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### **Crisis – Competition – Creativity.**

## **Changes in German and European Higher Education, Research, and Technological Development.**

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Since the late 1990s we have been witnessing enormous changes in the higher education and research landscape of Europe. Declarations and agreements named after cities like Bologna (1999), Lisbon (2001), and Barcelona (2003) are just publicly acknowledged signposts of new policies and approaches which more or less simultaneously affect institutions at various levels of decision-making within the European Union (EU). Creating European Higher Education and Research Areas (EHEA, ERA) is by no means a straightforward endeavour. Indeed, it forces us to thoroughly rethink and subsequently realign our hitherto quite stable institutional concepts and approaches, in particular when it comes to meeting the requirements of up-to-date and sustainable undergraduate and graduate education, but also in creating a stimulating and inspiring environment for achieving breakthroughs in research and technological development. Ultimately, each institution has to live up to the challenges of increasing global competition and of establishing its own culture of creativity.

It is against this background that the paper addresses some of the most significant shifts in policy-making, financing, and governing of higher education and research in Germany and the EU, as well as the challenges involved in reconfiguring enrolment policies, management processes, and institutional research structures. Last, but not least it also comments on the rapidly changing public-private interface in higher education, research, and technological innovation.

I. Changes and Challenges

Change and talking about change and the challenges that go with it are as old as European thinking. The Greek philosopher Heraklitos once said: "Change is the only thing in the world which is unchanging." And yet, when we look back at the fundamentally new developments of the past ten to fifteen years, we cannot help but recognize that the speed as well as the impact of change have increased quite dramatically. This not only applies to the European political landscape and its restructuring since 1990, but also to the public and private infrastructures that impact so deeply on our daily lives. Gradually, we have come to realize that we live in an increasingly interdependent, basically science and technology driven world which requires a thorough rethinking and subsequent realignment of traditional approaches.

As far as the higher education and research system itself is concerned, I foresee six major developments. The first one is the growing impact of electronics and information technology on the creation, distribution, and absorption of new knowledge. The second one is an increased emphasis on inter-, or transdisciplinary approaches; and the third one is the move from bi- or trilateral internationalisation towards network approaches and strategic alliances, setting up for example joint graduate schools or virtual research centres across the globe, and thus linking up with elite institutions in other countries. The fourth major development is the changing public-private interface and its consequences for the division of labour, particularly in the research and technology sector, as well as the need to mobilise more private resources for public purposes like basic and strategic research. The fifth major development is on the research side itself which has to come to terms with integrating evaluation, foresight approaches, and priority-setting processes, thereby trying to find new ways of assessing performance while at the same time avoiding solutions that are too technocratic. And finally, of course, the growing public concern about recent scientific and technological developments, particularly in areas like stem cell research or nanotechnology, but also in other areas, where the research

community has to consider discussing openly which kind of programmes and which kind of approaches we develop.

During the next 20 years, Europe's economic paradigm will change fundamentally. While the manufacturing base will continuously shrink, future growth and social welfare will rely increasingly on knowledge-intensive products and services. And we can also observe that, particularly with our demographic development in Germany and more or less in the whole of Europe, we are faced with a completely new challenge of how an ageing society can actually innovate. In this respect – as well as with respect to the overall financial situation – priority-setting will become even more important in the future.

## II. Strengths and Weaknesses

When we try to position Europe's performance on a global scale, it is interesting to see that the picture is not as bleak as it is often perceived and also reported in the press. As you know, the EU countries have agreed to a goal for 2010 of spending 3 % of GDP for research and development. It is an ambitious goal, and thus far only the Nordic countries have reached the 3 % threshold or are even far beyond it. With respect to the total number of graduates the figure for the EU is considerably larger (roughly 3 million) than for the United States (2.2 million) . Also the number of PhD graduates (85,000) is almost twice as large as the number for the US (44,000). When we look at the numbers of scientific papers published in the different parts of the world, we also see that Europe has overtaken the United States in the mid-1990s and is currently the largest producer of scientific publications (with a 38 percent share compared to 33 % for the US). But in the meantime we have to recognize that the Asia-Pacific region (with a share of 25 %) is catching up quite fast. This rapid growth of scientific output in Asia-Pacific nations is in stark contrast to slow growth in Europe and stagnation in the United States. If this trend continues, the Asia-Pacific nations will be the biggest research community in about ten years time from now. In a number of other relative indicators – such as publications per inhabitant, per scientist, or per million Euros spent in our universities – the EU is also ahead of the United States and Japan; and in triad pat-

