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THE FUNDING OF UNIVERSITY-BASED RESEARCH AND INNOVATION IN EUROPE

AN EXPLORATORY STUDY

BY BERNADETTE CONRATHS AND HANNE SMIDT

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By Bernadette Conraths and Hanne Smidt

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FOREWORD

Universities make a major contribution to Europe's research effort all across the continent. However, there is very little compiled information on funding research in universities in different national and institutional contexts, and on the issues facing institutions as they seek to consolidate the link between teaching and research, and to reinforce their contribution to the building of the European Research Area. Awareness of these challenges is all the more germane at this time of increasing competition for public funds and when society is expecting more and more from universities in training an increasingly diverse student population, in becoming more competitive in their research activities, and in contributing to the dissemination and transfer of knowledge in different contexts.

EUA is grateful to the European Commission's Directorate General for Research that commissioned this feasibility study and thus for enabling EUA to address this theme of core importance for universities. The study was designed to identify the key trends and issues and to contribute to the EC Conference in April 2004 in Liège on "The Europe of Knowledge 2020: a vision for university-based research and innovation." EUA's researchers undertook what turned out to be a preliminary investigation of complex and diversified issues of national funding of research and the range of realities in institutional research financing and its management across Europe. The authors identified key trends and in conclusion point to the rather pressing need for additional research and a major investigation in this field enabling the development and monitoring of a more comparative information base at institutional, national and European level. It would be important for any such effort to include consideration of practical data management and information tools of use to individual universities.

Despite research constraints, and in particular thanks to the universities that generously contributed their institutional data, EUA hopes this feasibility study opens a number of questions of interest to all parties to be examined in the future. The complex funding and governance issues identified will form an important focus for future EUA activities.

Eric Froment
President

ACKNOWLEDGEMENTS

This feasibility study could only be produced with the support and active collaboration of the thirty-nine EUA member institutions that completed institutional questionnaires and gathered complex financial data – often requiring considerable time to compile – under very tight time deadlines. Our sincere thanks go to all of them. In addition, the individuals within these institutions that generously offered their time and expertise in telephone interviews made an extremely valuable contribution to understanding the varied institutional situations and strategies. The authors are also thankful for the contextual national data on research financing provided by the national rectors' conferences.

Warm thanks also go to our colleagues at EUA who supported us at different moments of the sometimes difficult research and production processes.

Finally, as our team struggled with many difficulties of data consolidation in areas where common patterns of data collection exists – not even on national levels – it became clear just how important such "exploratory" studies are to advance the European Research Area and the individual institutional research agendas: Identifying needs and deficiencies help to shape future action agendas. Thanks are extended to the European Commission's Directorate General for Research for having prompted this process.

Bernadette Conraths, Hanne Smidt, Kate Geddie (EUA)

1. EXECUTIVE SUMMARY

Background and objectives

This EUA study was undertaken in the first half of 2004 to meet the need for informed European policy discussions with an overview of the main trends and developments in the financing of university research and innovation. The objective of this study has been to illustrate needs and potential methods for gathering systematic data and an analysis of key elements of the funding of research and innovation in Europe. The study has been made possible by a grant from DG Research – Directorate for Science and Society.

In conducting the study, EUA has drawn upon the support of thirty-four national rectors' conferences from the EUA membership – including the twenty-five countries of the enlarged European Union – who were asked to perform two key tasks: first, to provide access to national information sources on financing university research and innovation; and second, to recommend a sample of research-active universities willing and interested in providing information for the study.

EUA is deeply grateful to the member universities that participated – thirty-nine institutions from twenty-three countries (see appendix for full list) who responded to the questionnaire – for providing valuable information both through questionnaires and follow-up interviews. While caution must be exercised in translating to European level the findings based upon the select institutions involved, the resultant identification of a series of institutional governance and development issues that are crucial factors in promoting research and innovation activities in Europe's universities is invaluable for Europe's higher education community.

Summary of findings

1. The willingness of Europe's universities to participate in this study and provide institutional information – despite very tight time pressure and the burden of data-gathering – is **evidence of the importance attached by universities to these key research and innovation funding issues**. Universities recognise that they have the major role and responsibility for developing Europe's research and its researchers, and therefore feel strongly that their voice – as institutions – needs to be heard in European policy discussions.

2. The **enormous diversity in national funding structures** has been confirmed by the study, as have the considerable **institutional differences in methods of data collection, management and budget allocation**. This poses major challenges in comparing the research environments of universities across Europe. In addition, major reform processes in the governance and management of universities are in course – **a state of flux is the only common denominator** in this extremely diverse European scenario.

3. While national Research and Innovation (R&I) expenditure has not greatly increased between 1995 and 2001, **total institutional expenditure on R&I in this period has significantly increased** in all but two institutions in this sample (range = 0.92 to 6.11, mean = 2.2907). The implications of these findings will require further examination.

4. Universities are increasingly placing **emphasis on the European level to develop their research activities,** despite the relatively **small amount of funding** received from this source compared to national sources. In particular, high expectations are placed by many universities in Central and Eastern Europe on access to European Structural Funds. **Inter-institutional cooperation, interdisciplinary research, centres of excellence and doctoral education are considered to be the main future priorities to develop at the European level.**

5. There is a general expectation that **funding sources will continue to diversify** in the future, as well as an awareness that this trend towards increasing diversification of external funding sources, and in particular the shift towards more competitive and performance related project funding, is slowly **creating a culture change** in many parts of the universities. Individual researchers, departments and institutions have to develop a more competitive and entrepreneurial attitude and be more accountable for their performance.

6. Increased autonomy, often translated in "global" budgets with less public funding, requires more accountability and transparency of costs and financial management. This forces more and more universities to face the challenge of a **major reform of their management and accounting structures**. Generally in this sample, with the exception of the UK, the cost of research activities, related policies for overhead calculations and allocations are unclear within the institutions, vary enormously and revenues do not cover the cost – thus posing a threat to long-term sustainable research development in the institution and its component parts.

7. As a result, **professional development issues are considered to become more and more critical**:

   a. Training and development of academic staff/researchers through doctoral programmes are perceived as an important strategy for supporting an institution's research policy and strengthening its research capacity. This is needed particularly because seeking and managing external research funds has led to a greater workload for researchers, especially in their early careers. Currently, there is little management training or funding support for researchers or professional staff to assume these tasks.

   b. All these trends point to the need for greater professionalisation of university research management, taking account of the specific context and culture of institutions.

   c. Universities in Central and Eastern Europe have been particularly active in building future human resource capacity through developing doctoral programmes.

8. From the evidence of this sample, many universities are in a **period of development regarding innovation structures and activities**. Initial steps have been taken to integrate innovation into mainstream university research activities where technical transfer offices and university-industry partnerships are becoming increasingly commonplace. Nevertheless, at the present moment **systematic support to innovation activities remains a relatively marginal issue in comprehensive universities**. Also, many institutions perceive a danger that over-reliance upon external funds for short term applied research projects may be detrimental to basic research in the long term.

9. **Particular challenges face new EU member state countries** where **core research funding is practically non-existent**. However, in these countries **academic staff development initiatives are at the forefront of institutional strategy**, providing evidence that many institutions are preparing well for the forthcoming challenges of a European Research Area.

II. INTRODUCTION

The European Union has set itself ambitious R&D objectives in Lisbon and Barcelona (2002): to become the world's most competitive knowledge society and to substantially increase R&D investment to reach 3% of GDP by 2010.

Universities, through their role in knowledge creation and dissemination, must be at the centre of this major effort of European societies. At the same time, as key players in research and higher education in a world of growing competition and often decreasing public funding, universities are undergoing fundamental changes. The State is no longer the only financial source and universities have to look for diversified funding and often adopt more entrepreneurial approaches and flexibility in their activities.

EUA was commissioned to undertake this study by DG Research of the European Commission in January 2004 with the aim to provide further insight into the financing of research and innovation at Europe's universities. Initial findings were presented at a major conference convened by DG Research, "The Europe of Knowledge 2020: a Vision for University-based Research and Innovation" in Liège, 26-28 April 2004 (cf. bibliography).

The objective has been to shed light on the ways in which institutions are responding to challenges in research funding at local, national and European level. As a representative association of 750 European universities in 45 countries and of 35 national rectors' conferences, EUA is well aware of the pressures to which higher education institutions and their research activities are exposed, and an increasing proportion of the Association's activities are linked to the research field. EUA has stressed the importance of improving the information base and searching for innovative financing strategies on numerous occasions, most recently in its response to the Commission's Communication on "The role of universities in a Europe of Knowledge" (cf. bibliography). The findings of the present study further support and confirm these and other related needs, as have many contributions to the Liège Conference In April 2004, as well as underpin the various recommendations of EURAB (European Union Research Advisory Board, cf. bibliography).

Financing research and innovation at Europe's universities will undoubtedly be one of the main challenges facing the higher education sector at a time of rapid transition towards a competitive knowledge society and economy.

The focus of this study is deliberately placed on institutional perspectives, given that most previous research has focused on national public research funding systems: country analyses, comparisons, trends, data, change factors and national policies undertaken by the OECD and its Institutional Management in Higher Education (IMHE) department, as well as by the European Commission DG Research itself, have provided the basis for this research.

The less researched and publicised aspects of the funding for research and innovation still rest at university level. This study was focussed particularly, therefore, on institutional policy, governance and practice while taking as full account as possible of the national, historical and societal realities in which all higher education institutions are deeply rooted.

The immediate willingness of universities to participate in the study provided impressive proof of the topicality of the issues raised and the genuine interest of universities to collaborate and contribute to a European level discussion on these key themes. A broadly spread sample of research-intensive European universities have shared institutional figures and candid opinions on policy developments, from which the authors have identified common emerging issues and needs which may help guide European discussion and action in this area in the future.

