by very limited resources.

B. Academia-industry link progress by UM

UM-industry link [4], [5], [6] is improved in 19 main categories:

1. 100 to 170 *industry personnel* of over 200 contracted industry/firms are involved in joint design and evaluation of engineering curriculum, monitoring of engineering courses, organization and evaluation of industrial practice of students and graduates if and when needed.
2. *Gaining industry experiences in industry* criterion targets mainly young lecturers by involving them in joint university-industry projects, strengthening academia-industry link, short-term industrial practice in summer-time, their contribution to courses run by industry personnel in industry with the involvement of 12 to 15 young lecturers a year and leading industrial practice of 200 to 400 students, both in this country and monitor 20 to 30 students abroad.
3. 30 to 50 joint research and technological development (RTD) *projects* are initiated and implemented each year in all engineering science areas attributed to UM.
4. *University-attached research centre* on applied chemistry, a Regional Knowledge Centre on Logistics and Material Science and Uni-Flexys Ltd dealing with innovation and projects with industry are working; 60 to 90 academic staff participates in research carried out by these units and 15 to 25 researchers deliver lectures or conduct laboratory and other engineering practice for students of UM each year.
5. Close co-operation is being established with respective *research laboratories* working in the region: "Z. Bay" National Research Institute for Logistics and Production Engineering and Nanotechnology Research Institute. Both researchers and academic staff cross the border to participate also in joint research project and conduction of courses run at UM.
6. 6 to 9 *joint research projects* a year are launching together with few EU and third country universities, mainly Switzerland, Ukraine, Russia, Canada, the USA, Turkey and/or few enterprises mainly in mechanical and electrical engineering, logistics, information technology, material science and technology, earth science and technology.
7. 10 to 14 industry personnel are involved in *European education and research projects* based on their knowledge in manufacture, research, management and the vision of respective engineering fields.
8. 20 to 28 *industry leaders' involvement in final examination* of UM students, provide feedback on students' knowledge, skill and competences. Tutors and industry supervisors/referees evaluate the theses for graduation and submit their joint opinion to the final examination board appointed by the Rector with the involvement of industry leaders and specialists as well. All components of final examination like the results of basic, fundamental and applied engineering courses and the thesis after providing different weighted factors to each component give the final result of the diploma/degree. This symbolizes the knowledge, skills, capability and competences of the graduate in one rank dedicated excellent/outstanding, very good, good and satisfactory marks written in the diploma/certificate. This is the real output of higher engineering education, the engineer of the 21st century.

   The *Final Examination Board* has a particular duty to select the best three or four diploma theses between each group of 20 or so prepared and presented by the students of UM. The respective theses along with the evaluation of the Board will be submitted to the Institutes of Electrical, Mechanical and other Engineering of Hungary.
9. *New 'Robert Bosch' Department of Mechatronics* was initiated by the German Bosch GmbH Industry with financial aid at the University of Miskolc and its operation started on 1 July 2005 involving four Bosch sister companies working in Hungary. In addition to engineering education in the fields of mechatronics for undergraduate, graduate and PhD programs with the utilization of new laboratories like hydraulics, pneumatics, sensor application and development research is carried out. Bosch industry enjoys priority in the selection of the best graduates.
10. There was a complete *reference laboratory* equipped by National Instruments, the world-wide known multinational industry, at the Department of Electrical and Electronic Engineering where relevant research projects, then full-day regular, in-service and other courses can be implemented and run.
11. Specific component of industry-university collaboration in emerging technology is to run 3 to 10 intensive in-service training courses a year on *computer-aided engineering* in various disciplines by academic staff to industry personnel by industry request. Industry technical staff need emerging technology integrating theoretical background of design, operation, diagnostics, condition monitoring, measurement performances, etc. of the respective products, components, devices, equipment, machines, processes, all in one to give responses to adequate challenges by the use of software concerned.
12. 24 to 28 *UM staff serve respective Hungarian Engineering Institutes*, that maintained close co-operation with all important industries in the country, as chairpersons/members of editorial boards of their periodicals, executive-, scientific and professional committees, and invited speakers of their annual conferences strengthen the link directly with these Institutes and indirectly by Hungarian industries, their leaders and specialists as well.
13. *Recognition of talented graduates*: since several diploma theses go to the Engineering Institutes from all Higher Engineering Education Institutions of the country there is an evaluation committee composed of high-ranking industry personnel and principal academics makes decision on the first, second and third ranks of the theses. At the Annual Conferences of the Engineering Institutes usually taking place at end of summer on rotation in different cities of the country the graduates deliver the summary of their theses for 500 to 600 leaders of respective firms and industries. The gold, silver and bronze medals and also the 4th, 5th and 6th ranks are awarded there to the selected outstanding graduates. The summaries of the theses are published in the periodicals concerned like Elektrotechnika (Electrical Engineering), Gép (Machine Industry) or in other periodicals. This event proves to be an excellent forum for the young generation to get acquainted with the respective professional personnel and participate by their works in knowledge transfer and brain circulation.