ents per millions spent in business R & D, some European countries – Germany, Sweden, and the Netherlands – clearly outperform Japan and the US.

With respect to top ranking elite institutions, Europe is not in such a good position. For example in a ranking of the best universities published by Shanghai Xiaotong University 2005, only two of the top twenty universities were European, while 17 were American. On the other hand, in the top five hundred of the same ranking, Germany comes second with 46 universities compared with 38 British and 168 American universities. Of course, we could discuss the basis for these rankings and the explanations for these results at length, but it seems to me that the results basically reflect the fact that we have tried to develop good universities in the various parts of Europe, but over the last three decades we have largely considered higher education as a tool for regional development, and not really focused on creating high-class, internationally competitive universities. The result is not only reflected in these rankings, but also in many other benchmarking studies.

In particular, Europe has been losing ground in the field of basic breakthroughs. Fifty years ago, European scientists dominated the lists of the Nobel Prize awardees and other prestigious prizes as well. Today, Nobel Prizes and similarly renowned awards are mainly won by scientists working in the US. And the gap in R&D investments per capita between the EU and the US is steadily increasing. Apart from a few research areas such as astrophysics, space research, nuclear physics, and molecular biology, Europe suffers from an almost total lack of transnational support of basic and strategic research. In particular, risky, open-ended frontier research is not supported sufficiently, and it still remains to be seen whether the newly established European Research Council (ERC) will be able to change this.

The message for European higher education and research in an environment of global competition seems pretty clear: We really have to make an effort if we want to develop competitive breeding grounds for new talents and ideas, as well as attract some of the most competent researchers to our institutions. However, as the relative indicators show, we are not doing as badly as is pub-

licly perceived, we are doing quite well in some respects, and we still have a very strong research base – I believe it is important to keep this in mind when analyzing the overall situation. But we really have to do something to establish new creative milieus in order to achieve more breakthroughs (see chapter VI.).

### III. New Contracts between Universities and Governments

With the exception of the United Kingdom and the Netherlands (where the principles of accountability and new public management were applied to the higher education sector already in the 1980s), the relationship between European governments and universities, even in the early to mid 1990s, was still characterized by political and financial patronage. Based on input-related facts and figures, in most cases just the sheer numbers of students, professors, assistants, etc. the respective institution was more or less entitled to a certain amount of government subsidies. In many respects, the related processes and procedures put the universities, in particular their leadership, in a quite comfortable position. Without almost any pressure to demonstrate the efficiency and effectiveness of its operations, often more money would flow into the institution solely based on mutually agreed upon quantitative increases (more students = more professors = more money).

By and large, this system of political and financial patronage came to an end in the course of the 1990s. With the implementation of new budgeting procedures, performance indicators, evaluation and benchmarking exercises, an explosion in the area of institutional as well as subject-related rankings, and an increased emphasis on successfully raising money from other sources, e.g. from research councils, private foundations, and from industry, the relationships between governments and universities were transformed into contractual partnerships. Usually, the university had to commit itself to achieving mutually agreed upon goals in teaching and research (occasionally also in technology transfer) within the next four or five years, and in exchange for its endeavour the government committed itself to secure budgetary continuity for the respective period of time.