1. Methodology: scope and content of the study

This study was conceived to offer input for the Liège Conference of DG Research in April 2004, giving the authors little more than three months and limited resources to produce results from a broad European survey based on incomparable data sources on a complex issue. The study thus primarily addresses developments and specific trends in the financing of research and innovation in universities of the enlarged Europe. It would be desirable to also compare the European situation with the reality of the US, Canada and Japan but this could not be carried out due to the time and resource constraints as well as due to the difficulty in comparing the gathered data.

The researchers tried to trace the present state of issues, the main change factors, the emerging trends and the stated needs. It is therefore more accurate to describe the present report as a snapshot of the present state of flux which prevails in the area of financing of research and innovation in European universities.

The following processes were used to gather and analyse data:

1.a. Desk research/stocktaking

A first analysis was conducted of trends and practices of research-financing based on publicly available information from a variety of sources, including the studies done at national level by governments, national bodies or national rectors' conferences, statistics available from European and International bodies such as OECD, EUROSTAT, the European Commission, US National Science Foundation, HEFCE (Higher Education Funding Council of England), and case studies reflecting the situation in university research funding in Europe (cf. bibliography).

1.b. Questionnaire to national rectors' conferences

National rectors' conferences from the twenty-five countries of the enlarged Europe as well as Switzerland, Norway and Iceland were contacted with a questionnaire aiming to elicit an overview of the current situation and policies in the financing of research and innovation in each national context. This information was synthesised into national fiches and used as background for the analysis of institutional information.

1.c. Institutional data collection

In addition to providing national information, the rectors' conferences also helped EUA to identify a sample of research-active universities willing to participate in the study. The institutions were identified as being research active and were requested to participate in the study by providing information through a questionnaire, and subsequently by offering supplementary information through interviews.

The institutional questionnaire was designed to gather information on research and innovation funding and expenditure, strategies to promote R&I, management of R&I, quality assurance processes, trends and future expectations. The questionnaire was in English and contained explanatory notes to facilitate the understanding of terminology. It was sent to sixty-two universities (including twenty institutions in the Czech Republic), and thirty-nine completed questionnaires from twenty-three countries were returned (see Appendix).

A preliminary analysis of the institutional questionnaire responses was followed by in-depth telephone interviews with senior university officials responsible for research, namely vice-rectors for research, managers and heads of research offices, to address underlying questions of governance, strategic policy and practice related to research and innovation and their funding and to seek further clarification on the data provided. In total, nineteen interviews were conducted in the following countries: Austria, Belgium, Czech Republic[1], Germany, Estonia, France, Hungary, Italy, Poland, Sweden, Switzerland, and the UK. This selection was made in order to illustrate the apparently significant diversity across European university systems.

1 The Czech Rectors' Conference felt that all universities may be interested in providing information for the survey, and encouraged EUA to contact all its members: 20 questionnaires were received.

2. Presentation of information

The data and information obtained have been clustered under the main categories identified by the authors as the most important factors for university-based research funding: institutional governance, policy and strategy, funding sources, innovation policy and practice, research management and human resources.

Some of the data and interview results have been condensed into small case studies or examples of interesting practice which illustrate different approaches to particular issues.

The major emphasis has been placed upon:

- Institutional governance, strategic policies and decision making with reference to research and innovation funding.
- Financial management of research and innovation funds (e.g., income and expenditure, budgeting processes, costing of R&I, accounting systems), as well as on human resource management and development (e.g., career situation, work conditions of researchers/PhDs).

3. Challenges and constraints

The study objectives presented three major challenges, one ex ante, two ex post. The two latter being already indicative findings and point to areas where action is needed at European level.

3.a. Time and resources

The time frame for reaching initial findings had been set at little more than three months and limited funding only allowed a very basic research methodology to cope with the task. Clearly, this study can therefore only be regarded as a very preliminary first step in opening up a subject of enormous interest in Europe. Findings should be regarded first and foremost as possible indicators of trends and developments. At the same time, an attempt is also made to sketch the issues which require much greater attention along the path towards a European Knowledge Society.

For reasons outlined next in points b and c, statistical information gathered for this survey has little value for purposes of comparability, and cannot be easily used to make generalisations about national and/or European trends. Comparable statistical information across universities in Europe on this topic would require the development of a sophisticated methodology involving major transnational inter-institutional cooperation and significant investment.

As mentioned above, the limited time to collect and analyse institutional data meant that it was only possible to gather information because of the quick and generous response of universities that were put in touch with EUA through their national rectors' conferences. While geographic diversity was sought among the universities (twenty-five institutions were from the EU/EFTA and fourteen from the CEE), there is evidently a bias to the "type" of institution that participated: all universities in this study can be defined as research active. Therefore, there are limits to the broader applicability of the findings, but the trends certainly highlight areas that merit further research and attention.

3.b. Terminology and definitions

A major obstacle to gathering information was the absence of commonly understood terminology. Given that the language of the questionnaires was English, it became clear that many terms and concepts tended to be interpreted differently by different institutions in different countries.

In accordance with the terms of reference defined by the European Commission for this study, the questionnaire for the higher education institutions was designed with reference to OECD data and the model of the US survey which is run annually by the US National Science Foundation (NSF Survey of Research and Development Expenditures at Universities and Colleges). However, the adaptation of the US model proved difficult, as some of the terminology and structures that may be subject to a single cultural understanding in the context of the United States could not be transferred easily to the diverse institutional realities and systems throughout Europe.

This is perhaps not a surprising finding. There is general acknowledgment in the relevant literature that there are blurring boundaries in the European research terminology and definitions. Examples are the concepts of basic and applied research and the lack of a clear definition of "development" or "innovation." The qualifications of funding sources, although derived from OECD references, were also not always easily differentiated.

The common sources of confusion were, amongst others:

- the notion of "basic research" which is not utilised in many universities when accounting for research funding;
- breakdown of funding sources/definitions, which were subject to local interpretation;
- the meaning of types of funding which were not always clear in different institutional contexts (e.g., grants, earmarked funding, capital grant);
- the term "overheads" which was subject to different interpretation;
- the term "research staff" which was subject to a wide range of interpretations;
- disciplines and subdisciplines – also subject to a variety of local interpretations.

All of these variations in understanding of terminology had a dramatic impact on the nature of the data provided.[2]

This indicates a fundamental difference and a European weakness/tendency with regard to the global market for knowledge competition, in particular with the US. While in the United States major differences also exist between HE institutions and individual states, they have still developed a common indicator and measurement scheme for their R&D activities, income and expenditure, the breakdown of sources and the allocation to disciplines. In addition, the US benefits from a shared language and a common – though complex – education and research system.

2 For the sake of clarity in the questionnaires and in this report the following definitions of terms have been used:

Basic research

Research carried out with no direct link to a given application and, if not exclusively, in any case and above all with the objective of processing knowledge (ref. Communication from the Commission: Europe and Basic Research, 17 January, COM (2004) 9final).

Applied research and development

Research carried out with a view to potential application and a possible transformation into a service or product (for either common or commercial purpose).

This is far from being a reality in Europe and hence, for this study, made a meaningful and scientifically valid comparison of data practically impossible.

Nevertheless, the data and information gathered for this study allowed trends to be discerned in the institutions' struggle to develop and improve in a rapidly changing environment. However, also in view of the rising importance of international/European funding and the discussions around the role of a European Research Council (ERC), a consensus on terminology is both desirable and necessary, as indeed is a European level discussion about what constitutes necessary and relevant common indicators and performance data (cf. recommendations).

CASE STUDY:
DFG'S INSTITUTE FOR RESEARCH INFORMATION AND QUALITY ASSURANCE

The Deutsche Forschungsgemeinschaft (DFG) is launching an interesting initiative to this regard: This year they will create an "Institute for Research Information and Quality Assurance." Given the federal structure of the country (sixteen Länder) and the increasingly complex responsibility and accountability lines between regional and federal ministries and agencies as well as individual institutions the need for a central collector of data and information was recognised as being urgent. The concept could serve as a model for a possible European level initiative.

3.c. Data incompatibility

Following from the points above, much of the financial data requested could not be properly compared because the manner in which institutions recorded data on relative sources of R&I income varied considerably, both in terms of the categorical definitions as well as the sources of data within an institution. For example, much research funding is earned by individual researchers directly from research councils and international sources, and may not be recorded centrally in each university. Furthermore, the organisation and accountability of research funds may fall within the remit of faculties in several countries and cannot accurately be amassed at the institutional level. In other institutions, the relevant information is spread across departments, Technology Transfer Offices. It should also be noted that several universities explained that they had never been asked to provide research and innovation income and expenditure data at the institutional level, contributing to the difficulty for institutions to provide the requested information in the short time allowed. Lastly, in many institutions, while 2001 data could be amassed, it was difficult to provide comparative 1995 data because of recent mergers with other institutions, because of major national reforms to the higher education sector and/or national economic reforms (exchange rate fluctuation) meaning that the temporal aspect of the data was either unavailable or incomparable.

Despite these obstacles, the very high rate of return of the questionnaires is indicative of universities' interest in the issue, and their sense of responsibility and accountability for expenditure of research funds; however, this also raises an important question about the current capacity of institutions to respond to increasing societal demands for accountability.

As a result of the data limitations, only changes to individual institutions' relative income sources and expenditure are provided and absolute sums were deemed too variable to be reliable for this study, as reflected on the precision of the provided tables.

Innovation: A result of combining more knowledge and from multiple sources for a rapid and direct transfer of discoveries into industrial development, a creation of opportunities and ways to use them for the common benefit (ref. OECD Business and Industry Advisory Committee to the OECD, Promoting better Public-Private Partnerships, September 2003).