14. *Short visits* each year are organized for groups of selected UM students to the EU and third countries' industries based on joint agreements between UM and respective Engineering Institutes/Industries with the involvement of 20 to 30 students.
15. Industry contribution to *increase or at least maintain the number of new entrants* to UM by offering attractive technical environment for industrial practice, contributing to the implementation of thesis is highly appreciated. At the opening and closing ceremonies of academic year UM appreciates its industry partners' achievements and awards various University medals to 3 to 5 industry representatives.
16. UM helps industry creating *more jobs for graduates* by publicizing UM-industry link through 30 to 60 projects a year, by conferences, events and written and electronic media.
17. Knowledge generation and transfer are represented well by 8 to 16 *engineering PhD theses* presentations and defenses where industry leaders and specialists, one at each board, are invited as referees, members of evaluation boards, consultants and partly potential employers.
18. *Euro-PhD* will be the future. University of Cassino, Italy runs a European PhD School on Power Electronics in Electrical Machines and Energy Control with mechanical and electrical systems since 2009. The International Scientific Committee with the involvement of one UM academic staff (one of the authors) provides expertise and evaluates the new achievements, contributes to the PhD students' presentation sessions held each year at Spring-time. The PhD students of UM are invited together with other EU and non-EU students to present their scientific achievements for the PhD students' presentation session chaired by the Rector of Cassino and evaluated by the joint professorial-industry group. EU industry leaders, with some Chief Executive Officers, give clear picture on the industries, for the coming research topics and the recruitment chances of PhD-holders. Panel discussions on "Industries meet PhD programs", state-of-the art of research in Europe in this field, future collaboration opportunities, 6 lectures delivered by international experts made the event colorful and useful. Although this program is in its initial stage, paves the way for strengthening the Euro-PhDs.
19. UM organizes each year in Spring-time *microCAD Conferences*. On 31 March and 1 April 2011 the 25th Conference was held by UM. 250 papers were accepted for publication and presentation, UM staff and PhD students received acceptance for 96 papers. The contributions were delivered within 19 scientific sessions; more than 2/3 of sessions were run by engineering departments.

The *result summarized* as UM is (i) possesses sufficient and professional information about industry products, processes, services, infrastructure, management, marketing and technological development trends, (ii) gets familiar with requirements for the new expected graduates, (iii) receives feedback on graduates' knowledge, skill, competences and in indirect way on the quality of teaching, (iv) can improve curriculum, teaching materials and methods, (v) can implement its successful research mission partly by joint projects, (vi) can pave the way for the provision of engineering graduates to the knowledge-driven economy, (vii) reduces the height of the wall between academia and industry what the EC envisaged, (viii) can increase the optimism of Europeans regarding science and technology.

Industry, benefitting of all progress components, (i) can-employ engineering graduates meeting industry requirements, (ii) can get familiar with teaching and research missions of the UM, its infrastructure, (iii) can improve professional quality of joint conferences and events by the active participation of UM academic staff, MSc and PhD students, (iv) can rise science and technology application in new products, processes and services by the invitation/employment of new PhD-degree holders, (v) can generate, and mainly transfer, apply and disseminate new knowledge by joint projects, seminars, in-service training courses and publications worldwide.

All in one UM serves as a *strong research and competence base* both for large international companies and also for SMEs.

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