Due to the fact that European universities were neither organisationally nor administratively, let alone with respect to the necessary personnel development and technical infrastructure equipped to manage their affairs by objectives, the transformation of the contract relationship with the government into its internal decision-making structures and processes turned out to become quite a cumbersome learning process. With a few exceptions, mostly those supported through specifically designed programmes such as "Efficiency through Autonomy" by the Volkswagen Foundation, or similar initiatives of the German Donors Association (Stifterverband für die Deutsche Wissenschaft) and the Bertelsmann Foundation, hardly any university was aware of its own strengths and weaknesses. Strategically relevant reporting systems and medium-, to long-term planning procedures were practically non-existent. They were often introduced on request of the newly established governing boards whose members helped to transfer know-how from other institutions as well as the private sector.

Despite the many difficulties encountered in the late 1990s and the numerous controversies, even in the early years of the 21<sup>st</sup> Century, about the adequacy and usefulness of the new governance structures, decision-making processes, and financial operations, it can rightly be said that at least all those universities which proactively made use of the new opportunities for increased self-regulation and enhanced transparency nowadays feel no desire to return to the old system. Last, but not least in view of the enormous speed of change and the widely felt need to quickly adapt to an ever more competitive environment it has become clear that the necessary degree of efficiency and effectiveness can only be achieved by unbureaucratically, interactively, and flexibly governed institutions which are fully aware of their strengths and weaknesses, and know how to make the best possible use of newly emerging opportunities.

#### IV. Reconfiguring the Public-Private Interface

In many European countries, citizens are used to carrying a high tax burden, and expect governments to cover the costs of public institutions. However, the interface between domains that have been publicly financed, and those that

hitherto have been part of the private sector, is becoming blurred, and over the past decade there has clearly been a shift towards a stronger involvement of private persons and institutions. Higher education and research policy-makers as well as university rectors are increasingly stressing the need for new 'public private partnerships', and are practising new modes of financing. Meanwhile there is a wide spectrum of private involvement in funding public universities. These range from newly introduced tuition fees and donations by alumni, increased funds raised from foundations all the way through to contract research and newly established linkages between publicly financed universities and privately run research laboratories and companies. This has by no means been a straightforward development; rather it has turned out to involve a difficult process of mutual learning and trust-building. Nevertheless, it seems a necessary, if not inevitable step for both sides.

Well into the 1980s, there was to be a dividing line between publicly financed universities dedicated to the creation of new knowledge as a public good, and industry which was to produce marketable goods financed by private capital. Today, the borders between the two domains have lost importance. In many areas, the distinction between the results of basic research, and their contribution to the advancement of the knowledge base as well as the development of new solutions to practical problems which can be transferred into new products and processes is no longer valid. Especially in generic technologies, such as computer science, materials research, and biotechnology innovation has turned into a simultaneous, interactive process. Private investment in publicly funded research laboratories, joint ventures between universities and major companies, the outsourcing of long-term research activities by industrial R&D divisions, the establishment of joint professorships for entrepreneurship – these are just a few of the changes occurring at the public-private interface which require not only more flexible regulatory policies, but also more effective approaches to the production, absorption, and distribution of new knowledge.

Also with respect to infrastructures there are now a number of initiatives and concrete examples in which the interface between the public and private areas of responsibility has shifted far into the field of commerce, and this does not

just apply to the construction and management of real estate, the provision of high-power computers, and so forth, but also to joint training courses. In addition, there are by now in Germany alone more than 30 private higher education institutions, most of them small-scale, often single-subject institutions, e.g. law schools and business schools. The only exception being the International University at Bremen which recently joined forces with the Swiss-based Jacobs Foundation. It provides more than 1200 student places in a wide spectrum of different disciplines encompassing undergraduate as well as graduate courses. On the other hand also some of the technical universities such as Karlsruhe, Munich, and Hamburg-Harburg have developed private arms in order to market their training and research capacities at an international level, in particular to students from outside Europe.