III. RESEARCH FUNDING SYSTEMS: KEY ISSUES

European universities take great pride in the research mission of their institutions and consider this an integral part of their role in society. When looking more closely into the institutions and countries, the wide variety of interpretations of this dual mission of the generation and dissemination of knowledge is striking, as are the different national support systems.

In the following section, we look at the main European funding structures and identify main change factors, trends and expectations as well as the different funding sources and flows.

1. Public research funding systems

A useful point of departure for considering the impact of the diversity of national systems and the ways of fund allocation within institutions are the system clusters provided by the OECD publication "Governance of Public Research" (2003). It clusters the various science funding systems in main archetypes which we found still valid and confirmed in our sample, although of course in varying degrees and mixed forms.

The Centralised Archetype: Top down priority setting from ministry/central government, funding streams directly to public research institutions and universities, no independent funding agencies. This model partly applies to many systems in the EU new member states and to some Western European countries (e.g., Italy).

The Dual System Archetype: Federal and regional structure and ministries, both bottom-up and top-down practice, a mix of direct funding for public research institutions and universities AND competitive grant programmes offered by independent funding agencies (research councils or associations). This model can be found in many Western European countries (e.g., Germany, France, UK, Sweden, The Netherlands, and Switzerland).

The Decentralised Archetype: Multiple ministerial research responsibilities, a primarily bottom-up agenda setting, mostly project funding via competitive grants from independent agencies. This model seems to be the least represented system in Europe.

It should be underlined, however, that beyond these traditional funding system archetypes, many countries have initiated reforms with regard to higher education and research funding schemes, which makes a Europe-wide analysis of university research funding-related activities even more challenging: A state of flux seems to be the common denominator.

COUNTRY EXAMPLE:
HIGHER EDUCATION REFORM IN AUSTRIA

A system-wide reform was recently undertaken:

Austria has decided to take the challenge of fundamentally overhauling both funding structures and university governance. In 2004 major funding organisations planned to be partly merged and all brought under one roof, "The House of Research", in an attempt to streamline bureaucracy, make application and funding processes more transparent and effective. An "Austrian National Foundation" is being created with major annual funding from a 1.5 billion € capital stock of the Austrian National Bank.

Universities have been granted almost complete autonomy with the requirement of making substantial changes to their financial and managerial governance.

In addition, the European Investment Bank (EIB) has given a 65 million € loan to Austria which is aimed at modernising university and research facilities. Part of this programme is the launch of six new HE and research facilities, thus backing the Austrian National Innovation Plan which has as objective to increase collaboration between university research and industrial research.

Nonetheless, across Europe, several common trends can be observed:

- the further introduction of competitive grant funding through agencies and ministries (often accompanied by a reduction of the overall institutional block funding);
- the steering of public research agendas through financial support to specific (excellence) programmes;
- the increasing levels of autonomy for HE institutions, which has been accompanied by pressure from governments to diversify income sources, such as attempting to match public funding streams with funds from business, other private non-for-profit, and international sources.

1.a. Public research funding: issues particular to the EU new member states

University based research in many of the new member states is largely under-funded because the base-line funding (which was more common in the EU fifteen) contributes less than ten percent of the overall budget and is generally attached to the institutions' doctoral programmes. In addition, the relationship between universities and Academies of Science regarding the limited research funding is still a cause of friction. Although the 1990s witnessed the introduction of reform to nearly all university systems and student enrolment levels have been increasing rapidly albeit from a very low base, funding for research has not kept pace.

The generally tight public budgetary situation does not allow for the necessary investments and slows down the process of change. Not surprisingly in many of the new member states, expectations of significant funds from European sources are high for projects, infrastructure, staff, especially through the structural funds (less so for the Framework programmes) and a future European Research Council. Within this climate of limited funds, a major trend in the universities from the new member states involved in this survey was to concentrate investment in doctoral programmes in order to create a competitive human resource base and prevent on-going brain drain.

Many of the traditional universities in the new member states – more so than the technical universities – find it difficult to find alternate funding sources, namely from business or other non-government sources because of weak local economies. The perception of institutions is that international and overseas business investment is currently mainly being received by institutions in the EU fifteen.

COUNTRY EXAMPLE: RESEARCH INVESTMENT IN THE CZECH REPUBLIC

The Czech Republic has made great strides in furthering research investment, especially in the higher education R&D sector for which funding has increased by 27% over the last ten years. Expenditure on basic research as part of the overall R&D expenditures (GERD) amounts to over 40%. These investments have been coming both from government and the private sector, similar to successful models of Finland and Sweden where business R&D investment has dramatically increased over the past ten years (see also reference to "triple helix model" below).

The Czech Republic has retained the structure of Academies of Science and universities. It is therefore not necessarily the universities that attract all the external funding. They are, however, gearing themselves up for a more competitive funding environment. Traditionally, the Czech government has spread the funding more or less evenly among universities but as of 2004 there will be a more competitive evaluation scheme that may result in a research ranking of Czech universities, with a possible consequence of concentration of funding.

2. Changes to research funding sources and levels

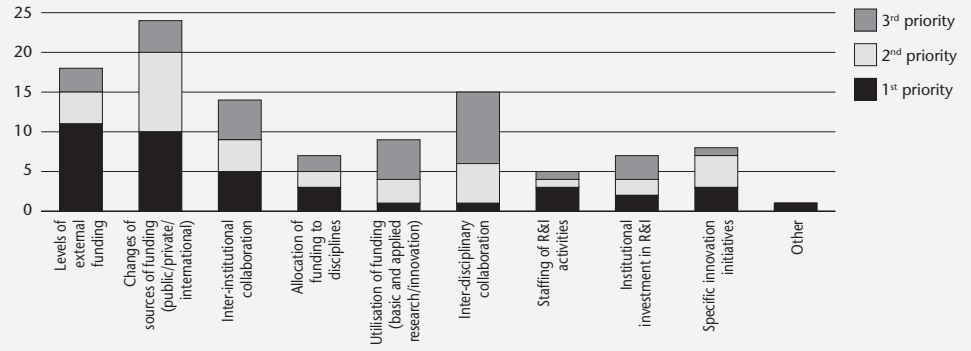
A majority of the institutions surveyed indicated that the two main factors that have impacted their institutions in the past ten years and that will continue to play a role in the coming five years were the levels of external funding and the changing sources of funding (see graphs below).

Many institutions were unable to provide accurate information on total R&I income and offered estimates based on the partial information available. Despite the difficulty in assessing the source of all research funds for the institution, the largest source of income is clearly the national government for nearly all institutions (56% average estimate across institutions). It should also be noted, however, that the relative importance of this source for each institution varies considerably, from 0 to 100 percent across the sample.

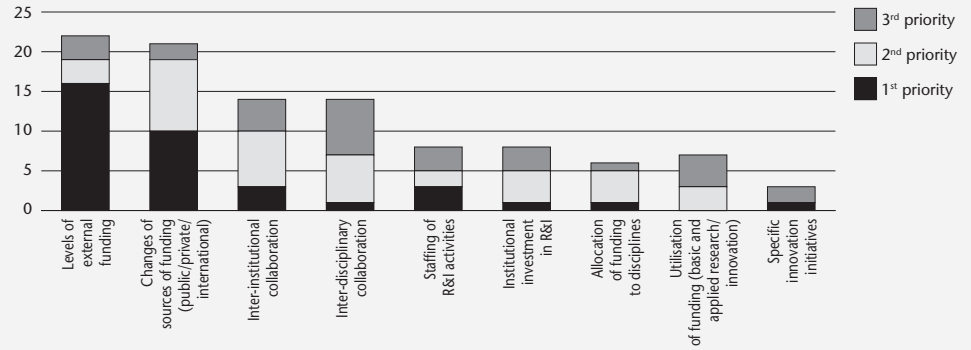
Government range is 0-100%	(average 56%)
Other national sources range is 0-85%	(average 21%)
Business sector range is 0-46%	(average 10%)
International funding range is 0-29%	(average 7%)
Other range is 0-42%	(average 4%)

While the public discourse on public funding for university research suggests decreasing levels of government support, the data received from the institutions in this survey showed remarkably little change in the past few years (1995-2001). Indeed, while it was difficult to compare absolute levels of funding, there seemed to be little change in the relative value of these sources to an institution's overall source of R&I income. The changes for individual institutions in this sample actually indicate a rather stable income flow from government; one possible explanation for this may be a higher government fund allocation due to rising student numbers. Other national sources as well as business, international and other funds show greater fluctuations, resulting in an overall increase.

Graph 1: Factors that will most impact the institution in the coming 5 years



Graph 2: The most important factors to have influenced change and development of R&I over the past 10 years



On the other hand institutional expenditure on R&I in the same time period has, with very few exceptions, considerably increased (see chart below).

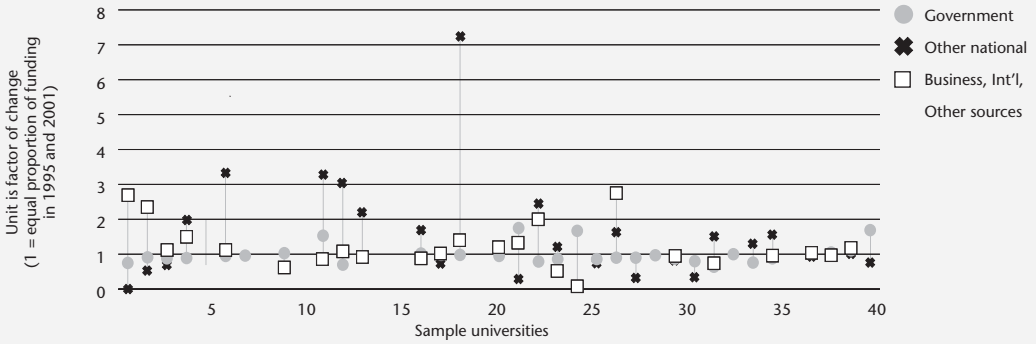
According to OECD data, the increase in national expenditure on R&I in Europe is far less significant than the findings shown from this sample. This suggests that these universities have made major efforts to strengthen their research activities.

The findings in this survey would also confirm the assessments of the OECD/IMHE/HEFCE in their reports on "Financial Management and Governance of Higher Education".[3] Most European governments have not, or not sufficiently, increased their investment for R&D in higher education with respect to the target of 3% of GDP nor have they ensured necessary investment in research infrastructure. Universities, therefore, seek other sources of income, which often means allocating resources for highly competitive targeted project bidding, and as a consequence, higher volatility of income streams.
Other survey results underpin and extend this issue and will be referred to again in chapter IV.1.

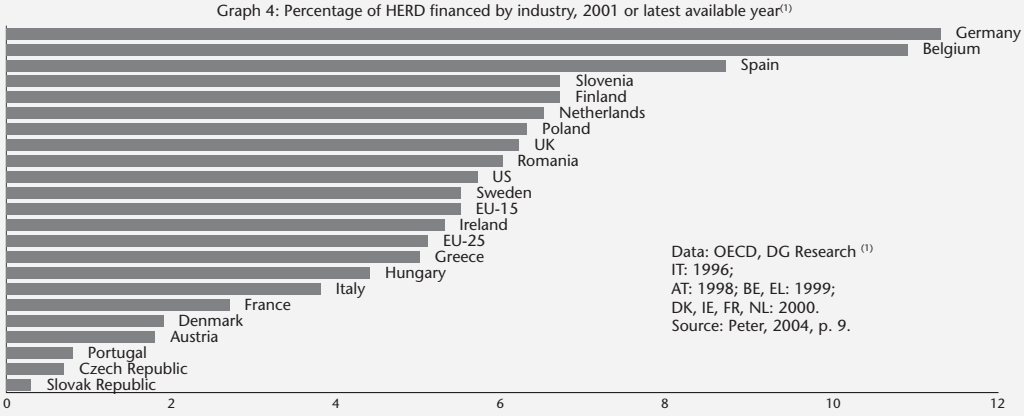
3. Funding from external partners

There is a general acknowledgement that effective R&I collaboration between universities and stakeholders is key to the development of the knowledge society and to increasing the competitiveness of Europe's economies. A well functioning knowledge circulation and technology transfer and the much advocated Scandinavian "triple helix" concept – R&D collaboration of higher education, business and the public sector (see below) – are high on all policy agendas whether at national or international level. The push for action in this field is part of all policy statements of international organisations, e.g., the EU, the OECD, international representative associations like EUA, EIRMA (European Industrial Research Management Association) and other relevant bodies.
Interviews with the institutions in our sample confirmed what OECD and EU data have indicated for years: Business investment in HE research is not yet very significant – with the exception of Belgium and Germany where it lies above 10%.

Graph 3: Change in proportional contribution to institutional R&I income 1995-2001



Graph 4: Percentage of HERD financed by industry, 2001 or latest available year[1]



3 Financial Management and Governance in Higher Education – an OECD/IMHE/HEFCE project OECD Report "Securing a sustainable future for HE", 2004 with related country reports.

In the survey, joint projects with industry ranked highest on the scale of strategies, structures and/or instruments to support innovation activities in universities. However, collaborative research with industry was not quoted as a very high priority with respect to the overall support to research, which correlates again with the relatively low business investment figures in HE mentioned above.

The issues identified with respect to innovation policy and practices in European HE institutions will be referred to in chapter IV.4.

COUNTRY EXAMPLE:
SWEDEN AND FINLAND

These are the only EU countries to have already reached the 3% of GDP for R&D line; they are a remarkable exception and offer an interesting model, having succeeded in creating consensus on the utility of investment in R&D as a way to maintain and create public wealth: "The 3% of GDP target is typically interpreted as implying public R&D expenditure of 1% of GDP and private (i.e., primarily industrial) R&D of 2%. The 3% target cannot be achieved by concentrating primarily on driving up public expenditure on R&D. Finland and Sweden are in the bottom three of all (15) EU member states in terms of the proportion of R&D spent by public sources. An overriding consideration is therefore how to create the facilitating conditions under which it is industry's interest to invest strongly in R&D."[4]

Finland proved a good example of how to incorporate the funding from different sectors:

"The national technology programmes are typically organised around research and industry projects, such that universities are charged with the responsibility of carrying out generic research projects and industry projects are organised around these."[5] Some basic prerequisites for such a successful triple helix experience can be identified in both countries: a national consensus on the importance of high quality education, a well functioning education system, and the presence of strong multinational companies in the high tech sectors.

4. International funding

For the universities of our survey sample, international research funding would typically be drawn from the EU Framework Programmes. The very small part received from non-European sources also puts a question mark towards the global scope of the research undertaken in European universities and may need further inquiry.

There is an interesting apparent contradiction between the actual international level funding volume which is still rather low – an average of 7% and an absolute maximum of 30% – and the high expectations generally expressed for a European and international R&D contribution. A vast majority of the surveyed institutions considered the European and international level as either "the most important" or "very important" for the development of their future R&I activities.

These high expectations are, however, often coupled with substantial scepticism and criticism of the bureaucracy involved in EU project funding. An underlying refusal of a "one-size-fits-all" approach which seems often to be associated with a "Brussels" approach was repeatedly expressed when referring to FP administrative approaches and procedures.

Collaborative research remains important and also much hope is placed in the creation of a European Research Council (ERC), as long as this new body is not going to be inhibited by bureaucratic control but will be entirely devoted towards supporting European research development.

4 European Academies Science Advisory Council, EASAC,: Towards 3% attainment of the Barcelona target, EASAC policy report 01, 2004.
5 Ibid.

5. Types of research funded: basic vs. applied research

Many public statements and policy papers refer to basic research as the grounding for leading edge knowledge generation and view the universities and public research organisations as the key providers.[6]

However, many universities in our sample were not able to deliver any specific data on basic research (differentiated from applied research) as they do not use this division in their research accounting. They confirm that the line between the two becomes so blurred and research activities so diversified that a separation, in funding terms, is practically impossible or no longer meaningful.

6. Interdisciplinary and inter-institutional research

Two other policies are currently strongly recommended to HE institutions on all European policy platforms: the support of interdisciplinary and of inter-institutional research activities.

The picture emerging from our survey does not provide a clear indication of major initiatives in these directions.

Surveyed institutions when asked about what would have the most impact on their R&I in the next five years put interdisciplinary collaboration only on a fourth rank, very close to inter-institutional cooperation, with changes in level and sources of funding ranked much higher at first and second rank.

When ranking their priorities for supporting research with strategies, structures and/or instruments, interdisciplinary research was ranked even lower: sixth after international projects. This may hint to persisting difficulties in crossing discipline boundaries.

On the other hand, in the interviews many universities showed a strong concern to create the critical scientific mass necessary for the increasingly tough global knowledge competition through building complementary inter-institutional links and networks.

The case of the Technical University Aachen (RWTH), Germany, combines a range of both national/regional and institutional policies and practices found in this survey, and hence is presented here to illustrate the above point and to lead into the following main chapter on institutional issues.

CASE STUDY:
TECHNICAL UNIVERSITY AACHEN (RWTH), GERMANY

RWTH Aachen University is a technical university, founded in 1870. It is located in the west of Germany, close to the borders of the Netherlands and Belgium, today called Euregio Maas-Rhine. During the past decades, this has turned out to be a strategic advantage for the University, supported by European Structural Funds and Interregio programmes.

Around 30 000 students are enrolled at RWTH Aachen University in over eighty degree courses, in nine faculties. The most popular fields of study are Engineering (40%) and Natural Sciences (24%), whilst the faculties of Humanities, Economics and Medicine count about 10% each.

About 400 professors, 1800 academic and 2200 non-academic staff are employed in 260 institutes, chairs, teaching and research fields as well as central units. The overall budget now exceeds 430 million €. The base line funding of the university budget derives from the government of the Land North-Rhine Westphalia (NRW). The University can supplement this with other funds by approximately 50%. The researchers are benefiting from different funding sources, e.g., industry, EU, federal government and DFG.

As partner in a university pilot project of the State NRW, RWTH Aachen benefits from a "global" thus flexible budget which allows the University management to support the institutes according to strategy and need. In this pilot project, NRW strongly supports the critical research mass approach with budgets for research and education: The dedicated budget for research is allocated depending on the number of professorships, the

6 See for example: Communication from the Commission – Europe and Basic Research COM2004914.1.2004.

number of finished doctorates and the acquisition of third-party funds. Hence, the more third-party funds a university is able to acquire, the more public money it receives. The University has a leading position amongst German universities in attracting third-party funding, approximately 140 million € in 2003 from both public and private sources. About 21 million € came from the 6th European Framework Programme.

RWTH Aachen University is a good example for a combined bottom-up/top-down research policy. It has developed strategic statutes, the so called "Leitbild," where the management sets guidelines for the University and its component parts. Some of those directives have a clear reference to the central role of research, and how to go about it:

Encouraging merit, quality and competition:

In order to respond to the increasing importance of research and external funding, central units support the research institutes of the University in the management of funding. This service is free of charge, because the central units are financed by the central university management.

In particular, the central service unit "Research Funding and Marketing" within the department "Technology Transfer and Research Funding" deals with the diverse funding sources. It collaborates closely with the European Liaison Office which offers special service regarding the EU Framework Programmes. Furthermore, the University is actively creating a professional patenting and commercialisation infrastructure.