#### V. Higher Education and Research Policy-making in the EU

Despite the wide variety of different higher education and research systems in Europe as well as the quite diversified and often multi-faceted structures within each country, we can nevertheless observe a growing trend towards converging policies, similar reconfigurations, and subsequent realignments across the continent. Last, but not least this is due to the impact of the new currents of globalisation. The 'Bologna Process' and the creation of a common 'European Higher Education and Research Area' proposed by the Commission and endorsed by the Council of Ministers must also be seen in this context. Based on similar student workloads, Bachelor and Master degrees will in future be conferred by universities all over Europe, and the implementation of a European Credit Transfer System (ECTS) has enhanced mobility while at the same time diploma supplements allow for a high degree of flexibility. Competition and cooperation across borders are no longer mutually exclusive. On the contrary, networking and establishing strategic alliances in competing for the best students and the most prestigious research grants at the European level are of greater importance than ever before.

However, this does not imply that at the end of this restructuring process there will be only a few "global universities" (Peter Scott) left. Growth in size of staff

and student numbers, mergers and campus acquisitions, or an expansion of one's campus across the globe do not seem adequate responses to the changes and challenges outlined above. What is needed is not a megalomaniac approach, but rather a careful selection of aims, strategies, and structures which can help the respective institution to fully realize its potential. In this respect, proactively minded, small-, to medium-scale universities may well be better equipped to successfully weather the storms to come than larger tankers. In particular, research-active universities with a clear focus on creating a strong community of researchers, lecturers, and students will through international linkages of their research centres and graduate schools probably have a competitive advantage. It could come as a surprise to many policy-makers and university leaders on the current scene that Wilhelm von Humboldt's basic ideas will yet again survive another revolution in higher education and research in a quite triumphant manner.

This process of realignment within the university sector coincides with a wide array of attempts in several European countries to assess and subsequently reconfigure the existing funding agencies, or to establish new ones (like in France and Ireland). Although in recent years more and more national funding agencies have been moving towards providing new incentives for medium-, to large-scale inter-, and transdisciplinary centres as well as towards international collaboration, it has become increasingly clear that there is a lack of pan-European funding structures which could help to establish both a cooperative climate for the development of new ideas, and an institutional environment that will encourage competition among Europe's best researchers to produce more cutting-edge results.

Crucial to the process of ultimately establishing a European Research Council (ERC) was a redefinition of "European Added Value" which until recently was confined to the collaboration of research teams from different countries. With the advent of the 7th Framework Programme we now have a more widely-defined definition which incorporates the principle of allowing a researcher in any European country to compete with all other researchers on the basis of excellence. Competition in order to achieve real excellence in research will

thus become an essential part of a new, forward-looking definition of "European Added Value".

The ERC is designed to be a funding body for basic research and will cover all fields of science and scholarship. Initially, there will be two types of grants available. First, the Starting Independent Researcher Grants ('ERC starting grants') will provide support to the independent careers of excellent researchers, whatever their nationality, located in, or moving to the EU and associated countries who are at the stage of establishing or consolidating their research team or programme. The ERC starting grants will amount to a lump sum of up to 2 million Euros for up to five years. It is envisaged that 200 such starting grants will be made annually. Due to the fact that the ERC's funding will increase substantially over the period 2007-2013, there will also be a second scheme for so-called 'Advanced Grants' which will support excellent research projects led by established top research leaders, working in or moving to work in Europe, whatever their nationality. Both schemes are designed to foster Europe's traditional scientific excellence and in particular to stimulate transformative research. On its homepage the ERC clearly emphasizes the goal of supporting 'frontier research'. It stresses as 'the secret of success': "The ERC will offer the long-term support that can provide top research leaders the freedom and flexibility they need to succeed. As a result, it will boost Europe's research performance by helping to attract and retain the best researchers; stimulating creativity; encouraging risk-taking; promoting discovery and high-impact research." ([www.erc.europa.eu](http://www.erc.europa.eu))

#### VI. Facilitating Creativity

Europe can only be successful in establishing and maintaining a globally competitive knowledge-based society if it continuously strives to enhance the quality of its research base, to strengthen the structural dynamics of the various research and innovation systems, and to support frontier research in carefully selected areas. Each institution will have to review its own processes of quality assurance, and to respond to the question whether it provides a stimulating

training and research environment which encourages risk-taking and enables its members to break new ground.