One example for internal competition in research is the so-called "Drittmittelreport": an annual report on third-party funding, presenting both the benefiting institutes and the sources of funding. Following the merit principle, the volume of third-party funds is used as a criterion for additional money from the global university budgets.

Considerable freedom is left to the faculties and institutes to drive their own research agenda, marketing and acquisition and the corresponding costing of their projects.

Strengthening bonds with industry:

Newly appointed chairs are expected to have meaningful industry experience and bring their network contacts to the University's table. Moreover, large enterprises fund chairs for applied research within their domain at RWTH Aachen University (e.g., Ericsson, Philips, Grünenthal, Deutsche Post). Through this they gain closer co-operation with the researchers of the University. An active network of RWTH Alumni is another effective ways of tightening the bonds between the University and its socio-economic environment.

The University is taking part in several Competence Clusters of the region. These Competence Clusters are driven by industrial partners and strengthen inter-institutional research while raising the region's reputation for top level research.

Expanding interdisciplinary structures:

At RWTH Aachen there is consensus that complex problems almost never find their solutions within just one discipline. Interdisciplinarity is a prerequisite for problem-driven research. Hence, the University has created to date six Interdisciplinary Forums: Technology and society, Information technology, Materials science, Environmental sciences, Mobility and transport, and Life sciences. Its members are professors based throughout the nine faculties of the University. Each Forum has an executive who acts as broker within each field. They are coordinated at the department of Technology Transfer and Research Funding at the central services of the University.

The Forums have three main areas of activity: research, training and teaching (including interdisciplinary graduate programmes) and public dialogue. They have been able to attract several donors to the University.

IV. INSTITUTIONAL ISSUES

In addition to identifying the funding issues outlined above and despite the vast variety of funding systems, the data analysis and insights pointed to a number of common concerns and trends regarding policies and change processes at institutional level. They all eventually relate to the financial situation of the institutions and their research activities, and have a major impact on their performance and success in the future.

These common concerns and change factors could best be clustered in the following six areas: Governance, policies and strategies, funding and costing of research & innovation, innovation policies and practices, management of research & innovation, and related human resource issues.

1. Governance: a bottom-up top-down development

When asked about their highest priorities in supporting the institution's research policy the surveyed universities ranked equally high two diverging options: A centrally defined strategy and a decentralised approach. These priorities were followed by targeted funding for research priorities/ centres of excellence and by PhD based research.

What seems odd at first glance becomes understandable when looking closer into current governance issues: transition is the norm. While the European university reality is still predominantly characterised by a decentralised, bottom-up system, with strong faculties and an important role of individual researchers, change is underway to differing degrees. The increasing external pressure and demands put upon HE institutions (reduced public funding, increasing student numbers, higher costs of infrastructure, higher degree of accountability to the environment and stakeholders, a need for national and international profiling and competition – to name just the main factors) cause more and more institutions to provide the central leadership with more authority for setting research policy (mostly through a research committee or council together with the Rector).

A trend towards a stronger coordination role for centralised institutional research committees could be observed where such bodies exist, while their introduction was being considered in institutions which do not yet have such bodies. While most funds flow directly to the faculties where the responsibility for allocation mainly resides, there is also a tendency towards a more systematic central support for centres of excellence, driven both by external funding (national or regional sources related to specific political agendas) and by internal priority setting financed by overhead allocation or other internal funds. Such developments require a review of the traditional relations, a new "negotiation" between the central rectorate, faculties and individual researcher, especially as selection is often made based on the amount of previously successful third-party funding ("money follows money").

A shifting culture from a more collegial towards a more entrepreneurial and competitive climate can be perceived as being caused by several different factors:

- With a higher degree of financial autonomy (often meaning less public funds and more accountability) the university needs to increase its own funding resources in order to steer the research agenda and create academic visibility and an institutional profile, both nationally and internationally.

- A marked increase of competitive project funding which forces researchers to focus on external acquisition and competitive bidding. As a result, both responsibility and risk are on the rise.

- Especially with respect to Central and Eastern Europe, universities underlined that they were looking forward to more competitive bidding for funding whether that be on national or international level.

- The challenge – and dilemma – is to combine institutional research and revenue generation priorities by collaborating in the relevant networks and teams, while leaving the freedom to the individual scholar to follow his/her curiosity and creativity.

CASE STUDY:
STRATEGY BY CONSULTATION AT UPPSALA UNIVERSITY, SWEDEN

Research policy and strategy

Uppsala University is the oldest university in the Nordic Region and has presently almost 40 000 students. The University is actively promoting a profile based on the dual mission of a comprehensive university, as a centre of learning and a centre for internationally competitive research. In order to maintain and enhance the competitiveness and the quality of research at an international level as well as to retain a balance between the faculties, the University has developed an institution-wide research strategy based on consultation with the faculties and other relevant parties. Research policy and strategy are seen as tools to support these objectives, attract external funding and to measure the quality and level of institutional research.

The strategy is based on a wide consultation process within the University. The resulting strategy report combines the interests of the individual researcher and the objectives of the whole institution. This strategy report is based on an analysis of strengths and weaknesses of all research carried out and research related activities. As an example, on the linking of research and teaching, the Senate asked all faculties and related research groups to analyse the research production and education at bachelor level over a five-year period and subsequently make recommendations on how to hitherto save 5% of the funds dedicated to faculty research and 3% of the funds for the bachelor education. Furthermore, the faculties and departments were asked how to best reinvest the money. The consultation included the administration and the library.

The results were sent to three external university partners for advice. Based on this advice the Senate and student organisations drew up a plan for the redistribution of funds which was sent to the faculties for reactions. The senate eventually adopted the final strategic plan.

Evaluation and "measurement"

With regard to the evaluation and "measurement" of the research carried out, the University has at present not yet found an approach beyond the traditional citation index and peer review systems. Under current accounting law all information about external funding rests with the faculties. The central level is aware of the present research activity, but does not collect statistical data systematically and there is no general internal quality measure of research delivered.

Strategic funds

Since 1998, Uppsala University has slowly accumulated a strategic fund at the disposal of the Rector. These are used, for example, to create new Chairs which support the university strategy. A number of research areas have been reinforced along the pattern of "money follows money," but a proportion of the funds have also been allocated to specific areas, e.g., special doctoral grants for women.

Both a strategic plan and fund are seen as powerful tools to enhance and develop research at the University in an internationally competitive environment. The plan forms the basis of a demand for further government funding of university-based research and innovation.

The University has applied for 45 million € divided as follows (in million €):

Post doc training	8
PhD training	6
New Chairs	15
Links between Chairs and Bachelor education	4
Infrastructure	4
Support for innovation and the research holding	8

2. Policies and strategies: building critical mass and networks

All information indicates that the competition for critical research capacity is intensifying everywhere and a landscape of high profile, strongly research driven institutions vs. the more teaching oriented institutions is rapidly evolving. Those universities who dispose of a highly qualified and profiled researcher pool are able to attract substantial external funding and receive substantial chunks of the available public research funding in return.

However, many institutions are well aware that they will not be able to operate on these levels. Those who have not reached or do not have the academic and financial muscle to build this critical scientific mass increasingly seek inter-institutional cooperation and look towards international funding to participate in collaborative scientific networks. Expectations regarding European support are particularly high in the new member states, but also Western European universities continue to hope for more incentives and opportunities at European level.

Internal funds, or a mix of external and internal resources, are used to apply a variety of policies, in order to finance the chosen research strategies, *inter alia*:

- Matching the third-party funds acquired for determined research areas and projects (supporting or developing areas of excellence);
- Supporting humanities and social sciences research in an effort to balance strong external funding to natural sciences;
- Inter-disciplinary or inter-institutional projects, fostering new forms of cooperation;
- Recruitment and retention of scientific staff and improvement of doctoral studies;
- Establishing central research support offices to better coordinate and professionalise the bidding processes and disseminate relevant information.

Such activities may be partly financed from funds received from overheads charged to other projects (see also 3.Funding and costing).

The tension between a collegial and an entrepreneurial culture is tangible here too.

Universities have to strike a balance between:

- using the available internal resources as a "solidarity fund" for those disciplines who do not benefit from consistent external funding flows;
- creating an incentive tool for promising initiatives;
- rewarding achievement in attracting third-party funding.

CASE STUDY:
INTRODUCING A COMPETITIVE RESEARCH CULTURE AT THE UNIVERSITY OF TRENTO, ITALY

Located in the north eastern part of Italy in the medium sized town of Trento, the University belongs to the younger academic institutions in the country. It emerged from the 1962 locally founded Institute of Social Science, became a public university ten years later and received the state university status with special autonomy in 1982.

The current Rector of the University has made the most of the possibilities for more autonomy, self-management and competition offered by the university reforms introduced in Italy since the mid-nineties. He engaged in a major internal reform process which included a new, multiple-focus strategy for research and development/training, the development of new internal rules and a new culture of governance, accountability and entrepreneurship, the involvement of stakeholders as partners (industry, local & regional bodies).

Today, the University of Trento is a small-medium sized institution of 15 000 students (396 PhDs); 457 academic and 575 administrative and technical staff in six faculties, 13 research departments with altogether 35 research labo-

ratories, with an overall budget of 110 million €. It has been ranked first, or in the first rankings, from amongst the small sized Italian universities (up to 20 000 students), since 2000 by CENSIS, the Italian Statistical Office.

In Italy, the funds for research and technological development derive basically from two main sources: Government and the European Union. The main funding source for universities is the government, with the Ministry of Education, University and Research offering four main research funding lines: for national interest research, for basic research, for applied research activities (with industry) and for research in cooperation with public bodies.

Within this framework, Trento has developed a strategic approach to an institutional research policy using a combination of externally steered incentives and internally supported research activities. In 2003, some 7 million € were allocated to selected research areas. This approach, though creating tensions in the transition from a traditional academic consensus culture to a more competitive one, has been an important and successful pilot experience in Italy. Business and other regional funding has increased considerably due to the more collaborative strategy of the University, public funding has been exploited more effectively, and international networks expanded.

As a first step, teams of external international peers were invited to assess the quality of the research activities of each discipline and department of the University and compare them with leading centres in their field world-wide. Upon this analysis of strengths and weaknesses, a map of areas of interest for internationally competitive research was established and a matching fund policy applied: Those who bring in external funding from competitive sources will have their acquisition matched to different degrees by the university fund. A basic amount is granted to all research departments taking into account: the number of researchers, the number of PhD students, and the mean amount of the last three-year external funding. Start-up and bridge money are also granted in line with the suggestions from the peer review teams.

To support the creativity of individual researchers, optimal use is made of available public funding while achieving a triple benefit: The Ministry of Education releases 130 million € p.a. to all researchers across the country in a bidding exercise. Applications are submitted directly from the researcher to the Ministry and funds proceed directly to the researcher, if selected. Funds are assigned on the basis of peer evaluation and on a matching fund scheme. At Trento, all researchers are invited to participate without discrimination. Those who decide to apply must then identify their financial needs and the University supports all applications with the required matching fund that are transferred to the researcher if successful. Submitting the maximum number of applications means the greater chance for a high number of projects selected which in turn will provide both support to the researchers' activity and development as well as a return on investment to the University.

Introducing Graduate Schools and fellowships with an investment of 3 million € p.a. including grants for forty to fifty PhD students per year constitutes another systematic move towards building critical research mass – a particularly important decision in a country where doctoral education is traditionally under-funded and a scientific career in an academic institution rather unattractive.

Another important further step towards more efficient university management was the introduction of an analytical accounting and a management system (SAP) which makes it possible to move towards a full cost model by identifying costs at department level and making overhead costs more transparent. A flexible overhead policy is applied depending on the cost structure of the department involved.

3. Funding and costing

The shift in types of funding towards more competitive and performance related project funding is slowly creating a culture change in many parts of the universities. Individual researchers and departments have to develop a more competitive and entrepreneurial attitude and be more accountable for their performance.

While, on the one hand, this culture change generates considerable dynamics and creativity, a series of concerns, on the other hand, were flagged in several institutions across the continent:

- An increase in workload related to acquisition and project management can inhibit the career development of the (junior) researcher as there are insufficient professional staff to take care of this, and limited "skills training" for the researchers: too much time is spent on acquisition and management and too little on the actual research work involved (see also section V).

- The danger of a predominance of third-party funded, short term applied research projects which worked to the detriment of long term, basic research projects (and related necessary infrastructure investments) owing to the need to balance shrinking public funds.

- A dependency (higher than 50%) on such external funding may result in quality decline and eventually put the institution at risk due to volatile income streams and insufficient cost coverage.

In the UK, often at the leading edge when it comes to the professionalisation of the academic institutions, negative effects of this type have already been experienced.[7] Based on longstanding experience with the extensive and sophisticated public Research Assessment Exercise (RAE), it has been acknowledged that, in the long term, quality research capability in HE institutions can only be developed, maintained and improved if a proper costing of the activity is carried out and a realistic price charged to the client or funding agency.

A Transparency Review of Higher Education Funding has been carried out in the UK since 1998, and produced methods to calculate the full economic costs of university activities. As a result of some rather daunting outcomes of the review which showed that, for example, publicly funded research was 40% under-funded (2001), UK HE institutions will seek, in future, to introduce costing of their research projects at 100%. With external funding growing, transparent costing is crucial to the survival of institutions. Governments will increasingly have to provide the framework in which to manage this, and institutions will have to make choices on how to implement the system. Greater transparency in costing systems should help to ensure that the research base will become sustainable in the long term. However, the "capping" of the volume of research funding for many universities may bring the disadvantage that industry (both large, and particularly SMEs) funding may diminish because the "price" of university-industry collaborations will rise.

The consequences of such major reforms in the UK are already a matter of intense discussion and review for UK Government and HE Funding Councils. While the introduction of more managerial and quality driven systems and processes in UK HE institutions improves their performance and financial viability, it also shows initial imbalance effects in terms of a strong funding concentration on a relatively small number of institutions while the majority has to manage with less. Continental European policies are, as yet, far from the UK approach and there are very mixed reactions to it.

As far as the information from this survey illustrates, costs of research are only partly covered by official funding sources and the allocation policies for overhead costs vary enormously, and are also dependant on limits set by public funding agencies, including the EU. In the survey sample, a range of variance from 0 to 20% of research project funding to cover institutional overhead costs could be found. Furthermore, it is often unclear on what basis these overheads are calculated and how they relate to the actual cost structures.

7 HEFCE England report for OECD-IMHE, 2003, and Richard Lambert report on business-university collaboration, December 2003.

Many universities are aware of the unsatisfactory situation and are reviewing the scope and size of overhead charges in the context of a general overhaul (or introduction) of management systems for the whole institution. A specific pattern could not be detected.

*Some institutions, such as the **Université de Rennes** which is a strong French research university and closely linked to the major national research organisations, are introducing analytical accounting and know their cost levels, but apply a flexible pricing scheme depending on the type of client/funding agency and upon negotiation (i.e., 100% to industry contracts, flexible with major public research partners).*

On a European level, a common definition of meanings, i.e., a common terminology when dealing with these complex issues, will be crucial for the success of the ERA.

EURAB (the European Research Advisory Board)[8] recently made recommendations for an initiative to reach full transparency of costs and work towards a generally accepted accounting system for research. It has also been strongly advocated by various stakeholders during the Liège Conference (April 2004) that the sustainability of Europe's research lies to a great extent in its capability and political ability to introduce a cost-awareness and a costing competency in its HE institutions as well as an acceptance from business and industry, but especially also on the public side, to pay an adequate price for the knowledge generated.

CASE STUDY:
FUNDRAISING AT MASARYK UNIVERSITY, CZECH REPUBLIC

Masaryk University is a comprehensive university with 26 000 students and nine faculties. The University has made a concerted fundraising effort to improve the infrastructure and has been able to build a new campus for Science and Medicine with external funding from the European Bank for Research and Development (EBRD) and the Phare programme. This new environment is expected to attract better quality staff and doctoral students.

The University does not, at the moment, apply a top-down research policy, but relies on a decentralised approach and on creating a research-friendly context. There is no baseline funding for research – only 4% of the government funding for the institution is dedicated to research. The funds for basic and applied research are provided by government or different government programmes for which individual researchers, teams and faculties apply directly. The University hopes that the fund raising success with the new campus can be extended to research funding and looks forward to more opportunities for competitive funding both nationally and internationally.

8 EURAB: Some Issues Affecting the Future of University Research in the EU, 2002.

4. Innovation: significant activity – small funding – low innovation culture

The survey provided insight into four main aspects related to the area of innovation funding and management in universities: types of activities, funding, culture, and concepts/strategies.

4.a. All universities have some innovation activity underway, many are still in a first development phase of trial and error, and some have very effective policies in place.

Once again, it is noted that the variety of realities is vast. Far ahead in terms of integrating the role of innovation appears to be the UK where the commercialisation of knowledge and the management of technology transfer is strongly supported and well developed (though business sector involvement is rather low there as well). Knowledge and Technology Transfer Offices often generate substantial revenue for UK universities.

The three main reasons for innovation activities at universities are:

- regional development
- societal & scientific enhancement
- commercial success / revenue generation

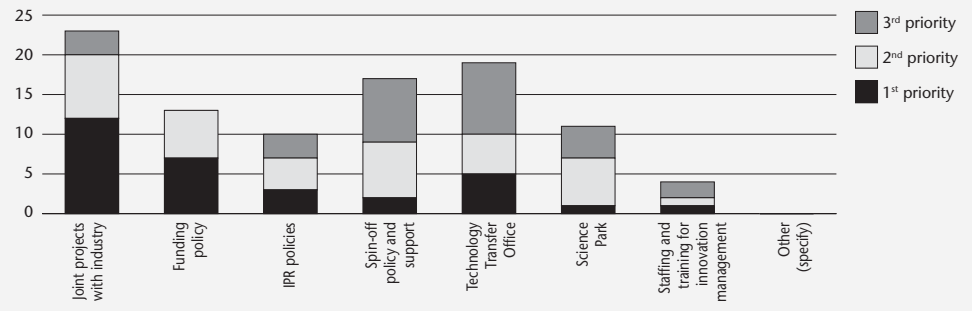
In the UK the latter reason is certainly a more important factor than in other European countries, where often it does not seem to be even yet a strategic objective. In most of the universities contacted, innovation projects are niche activities driven by life sciences or technical disciplines, either to serve regional partners, with the help of local governments, or to create incentives for young researchers to develop their concepts.

the field of innovation and its management. But many of these activities in traditional universities are still in a pioneering trial and error phase. This is certainly partly due to the often still unclear and unattractive conditions concerning intellectual property rights, the absence of a European patent system and a much felt absence of supportive seed money schemes and venture capital availabilities.[9]

Recommendations from the Pan-European Network of Technology Offices linked to Public Research Organisations and Universities (ProTon) in the context of a joint project for "European Guidelines for Responsible Partnering" between universities and industry act as a useful summary of many views expressed throughout the conduct of our survey: "The complexity and cost of the patent system in Europe is much less appropriate to university-based inventions than the US patent system and is acting as a barrier to innovation from public research. It lacks a grace period, a provisional patent system, a continuation-in-part (CIP) system and is several times more expensive. ProTon Europe is convinced that these differences account for a large part for the much lower patented inventions coming out of public research. Harmonisation issues at worldwide level need to be addressed as a matter of urgency."