Achieving and maintaining such a culture of creativity is not at all straightforward. On the contrary, it is full of paradoxes and contradictions. Whilst every institution, not least for securing its own survival, has to insist that its members adhere to its rules, quality standards, etc. the creation of new ideas ultimately is about breaking the rules and about being tolerant to errors made. Epistemologically speaking, radically new ideas can often not be phrased in terms of the initial question, and the openness for "fresh thinking" is not only required by those who produce new ideas, but also by those who are expected to pick them up. The readiness to listen to independent voices inside and outside of one's own institutional network, to encourage risk-taking in "off the beaten track" areas, and to foster a climate of mutual learning are prerequisites for successfully establishing a true culture of creativity. They have to be complemented by an innovation-friendly human resource policy.

In view of the increasing complexity of knowledge production, many universities and research institutions have tried to expand in size and diversity, and subsequently created an increase in hierarchic structures and bureaucracy. More and more it has become clear that such increases in size and diversity have negatively impacted on performance, and produced a great deal of unproductive heterogeneity, a decrease in interdisciplinary interaction, or transdisciplinary integration, and ultimately led to great losses in innovation-friendly experimentation and flexibility.

When it comes to establishing a true culture of creativity, there are at least seven aspects which have to be considered:

1. Competence  
Train or hire competent researchers and enable them to develop their skills as freely as possible.
2. Courage

Not only on the side of the researchers, but also at the level of institutional leadership and on the side of funding organisations, in particular endowed foundations. The readiness to take risks must be complemented by a high degree of error tolerance.

3. Communication

Thought-provoking discussions are essential for achieving progress in research, in particular cross-disciplinary and transcultural exchanges, but also interactions with the outside world.

4. Diversity

New knowledge is usually formed at the boundaries of established fields, so the interfaces between these areas of expertise must be activated. To be successful it is essential to provide ample opportunities for all the researchers to interact intensively so that new paths can be developed and breakthroughs achieved.

5. Innovativeness

Academic leaders as well as heads of foundations must appreciate unconventional approaches and encourage risk-taking by providing incentives such as additional funding and long-term commitments.

6. Persistence

To forge new paths in a barely known territory often takes longer than two or three years, the usual lengths of project funding. Mistakes must be allowed as well as changes of direction.

7. Serendipity

It is impossible to plan the precise moment at which a radically new idea emerges or a major scientific discovery occurs. But there are numerous examples in the history of university-based research, which prove that it is possible to establish a particularly stimulating environment more conducive to scientific breakthroughs than others. Although there is no one-size-fits-all kind of recipe we can apply, it is certainly worthwhile to try and try again.

With respect to fostering creativity I consider these aspects as preconditions. It is important to focus on small teams of five to seven researchers embedded in an adequately enriched environment, and supported by modes of funding which provide medium-, to long-term financing of some seven to ten years. Such time and space for some thorough rethinking of common wisdom is urgently needed and has to be expanded. This also calls for a reconfiguring of the review process, including personal presentations and interviews, and last, but not least the actively communicated readiness of the leadership of the institutions involved to take risks.

## VII. Conclusions

If Europe wants to meet the challenges involved in the increasing processes of globalisation, it must act swiftly and at the same time take a long view. It must also be prepared to make long-term commitments whilst maintaining the flexibility to respond to new challenges. The most important prerequisites for performing successfully at the global level clearly are new, Europe-wide arenas of competition for some of the most prestigious grants, more coherent approaches to higher education and research policy-making at the national level, and at the institutional level an innovation-friendly governance and decision-making structure. Universities and research institutions have to constantly tap their resources and realize their potential, ensure efficiency in their spending practices, accelerate and simplify their processes, and intensify communication within the organisation and beyond it. Ultimately, we should not feel overwhelmed by the complex and sometimes quite complicated issues involved. Rather we should take an optimistic view, just like Albert Einstein who once said: "Amidst all the difficulties, there is also room for opportunities."