Joint projects with industry are, therefore, not surprisingly still at the top of the priority list for universities when asked to rank strategies, structures and instruments for the support of innovation. Technology transfer offices, funding policy and spin-off policy follow at quite a distance (see chart below).

Graph 5: The most important R&I strategies, structures and/or instruments in supporting the institution's innovation policy



9 Cf. ProTon, EIRMA/EUA/EARMA report 2004.

Key questions for universities that engage in innovation initiatives is whether (i) to keep the whole "value chain of innovation" in-house, from the identification of the new knowledge through to the search for appropriate partners for the patenting and commercialisation (e.g., the Université Libre de Bruxelles changed to this option, while the neighbouring Université Catholique de Louvain created a company, Sopartec, which has operated successfully in the innovation arena), or (ii) to create a separate university-linked structure (see case of Edinburgh University), or, possibly (iii) to outsource the process completely to an external partner (University of Siena). In reaching decisions, much depends obviously on the national legislation and how supportive the legal context is for innovation ventures.

4.b. Funding for innovation activities is not generally high, with very limited amounts of university budgets allocated to them.

In most reviewed cases, funding for innovation, its transfer into a product or service and its commercialisation is funded by the University at the early stage, and later financed in partnership with local or regional public bodies. Science parks are often the result and are of varying success. Business or industry is less often a partner in such investment ventures. This seems often due to a sheer lack of communication between SMEs and universities, as well as to a certain degree of risk avoidance on the part of business/enterprises.

Certainly, availability of seed capital/venture capital is seen as a core problem and a major barrier to a swifter and more dynamic development in this area. Some cite the risk aversion of local banks also as a major obstacle.

4.c . An innovation culture is strongly developed in technical universities – In traditional universities it is not an integral part of the culture.

According to our study, a clear difference has to be made between "traditional" universities and technical universities who by their very nature have a closer collaborative relationship with business and the translation of their research production into application, often through well organised Technology Transfer Offices. While it is more difficult for them to "prove" research performance through the classic criteria of citations and publications, they have developed an innovation culture much more deeply across disciplines and usually have a solid track record of knowledge circulation (rather than transfer) including spin-offs and patents. Business funding is higher and often there is a strong regional rooting.

At many of the classical multidisciplinary universities included in the survey, innovation as an implementation culture is typically limited to engineering, natural and life sciences, and not integrated within the rest of the institution. But, of course, this is an observation from the limited survey sample and should not be over-interpreted as a general rule.

4.d. Many institutions simply seem to lack a concept for innovation

Given all of the above considerations, it is not so surprising that often, the impression was given that institutions did not have clear objectives for their innovation policies. Nevertheless, this impression is changing with intellectual property rights now moving from the individual researcher to the institution in many countries. This will prompt the need for an institutional innovation strategy. Rules of the game and codes of conduct need to be established and expectations of performance formulated. At present, this seems to be rather the exception than the rule in the decentralised cultures of universities.

As a result, apart from the UK, very little evidence was found of innovation initiatives' track records, performance objectives and returns on investment partly because it was too early to have any data and partly because they were not gathered in the first place.

AN INTERESTING EXAMPLE FOR OBJECTIVE SETTING WAS FOUND AGAIN AT RWTH AACHEN:

The Technical University would like to see 2% of their graduates create their own companies.

Still, even in the well established Office for Technology Transfer and Research Funding of the Technical University Aachen, the office managers would not necessarily know about all the external contacts and activities driven by the members of the various faculties, nor, so they claim, would they need to know as long as the final results enhance the knowledge circulation.

CASE STUDY:
UNIVERSITY OF EDINBURGH AND ITS EDINBURGH RESEARCH AND INNOVATION (ERI) OFFICE

The University of Edinburgh is part of the UK system which consists of a dual support scheme: The Higher Education Funding Council – in the Edinburgh case, the Scottish Higher Education Funding Council (SHEFC) – covering academic salaries, accommodation and computing, the Research Councils providing funding to support the research infrastructure and the Higher Education Innovation Fund (HEIF) providing funds jointly by the funding councils and the Office of Science and Technology (OST) for innovation and links with business and the community. The dual support system is currently under review.

At Edinburgh, the double role of "public good" and "market operator" is explicitly outlined in the Strategic Plan which the University sets up for five years and which is updated annually. Financial sustainability and profitability for the institution are spelled out just as the "usual" university goals of pursuing excellence and quality.

While one of the objectives in pursuing its goal of Excellence in Research is the "attempt to ensure that the full economic cost of research activity is recovered from sponsors," the University also states its goal very clearly: "Commercialisation and Knowledge Transfer" operates by "[i]ncreasing the use by industry and other external organisations of its technologies, research and expertise to create social and economic benefits, while generating income to support research and education.

Commercialising its research base in an effective manner, for example, by increasing both technology transfer and research exploitation through licensing and spin-outs, and optimising the local economic impact of its research."

To achieve these goals the University has created a research support and commercial liaison office, Edinburgh Research and Innovation (ERI), which offers a comprehensive range of pre-award support and commercialisation services to the university staff. The office also promotes and commercialises the results of research, developing collaborative links with industry, through collaborative research technology licensing and consultancy services.

ERI operates as a separate office with its own annual plan and report. With 53 people employed, it is one of the biggest Research and Technology Transfer Offices in the country and in Europe, with a budget of 2.6 million GBP (3.9 million €) p.a. The commercial perspective prevails over the other goals, as there are regional economic benefits and social and scientific enhancements: the office has a good portfolio of income from consulting, management fees (projects) and royalties which can be extremely lucrative when a patent is successful (recently 37 million GBP were made from one patent). The royalty flow is divided as follows: 30% for ERI, 35% for the department where the innovation originated and 35% for the researcher. The profit that the office brings in is channelled back to the University.

Unlike many of the Continental offices, there are clear performance criteria and checks.

Key performance indicators are the number of research awards as well as the number and commercialisation of disclosures. The office runs a monthly check of the number of licenses and patents, companies founded (on average one a month) and royalties generated.

Although training of those who work with the office is mainly done on the job, employees also attend courses in the UK and USA. In addition, post graduate Science and Engineering students receive training in entrepreneurship through the Scottish Institute for Entrepreneurship – a virtual inner-university training unit.

It can be observed, therefore, that well-functioning Technology Transfer Offices will be operational mainly in strong research universities. However, it is important that the Institutions set clear objectives for the offices and recognise that they are a long term investment whose primary goal is economic development.

5 . Management of research and innovation: high need for professionalisation

The need for institutions to clarify their cost analysis and management with a view to sustaining long term high quality research activities has been emphasised as an essential part of a general reform of the institution's financial management, allowing for more transparency and efficiency in accounting for its activities.

Beyond the financial management requirements a strong need was expressed across all universities for more professional support of, and training for researchers and the relevant administrative staff.

5.a. Management support

The steadily increasing amount of third-party funding through competitive bidding has generated the need for a range of skills and services: for example, more proactive marketing of research capacity, communication and negotiation skills, (international) project management, contact brokerage, legal knowledge and financial management. Especially in large-scale international projects these skills are crucial to achieve success, but not enough training is being provided with the consequence that much time and funds are wasted because of ineffective management.

Almost all universities complained about the increasing demand on researchers in dealing with all these aspects of research management, and its impact on their "core" activity of conducting the research itself. Many identified an inherent danger of under-utilising scientific capacity and slowing down academic career development, especially for young researchers, where most of their time was spent acquiring and managing projects rather than furthering their scientific work. Others acknowledged, though, that these additional skills would greatly advance their range of experience, and open new opportunities for researchers.

Two options for meeting this demand were explored:

- The creation of a central unit which offers services to the whole university research community, from the screening of available public or private funding programmes, to helping put together appropriate bids, to seeking legal and technical advice and administrative support.

- Regular training and skills development for the academic and the administrative staff in order to better cope with the new demands of their professional career.

Contradictory evidence was discovered in this regard, which indicates, once again, that many institutions are in a state of transition and reformation:

Although only a few of the surveyed institutions regarded Central Research Offices as a prime tool to support their research activities, many of those interviewed had established them or were in the process of doing so. These often had "start-up" problems of gaining acceptance in the institution and in the individual faculties. Those who have been able to establish a role for themselves reported increased attention and demand for their services.

Although the lack of research management skills was an issue practically everywhere, the institutions, when asked to identify their research support priorities, ranked training (for innovation management) as very low. This is linked also to the question of research career development.

The University of Heidelberg, Germany, located in the Land of Baden-Württemberg, is one of the oldest European universities and one of the top research institutions in Germany. The need to adapt to internationalisation and competition – not least fuelled by the political High Performance Initiative for HE and R&D in the country – and the strong reform drive of the State of Baden-Württemberg have caused a change process in this traditional decentralised academic culture. A strategy is being developed to make the substantially increased third-party funding activities more effective, through more professional personnel in management and marketing. Also, the costing issues will be addressed as part of an overall reform towards more accountability in the organisation. It is planned to recruit a managing director for each of the fourteen faculties in order to better manage and coordinate the activities.

5.b. Quality assurance and performance indicators

Specific quality assurance and performance evaluation for R&I activities are not the general norm and are mostly input/output oriented, but have little process orientation. Once again, it seems that the traditional processes of research selection and evaluation are not yet orientated towards the development of more diversified R&I activities.

Internally, research projects eligible for funding are usually screened by internal Research Councils or Committees. When competing for external funding, national or international peer review teams will assess the proposal on the criteria of scientific substance and creativity, coherent project management, success records of the bidders (publications, citations, successful previous funding, etc.).

Once the project was accepted, little evidence of continuing quality control of the activity was found, let alone of the eventual performance in terms of reaching set goals and objectives other than publications and citations resulting from the works. Here, the Technical Universities have a

more difficult situation as many of their disciplines work less with an academic citations record and more with project implementation results.

The University of Geneva, Switzerland

The University is engaging in the adaptation of a more sophisticated performance indicator system from their medical faculty to other faculties. Indicators in the Medical faculty are not only bibliometrical and third-party funding based, but also take the teaching loads of the bidders into account.

At the University of Rennes, the knowledge transfer of the research into teaching is a criterion for quality.

An important trend also often mentioned is the change in selection criteria for projects: public acceptance and communication, social and societal dimensions are becoming increasingly important criteria.

5.c. Skills development

An issue mentioned in practically all surveyed universities is that of a lack of professional (administrative) staff, i.e., people who have the skills and competences to cope with the new demands made on HE institutions in terms of management, not only of research activities. This is true also for the competence and skill development of academic researchers.

An interesting though probably typical contradiction emerged in this respect: while skills training was identified as in dire need of improvement, only a few institutions had (small) budgets or systematic activities allocated to such development.

The University of Siena, Italy, in a concerted effort to improve their researchers' skills, has created a training consortium for administration/management and project management together with nine Central and Northern Italian universities.

6. Human resources issues: growing scientific capacity under adverse conditions

All universities surveyed were well aware of the urgent need to increase their scientific capacity in the near future. The main drivers of this need being: The rapidly increasing demand for scientific knowledge in a more competitive and more interdisciplinary context; and the ageing of the researcher population in almost all countries as a considerable percentage will retire from academic institutions in the coming years.

This human resource aspect of university-based research and its funding displays multiple facets which cannot be exhausted here. In addition, the legal situation for public sector/university staff recruitment and administration obviously differs enormously across Europe.

In the survey, two main and interlinked common issues were encountered:

- the need to attract PhD students
- problems of retention and career development for young researchers

6.a. PhD students

The survey sample did not allow for a consolidated picture but it became evident that most universities have increased their PhD student numbers over the past five years. Asked for their priorities in research supporting policies the institutions placed PhD based research high (third) on their list. Developing doctoral schools is a particular concern in the new member states where universities need to rapidly grow more research capacity.

There are great differences in national funding for doctoral students across Europe and still too little initiatives to support a European dimension of PhD programmes. EUA is at present conducting a major project, supported by EU DG Education of the European Commission, which gives fifty universities across the continent the opportunity to deepen different aspects of PhD education in a network approach. Initial results and recommendations were presented at the EUA Conference in Maastricht in October 2004[10] and final outcomes will be reported in June 2005.

10 See EUA Conference documentation at www.eua.be.

6.b. Retention and career development of researchers

OECD figures show that Europe produces roughly the same number of PhDs as the US but are then not able to retain them or to produce the same kind of scientific output. While there are many diverse reasons for this phenomenon, one reason confirmed by this study is certainly the work context. To a varying degree, low financial remuneration, inflexible or unattractive contracts and working conditions, especially for married doctoral candidates, and an absence of career development prospects often make universities a rather unattractive place for young researchers. One extreme would be found in the new member states where (not only young) professors may be forced to have two jobs in order to make a decent living (with an obvious impact on their research intensity), but also in Southern Europe the situation of researchers is often precarious and induces them to rather move on to business or other occupations.

There was a generally expressed desire (from institutions in different countries and legal environments) for more flexibility in drawing up contracts and offering incentives (most universities have already developed a certain degree of creativity in doing so when necessary (but often in a sort of "grey area"). Linked to this is the demand for greater freedom in recruitment of staff and the management of human resources. In some countries, posts are still granted, administered and remunerated directly by the Ministry, leaving practically no room for the manoeuvring of human resources to the institutions themselves.

CASE STUDY:
STAFF MANAGEMENT AT THE UNIVERSITY OF TARTU, ESTONIA

The University of Tartu is the main university in Estonia. Relatively small by European comprehensive university standards (18 000 students), it has managed to become a highly competitive institution on a national, and soon to be, on an ERA level, building on a high institutional autonomy and strong management structures.

The Estonian government has abolished the division between Academies of Science and universities, traditional in the Soviet bloc countries, and has integrated basic research into the university mission – while not providing baseline funding for it as is still the norm in CEE countries. Thus, Tartu has to rely almost entirely on external funding for research.

Staff management

The University has systematically promoted doctoral studies: the number of doctoral students has more than doubled over ten years (from 69 in 1991 to 149 in 2001). At present, the Ministry of Education is carrying out pilot projects for doctoral schools attached to the University's several national centres of excellence. The most successful ones are expected to have doctoral schools established there.

University staff can be employed in a flexible way, either as sole researchers, as lecturers or a combination of both. Employment contracts run for no longer than five years which allows switching between activities depending on the flow of funding. Life-long contracts have been abolished and the academic staff – be they teaching or research-oriented – are being appraised on their achievements before contract renewal. International experience is a prerequisite for full-time (five-year) employment. A special scheme to avoid brain drain and to achieve brain gain (through PHARE or other future European sources) has been set up.

Research Management

The University of Tartu has created two different units to manage applications for external funding: the Research Management Office (for national sources) and the Institute of Technology (for innovation and international cooperation). The Research Management Office will provide the classic functions of funding screening, information to researchers, support with applications and quality check. The Institute of Technology puts an emphasis on the training of scientists and future entrepreneurs in collaboration with the national centres of excellence in the University. The unit builds on experiences with the Tartu Science Park, founded in 1996, and other regional innovation initiatives. These activities are still at a development stage and are not yet significant due to lack of funds and infrastructure. It is hoped that the European Structural Funds will provide more support.

V. RECOMMENDATIONS

The results of this study and the related reflections have lead to the following recommendations for action, addressing both the European Commission, the broad community of Higher Education institutions and, most importantly, the individual institutions themselves.

The major deficiency dealt with in the research was the lack of the basic tools for a European analysis: comparable and compatible data and a commonly defined and understood terminology of research financing and management.

Thus, a fundamental, strong recommendation to all stakeholders is two-fold, as follows:

1. Develop a common ground for research management terminology by identifying the key notions and processes and defining them, thus creating the basis for:

The development of a set of data and indicators understood and accepted on the European and international level for the comparison of research and innovation activities, funding flows, allocation and performance modes. This should entail:

- At the institutional level, a reform of the universities' information collection procedures and the establishment of a central recording system for key data.
- At the national and European HE community level, an agreement on the scope and type of data to be made comparable and compatible.
- At the Union level, the support to such initiatives in close consultation with the European HE community and the HE institutions as well as international stakeholders.

2. Aim to develop European wide comparable cost and accounting systems for research (as part of overall HE institutional finance management guidelines)

The study underscores the relevance of the recommendations of EURAB (European Research Advisory Board) for an initiative to reach full transparency of costs and work towards a generally accepted accounting system for research. The sustainability of Europe's research lies to a great extent in its capability and political ability to introduce a cost-awareness and a costing competency in its HE institutions as well as an acceptance from business and industry, but especially also from the public to pay an adequate price for the knowledge generated.

A further recommendation applies to the HE community and its representatives to engage in such an initiative, drawing on the experiences already made in countries such as the UK and elsewhere, and to the European Commission to support such initiatives proactively.

3. Expand European funding sources and opportunities for cooperation

The high expectations of the European HE institutions for more and broader European level research funding should be taken up in a serious and concerted way by governments, international agencies and companies: both in terms of the implementation of a European Research Council and other Research Framework Programme instruments, but also in terms of increased means and opportunities to form European and international bilateral or multilateral networks, and support to inter-institutional strategic cooperation and innovation, and university-industry or triple helix partnership models.

4. Improve professional development conditions in universities, in particular for researchers.

Universities need the best people if they are to master the change process, succeed in international competition, increase research quality and output and meet accountability needs.

A recommendation to government administrations is to clarify and improve, where necessary, the financial and administrative positions of PhD students and young researchers, and to provide universities with the opportunities, freedom and flexibility in recruiting, remunerating and developing their staff, both academic and administrative.

A recommendation to the universities is to allocate more funding and attention to the development of their young researchers, to their career and managerial skill development. The same applies to the administrative staff involved in research and innovation management.

A recommendation to the national and European HE community is to aim towards developing human resource development policies and initiatives in support of the individual institutions.

VI. APPENDIX: PARTICIPATING INSTITUTIONS

University of Vienna, AT
University of Ghent, BE
KU Leuven, BE
Université Libre de Bruxelles, BE
Institute of Chemical Technology, Prague, CZ
Mendel University of Agriculture and Forestry, Brno, CZ
Masaryk University, Brno, CZ
Brno University of Technology, CZ
Czech Technical University in Prague, CZ
Technical University of Ostrava, CZ
University of Southern Denmark, Odense, DK
University of Tartu, EE
Åbo Academi University, FI
University of Rennes 1, FR
University of Franche-Comté, Besançon, FR
Technical University of Aachen, DE
Hamburg University, DE
Heidelberg University, DE
University of Crete, GR
University of Pécs, HU
University of Iceland, IS
University College Dublin, IR
University of Trento, IT
University of Siena, IT
University of Messina, IT
University of Latvia, Riga, LV
University of Twente, NL
Adam Mickiewicz University in Poznan, PL
Technical University of Lodz, PL
University of Porto, PT
Alexandru Ioan Cuza University, Iasĭ, RO
Slovak University of Technology in Bratislava, SK
Technical University of Kosice, SK
Autonomous University of Madrid, ES
University of Uppsala, SE
University of Geneva, CH
Edinburgh University, UK
University of Bristol, UK
Heriot-Watt University, UK

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